Stormwater Annual Report
for the City of Eugene, Oregon

Permit Year 2014 July 1, 2013–June 30, 2014

Submitted by: City of Eugene

Submitted to: Oregon Department of Environmental Quality

December 1, 2014

National Pollutant Discharge Elimination System (NPDES) Permit 101244

Eugene

Stormwater Annual Report

Status Report for Permit Year 2014
(July 1, 2013 – June 30, 2014)

Submitted to:
Oregon Department of Environmental Quality

Submitted by:
City of Eugene

Submitted in Accordance with the
Requirements of National Pollutant
Discharge Elimination System (NPDES) Permit
Number 101244, File Number 107989

December 1, 2014

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1 INTRODUCTION

Discharges from municipal stormwater systems into waters of the United States are regulated by the federal Clean Water Act and National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System permit ("MS4 Permit") program. The City of Eugene has operated its stormwater program under a MS4 permit since it was first issued in November 1994. Annual reporting is a requirement of the permit. This document, *Year 2014 Stormwater Annual Report*, is Eugene's nineteenth annual report. Herein referred to as the "2014 Report," this document fulfills the requirements of Schedule B, Item 5, of NPDES MS4 Permit Number 101244, File Number 107989, issued December 30, 2010.

Section 1 of this report includes background information and a history of Eugene's stormwater MS4 permit (Section 1.1), a brief summary of the MS4 permit requirements (Section 1.2) and an overview of the contents of this report including relevant permit conditions (Section 1.3).

1.1 Background and Eugene's NPDES Permit History

Discharge of industrial wastewater, municipal wastewater, and stormwater into waters of the United States are all regulated through the NPDES permit program which is authorized by Section 402 of the federal Clean Water Act. In the state of Oregon, the NPDES permit program is administered by the Oregon Department of Environmental Quality (DEQ) on behalf of the U.S. Environmental Protection Agency (EPA). With regards to stormwater specifically, NPDES permits are issued for discharges from municipal separate storm sewer systems, or MS4s, which are publicly owned or operated facilities including streets, curbs, gutters, catch basins, ditches, manmade channels and storm drains that are used for collecting or conveying stormwater.

Sources that need to obtain a MS4 permit are classified as either "Phase I" or "Phase II." Phase I MS4s are those with populations greater than 100,000, while regulated Phase II (or "small") MS4s serve populations less than 100,000 and are located within Census Bureau-defined Urbanized Areas. Federal regulations also provide EPA and the states the discretion to require other MS4s outside of Urbanized Areas to apply for a permit. In 1990, the EPA published its "Phase I" regulations governing stormwater discharges from larger municipal systems, and these municipalities, including Eugene, were required to apply for a MS4 permit for their stormwater discharges.

The City of Eugene and Oregon Department of Transportation were co-permittees on the City's first term permit which was issued in November 1994. ODOT ceased to be a co-permittee with Eugene in April 1998, following a request to DEQ that the organization be able to submit one state-wide annual report. The City's first-term MS4 permit, scheduled to expire November 1999, was administratively by DEQ until the second-term permit was issued in March 2004. The second-term MS4 permit, scheduled to expire in February 2009, was administratively extended by DEQ until the third-term permit was issued in December 2010. Accompanying each permit, and incorporated by reference, is a Stormwater Management Plan (SWMP) which is the set of best management practices (BMPs) the City implements to meet the requirements of its permit and the Clean Water Act. Occasionally, as a result of program adaptive management, revisions

are made to the SWMP and submitted to DEQ for approval. The City is currently operating its stormwater system under the December 2010 MS4 Permit (Appendix C of this report) and December 2012 SWMP (Appendix D of this report). The area covered by the MS4 permit is the Eugene city limits as depicted on Figure 1-1.

1.2 2010 NPDES Permit

Eugene's 2010 MS4 permit consists of Schedule A, B, D, and a set of General Conditions, summarized as follows:

Schedule A lists controls and limitations for stormwater discharges. Specifically the City of Eugene must:

- Prohibit non-stormwater discharges into the MS4.
- Reduce the discharge of the pollutants from the municipal stormwater system to the maximum extent practicable.
- Implement and assess the effectiveness of the DEQ-approved SWMP which must include following program elements:
    - Illicit discharge detection and elimination
    - Industrial and commercial facilities
    - Construction site runoff control
    - Education and outreach
    - Public involvement and participation
    - Post-construction site runoff
    - Pollution prevention for municipal operations
    - Structural stormwater controls operations and maintenance activities
- Conduct a hydromodification assessment.
- Develop a stormwater quality retrofit strategy for developed and underserved areas.

Schedule B outlines monitoring and reporting requirements:

- Implement a monitoring program to support adaptive management and the evaluation of SWMP effectiveness in reducing pollutants.
- Develop and implement an approved Monitoring Plan, incorporating specific monitoring types, locations, frequencies, and pollutant parameters to be analyzed.
- Submit an annual report by December 1st of each year.
- Submit a permit renewal application package 180 days prior to the scheduled expiration of the current permit.

Schedule C, not applicable to Eugene's permit, is reserved for compliance conditions.

Schedule D outlines Special Conditions:

- Maintain adequate legal authority to implement and enforce the permit conditions.
- Conduct an evaluation of 303(d) listed pollutants applicable to Eugene's MS4 discharges.
- Complete an assessment of applicable Total Maximum Daily Load (TMDL) wasteload allocation attainment.
- Evaluate progress towards reducing applicable TMDL pollutant loads.

- Establish TMDL pollutant load reduction benchmarks for the next (fourth) permit term.
- Follow and document an adaptive management process.
- Revise SWMP to incorporate specific changes to five BMPs.
- Definitions related to the MS4 permit.

Schedule E does not exist in Eugene's MS4 permit.

Schedule F outlines the General Conditions of the permit including penalties for violations of the permit, operations and maintenance of pollution controls, procedures for conducting monitoring and managing data and records, general reporting requirements, and definitions of generally used terms.

1.3 Annual Report Contents and Relevant Permit Conditions

This 2014 Report provides information on the progress of the MS4 permit activities from July 1, 2013 through June 30, 2014, which coincides with the City's 2014 fiscal year. The report includes: this Introduction (Section 1); Overall Program Management, including program structure, the relationship of the MS4 permit to local policy and other local jurisdictions, financial summary, legal authority, summary of concept planning, land use changes and annexations, and adaptive management (Section 2); Status of SWMP Implementation (Section 3); and Monitoring Program Results (Section 4). Appendices include water quality monitoring data and long term trends (Appendices A and B), current permit (Appendix C), current SWMP (Appendix D), a summary of the City's legal authority to implement and enforce the permit program (Appendix E), adaptive management evaluation template (Appendix F), and the City's public education effectiveness evaluation summary (Appendix G). Table 1-1 includes each annual report requirement outlined in Schedule B.5 of the NPDES permit, and where the information is located within this report.

A Supplement to the 2014 Report is being submitted under separate cover and includes the City's: 303(d) Evaluation; Pollutant Load Reduction Evaluation; and Wasteload Allocation Attainment Assessment. Two additional reports are also being submitted under separate cover as stand-alone documents: Hydromodification Assessment Report and Stormwater Retrofit Plan.

The 2014 Report and previous annual reports are posted on the City's stormwater web site at: www.eugene-or.gov/stormwater (see "Planning, Permits and Regulations" and select "NPDES Municipal Stormwater Permit").

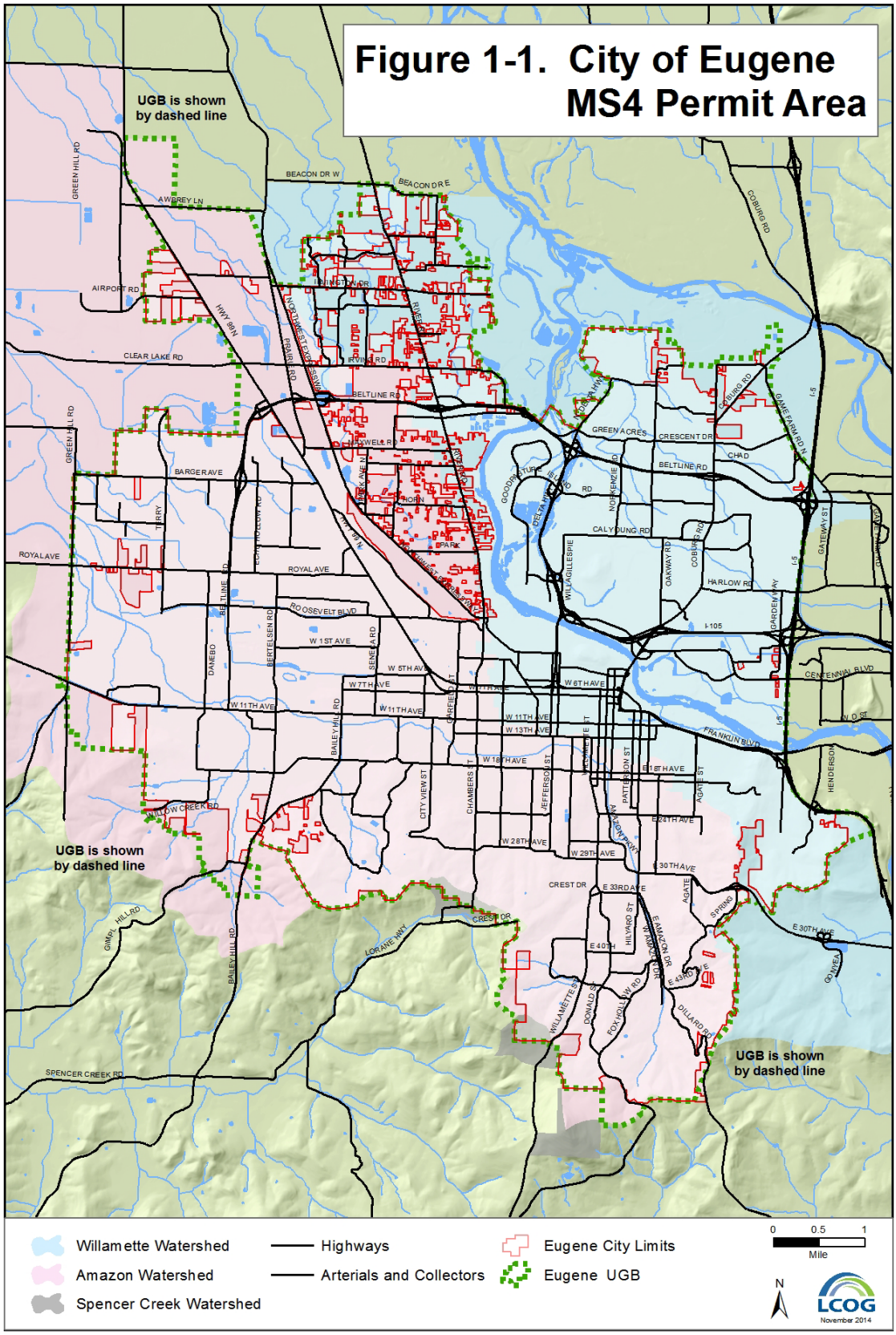


Figure 1-1. City of Eugene
MS4 Permit Area
UGB is shown
by dashed line
UGB is shown
by dashed line
UGB is shown
by dashed line
Willamette Watershed
Amazon Watershed
Spencer Creek Watershed
Highways
Arterials and Collectors
Eugene City Limits
Eugene UGB
0
0.5
1
Mile
N
LCOG
November 2014

Table 1-1. Annual Reporting Requirements and Location within this Report

Schedule B.5 Requirement	Report Section
a. The status of implementing the stormwater management program and each SWMP program element, including progress in meeting the measurable goals identified in the SWMP.	Section 3
b. Status or results, or both, of any public education program effectiveness evaluation conducted during the reporting year and a summary of how the results were or will be used for adaptive management.	Section 3.1.1 and Appendix G
c. A summary of the adaptive management process implementation during the reporting year, including any proposed changes to the stormwater management program (e.g., new BMPs) identified through implementation of the adaptive management process.	Section 2.8.5 and Appendix F
d. Any proposed changes to SWMP program elements that are designed to reduce TMDL pollutants.	No TMDL-related changes proposed
e. A summary of total stormwater program expenditures and funding sources over the reporting fiscal year, and those anticipated in the next fiscal year.	Section 2.5
f. A summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year and/or assessments or evaluations.	Section 4 and Appendices A, B
g. Any proposed modifications to the monitoring plan that are necessary to ensure that adequate data and information are collected to conduct stormwater program assessments.	No proposed modifications
h. A summary describing the number and nature of enforcement actions, inspections, and public education programs, including results of ongoing field screening and follow-up activities related to illicit discharges.	Sections 3.3.1, 3.3.3, 3.4.1, 3.4.2, 3.4.3, 3.4.4, 3.6.1
i. 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 reporting year, and those forecast for the following year, including the number of new post-construction permits issued, and the estimate of the total new or replaced impervious surface area related to new development and redevelopment projects commenced during the reporting year.	Section 2.7
j. Results of ongoing field screening and follow-up activities related to illicit discharges.	Section 3.3.3
k. In addition to the elements listed under Schedule B.5.a. through B.5.j., the annual report submitted by December 1, 2014 must include: i. The TMDL Pollutant Load Reduction Evaluation as described in Schedule D.3.c. ii. The Wasteload Allocation Attainment Assessment as described in Schedule D.3.b. iii. The 303(d) evaluation as described in Schedule D.2.	Separate Document: "*Supplement to 2014 Stormwater Annual Report (December 1, 2014)*"

2 OVERALL PROGRAM MANAGEMENT

This section of the report provides information about how Eugene's stormwater program is managed (Section 2.1), an explanation of SWMP BMP coding and general BMP categories (Section 2.2), the relationship to local stormwater program policy (Section 2.3), the relationship to other local jurisdictions (Section 2.4), a financial summary (Section 2.5), a summary of the City's legal authority to implement the program (Section 2.6), a summary of concept planning, land use changes, and annexations within the urban growth boundary (Section 2.7), and a summary of the City's adaptive management process and results (Section 2.8).

2.1 Program Structure

The Eugene Public Works Department has overall responsibility to implement the MS4 permit and SWMP. The SWMP elements are managed by five divisions in the department: Administration, Engineering, Maintenance, Parks & Open Space, and Wastewater, with two elements managed by the Planning & Development Department. Table 2-1 provides a summary of the general areas of responsibilities within the stormwater program.

Table 2-1. General Areas of Responsibility within the Stormwater Program

Department/Division	Areas of Responsibility
Public Works Administration Division	Stormwater outreach and education, graphics Financial management
Public Works Engineering Division	Standards for new development Erosion control and construction site management Capital improvement projects Storm system mapping & data management Stormwater planning NPDES permit management
Public Works Maintenance Division	Illicit connections/Illegal discharges Spill response Street sweeping Leaf pick-up Constructed system maintenance Regulation of private underground facilities
Public Works Parks & Open Space Division	Open channel and vegetated facility maintenance Vegetation management Litter pick up Volunteer programs Regulation of private vegetated facilities Bacteria pilot study coordination
Public Works Wastewater Division	Water quality sampling and data analysis Industrial stormwater program
Planning and Development Department	Recycling and waste prevention education Yard debris recovery program

Coordination of the various activities occurs through routine staff communication, and via several staff teams as shown in Table 2-2.

Table 2-2. Stormwater Program Policy, Management and Coordination Teams

Stormwater Program Team	Team Purpose
Stormwater Policy Team	Provides policy direction for the Stormwater Program.
Stormwater Management Team	Provides overall management for Stormwater Program. Oversees development of new policy for approval by Policy Team. Implements Policy Team direction.
Stormwater Operations Team	Shares information for on-going program coordination. Resource pool of key staff for specific tasks.
Stormwater Enforcement Coordination Team	Coordinates on code compliance incidents. Shares information on enforcement actions.
Stormwater Penalty Review Team	Reviews administrative civil penalties and makes determination. Provides inter-divisional coordination.

2.2 Stormwater Management Plan BMP Categories

Eugene's SWMP includes 24 BMPs designed to reduce the discharge of stormwater pollutants to the maximum extent practicable. Each BMP is given a code (for example, A1) for tracking and reporting purposes; the coding is based on the division within the Public Works Department or Planning & Development Department that has lead responsibility, as follows:

A = Administration Division of Public Works
B = Building Division of Planning and Development
E = Engineering Division of Public Works
M = Maintenance Division of Public Works
P = Parks and Open Space Division of Public Works
W = Wastewater Division of Public Works

The 24 BMPs fall into eight general categories: Public Education; Operations and Maintenance; Illicit Discharge Controls; Waste Management; Construction and Design New Development; Planning, Capital Improvements, and Data Management; Industrial Controls; and Permit Management. The grouping of BMPs and a general description of each category are described below. Table 2-3 includes the full list of BMPs by BMP number, title and category.

2.2.1 Public Education

The purpose of public education BMPs is to inform the public, the commercial/industrial sector, and in-house personnel about the sources and causes of stormwater pollution, its effect on the local receiving waters, and to encourage active involvement (e.g. behavioral changes, volunteerism, etc.) in the effort to reduce pollution. The following BMPs represent the public

education elements of the SWMP:

A1 Stormwater Education
P1 Educational Volunteer Program

2.2.2 Operations and Maintenance

The purpose of operations and maintenance BMPs is to maintain the publicly managed stormwater system (e.g. pipes, culverts, open waterways, water quality facilities), balancing flood control, drainage services, water quality, and natural resource protection needs, and to adaptively manage for continuous improvement of current operations and maintenance practices. Operations and maintenance BMPs are also focused on planning and performing other City services, such as landscape maintenance or road repair projects for example, in a manner that minimizes the potential for stormwater pollution from these activities. The following BMPs represent the operations and maintenance element of the SWMP:

M3 Street Sweeping Program and Leaf Pick-up
M4 Prevent Leaks and Spills from Municipal Vehicles and Equipment
M5 Public Stormwater System Cleaning Program – Piped System
M8 Winter Road Sanding and De-Icing Program
P3 Tree Planting and Information Programs
P4 Public Stormwater System Maintenance – Developed Parks and Rights-of-Way
P5 Public Stormwater System Maintenance – Open Waterways

2.2.3 Illicit Discharge Controls

The purpose of illicit discharge control BMPs is to become aware of, investigate, detect, mitigate, and enforce the elimination of illicit (non-stormwater) discharges and illegal dumping to the stormwater system. The following BMPs represent the illicit discharge control element of the SWMP:

M1 Management of Illicit Discharges to the Municipal Stormwater System
M2 Spill Response
M7 Systematic Stormwater Field Screening and Investigation
P7 Litter and Illegal Dumping Control

2.2.4 Waste Management

The purpose of the waste management BMPs is to educate the public, regulate waste management services, and to ensure that proper facilities are available in order to minimize the potential of negative stormwater impacts from solid waste collection, improper disposal of toxic materials, and illegal dumping of garbage and debris. The following BMPs represent the waste management element of the SWMP:

B1 Household Hazardous Waste Disposal
B2 Solid Waste Management

2.2.5 Construction and New Development

The purpose of the construction and new development BMPs is to ensure that appropriate control

measures are considered, implemented, and maintained during and after the planning, design, and construction phases for new public and private development and significant re-development projects. The following BMPs represent the new construction and new development related elements of the SWMP:

- E2 Erosion Prevention and Construction Site Management Program
- E4 Stormwater Development Standards
- P6 Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities
- M6 Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures

2.2.6 Planning, Capital Improvements and Data Management

The purpose of planning, capital improvements and data management is to develop and implement comprehensive stormwater basin plans, evaluate potential sources of specific pollutants and related BMPs to address them, and maintain up to date data on the stormwater system. The following BMPs represent the planning, capital improvements and data management elements of the SWMP:

- E1 Stormwater Capital Improvement Projects
- E3 Stormwater System Mapping and Data Management
- P2 Bacteria Pilot Study

2.2.7 Industrial Controls

The purpose of industrial controls is to provide oversight of stormwater discharges from industrial facilities, including screening, inspections, technical assistance, and response to spills at permitted facilities. The following BMP represents the industrial element of the SWMP:

- W1 Industrial Stormwater Management Program

2.2.8 Permit Management

The purpose of permit management is to ensure effective permit management, coordination, and reporting. The following BMP represents the administrative element of the SWMP:

- E5 Permit Management and Reporting

Table 2-3. December 2012 SWMP Best Management Practices

BMP ID	BMP Title	BMP Category
A1	Stormwater Education	Public Education
E1	Stormwater Capital Improvement Projects	Planning, Capital Improvements, Data Mgt.
E2	Erosion Prevention & Construction Site Management Program	Construction and New Development
E3	Stormwater System Mapping and Data Management	Planning, Capital Improvements, Data Mgt.
E4	Stormwater Development Standards	Construction and New Development
E5	Permit Management & Reporting	Permit Management
M1	Management of Illicit Discharges to the Municipal Stormwater System	Illicit Discharge Controls
M2	Spill Response	Illicit Discharge Controls
M3	Street Sweeping Program and Leaf Pick-up	Operations & Maintenance
M4	Prevent Leaks and Spills from Municipal Vehicles and Equipment	Operations & Maintenance
M5	Public Stormwater System Cleaning Program – Piped System	Operations & Maintenance
M6	Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures	Construction and New Development
M7	Systematic Stormwater Field Screening and Investigation	Illicit Discharge Controls
M8	Winter Road Sanding and De-Icing Program	Operations & Maintenance
P1	Educational Volunteer Program	Public Education
P2	Bacteria Pilot Study	Planning, Capital Improvements, Data Mgt.
P3	Tree Planting and Information Programs	Operations & Maintenance
P4	Public Stormwater System Maintenance – Developed Parks and Rights-of-Way	Operations & Maintenance

BMP ID	BMP Title	BMP Category
P5	Public Stormwater System Maintenance – Open Waterways	Operations & Maintenance
P6	Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities	Construction and New Development
P7	Litter and Illegal Dumping Control	Illicit Discharge Controls
B1	Household Hazardous Waste Disposal	Waste Management
B2	Solid Waste Management	Waste Management
W1	Industrial Stormwater Management Program	Industrial Facilities

2.3 Relationship to Comprehensive Stormwater Management Plan (CSWMP)

In 1993, the Eugene City Council adopted as a refinement to the Eugene-Springfield Metro Plan, the Comprehensive Stormwater Management Plan (CSWMP) which provides the policy framework for the City's stormwater program. The impetus for adopting CSWMP was in part the anticipated federal requirements of the MS4 permit, but it was also necessitated by concerns over open waterway management and the discovery, in the early 1990's, of an extensive concentration of wetlands in west Eugene. A major goal of adopting CSWMP was to address a variety of stormwater issues within a comprehensive management framework -- to manage each of the program areas so that they are coordinated and consistent, meet the requirements of federal law, meet the needs of the community, and meet multiple objectives. CSWMP policies cover four general areas:

- **Flood control** efforts are to be modified to maintain current levels of service while improving water quality and protecting natural resources.
- **Water quality** efforts are to be employed to reduce the discharge of pollutants to the maximum extent practicable.
- **Natural resources** that are related to the stormwater drainage and flood control system, such as conveyance corridors and adjoining wetland and riparian zones, are to be managed to benefit water quality and wildlife habitat.
- **Operations and maintenance** practices are to be modified to meet the objectives of flood control, water quality improvement, and related natural resources protection.

CSWMP incorporates the City's original (1994) MS4 permit SWMP BMPs, as well as other implementation measures to achieve CSWMP goals and objectives. Many of the MS4S-related BMPs overlap with other CSWMP objectives such as the use of native plants along water

corridors for bio-filtration purposes and for wildlife habitat, and the restoration of local waterways for increased capacity, water quality improvement, and habitat enhancement.

As part of a stormwater program review in 2013, the Public Works Stormwater Policy Team reviewed CSWMP and concluded that it still represents the appropriate policy basis for Eugene's stormwater program. CSWMP is available on the internet at: www.eugene-or.gov/stormwater (and following links to: Planning, Permits and Regulations > NPDES Municipal Stormwater Permit > CSWMP).

2.4 Relationship to Other Local Jurisdictions

EPA adopted rules to implement Phase II of the MS4 permit program in December 1999. Phase II expanded the permit program to include smaller communities located in United States census-defined Urbanized Areas, including Eugene's metro area partners: the City of Springfield and Lane County. Phase II rules require communities to develop, implement and enforce stormwater management programs that address six minimum measures:

- Public education and outreach
- Public participation/involvement
- Unlawful discharge detention and elimination
- Construction site runoff control
- Post-construction site runoff control
- Pollution prevention/good housekeeping

NPDES MS4 Phase II first-term stormwater permits, including for the City of Springfield and Lane County were issued in January 2007. In anticipation of Lane County's permit, and for the mutual benefit of both agencies and the customers they serve, Lane County and the City of Eugene first entered into an intergovernmental agreement ("Stormwater IGA") in April 2004 to collaborate on certain stormwater program elements within the jurisdictional area outside of the Eugene city limits and within the Eugene urban growth boundary including: stormwater planning; stormwater education; erosion prevention and construction site management; and illicit discharge detection and elimination. The Stormwater IGA was amended and renewed in November 2011 for another three years. MS4 Phase II permits, scheduled to expire on December 31, 2011, were administratively extended by DEQ pending action on new (second-term) permits. Lane County and the other Phase II permittees are currently in discussions with DEQ related to their new permit.

On an on-going basis, formally through the Stormwater IGA with Lane County and informally through participation in multi-agency efforts such as the Pollution Prevention Coalition, the cities of Eugene and Springfield and Lane County often collaborates on pollution prevention and stormwater education activities. Examples of collaborative efforts include working together on topical articles for the City of Eugene's Stormwater Connections newsletter, and topic-specific outreach and education efforts such as creating and distributing pressure washing educational brochures. The City actively participates in collaborative stormwater-related efforts with other

agencies across the state, including under the auspices of the Oregon Association of Clean Water Agencies (ACWA).

2.5 Financial Summary - Actual (FY2014) and Projected (FY2015) Expenditures

Stormwater program activities are funded by a combination of public and private financing: stormwater user fees, stormwater systems development charges; assessments; state and federal funds; volunteer services; and partnerships (Youth Corps/Bureau of Land Management/The Nature Conservancy).

The two primary on-going funding sources for stormwater program activities are:

- Stormwater User Fees are monthly fees paid by all existing and new residents and businesses. User fees fund on-going operations and maintenance (including street sweeping, catch basin cleaning, litter pick-up, spill response, stormwater education and volunteer activities) and new capital (including major system rehabilitation projects, retrofits of the existing system to address water quality, wetland and waterway restoration projects, and new stormwater facilities such as pipes, culverts, constructed wetlands, ponds, and filters). The amount of the fee is generally proportional to the amount of impervious surface area on the site. A flat rate is charged for small and medium residential users (less than 3,000 square feet of impervious area), based on an estimated average amount of impervious surface area. Large residential users (over 3,000 square feet of impervious area) and commercial / industrial users pay a fee proportional to the amount of impervious area on the site. Users can qualify for a reduced fee if the quantity of stormwater discharge to the public system is reduced through disconnecting impervious surfaces, or providing on-site retention or infiltration. Users can also quality for reduced fees if the applicant went beyond the minimum required level of treatment, essentially retrofitting the system to incorporate stormwater treatment for existing developed portions of a site.

- Systems development charges (SDCs) are one-time impact fees that are generally collected when expansion, new development, or an intensification of use occurs on property served by City infrastructure. These fees are used to fund the non-assessable portion of the infrastructure costs needed to support growth in the community and to recoup a portion of the community's investment in the infrastructure already in place. Small and medium residential development pay a flat rate based upon an estimated average impervious surface area specific to each category. All other development pays an amount proportional to the impervious surface area of the site. SDC credits (reductions) are given if the quantity of stormwater discharged to the public system is reduced or if the water quality treatment exceeds the minimum standards.

The City of Eugene's stormwater user fee and SDC rate structures thus have built-in financial incentives to reduce impervious area, reduce the quantity of stormwater runoff, and go beyond the minimum in terms of water quality treatment. More information about the City's stormwater charges is available on the web site at: http://www.eugene-or.gov and follow links to: Departments > Public Works > Engineering > Systems Development Charges.

The stormwater program-wide actual expenditures for Fiscal Year 2014 and projected expenditures for FY2015 are shown in Table 2-4. The MS4 permit reporting year aligns with the City's fiscal year. Expenditures reported include funding for MS4 permit related activities and for stormwater program activities which are not required by the MS4 permit, such as: system maintenance for conveyance and flood control and wetland program management.

Table 2-4
City of Eugene
Public Works Department - Stormwater Funds (335, 531, 535)
Actual Expenditures FY13, Projected Expenditures FY14
(Fiscal year is July 1 - June 30)
September 22, 2014

Fund		Division	FY14 Actuals	FY15 Budget	
335	Stormwater SDC	93 - Engineering	$161,792	$348,903	a.
		99 - Non Departmental	$2000	$2,000	
335 Total			***$163,792***	***$350,903***	
531	Stormwater Utility - Capital	93 - Engineering	$2,643,197	$7,093,342	b.
531 Total			***$2,643,197***	***$7,093,342***	
535	Stormwater Utility - Operation	87 - WWTP	$451,743	$525,811	
		89 - Administration	$1,550,659	$1,809,076	
		93 - Engineering	$1,490,328	$2,154,851	
		94 - Maintenance	$4,141,534	$4,574,769	
		96 - POS	$4,265,283	$5,223,081	
		99 - Non Departmental	$927,000	$859,000	
535 Total			***$12,826,547***	***$15,146,588***	
Grand Total			**$15,633,536**	**$22,590,833**	

a. FY15 Stormwater SDC budget includes $149K carryover from FY14.
b. FY15 Stormwater Capital budget includes $4.6 million carryover from FY12.

2.6 Continued Legal Authority

Schedule D.1 of the NPDES permit requires that the City of Eugene maintain adequate legal authority, through ordinance(s), interagency agreement(s) or other means to **implement and enforce the provisions of the permit.** Appendix E contains an updated summary of the legal

authority, including Eugene Code sections and related Administrative Orders, that the City of Eugene relies on to apply and enforce stormwater related regulations.

2.7 Planning, Land Use Changes, and Annexations within the UGB

For the reporting year, 26.45 acres of land was annexed to the City of Eugene from Lane County. Envision Eugene, the City's long range planning process, continued to make progress towards determining the best way to accommodate projected population and job growth for the next twenty years. In June 2012, the Eugene City Council approved the Community Vision and asked staff to move forward with recommendations as described in the Envision Eugene Draft Proposal dated March 14, 2012. From July 2013 to July 2014, there were several accomplishments related to Envision Eugene including an update to the buildable lands inventory, employment and industrial zone and code amendments, downtown and mixed use code amendments, re-designation and code amendments to facilitate re-development of the 27 acre Eugene Water and Electric board property along the Willamette riverfront, and re-designation and code amendments to accommodate more single-family housing inside the urban growth boundary (UGB). The Envision Eugene Draft Proposal can be found on the City's web site at: www.envisioneugene.org.

2.8 Adaptive Management Process

Schedule D.4 of the MS4 permit requires that the City of Eugene follow an adaptive management approach to assess and modify its SWMP to achieve reductions in stormwater pollution to the maximum extent practicable. This section describes the City of Eugene's adaptive management process and summarizes the results from the 2014 reporting period adaptive management assessment.

2.8.1 Introduction

Consistent with Schedule A.2 of its MS4 permit, the City of Eugene must reduce the discharge of pollutants from the stormwater system to the maximum extent practicable (MEP). The MEP requirement is met through compliance with the permit, specifically through implementation of a stormwater management program and associated Stormwater Management Plan (SWMP). Assessment and modification of the SWMP must follow an adaptive management approach, which is defined in Schedule D as:

> *A structured, iterative process designed to refine and improve stormwater programs over time by evaluating results and adjusting actions on the basis of what has been learned.*

The stormwater management program that is described in the City's current SWMP is the result of adaptively managing (e.g., implementing, evaluating, and adjusting) program activities since first being issued a MS4 permit in 1994. The history of this adaptive management approach may be found in Section 3.3 of the City's NPDES MS4 Permit Renewal document (September 2008).

The purpose of this section is to describe the adaptive management approach that the City will follow through expiration of its current permit to routinely assess the stormwater program's effectiveness in addressing water quality and protection of beneficial uses. Ongoing adaptive

management of the SWMP as discussed in the MS4 annual reports demonstrates that City is meeting the MEP requirement.

The adaptive management approach is divided into two distinct processes, as described below:

> 1) An *annual* adaptive management process to assist with BMP assessment and/or evaluation, in order to determine whether adjustments to BMPs are warranted and/or practicable to achieve reductions in stormwater pollutants to the MEP.
>
> 2) An MS4 *permit cycle* (5-year) adaptive management process to evaluate water quality monitoring results, assess the stormwater management program and overall effectiveness of the SWMP, in order to update the SWMP and associated measurable goals to achieve reductions in stormwater pollutants to the MEP.

2.8.2 Annual Adaptive Management Process

Following guidance in DEQ's Permit Evaluation Report and Fact Sheet for the City's MS4 permit, the annual adaptive management process involves an operational cycle for assessing BMPs, including the steps of: 1) BMP implementation, 2) data collection, 3) assessment, 4) identifying needs, and 5) BMP modification.

Throughout the duration of the current MS4 permit cycle, the City will *implement* BMPs identified in the DEQ-approved SWMP as part of its stormwater management program. Tracking measures are identified for each of the BMPs to assess progress toward achieving measurable goals outlined in the SWMP. *Data collected* during implementation of BMPs will be consistent with documented tracking measures (e.g., miles of streets swept, number of catch basins cleaned, etc.) and will allow for the assessment of BMP measurable goal attainment. Data collected as part of the environmental monitoring plan will also be reviewed and utilized, as applicable, during the assessment phase of the adaptive management process (e.g., identification of data anomalies or water quality standards exceedances).

The assessment *of BMPs* will occur annually during preparation of the City's MS4 annual report, to be submitted to DEQ by December 1 of each permit year. Among other reporting requirements, the MS4 annual report must contain (Schedule B.5) the following:

> *The status of implementing the stormwater management program and each SWMP program element, including progress in meeting the measurable goals identified in the SWMP.*

By providing a summary in the MS4 annual report of progress toward attaining BMP measurable goals (through data collection and tracking measures), the City both: 1) meets the aforementioned reporting requirement, and 2) facilitates a critical step in adaptively managing its stormwater program by assessing each BMP.

While preparing the MS4 annual report, the City will collect data and feedback from staff responsible for implementing/reporting on each BMP to facilitate the BMP assessment process. Factors considered during the assessment phase are reflected in the Adaptive Management BMP

Evaluation Tool template provided in Appendix F. Key factors considered in the annual evaluation include but are not limited to:

- Was the BMP measurable goal attained? If not, describe circumstances why, and how progress will be made toward future attainment.
- For multi-year BMPs, were milestones or timelines met?
- Can we feasibly refine or improve the BMP to gain efficiency or effectiveness in removing stormwater pollutants?
- Are staffing/financial resources available to support such a BMP improvement or refinement?

In addition to assessing the implementation of each BMP, staff will weigh *resource availability and needs* related to the overall stormwater program, including consideration of budget/funding, training needs, new technology, or available equipment.

The aforementioned assessment phase will inform any alterations to the stormwater program or *modifications* to the SWMP. A summary of the adaptive management process including any proposed revisions to the SWMP will follow the requirements of Schedule B. 5 and Schedule D.5 of the MS4 permit.

Subsequent to implementing modifications, the annual adaptive management process will continue to include an assessment of whether the modifications are resulting in the predicted outcomes/efficiencies through an iterative feedback loop. Annual adaptive management will, therefore, ultimately contribute to the City's SWMP updates required by Schedule B. 6. of the MS4 permit for the permit renewal application package, including the modification, addition, and removal of BMPs, and associated measureable goals.

2.8.3 Permit Cycle Adaptive Management Process

In preparation of the MS4 permit renewal application as required by Schedule B. 6 of the permit, the City will assess each BMP described in its SWMP, its environmental monitoring program, environmental monitoring data, and results from the additional assessments or studies conducted in support of their MS4 permit compliance to evaluate the overall effectiveness of its stormwater management program in reducing pollutants to the MEP.

As described in Section 2, BMP implementation data collected and evaluated over the course of the permit cycle, as well as historical data (if applicable), will be reviewed during preparation of the NPDES MS4 permit renewal package. This review will help determine BMP refinements and improvements that should be proposed as part of the program modifications at the end of the permit cycle. This process supports the examination of factors including but not limited to:

- Do we have information about new technology or other information to improve or refine existing BMPs, identify alternative BMPs, or include additional BMPs?
- Have we set the appropriate measurable goals for existing BMPs or should they be changed?

- Are resources (funding, staff, equipment, etc.) available to change the BMP measurable goal, and does it make sense to change it?

Where applicable, the effectiveness of individual BMPs may also be evaluated by use of data collected through the City's environmental monitoring program. For example, pesticide monitoring data may be of use in identifying targeted outreach activities related to pesticide use, and possible refinement of appropriate outreach/education BMPs. Data collected through the environmental monitoring program will also contribute to the assessment of the overall stormwater management program.

In addition to BMP implementation data and environmental monitoring data analyses, specific deliverables in the MS4 permit will also facilitate the adaptive management process. Other required permit elements that will aid the SWMP evaluation include:

- Hydromodification assessment (Schedule A.5),
- Stormwater retrofit strategy (Schedule A.6),
- 303(d) list evaluation (Schedule D.2),
- Total Maximum Daily Load (TMDL) Wasteload Allocation Attainment Assessment
- TMDL Pollutant Load Reduction Evaluation and establishment of benchmarks.
- Public education program effectiveness evaluation (Schedule A. 4. d.), and
- Public involvement and participation (Schedule A. 4. e.)

Cumulatively, these deliverables will require the City to identify strategies to reduce the impact of stormwater discharges on receiving water bodies. Some of these deliverables will also require identification of priorities for stormwater control facility implementation (i.e., the hydromodification assessment and the stormwater retrofit strategy). Others will help identify opportunities for further refinement and improvement of its stormwater management program, particularly as related to 303(d) parameters and TMDL benchmarks. Objectives and strategies identified in these deliverables will be considered in context of existing BMPs, and be used to revise appropriate BMPs (and associated measurable goals) during the MS4 permit renewal process. Finally, the City will utilize all of the above described analysis to evaluate the adequacy of the SWMP in reducing pollutants from the MS4 to the MEP according to the permit requirements in Schedule B. 6. b.

2.8.4 Summary of Adaptive Management Process

The adaptive management approach described in this section identifies both annual and end of the MS4 permit cycle processes that will facilitate continuous improvement of the City's stormwater management program. Each of the five steps identified in DEQ's Permit Evaluation Report and Fact Sheet for an adaptive management approach were addressed, including: 1) BMP implementation, 2) data collection, 3) assessment, 4) identifying needs, and 5) BMP modification. Implementation of these processes and the adaptive management approach, will assure that the City continues to improve its stormwater management programs and reduce the discharge of pollutants to the maximum extent practicable.

2.8.5 Summary of Adaptive Management for 2014

The annual adaptive management evaluation process described in Section 2.8.2 highlighted three main areas of adaptive management over the reporting year: updates to the City's stormwater development standards, broadened use of the City's maintenance management system for tracking and documentation, and collaboration to assess the effectiveness of public education.

As described in more detail in the BMP E4 (Stormwater Development Standards) report (see Section 3.4.2.), the City updated its stormwater development standards to reflect a new green infrastructure hierarchy and prioritization of on-site stormwater quality management. This change is expected to improve the effectiveness of the post-construction stormwater management program by further reducing the water quality and water quantity impact of new development and significant development.

Another area of adaptive management that is referenced from several BMP reports including BMPs E2 (Erosion Prevention and Construction Site Management Program), P3 (Tree Planting and Information Programs), P6 (Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities), and E3 (Mapping and Data Management) is the expanded use of the City's maintenance management system (MMS) for tracking, documentation, and communication of program activities. During the reporting year, the MMS was expanded for use in: tracking illicit discharges, tracking educational volunteer activities, tracking trees planted and pruned, expanded tracking of inspection and maintenance activities related to stormwater management facilities, and conveying digital corrections to data managers for subsequent entry into the City's asset management database and GIS application. The use of MMS is expected to improve internal coordination and documentation, and improve overall organizational efficiency.

During the reporting year, the City of Eugene participated in an Association of Clean Water Agencies (ACWA) collaborative project to compile and evaluate survey data to evaluate the effectiveness of public education efforts, culminating in a final report by DHM consultants (February 2014). The adaptive aspects of the City of Eugene's public education BMPs A1 (Stormwater Education) and P1 (Educational Volunteer Program) have to do, in part, with the platforms used to communicate with the public. A related but separate aspect of adaptive management is to increase the effectiveness of communications, regardless of the media used. These initiatives likely will require minor tactical changes in implementation strategies, for which the DHM report will be an excellent resource; however, the fundamental objectives of the public information and education BMP remain the same. As the City continues to educate and inform the public, we will look further into the following areas: because safety of children and pets is especially important to mothers and pet owners, the City will research how we can reach out to mothers groups and publications geared towards mothers as well as additional ways to reach pet owners; continue to focus on simple steps to behavior change through publications, our website, and at community events; and, partnering with other organizations, businesses and leaders. The City is currently updating an education campaign with Upper Willamette Soil and Water Conservation District and the Lane Pollution Prevention Coalition and discussing a new campaign with the Long Tom Watershed Council.

The annual adaptive management process described in Section 2.8.2 resulted in no proposed changes to the December 2012 SWMP.

3 STATUS OF SWMP IMPLEMENTATION

This section summarizes the status of implementation of the SWMP in the form of measurable goals, tracking measures and accomplishments for each BMP during the reporting year. A historical account of the program accomplishments may be found in prior annual reports, beginning with the Year 1 Annual Report (November 1995) through the Year 15 Report (December 2010). Also included with each BMP report is a list of planned activities or activities under consideration for reporting year 2012. No revisions to the SWMP BMPs are proposed at this time.

3.1 Status of Education BMPs

3.1.1 A1 – Stormwater Education

Responsible Department/Division:
Public Works / Administration

BMP Contact:
Administration Division Director

BMP Description
Plan, develop, implement and revise as necessary a program to provide stormwater information and education to homeowners, school children, City and other agency staff and the general public about the impacts to stormwater quality and natural resource values from both point and non-point sources of pollution.

In addition, educate professional, commercial, and industrial businesses about best management practices that can help prevent and reduce stormwater quality impacts to the public stormwater system and local receiving waters.

Tasks
1. Update and improve upon educational materials through assorted print material, videos, web, audio and visual media.
2. Prepare and staff booths at special events to reach community members.
3. Develop on-going campaigns as appropriate to support projects, programs, special opportunities and targeted pollutants.

Measurable Goals	Status of Measurable Goals – FY14
• Conduct surveys every two years with Eugene residents to determine attitudes and opinions of residents about the stormwater management program.	• Survey to be conducted in spring 2015.
• Provide SPLASH educational curriculum to teachers and administrators in local school districts.	• Work with teachers in 4J and Bethel School Districts to provide educational curriculum and supporting materials. • 83 teachers provided instruction. • 3,874 students received instruction.

• Develop and implement internal stormwater education to city staff through new employee orientation, “green team” presentations, work group presentations and audio/visual presentation.	• Our internal stormwater training video has been seen by 172 public works department employees. Tracking is documented through the city’s internal training program system. The video is also posted on the city’s website under public works video category.
• Increase catch basin markers with “dump no waste” messages and storm drain covers installed on public improvement projects.	• 25 catch basin markers were installed with “drains to stream” message • 139 fish-friendly manhole lids and “drains to stream” concrete curb inlets installed
• Work collaboratively on education campaigns with other local agencies.	• Water wise demonstration garden project, with multiple partners, is completed and available as a community resource. Project includes SMART control irrigation system, drought tolerant plants, multiple stormwater features and informational signage and take-away materials for site visitors. This year we worked with Upper Willamette Soil and Conservation District to give rain garden workshops and presentations. We gave one presentation at the Spring Home Show and one workshop at a community center. • Through the Lane Pollution prevention Coalition (P2C) and the Stormwater Special Ops Group we have worked on joint outreach projects that include: Distribution of “how to manage paint waste” brochures in English and Spanish, radio campaigns to promote fish-friendly car wash kits for fundraising groups, pressure wash booklets for mobile washers, pressure was hangtags and handouts for rental and retail stores, and informational postcards to property management companies. The P2C also has a website which lists agencies, links to their websites and upcoming events and pollution prevention tips. • Our primary focus at the 2014 spring home show was vehicle pollution and how to minimize it. Other pollution prevention information about air, water, land, waste and recycling was also on-hand. • We continued to promote our car wash kit program to school fundraiser groups and our website. In the fall of 2013, we mailed out

	postcards about our car wash kits to 17 middle schools and high schools in Eugene. • At the Good Earth home show in January 2014, our booth focus was healthy home, healthy water, and healthy rivers. We promoted the benefit of best management practices with yard and outdoor home activities for children, pets and out local environment. For the Earth Day celebration in April 2014, we highlighted "green" options and city's commercial food composting program which helps divert food waste out of the waste stream.

Tracking Measures	**Tracking Data – FY14**
• Number of information materials (all media) prepared and distributed to the public.	• Newsletters mailed to Eugene residents: 80,300 issues in Spring 2014 and in Fall 2013 • 47 pressure wash brochures at rental /retail stores. • 107 paint brochures in English/Spanish put in public display racks. • Gave out 193 Grow Smart, Grow Safe booklets and 63 information cards with Grow Smart, Grow Safe website address. • Provided 53 handouts of each of the following to the Sustainable Landscape Class participants: Make Clean Water Part of Your Life, Stormwater–friendly Lawn and • Garden Care, Think Twice Before Using Pesticides.
• Number of students and teachers who use SPLASH curriculum annually.	• 3,874 students received instruction. • 83 teachers provided instruction
• Number of attendees at public outreach events.	• 33,000 attendees at Good Earth Home Show. • 42,000 attendees at the Spring Home Show. • 4,600 attendees at Earth Day event. • 15 attendees to rain garden information presentation. • 21 participants in rain garden workshop.
• Number of employees attending stormwater education sessions.	• 47 attendees at Sustainable Landscape Program
• Track quantity of installed catch basin markers and storm drain covers.	• 25 catch basin markers • 139 fish-friendly manhole lids and "drains to stream" concrete curb inlets installed

• Identify collaborative campaigns, target audience and summary of campaign.	• Continue fish-friendly car wash campaign to encourage fundraising groups to use kit that is designed to prevent runoff from vehicle washing from entering storm drain system. Instructive video's on the city's website show how to use the kit. Kits were checked out 11 times. Mailed out postcards promoting car wash kits to 17 middle schools and high schools. • Staff an educational booth at the spring home show with P2C members. Target audience is area residents. Pollution prevention handouts on topics included stormwater, air quality, groundwater, waste prevention, water quality and hazardous waste. • Eco-biz program is in its 9th year and now has 14 businesses and 5 government agencies. This "green" automotive program recognizes auto shop participants for taking extra pollution prevention steps in the way they run their businesses.
• Documentation of stormwater survey responses.	• Next Eugene survey will be spring 2015.

FY14 Activities and Accomplishments

- Fall 2013 issue of Stormwater Connections newsletter highlighted pollutants from vehicles, pet waste pollution, hazardous product disposal options, flood risk, the work an adoption group in a local waterway and child-focused article about dragonflies. Spring 2014 issue of Stormwater Connections newsletter highlighted the history and transformation of Amazon Creek from primarily flood control to also include water quality and natural resource protection, how a new skate park gets special runoff treatment, clean and safe sidewalks, rain garden workshops, flood preparedness for property and personal safety, and for our younger citizens – the importance of clean water for bird habitats.
- Revised stormwater education webpages to make reader-friendly at www.happyrivers.org. Also reorganized education resources for teachers.
- Lane County Home Show focus was on "vehicle pollution and prevention". Other handouts covered topics about water, air, waste and land pollution issues and positive action that individuals can take.
- Booths at several events featured our Canines for Clean Water program. This pledge-based program addresses cleanup of pet waste and rewards pet owners for their help. Distributed 32 display stands and posters at local vet offices.
- Eco-biz automotive program is now in its 9th year. To date we have 14 businesses and are working with 4 businesses that should be certified in the fall of 2014.
- New "connect the drops" video on the city's stormwater page: www.happyrivers.org.

- Developed outline and recorded footage for a Delta ponds video for children in grades 1 & 2. Purpose is to help children explore the natural world and the value of clean water for all. Final version to be completed by Sept 2014.
- City of Eugene participated in a collaborative effort led by ACWA to develop a scope of work, guide and evaluation of public effectiveness surveys done by other agencies in the northwest. Final report will be used in adaptively managing our public education outreach.

Planned or Considered FY15 Activities

- Continue researching effective videos that portray stormwater information that we can link to our stormwater home page.
- Create e-newsletter about stormwater-related issues. Format has been developed.
- Continue partnership with East Lane Soil and Conservation District to present workshops to area residents.
- Work with local watershed council to provide information to Latino landscapers and yard care providers and their families about best management practices with yard chemicals to protect health and water quality.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.1.2 P1 – Educational Volunteer Program

Responsible Department/Division:
Public Works / Parks & Open Space

BMP Contact:
Parks and Open Space Division Director

BMP Description
Manage and support the City's Stream Team volunteer program and other community volunteer programs that promote stormwater education. Provide opportunities to involve citizens of all ages and socio-economic backgrounds in meaningful, hands-on and educationally oriented stormwater related projects. Such projects are aimed at providing both physical benefits and participant awareness related to protecting stormwater quality, fostering citizen stewardship of the City's water resources, promoting the use of native-vegetation, and enhancing fish and wildlife habitat within the local urban watershed.

Tasks
1. Recruit, support, and coordinate activities for groups or organizations to adopt portions of the City's stormwater system, such as creeks, ponds, and drainage channels.
2. Investigate inclusion of publicly owned vegetated stormwater facilities within developed parks and right of way into the volunteer program.
3. Advertise, coordinate and conduct periodic work parties for regular and drop-in volunteers aimed at waterway clean-up, invasive species removal, native vegetation salvage and native vegetation planting in riparian areas.
4. Partner with local agencies, organizations, businesses and/or corporate sponsors to plan, promote, coordinate and implement annual large scale waterway clean-up volunteer events.
5. Inform the public about the purpose of the volunteer program through public presentations, distribution of program information materials, event related press releases and news media articles and news stories. Include in the communication the challenges and benefits of managing stormwater properly.

Measurable Goals	Status of Measurable Goals – FY14
• As attrition occurs continue to recruit replacement adoption groups to maintain current levels of participation.	• On-going
• Conduct one volunteer work party annually that will address maintenance needs at publicly owned vegetated stormwater facilities with developed parks or the right of way.	• Complete
• On average, conduct 12 volunteer work parties per year.	• Complete
• Conduct at least one partnership based large-scale water resource clean-up or enhancement volunteer project per year.	• Complete

• Correspond with the city's stormwater education program coordinator on a regular basis to determine if there are opportunities to better inform the public regarding the challenges and benefits of stormwater management.	• On-going

Tracking Measures	**Tracking Data – FY14**
• Number of adoption groups that are retained and continue to participate in the volunteer program. Track number of new adoption groups brought into the program.	• One new adoption group was brought in to the program for a total of 53 adoption groups participating with Eugene Park Stewards.
• Number of volunteer work parties conducted that involve maintenance of publicly owned vegetated stormwater facilities and number of volunteer participants.	• Three volunteer work parties were held at Ferndale Park and Rosetta Park. Both parks have vegetated stormwater management facilities. A total of 22 volunteers participated in these events.
• Number of work parties conducted and number of volunteer participants.	• 38 projects were completed during the reporting period. The number of volunteers that participated was approximately 398.
• Document annual large-scale project(s), participating partners and number of volunteer participants.	• Eugene Park Stewarts partnered with Willamette Riverkeepers to coordinate the annual Willamette Cleanup. A total of 74 volunteers participated in the event. • Arbor Day Celebration was turned into Arbor Week. Focused on planting trees in all three park regions and Assembly at St. Paul. There were approximately 100 volunteers. • Eugene Park Stewards partnered with University of Oregon for cleanup of the Mill Race waterway. A total of 83 volunteers participated. • Eugene Park Stewards hosted two large clean up events in Alton Baker Park Whilamut Natural Area. Each event had over 50 volunteers participate.
• Document annually efforts to educate the public about the city's volunteer programs and the protection of water quality as it relates to stormwater.	Participated in 8 different public outreach events: o Awbrey Park: End of Season Celebration o Washington-Jefferson Skatepark: Grand Opening.

	o Hendricks Park: Rhody Garden Celebration o Creekside Park Grand Opening o Churchill Area Neighbors Annual Mtg. o Harlow Neighbors Mtg. o SE Neighbors Annual Mtg. & Picnic o Friends of Hendricks Park Volunteer Appreciation Event • Utilized Eugene Park Stewards E-newsletter to educate the public about tree and riparian planting events that are related to stormwater. • Utilized Eugene Outdoors newsletter to promote ongoing stewardship of our parks and natural areas.

FY14 Activities and Accomplishments

- Implemented and began to utilize the Maintenance Management System (MMS) starting on January 1, 2014 which will allow staff to track all volunteer events that are related to stormwater. Allows for easier and more accurate reporting for the NPDES annual report.
- The measure for a large scale event is having over 50 volunteers participate. During the reporting period there were five events that had over 50 participants, including three mentioned above.

Planned or Considered FY15 Activities

- Continue to introduce technology into the Eugene Park Stewards program by using alternative social media such Instagram and provide IPhone's to stay connected to the pulse of our volunteers and provide them with the latest parks information
- FY14 will be the first year all of Eugene Park Stewards program data will be housed in the MMS system and the Project Summary Spreadsheet will go away. In FY13, the first half of the year stats were tracked in the project summary spreadsheet and the second half in the MMS.
- The Eugene Park Stewards program will begin a implementing "Sparking Connections" presentation to the City of Eugene Neighborhood Associations, service organizations and local business about stewardship opportunities and adoptions of parks and natural areas
- The Community Stewardship Grant to Plant, Prune and Care for Public Trees in Partnership with Eugene Park Stewards Program was increased. Starting in FY14 will be administered by Natural Resources & Urban Forestry Section and no longer housed in Eugene Park Stewards program.
- Parks and Open Space staff will be evaluating the possibility of incorporating into the Eugene Park Stewards work plan opportunities to engage private property owners that are adjacent to publicly maintained vegetated stormwater facilities to assist city staff with maintenance of the facility.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.2 Status of Operations and Maintenance BMPs

3.2.1 M3 – Street Sweeping and Leaf Pick-up

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
Undertake both mechanical brush and vacuum sweeping of publicly maintained roads, bike paths, and parking lots in accordance with the Stormwater Operations and Maintenance Manual. Monitor and evaluate new technology and methods related to street sweeping, and make appropriate adjustments to the current sweeping program when feasible to maximize water quality benefits.

Tasks
1. Follow sweeping frequencies as outlined in the Stormwater Operation and Maintenance Manual.
2. Collect sweeping data such as amount of debris swept, curb miles swept, streets and/or areas swept.
3. Conduct annual curbside pickup of leaves on City streets.

Measurable Goals	Status of Measurable Goals – FY14
Follow sweeping frequencies as outlined in the Stormwater Operation and Maintenance Manual, more specifically described as follows:	
• Sweep downtown core twice per week.	• Goal was met for FY14.
• Sweep university and industrial areas once per week.	• Goal was met for FY14.
• Sweep arterial streets every 2 weeks.	• Goal was met for FY14.
• Sweep residential streets every 6-8 weeks.	• Goal was met for FY14.
• Sweep bike paths and improved alleys twice per year.	• Goal was met for FY14.
• Coordinate and manage two seasonal opportunities for the citizen's leaves to be picked up and managed by the SW operations crew.	• Goal was met for FY14.

Tracking Measures	Tracking Data – FY14
• Lane miles swept.	• Swept 44,347 lane miles.
• Amount of debris collected.	• Collected over 14,400 cubic yards of debris. • Collected over 1,800 cubic yards of sand and debris from winter storms.
• Amount of leaves picked up.	• Collected 18,600 cubic yards of leaves during the 2013-2014 leaf collection season.

FY14 Activities and Accomplishments

- Swept off-street bike paths totaling more than 70 lane miles.
- Continue to respond to emergency requests, such as vehicle accidents and spills.
- Maintained the ability to respond 24/7 to emergency requests, such as vehicle accidents and spills.
- Continue to review and update sweeping routes. The purpose of the review is to gauge the effectiveness and efficiency of the sweeping program in meeting the community's needs and producing equivalent workloads.
- Successfully completed another the City of Eugene's 2013-2014 curbside "Leaf Pick-up Program". This effort prevented over 18,000 cubic yards of leaf material from potentially entering the public stormwater collection system. This material is reused in the community's popular compost program.

Planned or Considered FY15 Activities

- Analyze street sweeping operations on a continual basis and make modifications as necessary to ensure maximum water quality benefits.
- Perform sweeping operations during eighteen of a possible twenty-one work shifts per week.
- Consider modifying leaf pickup program to target areas prone to street flooding.
- Continue to evaluate street sweeping technologies and equipment.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.2.2 M4 – Prevent Leaks and Spills from Municipal Vehicles and Equipment

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
Undertake preventive maintenance program for all municipal vehicles and equipment in order to prevent or correct sources of vehicle fluid leaks. Implement employee education practices and field operations procedures to detect and report leaks and to prevent incidences of fluid and material spills from municipal vehicles. Equip municipal trucks and large mechanized equipment with renewable spill response kits.

Tasks
1. Maintain training competencies for Fleet Services employees.
2. Maintain a preventative maintenance schedule for all vehicles and equipment.
3. Maintain a supply of spill kit materials for designated vehicles and equipment.

Measurable Goals	Status of Measurable Goals – FY14
• Include a spill procedure card in all City vehicles and equipment by December 1, 2011.	• Goal was met.
• Perform preventative maintenance service on all City vehicles and equipment annually, at a minimum.	• Goal was met for FY14.
• During the repair/clean-up process, analyze the type and cause of the spills associated with the repairs conducted by Fleet staff, and evaluate whether operator training maybe helpful with spill minimization.	• Goal was met for FY14.

Tracking Measures	Tracking Data – FY14
• Track the number of spill procedure cards issued annually.	• Vehicles are checked at time of service inspection to verify that spill procedure card is in vehicle and replaced if missing or damaged.
• Track the number of vehicle related leaks repaired annually.	• Fleet Services completed 1260 scheduled preventative maintenance inspections for this reporting period as part of the City's leak prevention program. Fleet Services also performed a total of 1103 17-point safety and operational inspections on scheduled and non-scheduled work for the reporting period.

• Track the percentage of vehicles which receive preventative maintenance service annually.	• Performed annual preventive maintenance service on 98% of City of Eugene vehicles in the reporting year. 1260 preventive maintenance services took place on the City of Eugene's 680 pieces of equipment that have preventive maintenance schedules.

FY14 Activities and Accomplishments

- The mechanical stormwater water quality structure at our maintenance facility was cleaned once during the reporting period with no structure failures, and no other maintenance required.

Planned or Considered FY15 Activities

- All municipal cars, service vehicles, fire apparatus, and large mechanized equipment are inspected and serviced on a routine and frequent basis.
- Vehicles found with fluid leaks or with worn/frayed hydraulic lines are either repaired immediately or taken out of service until necessary repairs can be made.
- Staff will issue spill kits to new Public Works vehicles and equipment as appropriate.
- Staff will replenish materials as spill kits are used.
- The performance of the structural BMP will continue to be monitored.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.2.3 M5 – Public Stormwater System Cleaning Program – Piped System

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
Undertake frequent, systematic cleaning of the components of the public stormwater system such as catch basins, pipes, culverts, inlets, and stormwater quality devices in accordance with the adopted Stormwater Operations and Maintenance (O&M) Manual. Document quantities of material removed from each structure. Using the maintenance management system, refine the regular cleaning schedule for pipes, catch basins and stormwater quality devices. Research and monitor developments in maintenance technology and operations and maintenance methods for the closed systems which will further increase the effectiveness of our cleaning practices and water quality improvement practices.

Tasks
1. Follow cleaning procedures as outlined in the Stormwater O&M Manual.
2. Collect loading information for individual structures and facilities.

Measurable Goals	Status of Measurable Goals – FY14
• Clean 50% of the all of the public catch basins and inlet structures annually unless increased efficiencies are shown through adaptive management.	• Goal was met. • 8,002 catch basins and inlet structures were cleaned, approximately 55%.
• Clean all of the public underground stormwater quality structures as outlined in the Stormwater O&M Manual.	• Goal was met.

Tracking Measures	Tracking Data – FY14
• Track the number of structures cleaned.	• Cleaned 8,002 catch basin/curb inlet structures.
• Track the amount of debris recovered.	• Removed 473 tons of debris from the piped stormwater system through a systematic catch basin and mainline cleaning program.
• Track the lineal footage of stormwater lines cleaned.	• Cleaned 32,768 linear feet of stormwater lines.

FY14 Activities and Accomplishments

- Continued to utilize operational crews across all 15 available weekday shifts. This includes two full-time stormwater jet/vac trucks and 1 stormwater field lead worker. These crews provide O&M functions to the piped system, manholes, proprietary stormwater devices, sediment traps and inlets, as well as providing 24/7 response to service requests.
- Continue to track sump depth of catch basins/curb inlets, and sediment levels prior to cleaning. This information is used to help determine cleaning frequencies, and the need for catch basin/curb inlet replacement.
- Continued stormwater line cleaning and performing Closed Circuit Television (CCTV) inspection and assessment of storm lines and inlets in advance of Pavement Preservation Projects. This work identifies conveyance problems in advance of surface improvements and promotes proactive maintenance practices.
- Cleaned 27 sedimentation manholes and 92 underground water quality structures.
- Continued to use the Maintenance Management System (MMS) to initiate and track stormwater cleaning requests for service and work orders. Primary features of the system include detailed documentation, work order tracking, and expedited response times.

Planned or Considered FY15 Activities

- Seasonally inspect key inlets and outfalls to prevent flooding; remove any blocking vegetation or other obstructions.
- Clean catch basins/curb inlets and connecting pipes of accumulated sediment, debris, and other pollutants on a systematic basis.
- Record quantities of debris removed and identify structures requiring more frequent cleaning cycles.
- Evaluate system performance.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.2.4 M8 – Winter Road Sanding and De-icing Program

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
Apply and clean up winter traction sand on publicly maintained roads and parking areas in conjunction with the application of a pre-wetting agent designed to reduce the need for repeat sanding. Conduct research efforts to identify and evaluate new technology and strategies for application of environmentally friendly chemical anti-icing and de-icing agents. Conduct research into new methods, practices, and efficiencies which may further limit the runoff of sanding related pollutants to the storm system. Conduct preseason staff training on the proper application methods of sand and chemical agents.

Tasks
1. Apply sand to roadways in accordance with the Public Works Snow and Ice Plan.
2. Apply chemical agents in accordance to Guidelines for Anti-icing/Deicing included in the Public Works Snow and Ice Plan.
3. Respond to priority routes as outlined in Public Works Snow and Ice Plan.
4. Collect data such as streets plowed and sanded, material used, and other data related to snow/ice events.

Measurable Goals	Status of Measurable Goals – FY14
• Minimize the use of abrasive materials for snow and ice control through adaptive management practices.	• Goal was met.
• Begin cleanup of abrasive materials when streets become free of ice and snow, and the forecast does not call for more ice and snow within the next 24 hours.	• Goal was met.

Tracking Measures	Tracking Data – FY14
• Document the quantities of sanding materials applied and collected during each storm event.	• 1,517 cubic yards of sand were applied last winter.
• Document the volume used for deicing/anti-icing operations.	• 12,333 gallons of liquid deicer/anti-icer were applied last winter.

FY14 Activities and Accomplishments

- A total of 8,107 hours of regular and overtime hours were recorded for sanding and clean up during snow and ice events.
- Removal of the sanding rock began at the conclusion of the storm events when streets became free of ice and snow, and forecasts did not call for new snow or ice within the next 24 hours. Priority routes for removing the sanding rock were the same as for its application. Special attention is given to street arterials with striped bike lanes to ensure they are clean.
- Continue to use sanding and sweeping logs during snow and ice events. During significant snow and ice events, Public Works will utilize the Emergency Command Center and the Maintenance Management Command Center software. This allows staff to track which snow and ice routes have been completed, track vehicle location, as well as pertinent data for recording.
- Subscribed to Weather Net to obtain focused weather briefings to help minimize unnecessary applications of anti-icing materials.
- Participated in Base Camp, a regional weather sharing site to help make informed decisions regarding sanding, plowing, and/or de-icing activities.
- Performed annual snow and ice equipment inspection and training.

Planned or Considered FY15 Activities

- Continue to subscribe to Weather Net, and participate in Base Camp in order to make informed decisions regarding sanding, plowing, and/or de-icing activities.
- Continue to research alternative technologies which may be viable for snow and ice control.
- Conduct annual snow and ice equipment inspection and training.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.2.5 P3 – Tree Planting and Information Programs

Responsible Department/Division:
Public Works / Parks & Open Space

BMP Contact:
Parks and Open Space Division Director

BMP Description
Manage and support both governmental and community tree planting programs. Provide information to the public about the multiple benefits that trees provide for protecting and enhancing stormwater quality.

Tasks
1. Manage and support the City's community focused Eugene Park Stewards (formerly Neighborwoods) volunteer tree planting program.
2. Manage and support the City's internally focused tree planting programs that regulate new development so they are fully planted with street trees and that ensure City-engineered street improvement projects include street trees in appropriate plantable areas.
3. Seek opportunities to provide and/or present information to the community regarding stormwater related benefits of trees.

Measurable Goals	Status of Measurable Goals – FY14
• On average, conduct 12 Neighborwoods volunteer program tree planting projects per year.	• Goal was met.
• Include the planting of street trees with all new private developments and with all new public street improvement projects as opportunities arise.	• Goal was met.
• Plant 600 trees per year through the Neighborwoods program and the City's regulatory tree planting program.	• Goal was met. A total of 940 trees were planted in FY14.
• Provide information about the stormwater benefits of trees at major publicly attended events at least 4 times per year.	• Goal was met.

Tracking Measures	Tracking Data – FY14
• Track the number of Eugene Park Stewards volunteer program planting projects and the resulting number of trees planted.	• The Eugene Parks Stewards (EPS) volunteer program held 14 tree planting projects. 142 trees were planted in these projects. In addition, 595 individual street tree replacements were planted for a total of 737 volunteer program trees for FY14.

• Track the number of trees planted through new development tree planting requirements and through City-engineered street improvements.	• A total of 166 trees were planted through new development projects. City-engineered street improvement projects resulted in 37 new trees.
• Track the number and type of publicly attended events where stormwater related tree information was provided or where a presentation was made.	• EPS attended 11 publicly attended events (Neighborhood Association Mtgs, Community Fairs & Celebrations, hosted Volunteer Leadership Trainings & Se4rvice Organizations). The Urban Forrester attended the 2014 Arbor Day and Tree City USA Award Presentation.

FY14 Activities and Accomplishments

- Urban Forestry staff continued work on an ArcGIS-based tree inventory system using staff and temporary workers for collecting data using a GPS hand-held computer and PDAs. Inventory data have been collected in all new developments that were planted under the Developer Street Tree Program. The street tree inventory, now approximately 90% complete, was added to with assistance from volunteers from the Jefferson Westside Neighborhood, who implemented a Neighborhood Matching Grant to collect data on trees and planting spaces in their neighborhood.
- The Friends of Trees (FOT) coordinated the volunteer pruning of 200 street trees through their Tree Stewards volunteer tree care program. This continues the partnership established between the City's volunteer program and FOT to perform crucial structural pruning of newly established trees.
- Mayor Kitty Piercy helped kick off the City's Arbor Day celebration by accepting Eugene's 35th consecutive Tree City USA award from the Oregon Department of Forestry. Speeches by the Mayor, Saint Paul Parish School Vice Principal Kelly Hughes, Link Smith, Western Lane District Forester, Eugene Parks Stewards and Urban Forestry staff provided information to the public audience about the myriad environment benefits of trees, including storm water runoff reduction. City staff coordinated the purchase and planting of over 37 new trees, including climate-adaptable species such as native Oregon white oak, valley oak, holly oak, shingle oak and swamp red oak.
- Urban Forestry staff assisted Public Works Engineering staff in designing effective tree preservation for large canopy shade trees on several street and bike path construction and reconstruction projects.
- A new model for both Friends of Trees (formerly Eugene Tree Foundation) and the new Eugene Parks Stewards volunteer program that was formalized last year continued to improve and was expanded this year through a Community Stewardship Grant to plant and Prune Public Trees.

Planned or Considered FY15 Activities

- In FY15, staff plans complete a revision and update of the City urban forestry webpages, increasing the educational outreach opportunities for citizens to learn about the benefits of

trees in improving water quality and reducing pollutants in streams and allowing for easier access to volunteer opportunities to plant and care for trees.

- The Natural Areas and Urban Forestry Section embarked on a plan to update the Approved Street Tree Species List. Public outreach is planned to major stakeholder groups, a project page will be placed in the City's web pages soliciting public comment, and a new list of trees that are projected to be climate resilient and provide increased storm water run-off reduction benefits will be adopted administratively by year's end.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.2.6 P4 – Public Stormwater System Maintenance – Developed Parks and Rights-of-Way

Responsible Department/Division:
Public Works / Parks & Open Space

BMP Contact:
Parks and Open Space Division Director

BMP Description
Evaluate and, as necessary, adapt or revise turf, landscape and natural area vegetation management programs for public lands under the City's jurisdiction. Such areas include developed parkland and public right-of-way.

The focus of this BMP is to minimize and further limit the discharge of pollutant laden runoff from these areas.

Tasks
1. Update and refine the Integrated Pest Management (IPM) policy document and operations manual as new techniques are researched and the results of implementation of these techniques are uncovered.
2. Research, evaluate and implement park and landscaped area design practices and new vegetation management techniques to minimize impervious surfaces; reduce pesticide and fertilizer use; and maximize the use of native vegetation, where appropriate.
3. Complete stormwater inspections utilizing inspection checklist for all publicly-maintained vegetated stormwater facilities within the right-of-way and developed parks. Update the new stormwater facility tracking system database with information gathered in field.
4. Evaluate the Pesticide Free Parks Program. Revise, adapt, and expand program as appropriate.
5. Utilize the IPM policy document to continue adding Pesticide Free Zones within Eugene's seven stormwater basins.

Measurable Goals	Status of Measurable Goals – FY14
• Review IPM manual at least once during the permit term, and update and refine the IPM policy document and operations manual in accordance with integrated pest management principles.	• Complete
• Conduct periodic inspection of each publicly maintained vegetated stormwater management facility within the right-of-way and developed parks. Populate the stormwater facility tracking system database with current information for each facility that is inspected.	• Complete

• Continue to provide services to existing Pesticide Free Parks.	• Complete
• All newly developed playgrounds, pools, sprayplay features, recreational areas and other park areas will be evaluated during design or within one year of initial public use for addition into the Pesticide Free Zone program.	• Complete

Tracking Measures	**Tracking Data – FY14**
• Document updates of IPM policy document and operations manual.	• Minor updates were made to the IPM policy document in June of 2014
• Document new techniques and practices that are incorporated into park and landscape design.	• The Washington/Jefferson Skate Park was constructed in this reporting period. A vegetated stormwater infiltration planter was built to treat stormwater from the restroom at the park.
• Document the number of publicly maintained vegetated stormwater facilities inspected and information entered into the stormwater facility tracking system database annually.	• 22 publicly maintained vegetated storm water facilities were inspected and the information was entered into the storm water facility tracking system database.
• Track the condition of existing parks that are currently maintained using the Pesticide Free Parks protocol.	• Maintenance was performed at nine pesticide free parks during the reporting period. Tasks included litter and garbage collection, weekly mowing during the first part of the growing season then a reduction in frequency to every two weeks, and weed and plant management throughout the year using alternative methods of weed control such as flame-weeding, hand weeding, and mulching.
• Calculate the total acreage that has been placed in the Pesticide Free Zone Program per year. • Utilize Chem Track program to track how much chemical (pound per acre) were used each year and determine total reduction of chemicals used annually.	• During this reporting period there were no parks added into the Pesticide Free Zone Program. To date a total of 201.25 acres of pesticide free zones exist in the park system. • A total of 22.5 pounds* of chemicals were applied to areas within the park system/right- of-way during the reporting period.

FY14 Activities and Accomplishments

- Staff worked with Oregon DEQ to report the amount of leaves removed from streets and right of way areas and delivered to the Bloomberg Park Compost site.

Planned or Considered FY15 Activities

- Continue partnering with the Volunteer Program (Eugene Park Stewards) to set up volunteer events for publicly -owned vegetated stormwater facilities.
- Continue to look for opportunities to develop the ability in ChemTrak to generate a report that shows chemical applications that occur in natural areas, developed parks or the ROW during each reporting period.
- Staff will be investigating the development of a free streets stewards program that will allow adjacent property owners to adopt vegetated facilities that are adjacent to their homes.
- Review and if needed update the IPM document.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.2.7 P5 – Public Stormwater System Maintenance – Open Waterways

Responsible Department/Division:
Public Works / Parks & Open Space

BMP Contact:
Parks and Open Space Division Director

BMP Description
Maintain and manage open waterways consistent with adopted Open Waterway Maintenance Plans. These plans are intended to protect and enhance stormwater quality and natural resources values while continuing to maintain sufficient conveyance capacity in the waterways.

Tasks
1. Follow written procedures for on-going maintenance of open waterways: Open Waterway Maintenance Plans (for all open waterways) and U.S. Army Corps of Engineers Levee Owner's Manual (for portions of Amazon Creek).
2. Establish native trees and shrubs along portions of open waterways that are lacking shade.
3. Repair channel banks as erosion or slumping issues occur.
4. Revise Open Waterways Maintenance Plans to incorporate new information and techniques to further advance the goal of maximizing water quality and habitat benefits while also maintaining sufficient conveyance.
5. Implement storm event monitoring at potential choke points in the open waterway system.
6. Complete stormwater inspections utilizing inspection checklist for all publicly-maintained vegetated stormwater facilities (e.g., detention ponds, wetlands, bioswales). Update the stormwater facility tracking system database with information gathered during inspection.

Measurable Goals	Status of Measurable Goals – FY14
• Implement "green piping" (i.e., pruning woody vegetation within active channel zone) on 5 miles of open waterway annually to maintain conveyance.	• Completed
• Establish native trees and shrubs on 5000 lineal feet of waterway annually to help shade streams, lower water temperatures, and increase slope stability.	• Completed
• Revise all Open Waterway Maintenance Plans by December, 2012.	• Completed; The plans, which are water quality protective, were thoroughly reviewed and deemed to be current, not in need of updating.
• Periodic inspections for publicly-maintained vegetated stormwater facilities (e.g., detention ponds, wetlands, bioswales). Populate the stormwater facility tracking system database with current information for each facility.	• Completed

Tracking Measures	Tracking Data – FY14
• Miles of open waterways that are green-piped each year.	• 11.5 miles of open waterway were green-piped.
• Track the number of riparian vegetation planting projects, including the number of lineal feet planted, and the number and general type of native species planted (i.e. trees, shrubs, grasses, etc.).	• 200 native trees and shrubs planted along the banks of Delta Ponds (non-linear planting) • 112 native trees planted along Amazon Creek at the Lane County Fairgrounds; approximately 900 linear feet of bank planted. • 30 native trees planted along the Amazon Creek upstream of West 11th Ave; approximately 200 linear feet of bank planted. • 260 native trees planted along Amazon Creek between City View and Oak Patch Streets; approximately 2000 linear feet of bank planted. • The following streams and linear distances were planted with native willow cuttings: Amazon Creek, Bailey Hill to West 11th (3100 feet); Spring Drive near Springwood Drive (400 feet); the A-3 channel west of Seneca (7000 feet).
• Number of channel bank repair projects (e.g., to reduce erosion or slumping) completed each year.	• 2 significant channel bank repairs completed; one at 39th Ave where a slump had occurred, and one south of Canyon Drive where significant scouring had occurred due to a poorly placed 48" diameter storm pipe.
• Number of times each year that the storm event monitoring program for open waterways is activated.	• No storm events occurred during the reporting period of sufficient severity to trigger monitoring.
• Number of publicly maintained vegetated stormwater facilities inspected and information entered into the stormwater facility tracking system database annually.	• Staff conducted annual inspections of 32 facilities and entered the information into the tracking database

FY14 Activities and Accomplishments

Planned or Considered FY15 Activities

- We will implement multiple projects (e.g., tree planting, green piping) that will address the measureable goals, above

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.3 Status of Illicit Discharge Control BMPs

3.3.1 M1 – Management of Illicit Discharges to the Municipal Stormwater System

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
Discourage and reduce improper discharges into the stormwater system through operation of a stormwater discharge compliance enforcement program. The primary goals of this program are to protect the quality of the receiving waters of the City's stormwater system and to ensure that discharges to the City's stormwater system are in compliance with local, state, and federal regulations to the maximum extent practicable. The City will conduct periodic review of enforcement program practices and procedures and make revisions as deemed necessary.

Tasks
1. Use CCTV inspection, dye testing, smoke testing and field investigation to identify illegal connections, cross connections with the wastewater system and failures in the pipe system.
2. Inspect stormwater outfalls to identify illicit discharges, as well as track outfalls added or removed from the stormwater system.
3. Implement the City's Stormwater System Administrative Rule, 58-02-01-F, with the intent to prohibit improper connections and illegal discharges to the City's stormwater system utilizing an effective enforcement program.

Measurable Goals	Status of Measurable Goals – FY14
• Work to reduce the number of improper discharges into the municipal stormwater system through public outreach and a reasonable enforcement of regulations.	• Goal was met.

Tracking Measures	Tracking Data – FY14
• Track the number of stormwater pollution complaints received by the City.	• A total of 97 discharge concerns were investigated after being reported to City staff and logged into the Maintenance Management System.
• Track the number of outfalls inspected annually.	• Public Works Maintenance inspected 100+ outfalls during the reporting period as part of a winter wet weather inlets/outfalls inspection program.
• Track the number of requests-for-service (RFS) related to illicit discharges to the municipal stormwater system which required enforcement.	• A total of 2 notices of violation were issued.

FY14 Activities and Accomplishments

- The second year of the Dry Weather Field Screening program took place in FY14, with 6 major outfalls being sampled and analyzed by an outside laboratory. Results of the sampling showed no evidence of illicit discharges.
- Public Works Maintenance – Spill Response Program – Technical Specialist continues to work closely with staff of Public Works Engineering-Erosion Control Team and Public Works-Wastewater Industrial Source Control as the Public Works Stormwater Enforcement Team. The Enforcement Team meets regularly to discuss discharges, educational outreach, compliance/penalty cases and joint field investigation.
- The City's Maintenance Management System (MMS) is the primary mechanism for database tracking of spills and illicit discharges. The MMS system now includes both a "request for service" and "work order" component for tracking purposes, with the next expansion to include mobile technology capabilities.
- Ninth successful year of combined efforts, working with City of Springfield Environmental Services staff and the City of Eugene Wastewater Industrial Source Control personnel to administer the "Fish Friendly" Car Wash Kits for local Non-Profits Fundraising. Planning for the eighth season is underway.
- 2 sites continue to utilize permanent Car Wash kits and 10 were loaned to volunteer organizations during the reporting year.
- The Polk Street Stormwater Vault was cleaned 3 times during the last reporting period and over 25 tons of debris was removed.

Planned or Considered FY15 Activities

- Continue the Dry Weather Field Screening program to monitor for illicit discharge activities.
- Continue outfall inspection program to look for illicit discharges, inspect conditions of infrastructure, and prevent flooding and other safety concerns.
- Continue to manage the "Fish Friendly Car Wash Kit Program".
- Continue to partner with the Local Emergency Planning Commission on Hazardous Materials trainings.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.3.2 M2 – Spill Response

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
Maintain an on-call team trained in spill response procedures involving environmentally hazardous materials and a vehicle equipped for such spill mitigation. Coordinate efforts with other local response teams such as the City of Eugene Fire and Police Departments, Lane County, and state agencies.

Tasks
1. Maintain an on-call list of personnel trained in spill response procedures.
2. Maintain an inventory of equipment and supplies necessary to mitigate improper discharges to the municipal stormwater system.
3. Coordinate in conjunction with Fire Department / Hazmat Team on mitigation efforts including hazardous material clean-up and disposal.
4. Update the City of Eugene's Public Works Maintenance Spill Response and Illicit Discharge Operations Plan.

Measurable Goals	Status of Measurable Goals – FY14
• Maintain a list of HAZWOPER trained personnel that are available for 24-hour emergency response.	• Goal was met. • Public Works currently has 10 employees with 40 hr. HAZWOPR training and 1 employee with 24 hr. HAZWOPR training. • Conducted annual refresher course for 8hr., 24hr., and 40hr. HAZWOPR trained staff.
• Maintain and update, as necessary, the City's On-Call Emergency Roster for Environmental Spills.	• Goal was met. • Maintained and Updated On-Call Roster during reporting year.

Tracking Measures	Tracking Data – FY14
• Up-to-date list of employees trained for spill response.	• Public Works maintains a staff of 116 employees with 8hr. HAZWOPR First Responder training. • Public Works maintains a staff of 1 employee with 24hr. HAZWOPR technician training. • Public Works maintains a staff of 10 employees with 40hr. HAZWOPR technician training.

• Track number of spills and follow-up details.	• A total of 97 concerns were investigated after being reported to City staff and logged in to the Maintenance Management System. • 68 illicit discharges were identified and eliminated.

FY14 Activities and Accomplishments

- Spill Response staff continue to work closely with Stormwater and Wastewater Vacuum Truck Operators, Systematic Field Inspection staff, Street Sweeper Operators, the Stormwater Supervisor, Parks and Open Space Staff, Wastewater Industrial Source Control Technicians, Stream Team Coordinator and volunteers, Engineering Division Construction Erosion Control Technicians to identify, investigate and abate Illicit Discharges and spills through combined efforts.
- 4 employees completed a 40hr. HAZWOPER technician training, bringing the total number of Public Works Staff with the 40hr. training up to 10.
- Continued response to spills by City Maintenance Staff, Fire and Police Emergency Services Personnel, and the use of Hazmat contractors for cleanup, consultation and material disposal needs.
- Expanded the cooperative relationship, with regular meetings and networking, with City of Springfield, Environmental Services staffers on IDDE, Non-Profit Car Washing kits, Landscaping businesses and Pressure Washing Contractors, Retailers and Equipment Rental outfits.
- The City's Maintenance Management System (MMS) is the primary mechanism for database tracking of spills and illicit discharges. The MMS system now includes both a "request for service" and "work order" component for tracking purposes, with the next expansion to include mobile technology capabilities.

Planned or Considered FY15 Activities

- Continue to manage the "Fish Friendly Car Wash Kit Program"
- Continue to partner with the Local Emergency Planning Commission on hazardous materials training.
- Continue to monitor on-street homeless camping activities with a goal of reducing levels of pollutants entering the MS4.
- Assist City of Eugene Administrative Staff with display booth at Public Works Day.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.3.3 M7 – Systematic Stormwater Field Screening and Investigation

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
The Stormwater Field Screening and Investigation program inspects the public stormwater system for condition assessment and the private stormwater system to assess water quality impacts to the municipal stormwater system. Where illicit discharges are found, attempt to identify the source and eliminate the discharge.

Tasks
1. Work with the Sub Surface Maintenance Crew to assess, inspect and map the details of the public and private stormwater system.
2. Conduct annual dry-weather field screening inspections per the City of Eugene Field Screening manual.
3. Work with the inspection and enforcement staff to continue to educate and regulate the users on the proper use of the stormwater system.

Measurable Goals	Status of Measurable Goals – FY14
• Improve accuracy of the Stormwater System layer in our Geographic Information Systems (GIS) through map update requests.	• Goal was met.
• Identify and remove illicit discharges to the municipal stormwater system through the dry-weather field screening process.	• Goal was met.
• Utilize interaction with the public as an educational opportunity to increase stormwater user awareness.	• Goal was met.
• Develop "map update" requests based on field inspections and forward this information to the GIS manager for inclusion into the citywide GIS system.	• Goal was met.

Tracking Measures	Tracking Data – FY14
• Track the number of map update requests forwarded to the GIS team.	• Forwarded 20 map update requests to the GIS team.

• Track and create work orders for the system repairs discovered through the inspection process.	• Created 26 work orders for stormwater system repairs.
• Track the number of dry-weather field screening inspections and follow-up details.	• Dry Weather Field Screening took place in 2014 at 6 major stormwater outfalls and a 3rd party testing laboratory was used to collect and analyze the samples. Results of the sampling did not exceed the pollutant parameter levels.

FY14 Activities and Accomplishments

- The stormwater maintenance lead worker position investigates and inspects both the public and private stormwater systems for conveyance issues and system mapping irregularities.
- The stormwater maintenance lead worker scheduled and oversaw the cleaning of the Polk Street Stormwater Vault. The vault was cleaned 3 times last year and over 25 tons of debris was removed.
- The stormwater maintenance lead worker worked in conjunction with Public Works Engineering staff on Pavement Preservation projects to identify conveyance problems prior to new road surfacing.
- Continued investigating conveyance problems such as utility breaches, grout build up, off-set joints, cracks and roots that Closed Circuit Television inspections capture.

Planned or Considered FY15 Activities

- The stormwater maintenance lead worker will continue to work in conjunction with Public Works Engineering staff on Pavement Preservation projects to identify defects to the stormwater system and prioritize and make recommendations for repairs prior to road surfacing.
- Work with spill response/illicit discharge staff to improve the mapping accuracy of the existing stormwater system.
- Continue to map both the public and private stormwater systems to increase information available through the GIS system.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.3.4 P7 – Litter and Illegal Dumping Control

Responsible Department/Division:
Public Works / Parks & Open Space

BMP Contact:
Parks and Open Space Division Director

BMP Description
Manage and support efforts to reduce impacts to stormwater runoff and local receiving waters by controlling litter and debris in public spaces and by removing illegally dumped refuse and debris as well as garbage and trash from illegal camp sites.

There are two primary focal points of this BMP. The first is to provide opportunities for proper disposal of litter and trash at strategic publicly owned sites to prevent it from being washed into the public stormwater system. The second is to clean-up illegal dump sites and illegal camp sites prior to pollutants from the trash and debris being washed into the public storm system or the local receiving waters.

Tasks
1. Place trash receptacles in parks, public areas and at venues for public events which are likely to generate garbage, litter and other throw-away items. Provide frequent collection service to prevent over filling.
2. Require up-front clean-up deposits for large events in City parks, for rental of City park shelters, and for rental of other City owned and operated recreation or outdoor cultural facilities.
3. Conduct routine debris inspections of significant waterways under the City's jurisdiction and remove illegally dumped or discarded debris and other items as appropriate.
4. Conduct routine inspections along riverbanks and in other undeveloped lands under the City's jurisdiction to locate, dismantle, and clean-up illegal camp sites and their associated trash, garbage, debris and bio-hazardous materials.
5. Identify and monitor known historic dump sites in remote areas of the public right-of-way (such as undeveloped cul-de-sacs, dead-end streets, etc.), attempt to identify a responsible party for significant piles of dumped debris, and remove the dumped material as soon as possible to discourage additional dumping by others.

Measurable Goals	Status of Measurable Goals – FY14
• Ensure all parks, all public space areas managed by the City and all venues for outdoor public events on City lands have adequate trash receptacles. Empty trash receptacles frequently enough to prevent spillage due to being over filled.	• Adequate trash receptacles provided in all public spaces for use by the public. Receptacles emptied regularly. • Staff continues to monitor for strategic locations to place litter receptacles due to high litter and debris activity.

• Ensure at least 75% of all rentals of parks, park shelters, and other City operated outdoor facilities will result in no loose litter and debris left behind.	• All park rentals during the reporting period were managed for litter removal.
• Inspect all major waterways and riverbanks weekly for dumped or discarded debris and illegal campsites. When found, remove dumped materials within two working days. When found, dismantle illegal campsites and clean-up as soon as is physically and legally possible.	• Priority waterways including the Willamette River, Amazon Creek and Delta Ponds were checked weekly and illegal campsites were removed.
• Monitor all identified historic dumping sites in the public right-of-way and clean-up as necessary at least twice per month.	• Patrolled reoccurring dump sites and camp sites throughout the reporting period.

Tracking Measures	**Tracking Data – FY14**
• Track the collection frequency for trash receptacles in City parks and other public space areas managed by the City.	• Monitored 656 outdoor public events and provided trash and litter collection. • All regional and high use neighborhood parks – trash collected daily, year round. • Low use Neighborhood parks –trash collected 2-3 times per week during winter months, daily during summer. • Dog waste cans at four dog off-leash areas dumped eight times per year for a total of approximately 60 cubic yards of dog waste disposed.
• Document the number or percentage of rentals of parks, park shelters, and other outdoor venues held on City managed land that forfeit all or part of their clean-up deposit due to excessive litter left behind.	• Of the 656 park rentals this year, no deposits were forfeited due to excessive litter left behind in FY 14. Cleaning deposit amount was raised to $150 to maintain compliance with event cleanup requirements.
• Track the number of illegal campsites cleaned-up along riverbanks, waterways, or other public space areas managed by the City.	• A total of 30 illegal campsites were cleaned up in developed park areas in FY 14. • A total of 538 illegal campsites were cleaned up along riverbanks, waterways, undeveloped parklands in FY 2014.

• Track the frequency of collection and the amount of debris collected from waterways and from the public right-of-way.	• Litter collected from waterways weekly by staff and Sheriff's work crew. A total of 3,000 bags of trash were collected by the Sherriff's work crew. This equates to approximately 111 cubic yards of trash. • Litter collected from developed parks daily. A total of 2,541 cubic yards of trash were collected in developed parks and rights of way. • Litter collected from public rights of way as found or reported. • Total amount collected in FY 14 = 2,652 Cubic Yards.

FY14 Activities and Accomplishments

- Continued satellite trash drop boxes in the North and South Park Operations service region to increase efficiency of litter removal and disposal. In FY14, approximately 900 Cubic Yards of trash and litter was disposed of in these satellite trash drop boxes.
- Began tracking the dumping of Roosevelt Yard drop box to capture total trash removed from park areas (excluding trash taken to Regional Satellite drop boxes), river banks and waterways (includes litter and debris picked up by staff and Sheriff's Work Crew), and public rights of way =1,752 Cubic Yards.
- The City sponsored and provided logistical support for the Willamette River Cleanup on October 5, 2013. A total of 74 volunteers collected debris and litter from the river and its banks. A total of 257 bags of litter and 240 needles were collected during the event.

Planned or Considered FY15 Activities

- None

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.4 Status of Waste Management BMPs

3.4.1 B1 – Household Hazardous Waste Disposal

Responsible Department/Division:
Planning and Development / Building and Permit Services

BMP Contact:
Building and Permit Services Division Director

BMP Description
Support existing efforts and programs within the Eugene metro area to inform citizens of local opportunities for the proper discard and disposal of their household hazardous waste materials. Support and promote facilities and programs that provide such opportunities.

The improper disposal of household hazardous waste poses a serious threat to local stormwater quality. Old paint, solvents and thinners, pesticides, bleach, drain cleaners, antifreeze, gasoline, used motor oil and other motor vehicle fluids can easily be flushed into the stormwater system if disposed of in yards, left uncovered in the rain, or poured down driveways or into the street. Supporting efforts to inform homeowners and tenants about where they can properly dispose of these products as well as supporting local household hazardous waste management facilities and efforts is an effective way to reduce the amount of these products that inadvertently make their way into the stormwater system and local receiving waters.

Tasks
1. Review City's web site for possible improvements to connecting the Eugene public to the hazardous waste disposal services provided by Lane County.

Measurable Goals	Status of Measurable Goals – FY14
• Update the City's web site periodically to direct residents to the latest information about recycling and waste prevention news, resources, and local events.	• Completed.

Tracking Measures	Tracking Data – FY14
• Document materials disbursed about household hazardous materials.	• Lane County materials.

FY14 Activities and Accomplishments
- The City's Waste Prevention and Recycling Program is primarily a regulation program focused on collection and rate regulation. Most of the Stormwater BMP's are handled by our County partners at Lane County Waste Management. We have links on our web site referring the public to their information.

Planned or Considered FY15 Activities

- The Cities of Eugene and Springfield, in partnership with Lane County, have begun work on a 20-year Solid Waste Management and Resource Recovery Plan that is expected for 2016, and will include elements related to improved household hazardous waste management.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None.

3.4.2 B2 – Solid Waste Management

Responsible Department/Division:
Planning and Development / Building and Permit Services

BMP Contact:
Building and Permit Services Division Director

BMP Description
Evaluate and revise, as necessary, existing solid waste and recycling collection rules to address stormwater quality.

Improper and/or unregulated collection and recycling of solid waste has a serious potential for creating negative impacts to stormwater quality. High collection fees, infrequent or spotty collection service may lead to illegal dumping activity. Unregulated waste containers may be prone to leaking or spilling allowing pollutants to wash into the storm system. By continuing to monitor and evaluate local solid waste management collection efforts, the City will be better able to improve local regulations so that stormwater quality is taken into account.

Tasks
1. Regulate solid waste and recycling collection activities within the city limits to curb possible impacts to the stormwater systems from leachate of garbage, yard debris, and recycling materials.
2. Support a minimum of biweekly collection service for organic materials and provide backyard composting classes for residents with or without collection service.
3. Implement the nuisance abatement enforcement program that provides rapid response to illegal dumping of garbage, yard debris, or other solid waste materials.

Measurable Goals	Status of Measurable Goals – FY12
• Review Administrative Rule to ensure regulations are up to date and include requirements to support appropriate waste management and prevention.	• Administrative Rule was updated for solid waste and recycling totes

Tracking Measures	Tracking Data – FY12
• Document total tons of yard debris collected through the curbside program.	• 10,389 tons of yard debris collected in CY2012
• Document total tons of commercial food waste collected through the Love Food Not Waste program.	• 1,788 tons of commercial food waste was collected in FY14.
• Document the number of compost demonstration workshops and participants.	• Twelve compost demonstration workshops were held with a total of 92 participants. Additionally, two worm bin workshops were held with a total of 36 participants.

• Document number of enforcement cases (i.e., received complaints) related to inappropriate garbage handling.	• 117 cases of nuisance complaints received related to garbage.

FY14 Activities and Accomplishments

- Total tonnage for the Love Food Not Waste commercial food waste program increased by 23 percent.

Planned or Considered FY15 Activities

- The Cities of Eugene and Springfield, in partnership with Lane County, have begun work on a 20-year Solid Waste Management and Resource Recovery plan that is expected in 2016.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.5 Status of Construction and New Development BMPs

3.5.1 E2 – Erosion Prevention and Construction Site Management Program

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
City Engineer

BMP Description
Administer and monitor an Erosion Prevention and Construction Site Management Program in compliance with Eugene Code 6.625-6.645, preventing and mitigating pollutant and sediment discharges into the city's stormwater system due to construction activities and land disturbance.

Tasks
1. Screen all development permits for sensitive area status, conduct plan reviews, issue erosion permits, conduct erosion inspections, and provide compliance enforcement as appropriate.
2. Issue Erosion Permits for activities which disturb an area one acre or greater in size or disturb an area 500 square feet or greater within a sensitive area (i.e. adjacent to a water feature or its buffer, ground slopes greater than 10%, having highly erodible soils).
3. Conduct education and outreach related to new erosion techniques/practices.
4. Act as 1200-C Agent for DEQ.

Measurable Goals	Status of Measurable Goals – FY14
• Conduct one inspection prior to the commencement of work for all erosion permitted sites.	• Measurable Goal was met. An initial inspection continues to be required prior to any ground disturbance and prior to issuance of building permits for erosion prevention permitted sites.
• Inspect non-erosion-permitted sites at least twice during the life of the building/construction permit or as necessary to assure compliance with the program.	• Measurable Goal was met. Non-erosion permitted sites received a minimum of two inspections to assure compliance with the BMP requirements.
• Inspect permitted sites monthly or as necessary to assure compliance with the program.	• Measurable Goal was met. All erosion permitted sites are inspected monthly and as necessary to ensure compliance.
• Conduct one annual erosion prevention training event.	• Measurable Goal was met. Five erosion training sessions were conducted.

Tracking Measures	Tracking Data – FY14
• Number of compliance orders issued.	• 20 Administrative Compliance Orders were issued in FY 14

• Number of erosion permits issued.	• 112 Erosion Prevention permits were issued in FY 14 (54 commercial, 58 residential, and 4 annual).
• Number of inspections.	• 1,048 inspections at permitted sites were conducted and documented in FY14. Additional support inspections were conducted regularly at capital projects, non-permitted sites, stormwater emergencies (e.g. water-line breaks) and in response to complaints.
• Number of training/outreach events.	• Five erosion prevention training/outreach events were conducted in FY 14.

FY14 Activities and Accomplishments

- Implemented integrated electronic Maintenance Management System (MMS) for tracking and reporting illicit discharges.
- All BMP inspection staff maintained Certified Erosion and Sediment Control Lead (CESCL) training.
- Program continued in its role as Agent for Department of Environmental Quality (DEQ) to administer NPDES 1200-C permitting within Eugene's jurisdictional boundary.
- Staff issued 5 new DEQ 1200-C permits in FY 14 and are currently administering 16 active DEQ 1200-C permits.
- Program continued to implement an intergovernmental agreement with Lane County to issue and administer Erosion Prevention permitting to properties outside the City limits but with the urban growth boundary.
- Staff responded to approximately 30 erosion prevention/stormwater complaints.
- Mailed over 200 post-cards to Erosion Prevention permit holders reminding them about the City's wet-weather season and associated required measures.
- Worked with local vendors to improve availability of current BMP measures (e.g. dual inlet inserts).
- Continued to provide full-time assistance (on-call basis) to help customers and counter personnel answer questions about and issue Erosion Prevention permits.
- Constructed an interactive Erosion Prevention display and participated in an all-day educational event for the public.
- Amended outreach/training presentations and as necessary to be relevant for each specific and diverse audience.
- Updated Standard Specifications and drawings to improve efficiencies and effectiveness of program.

Planned or Considered FY15 Activities

- Planned comprehensive review and update, as necessary of the City standard specifications and drawings for erosion and sediment control.
- Planned review of current permitting rules to consider expanding criteria to add types of ground-disturbing construction projects currently exempt.

- Planned review, update and expansion of BMP outreach/training materials and audiences.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.5.2 E4 – Stormwater Development Standards

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
City Engineer

BMP Description
Administer and monitor a program that implements the city's Stormwater Development Standards, Eugene Code 9.6790-9.6796, Eugene Code 7.143 (3), and associated Stormwater Management Manual. The Stormwater Development Standards regulate the location, design, construction and maintenance of private and public stormwater facilities for flood control, water quality, and natural resource protection.

Tasks
1. Screen development permits for post-construction stormwater management, conduct plan reviews, approve stormwater facilities, conduct inspections, and provide compliance enforcement as appropriate.
2. Maintain an up-to-date Stormwater Management Manual for new development.
3. Track, evaluate, and develop new technologies and practices for post-construction stormwater management.
4. Provide training and technical assistance on water quality facilities to city staff and the public.
5. Conduct a review of policies, practices and regulations to identify potential barriers to implementing low impact development techniques.

Measurable Goals	Status of Measurable Goals – FY14
• Review stormwater management proposals at the land use and/or development permit stage (i.e. earliest level of review).	• Measurable Goal was met. Public Works staff reviewed all land use and permit applications for compliance with Stormwater Development Standards. Review occurred during the first review and plan check stages.
• Review and approve construction plans for stormwater management facilities for all development sites which create 1,000 square feet or more impervious surface.	• Measurable Goal was met. Public Works staff reviewed all construction plans that included 1,000 square feet of impervious surface. Staff ensured that BMP goals were met through the application of the stormwater development standards.
• Update Eugene's Stormwater Management Manual every two years or as needed to provide new information or practices for post-construction stormwater management.	• Measurable Goal was met. City staff updated the Stormwater Management Manual in March of 2014.

Tracking Measures	Tracking Data – FY14
• Number of private water quality facilities permitted with building permits.	• 55 Green Facilities • 20 Mechanical Facilities
• Number of land use applications reviewed.	• 77 land use applications reviewed.
• Number and type of public water quality facilities constructed.	• 10 Mechanical • 5 Green
• Number of training/outreach events held.	• 2 outreach events were held. City staff solicited public comment and involvement during the development of the stormwater standards development code update and the stormwater manual update.

FY14 Activities and Accomplishments

- Adopted a stormwater management hierarchy emphasizing low impact development practices and alternative public off-site green infrastructure mitigation for site that are not suitable for on-site management.
- Updated and adopted the Stormwater Management Manual.
- Distributed handouts about sustainable stormwater management (i.e. rain gardens, swales, pervious pavements, etc.) at the Lane County Spring Home show booth.
- Built on and fostered good working relationships with people who share a role in the implementation of post-construction stormwater runoff management within the community (i.e. design professionals, contractors, and local agencies).

Planned or Considered FY15 Activities

- None (Anticipate updating Stormwater Manual in FY16)

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.5.3 P6 – Compliance Program for Maintenance of Privately Owned Vegetated Stormwater Facilities

Responsible Department/Division:
Public Works / Parks & Open Space

BMP Contact:
Parks and Open Space Division Director

BMP Description
Develop, implement and manage a program to ensure that privately owned and operated vegetated stormwater treatment facilities are maintained so that they function as designed and constructed. The program will employ a combination of rules, protocols and procedures to require: that each private vegetated facility is routinely inspected; that routine and corrective maintenance actions are performed in a timely manner; and that completion of both such activities are regularly reported to City staff. Based on Eugene Municipal Code requirements, penalties and/or other legal remedies will be employed to enforce compliance with these requirements when necessary.

Tasks
1. Continue to document pertinent information for new privately owned and operated vegetated stormwater facilities. This includes photo documentation of newly constructed facilities and populating the stormwater facility tracking system database with all new facility information.
2. Develop an administrative rule that details the policy guidelines, practices, procedures, specific authorities, permitted actions, and penalties to be used by City staff in managing the program.
3. Establish criteria for when maintenance audits, corrective actions, and/or enforcement actions are warranted.
4. Maintain mechanisms, processes and procedures to track BMP ownership, maintenance inspections, required reports, corrective maintenance activity and enforcement actions.
5. Develop templates for written correspondence to BMP owners, such as inspection notification, reporting reminder, notice of non-compliance, notice of violation, and enforcement documents.
6. Review required inspection and maintenance logs submitted by BMP owners.

Measurable Goals	Status of Measurable Goals – FY14
• Inspect all new vegetated private stormwater facilities at the time of construction and log pertinent information into the stormwater facility tracking database system. Adopt and implement an administrative rule to enforce the maintenance of private stormwater facilities by February 2011.	• All new vegetated private stormwater facilities were inspected at the time of construction. All information was recorded in the stormwater tracking database system. • Administrative Rule was adopted.

• Ensure the inspection of each vegetated private stormwater facility is conducted at least once per year by the owner/operator and an inspection and maintenance log documenting the necessary corrective actions is submitted to City staff annually.	• All inspection logs were received for 103 out of 115 letters sent out this reporting period. The 12 logs not submitted are facilities designated as low priority and each will have formal inspection completed during the next reporting period to ensure compliance with maintenance requirements. • 13 formal inspections were completed in the reporting period.
• Review annual reports for privately-owned vegetated stormwater facilities.	• All inspection logs submitted were reviewed by the stormwater inspector. Logs received were inputted into the Stormwater BMP tracking database.

Tracking Measures	Tracking Data – FY14
• Number of private vegetated stormwater facility inspections completed at time of construction.	• 34 privately maintained vegetated stormwater facilities were inspected at the time of construction and approved during the reporting period.
• Number of owner/operator inspection and maintenance logs received and reviewed annually.	• 103 inspection and maintenance logs were received and reviewed during the reporting period.
• Number of notices of non-compliance and subsequent enforcement.	• No notice of non-compliance was issued during the reporting period.

FY14 Activities and Accomplishments

- There were no additional accomplishments.

Planned or Considered FY15 Activities

- Staff will move forward on transitioning from an Access database to an MMS database which will allow for easier data entry and access to queries that will help tracking of log submittal and facility inspection frequency.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.5.4 M6 – Regulation of Inspection, Maintenance and Reporting of Private Underground Stormwater Structures

Responsible Department/Division:
Public Works / Maintenance

BMP Contact:
Maintenance Division Director

BMP Description
Develop, implement and manage a program to ensure that privately owned and operated underground stormwater treatment structures are properly maintained.

The program will employ the guidance provided by the required individual Operations and Maintenance (O&M) plan for each structure.

Tasks
1. Develop templates for written correspondence to the private operator, such as inspection notifications, reporting reminders, notices of non-compliance, notices of violation, and enforcement documents.
2. Establish criteria for when maintenance audits, corrective actions, and/or enforcement actions are warranted.
3. Develop and maintain mechanisms, processes and procedures to track structure type, ownership, maintenance inspections, required reports, corrective maintenance activity and enforcement actions.
4. Collect and file the required annual reports as provided by the private operator.

Measurable Goals	Status of Measurable Goals – FY14
• Inspect all new private underground stormwater structures at the time of construction and log pertinent information into a database.	• Goal was met.
• Establish a correspondence file for each structure/operator.	• Goal was met.
• Ensure that each private underground stormwater structure is inspected, maintained and reported on as required by the O&M plan for the specific device.	• Goal was met.
• Review annual reports for privately-owned underground stormwater facilities.	• Goal was met.

Tracking Measures	Tracking Data – FY14
• Track the number of O&M plans obtained.	• 31 new O&M plans were received for new private mechanical stormwater treatment systems.
• Track the number of private inspection, maintenance and reporting activities conducted.	• 19 private facilities were visually inspected during the last reporting period.
• Track any enforcement activities related to the individual structures.	• No enforcement activities took place last reporting period.

FY14 Activities and Accomplishments

- Track the number of private mechanical stormwater facilities installed, facility type, location, and all pertinent information for reporting, in a database shared jointly with Parks and Open Space.
- Utilize sewer inspection staff to map locations and connection points to the public system using a stormwater connection records form.
- Work with Public Works Engineering to ensure all private mechanical stormwater facilities are accurately mapped and include in stormwater layer of GIS as well as field maps.

Planned or Considered FY15 Activities

- Continue to work with private mechanical stormwater facility owners and maintenance contacts to provide information and education on maintenance and operations of facilities.
- Continue to work with proprietary stormwater facility manufacturers to stay current on emerging technologies and improvements in maintenance operations.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.6 Status of Planning, Capital Improvements, and Data Management BMPs

3.6.1 E1 – Stormwater Capital Improvement Projects

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
City Engineer

BMP Description
Implement the Stormwater capital improvement program (CIP), including projects identified in the City's Stormwater Basin Master Plans (Basin Plans) for Amazon, Willow Creek, Bethel-Danebo, Willakenzie, Laurel Hill, Willamette River and the River Road – Santa Clara basins.

The Basin Plans describe a multiple-objective strategy for managing stormwater that addresses water quality protection and improvement, conveyance and flood control, and waterway protection and restoration. The basin strategies reflect the unique characteristics, problems and opportunities in each basin. Volume I contains a prioritized city-wide capital projects list including: water quality facilities in high pollutant source areas, streambank stabilization, stream restoration, and capacity enhancement projects.

The Basin Plan capital projects are one of the main sources of capital projects that comprise the City's CIP. In addition to the Basin Plans, CIP projects also originate from a list of maintenance and rehabilitation needs, from focused planning studies such as the Metro Waterways Restoration Study, and other partnership opportunities. The prioritized Basin Plan capital projects are combined with projects from these other sources, re-ranked, and incorporated into the CIP in a timeframe in-line with available budget.

Tasks
1. Incorporate projects from the Basin Plans into the City's bi-annual Capital Improvement Program and annual budget processes.
2. Include water quality criteria in ranking of capital projects from multiple sources for the CIP.
3. Maintain a GIS coverage of capital improvement projects including such attributes as location, project or facility type, drainage area and cost.
4. Maintain up-to-date Basin Plans web site, make hard copies available to the public in key locations (Library, Public Works offices).

Measurable Goals	Status of Measurable Goals – FY14
• Incorporate into the CIP projects list the projects identified in the recently completed 2010 River Road-Santa Clara Basin Plan, by September 2010.	• Projects from the River Road-Santa Clara Basin Plan have been incorporated into the CIP projects list including underground injection control decommissioning projects.
• Implement Stormwater CIP projects including at least one "water quality facilities in high source areas" project over the five-year permit term, and other retrofits as opportunities arise.	• The city implements numerous Stormwater CIP projects each year, including WQ improvements.

Tracking Measures	Tracking Data – FY14
• Document completion of River Road-Santa Clara Basin Plan.	• Completed in 2010.
• Track the number, type, watershed location and total drainage area of capital improvement projects constructed for water quality.	• The city tracks information of all capital projects.

FY14 Activities and Accomplishments

- In FY14 the City constructed numerous CIP projects from the CIP projects list. Two major Amazon Creek Stabilization projects were completed that will provide water quality benefits. One project stabilized eroding banks of levee sections of Amazon Channel/Creek reducing major erosion potential. The Amazon Creek Stabilization and Enhancement project from Chambers Street to Garfield Street reduced erosion and will plant native plants improving water quality and habitat potential.
- In FY14 the City constructed the Willamette River Water Quality Improvement at River Road and Maynard, a structural water quality improvement treating 182 acres that drains to the Willamette River. The area includes River Road, (a major arterial) and mostly residential neighborhoods with some commercial areas.
- In FY14 the City constructed vegetated treatment planters to retrofit parts of Roosevelt Blvd from Danebo to Terry in conjunction with a paving project. This section of Roosevelt Blvd is adjacent to an industrial area and drains directly to the Roosevelt Channel open waterway (A3 Channel).
- Annual review of the CIP project list is conducted by a committee to add needed projects, update priorities and weigh project funding criteria. In FY14 the City reviewed the major projects list and added several stream restoration and stabilization projects, and three water quality improvement projects to the CIP.

Planned or Considered FY15 Activities

- Continue to evaluate best locations for public water quality capital improvements.
- Seek additional sources of funding for future projects including Oregon Department of Transportation (ODOT) retrofit grant funding.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.6.2 E3 – Stormwater System Mapping and Data Management

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
City Engineer

BMP Description
Keep up-to-date inventories and maps of the public and private, natural and constructed, stormwater system. Include mapping of public and private water quality and flow control facilities such as grassy swales and detention basins. Develop and integrate asset inventory data and geographic information system (GIS) systems which describe the conveyance system, water quality attributes and related natural resource information. Integrate information generated through BMPs such as E1 (Capital Improvement Projects) and E4 (Development Standards) which create or modify system components and/or change the attributes of the stormwater system.

Tasks
1. Update stormwater system inventory and GIS on a weekly and monthly basis.
2. Develop, upgrade and maintain software applications which make system information available to staff.
3. Update stormwater infrastructure paper map sets annually.
4. Along with adoption of Stormwater Development Standards (E4), help to ensure that data management needs are identified and protocols established for documenting appropriate information to ensure that operations and maintenance, inspection and enforcement, and BMP effectiveness objectives are met.
5. In implementing the capital improvement projects outlined in the 2002 Stormwater Basin Master Plans, help to ensure documentation of location, type and other attributes of stormwater capital projects for purposes of evaluating their effectiveness and reporting progress under our permit.

Measurable Goals	Status of Measurable Goals – FY14
• Enter 95% of all newly constructed stormwater system features into inventory databases and GIS within six months of final construction approval.	• At least 95% of all newly constructed public stormwater systems were inventoried in databases and GIS maps within six months of construction.
• Ensure that 90% of GIS and data application users surveyed rate the GIS/data systems as satisfactory or better.	• At least 90% of GIS and database application users are satisfied, except for the linking of stormwater facilities to scanned images of as-constructs which are currently being fixed.

Tracking Measures	Tracking Data – FY14
• Report on map and database update activities annually.	• See list below under "FY14 Activities and Accomplishments."
• Survey map and data system users bi-annually.	• Survey completed in FY14.

FY12 Activities and Accomplishments

Facility Data Development and Maintenance:

- Relocating storm system to align with manholes on 2013 air photos. Most of UGB area had been reviewed and upgraded, where appropriate.
- Conducted thorough review of UIC (Underground Injection Control) map features and attributes to insure they are current and accurate
- Began entering drainage areas in databases for public (260) and private (155) BMPs
- Began mapping of private BMPs, which do not connect to City storm system
- Identified easements with Storm Drainage Maintenance Agreements (SDMA) and linked them to facilities displayed in mapping application
- Finished mapping backlog of PUE (public utility easement) stormwater easements from plat maps
- Rescanned as-constructs to improve readability and labeled them with their coordinate system specifications
- Correcting links between facilities referenced in mapping and database applications and scanned as-construct images
- Updated NPDES map and added to mapping application used by City staff
- Remapped waterbodies from 2013 air photos

Maps:

- Flood problems reported by public during severe storms were recorded in Maintenance Management System (MMS) database and mapped (real time) for distribution to PWM crews for subsequent repair
- Prepared map of Proposed Construction Projects (PCP), including stormwater facilities
- Produced 2013 edition of Wastewater, Stormwater and Street System map book for general use by Eugene Public Works staff.

Applications:

- PWM continues to use MMS to record stormwater mapping and attribute errors subsequently used by Public Works Engineering to fix data in databases and mapping applications.
- A web version of Wastewater, Stormwater and Street System map book is under development for use on tablets and smart phones in the field.
- Stormwater map layers added to upgraded Property Explorer (PIPER) web application for City staff use related to property permits.

Planned or Considered FY15 Activities

- Continue improving spatial accuracy of the stormwater map features using 2013 air photos
- Map BMP drainage areas where source data exists
- Developing routine to count usage of storm related map layers in mapping application

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.6.3 P2 – Bacteria Pilot Study

Responsible Department/Division:
Public Works / Parks & Open Space

BMP Contact:
Parks and Open Space Division Director

BMP Description
Amazon Creek is water quality limited for bacteria and load reductions of 84% are necessary as specified in the 2006 Willamette Basin Bacteria TMDL.

The Bacteria Pilot Study includes three phases: Phase I focuses on efforts to identify source(s) of bacteria, followed by Phase II which focuses on the application of Bacteria Pilot Study BMPs ("BMPs") aimed at reducing bacteria, and followed by Phase III which focuses on evaluating the effectiveness of BMPs that are implemented.

Based on monitoring and site assessment work initiated with the 2005 Stormwater Management Plan the overall strategy for continuation of the Bacteria Pilot Study will be a more targeted approach that will narrow down the number of probable sources for investigation of the root of bacterial pollution within a selected study area. This more targeted approach will lead the City towards implementing Phase II and Phase III of the study.

Tasks
1. Conduct storm sampling and data analysis efforts aimed at specific monitoring locations within the study area that are suspected high source areas.
2. Continue to assess field conditions to confirm or rule out potential bacteria sources.
3. Develop and implement appropriate strategies that will help further identify or rule out potential sources of bacteria to MS4 system. Such strategies may include, but are not limited to: strategies for reducing the use of local waterways by waterfowl and rodents, evaluating historical maintenance activities including street sweeping and catch basin cleaning at commercial properties and the public system, expanding the current study area to incorporate discrete sites outside of the sub-basin which may assist in meeting study objectives.
4. Evaluate alternative investigative methods, techniques or methodologies including microbial source tracking and sediment analysis.
5. Improve internal communication by creating an electronic case history file that contains all documents generated as a result of field condition assessments and data collection and analysis.
6. When enough information is acquired to logically conclude that a particular condition or activity is a significant contributing source of bacteria, develop and implement BMPs as appropriate to target the specific source. Such BMPs, in the context of this Bacteria Pilot Study, may include, but are not limited to: door-to-door contact with residents and business owners; direct informational mailings; modifications to catch basin cleaning priorities and frequencies in specific areas; modifications to parks rules associated with wildlife feeding; and habitat management and tolerance policies for targeted wildlife species.
7. Conduct follow up stormwater sampling and data analysis to evaluate effectiveness of selected BMPs.

Measurable Goals	Status of Measurable Goals – FY14
• Collect and analyze stormwater samples within the study area during at least three (3) significant wet weather storm events per year for the duration of the permit cycle.	• Complete
• Report on all field condition assessments completed during the permit year. Show how collected field data is used to confirm or eliminate bacteria sources. Initiate at least two (2) new BMPs by December 2011 that will either identify or rule out specific sources of bacterial contributions to the MS4 within the study area.	• Complete
• Starting in July 2012, initiate at least one new BMP per year that will address identified specific sources of bacteria within the study area.	• Completed. During this reporting period, staff initiated a BMP at the Albertson's loading dock area at West 18th/Chambers St. Based on staff observations this area could be a source of bacteria to the MS4. A site visit, a one-on-one outreach, and a follow up written communication was conducted to ensure that the area was cleaned and site practices were modified to reduce the amount of food waste on site. Private catch basins and the dumpster area were subsequently cleaned by the owner. Sampling was conducted following cleaning of the site. Staff will continue to monitor the site and additional sampling will be conducted to further evaluate the effectiveness of the BMP.
• Develop an electronic case history file by February 2011 that contains documentation of findings and results that can be utilized by staff to evaluate overall success of study.	• Complete. Electronic files are being kept organized and updated.
• Report on results of stormwater sampling and analysis in association with implemented BMPs with emphasis on showing the effectiveness of the BMP selected.	• On-going

Tracking Measures	Tracking Data – FY14
• Track the number of sampling events, samples collected, and resulting bacteria analysis results.	• 3 storm events occurred during the reporting period. A total of 21 samples were collected at 6 sites within the study area. • See Section 4 of this report for monitoring results and analysis.
• Track results of field condition assessments conducted and the corresponding outcome of the assessment. Attempt to correlate noted conditions with results of sampling analysis. Document additional strategies that will identify or rule out potential sources of bacteria. Report on any conclusions derived as a result of implementing these strategies.	• A total of 6 were completed during the reporting period. Field evidence suggests that avian populations contribute significant amounts of bacteria. • Staff continued to look at the impact of local dog parks as a source of bacteria to Amazon Creek. During this reporting period a small stream that flows thru Morse Ranch dog park was sampled and bacteria levels exceeded the water quality standard. A fence that is intended to keep dogs away from the creek and surrounding area is in place; however the fence provides a limited buffer area. City staff is looking at potentially expanding the existing fence to create a larger barrier between the dogs and the waterway. It is possible that if the fencing project is completed that there could be opportunity to determine with sampling if installing the fence further back from the waterway will reduce bacteria levels. • Staff continue to verify and document the storm pipe locations at Albertson's to ensure data collected at the private catch basin and public manhole would be representative of the runoff from this focused area study. • Visual inspections of the Albertson's dumpster area and loading dock indicate that the outreach has been effective. Additional analytical monitoring will be conducted and the results will be used to evaluate further the effectiveness of our outreach efforts.
• Document the use of alternative investigative approaches such as microbial source tracking and sediment sampling.	• Continued to investigate costs associated with Microbial Source Tracking. • During the previous reporting period staff reported on a University of Oregon graduate student that was completing her thesis on whether it is reasonable for Eugene to utilize existing microbial source tracking complete by other municipalities. The student defended her

	master's thesis on December 5, 2013 and staff attended and participated in her defense. The final report is titled "Fecal Bacteria Management in the Pacific Northwest Watershed," a comparison methodology to determine significant sources and best management practices for fecal bacteria, using the Amazon Creek Basin in Eugene, Oregon as a case study. Staff reviewed the paper and will continue to investigate opportunities to utilize existing DNA source tracking efforts.
• Document all follow up sampling and analysis and conclusions derived regarding BMP effectiveness.	• To-date no BMPs have been put in place that will allow the study team to conduct sampling or analysis to determine effectiveness. • All sampling results have been documented, stored electronically, and summarized in Section 4 of this report and previous year's annual reports. Results of sampling for the BPM implemented in FY14 are included in Section 4. Site-specific sampling was not appropriate for the BMP implemented in FY13 (outreach at Amazon Dog Park), however in-stream monitoring downstream of the park continues as part of the broader bacteria sampling effort.

FY14 Activities and Accomplishments

- Staff will continue to update the BMP source tracking spreadsheet which will confirm or rule out sources of bacteria and inform future BMP implementation.
- During the last reporting period staff implemented a BMP that included partnering with local veterinarian to inform the public about the importance of cleaning up after your dog and how the fecal matter can cause not only water quality issues but also spread disease. On July 9, 2013 a local news station published and on-line article about the event and informed the public of how they can sign up for the city Canine for Clean Water campaign.

Planned or Considered FY15 Activities

- Monitoring staff will continue to monitor the private catch basin in the Albertson's loading dock area to obtain additional data which will help determine if the improved maintenance practices at this site will lead to a reduction in bacteria levels within the MS4.
- A potential BMP that may initiate during the FY15 reporting period includes a riparian planting project along Roosevelt Channel in West Eugene. The banks of this stream are a popular site for geese to congregate and there is substantial feces left behind. The intention is to complete a riparian planting along the north bank of Roosevelt Channel to deter geese from congregating. Staff will evaluate the effectiveness of this enhances riparian area on avian wildlife concentrations and in-stream bacteria

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.7 Status of Industrial Controls

3.7.1 W1 – Industrial Stormwater Management Program

Responsible Department/Division:
Public Works / Wastewater

BMP Contact:
Wastewater Division Director

BMP Description
Provide oversight of stormwater discharges and washing activities from industrial facilities, screening new businesses for those that may require NPDES Permits, conducting inspections and providing technical assistance to industries with NPDES Permits, and responding to spills at facilities with permits.

Tasks
1. Manage 1200Z and 1700A NPDES permit files.
2. Evaluate new and existing facilities for requiring NPDES permits.
3. Determine permit compliance with existing NPDES permitted facilities.
4. Issue Request for Corrective Action letters for permit noncompliance.
5. Conduct periodic monitoring for compliance determination.
6. Provide technical assistance to permitted facilities.
7. Retain copies of Stormwater Pollution Control Plans for each permitted industry.
8. Retain copies of facility inspections.

Measurable Goals	Status of Measurable Goals – FY14
• Conduct site inspections on 20% of permitted facilities annually.	• Completed.

Tracking Measures	Tracking Data – FY14
• Percentage of permitted facilities inspected.	• 27%.
• Number of corrective action letters sent and follow up responses.	• 36 corrective action letters were sent and all required responses were received.
• Number of Action Plans prepared by permit registrants.	• 38 Action Plans were prepared by permit registrants.

FY14 Activities and Accomplishments
- Currently there are seventy-six active 1200Z NPDES general stormwater permits and six active 1700A NPDES (wash water) permits.
- During this reporting period, no new 1200Z NPDES permit were issued or terminated, though one new 1200Z NPDES permit is scheduled to be issued in early July. Three sites

were evaluated and approved for No Exposure Certification status. Currently twenty-four approved No Exposure Certifications are on file.

- Two sites were evaluated for the need of a 1200-Z Permit or No Exposure Certification and it was determined that the businesses did not qualify for coverage.
- Eight existing Stormwater Pollution Control Plans were modified and approved.
- One permittee was referred to DEQ for formal enforcement. Pacific Recycling had multiple instances of failing to submit action plans within thirty (30) days and failing to implement adequate sediment control measures. DEQ issued civil penalty in response to these violations and also for failing to install a stormwater treatment system as detailed in the 2011 action plan.

Planned or Considered FY15 Activities

- Formal inspections and informal site visits will be conducted at 1200-Z and 1700-A permitted facilities to assist with and assess permit compliance.
- Stormwater sampling will be conducted at industrial and commercial facilities if there is a particular concern that the stormwater discharge from a site is significantly increasing the pollutant load to the MS4 or if there is a need to verify the accuracy of self-monitoring data.
- New and existing businesses will continue to be evaluated to determine the need for NPDES permitting and compliance with stormwater pollution related local ordinances.
- Forty-five 1200-Z permittees will be required to perform a geometric mean evaluation for statewide benchmarks (pH, TSS, Oil & Grease, copper, lead, and zinc). If the geometric mean of the samples collected during FY14 is above the benchmark for any parameter, the business will be required to compose a plan (stamped by a professional engineer or certified engineering geologist) to install treatment measures or reduce the volume of stormwater discharge from the site.

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

3.8 Status of Permit Management

3.8.1 E5 – Permit Management & Reporting

Responsible Department/Division:
Public Works / Engineering

BMP Contact:
City Engineer

BMP Description
Administration of the overall NPDES permit compliance effort, including permit renewals, annual reports, program evaluations and documentation of the City's adaptive management processes, and updates to the City's TMDL benchmark assessment.

Tasks
1. Coordinate with all City divisions and groups that administer BMPs described within the SWMP to review program commitments, gather tracking data, and where appropriate, assist with program evaluation and additional goal setting or BMP enhancements.
2. Evaluate programs and BMPs as described in the SWMP to ensure that the overall NPDES permit objectives are being met, including reduction of pollutants on the DEQ 2004/2006 303(d) list and established TMDLs as compared to the pollutant load reduction benchmarks.
3. Conduct appropriate public involvement efforts related to various NPDES permit elements such as SWMP/Monitoring plan updates or proposed adaptive management. May include presentations to advisory groups, elected officials, and public notices.

Measurable Goals	Status of Measurable Goals – FY14
• Submit Annual Reports to DEQ, that summarize implementation of the requirements as described in the City's MS4 permit, Schedule B.	• Annual report for FY2013 submitted November 27, 2013.
• Evaluate progress towards meeting TMDL pollution reduction benchmarks for each five year renewal submittal.	• Not applicable.
• Conduct public involvement within an appropriate time to meet legal requirements for the five year renewal submittals, and for on-going adaptive management as appropriate.	• Published notice in the Register Guard providing information about the 2-week public comment period for the draft 2013 Stormwater Annual Report. • Kept MS4 web page up to date, and included staff contact information, for interested persons.

Tracking Measures	Tracking Data – FY14
• Track public involvement events and number of people reached.	• No comments received on the draft 2013 Stormwater Annual Report.
• Post Annual Reports on City's web site.	• Final 2014 Annual Report posted on City's web site.

FY14 Activities and Accomplishments

- Included description of City's adaptive management process and results for prior reporting year in the Year 2014 Annual Report.
- Documented in correspondence with DEQ the City's water quality retrofit project identified for implementation during the current permit term as required by Schedule A.6.c of the City's MS4 permit.
- Documented in correspondence to DEQ the completion of updates to the City's post-construction stormwater management program as required by Schedule A.4.f of the City's MS4 permit. Updates to the program were comprised of changes to Eugene Code (Stormwater Development Standards) to prioritize low impact development methods of addressing water quality requirements for new development and re-development; revisions to the methodology for calculating stormwater systems development charges (SDCs); updates to the Stormwater Basin Plans to include and identify off-site low impact development (LID) mitigation projects; and updates to previously completed report evaluating potential barriers to implementing LID practices. Letter to DEQ dated February 28, 2014. Three month extension past permit due date granted by DEQ.
- Kept Stormwater Policy team and Stormwater Management team apprised of permit discussions with DEQ and Association of Clean Water Agency peers.

Planned or Considered FY15Activities

- Finalize and submit 2014 Stormwater Annual Report by December 1, 2014.
- Cross reference City's new MS4 web page with other related web pages and information for a more comprehensive regulatory and policy perspective.
- Work with other City stormwater managers to ensure that permit due dates continue to be met and, for multi-year efforts, that we stay on track to meet permit due dates.
- Coordinate with City stormwater managers and staff to continue implementing the adaptive management process of "develop – implement – collect data & information – evaluate – assess needs – modify."

Proposed Revisions to BMP, Measurable Goals or Tracking Measures

- None

4 MONITORING PROGRAM

4.1 Monitoring Results Summary

Water quality results for surface water samples collected from Amazon Basin ambient monitoring locations in Eugene, Oregon indicate statistically significant long-term decreasing concentration trends occur at specific sites for arsenic, cadmium, chromium, lead, mercury, molybdenum, nickel, silver, biochemical oxygen demand, phosphorus, nitrogen, suspended solids, temperature, and turbidity. Statistically significant long-term increasing concentration trends occur at specific sites for lead, zinc and chemical oxygen demand.

Significant decreasing and increasing concentration trends for pollutants in the Amazon Basin occur at monitoring locations downstream of the urban environment, and serve as an indicator of the effectiveness of the sum of stormwater program elements as described in the previous sections of this report.

While significant water quality improvements have occurred at downstream monitoring locations, activities within the permit area continue to have a measurable impact on levels of pollutants observed in Amazon Basin streams and channels. Intra-basin upstream and downstream water quality comparisons indicate the concentration of metals, temperature, chemical oxygen demand, occasionally nitrogen, suspended solids, and turbidity increase as Amazon Creek flows through the urban environment. Counts of *E. coli* and fecal Coliform, dissolved oxygen, pH, water hardness, dissolved solids, nutrients (nitrogen and phosphorus), and dissolved zinc decrease. Analytes for the A3 Channel are greater than those measured for Amazon Creek; dissolved arsenic and mercury are exceptions. Amazon Creek analyte concentrations are greater than those measured for Willow Creek; total arsenic, and total and dissolved chromium are exceptions. The Willow Creek drainage basin serves as a background water quality site because of its relatively low development compared to the urbanized permit area, although recent trends indicate some degradation of water quality.

Statistical tests also indicate Amazon Basin water samples collected during the 2013/2014 permit year at specific sites had significantly lower analyte concentrations when compared to historical data, including cadmium, chromium, lead, nickel, magnesium (hardness), dissolved solids, chemical oxygen demand and nitrogen; however, lead, selenium, zinc, magnesium, and dissolved oxygen concentrations were found to increase at other monitoring sites.

Within the Willow Creek drainage basin, a statistically significantly concentration increase was observed for dissolved zinc during the most recent monitoring period.

Water quality results for ambient samples collected from the Willamette River indicate statistically significant long-term decreasing concentration trends occur at two sites for ortho phosphorus, and at one for dissolved and total molybdenum; an increasing trend is observed at one site for conductivity. An increasing dissolved oxygen trend is also observed for Delta Ponds.

As the Willamette River flows through the Eugene urban environment, analyte concentrations increase for arsenic, copper, lead, mercury, nickel, silver, and zinc metals; nutrients (nitrogen and phosphorus), dissolved and suspended solids, hardness (calcium and magnesium), conductance, and bacteria (*E. coli* and fecal Coliform) also increase. Field pH decreases across the river reach through the urban environment.

A comparison of water quality for Delta Ponds, its riparian habitat recently restored, to the Willamette River at Owosso Bridge indicates the former site has higher metal concentrations for arsenic, copper, lead, nickel, and zinc; chromium and mercury concentrations are higher in the Willamette River at Owosso Bridge. Other analytes with statistically significant concentrations that are higher in Delta Ponds include hardness (calcium and magnesium), conductance, total phosphorus, nitrogen, and dissolved solids; pH values dissolved oxygen concentrations are higher in the Willamette River at Owosso Bridge. It is expected that long-term water quality characteristics for Delta Ponds will continue to change under flow management to restore hydraulic connectivity of Delta Ponds with the Willamette River to enhance riparian habitat.

In some instances the concentration of pollutants measured at Amazon Basin and Willamette River sites exceed Oregon water quality standards and beneficial uses for surface waters defined in Chapter 340, Division 41 of the Oregon Administrative Rules (OAR). For example, arsenic concentrations and bacteria counts in Amazon Basin streams and channels commonly exceed the human health criterion established for drinking water or recreational use. Toxicity criteria applicable to aquatic species are commonly exceeded for cadmium, copper, lead, mercury, zinc, dissolved oxygen, pH, and temperature at Amazon Basin sites, and periodically at Willamette River sites. Note, however, that exceedances of some of these pollutants also occur at the monitoring location upstream of the Eugene urban area, indicating some of these analytes either occur naturally in aquatic environments, or are affected by human activities upstream and outside of the permit boundary.

Water quality trends and comparisons indicate measurable progress is being made toward improving the water quality of channels, streams and rivers receiving stormwater runoff from the City of Eugene. Continued improvements are anticipated through continuation and refinement of existing BMPs, and implementation of new ones as needed.

4.2 Objectives of the Monitoring Program

Permits issued under the Stormwater National Pollutant Discharge Elimination System (NPDES) regulations for Municipal Separate Storm Sewer Systems (MS4) require ongoing water-quality monitoring to assess the chemical, biological, and physical effects of stormwater on receiving water bodies. The monitoring described in this report was conducted under the City's NPDES Stormwater Discharge Permit Number 101244 issued on 30 December 2010, and the City's Stormwater Monitoring Plan (SMP), incorporated by permit reference. For the purposes of the SMP, the term monitoring includes water quality monitoring (sample collection), monitoring activities (such as construction) in a watershed, monitoring changes in a watershed, or monitoring the success of BMPs. This section describes the overall program effectiveness by

means of analysis of water quality data and assessment of water quality trends for representative major surface water bodies receiving stormwater discharges from the City's MS4.

In addition to the regulatory requirements specified in the permit, the objectives of the Stormwater Monitoring Plan have been to:

- Identify pollutants of concern and their source;
- Identify the degree to which stormwater discharges may be contributing to water quality criteria exceedances in receiving waters;
- Identify, to the best practical extent, the impact of stormwater discharges to the aquatic environment of receiving waters;
- Identify the most effective best management practices (control measures);
- Refine estimates of annual and seasonal pollutant loads;
- Determine the frequency of monitoring required to reveal water quality trends and assess the effectiveness of control measures; and
- Maintain efficient and effective tools for storage, retrieval, and analysis of data collected, and assure data quality.

The monitoring plan was designed to provide technical information to assist in meeting the stated objectives to the maximum practical extent given available resources.

4.3 Organization of the Water Quality Monitoring Program

Water quality monitoring for the annual period covered by this report, includes three program elements:

- Storm event water quality monitoring;
- Ambient water quality monitoring of water bodies receiving MS4 discharges;
- Data management, analysis, and reporting.

Every third year biological assessments through macroinvertebrate surveys of the MS4 receiving water bodies, as well as physical field condition assessments are performed and results summarized in this report section. These field monitoring program elements were recently performed in 2014; biological and macroinvertebrate results will be reported in the 2015 annual report.

The following sections will focus on analysis of monitoring activities to assess overall stormwater program effectiveness by reviewing historical water quality trends for those water bodies receiving stormwater. Sampling sites are located in or near the permit boundary for the City of Eugene. Maps of the sampling locations to assess ambient and stormwater quality are referenced in the following paragraphs and included at the end of Section 4. All sampling follows the protocol established in the Stormwater Monitoring Plan (SMP), including appropriate sampling, handling, and analysis methods described by the EPA and in the guidelines of 40CFR136 establishing test procedures for the analysis of pollutants. Quality assurance and controls were applied to all elements of the monitoring program, including sample collection,

handling, laboratory analysis, and reporting. The Eugene/Springfield Environmental Laboratory performed analytical services under a DEQ-approved Quality Assurance Plan. Documentation and data management activities follow environmental management systems described in ISO 14001:2004(E); the Eugene/Springfield Wastewater Management Facility is registered as conforming to the ISO 14001 standard.

4.4 Program Activities

Program activities for the permit period primarily consisted of storm event monitoring, ambient water quality monitoring, and bacteria monitoring in the MS4 as well as receiving water bodies. Figure 4-5 is a small-scale map showing the overall locations of surface water and piped system sampling sites, as well as drainage basin areas. Larger-scale maps are provided and referenced in report discussions below.

4.4.1. Underground Injection Control (UIC) Monitoring

Stormwater flow to sedimentation manhole UIC devices were sampled during two storm events over the most recent reporting period. Table 4-1 presents a summary of laboratory results for the three UIC sites; their location is shown in Figure 4-5a; Tables A.6 through A.7 in Appendix A present a detailed summary. Boxplots for the data are presented in Appendix B, Figures B.21 through B.23. The concentrations reported for all analytes are less than the Permit Action Level.

Table 4-1 UIC Storm Event Monitoring Summary					
Location	**Analyte**	**2014 GeoMean**	**Historical Data GeoMean**	**Permit Action Level**	**Units**
Anderson & Briana: MH 75938	Copper, Total	2.09		1,300	µg/L
	Lead, Total	0.450	0.376	500	µg/L
	Zinc, Total	19.8		50,000	µg/L
	Benzo(a)pyrene	< 0.077		2	µg/L
	Pentachlorophenol	0.455		10	µg/L
	Dissolved Oxygen	11		NA	mg/L
	Field pH	6.5		NA	Std. Units
	Temperature	8.9		NA	˚C
Marjorie & Downing: MH 99302	Copper, Total	1.64		1,300	µg/L
	Lead, Total	0.233		500	µg/L
	Zinc, Total	60.7		50,000	µg/L
	Benzo(a)pyrene	< 0.077		2	µg/L
	Pentachlorophenol	< 0.568		10	µg/L
	Dissolved Oxygen	11		NA	mg/L
	Field pH	6.6		NA	Std. Units
	Temperature	8.1		NA	˚C
Shenstone & Tyson: MH 73919	Copper, Total	1.12		1,300	µg/L
	Lead, Total	0.205		500	µg/L
	Zinc, Total	688		50,000	µg/L
	Benzo(a)pyrene	<0.077		2	µg/L
	Pentachlorophenol	0.436		10	µg/L
	Dissolved Oxygen	11		NA	mg/L
	Field pH	6.8		NA	Std. Units
	Temperature	8.6		NA	˚C
Shaded cells indicate the higher analyte concentration exceeds the Permit Action Level. Sampled Storm Events: 1/28/2014 & 2/14/2014					

4.4.2. Storm Event Water Quality Monitoring

Storm event monitoring was conducted at multiple sites to assess stormwater quality; Table 4-2 summarizes the sampling locations and types of samples collected for the analytes indicated (see Figures 4-5 through 4-5d for monitoring locations). Sampling locations include sites within the MS4 and respective receiving water bodies in both the Amazon basin and Willamette River. Willow Creek is used to represent background conditions for comparison purposes because its drainage basin is relatively undeveloped.

Water quality is characterized through a variety of analytical tests, including field measures of dissolved oxygen, pH, and temperature; a suite of conventional water quality tests, including bacteria, hardness, solids, and oxygen demand; nitrogen and phosphorus nutrients; and metals. The sample type – either grab or flow proportional – is also shown in Table 4-2 for each sampling location. In addition, a few surface water and piped-system MS4 sites were tested for dioxin, chlorinated hydrocarbons, and methyl mercury.

Table 4-2
2013/2014 Storm Event
Water Quality Monitoring Sites

Location	MS4 System Type	Sample Type	Analyte Type
Amazon Basin Sampling Sites:			
Chambers at 18th Avenue, NE; MH 55402 NE Loading Dock Catch Basin Parking Lot CB Morse Ranch Dog Park Up and Downstream W 18th Avenue; E Side Storm Runoff to MH 67386	Piped System	Grab	Field, Bacteria
Chambers at 18th Avenue, NE; MH 55404	Piped System	Grab & Flow Proportional	Field, Metals, MeHg, Conventional, Nutrients, and Chlorinated Organics
West 5th at Seneca; MH 63693	Piped System	Grab & Flow Proportional	Field, Metals, MeHg, Conventional, Nutrients, Chlorinated Organics
Willow Creek at 18th Avenue	Surface Water	Grab & Flow Proportional	Field, Metals, Conventional, Nutrients
Willamette River Basin Sampling Sites:			
Copping; MH 77793 Altura; MH 99365	Piped System	Grab & Flow Proportional	Metals, Conventional, Nutrients, Dioxin

Flow-proportional stormwater samples collected from the 5th Avenue/Seneca monitoring site receives runoff from industrial and commercial properties; samples from the Chambers at 18th Avenue monitoring site is primarily from commercial, recreational and educational land uses; the Altura and Copping sites are residential. Within the Willow Creek drainage basin, primarily parks (25%), timber (17%), single family residential (6%), roads (4%), general services (5%), and vacant lands (44%) comprise the land use categories.

Laboratory data for stormwater samples collected from these five locations are presented in Appendix A, Tables A.1 through A.4 and color coded to indicate percent change of geomeans of the 2013/2014 samples compared to historical data. Boxplots of all data are shown in Appendix B, Figures B.1 through B.19. The boxplots also include a comparison to an Oregon water quality standard when available. While the water quality standard is not directly applicable to stormwater data, these comparisons are helpful in assessing whether stormwater pollutants contribute toward exceedance of a water quality standard for an impaired water body, or has potential to cause acute or chronic aquatic toxicity. Boxplots consist of a horizontal line in the middle of the box and marks the median of the sample set; the median splits the ordered sample

set in half. The box represents the central 50 percent of data values; the outer edge of each box mark the 25th and 75th percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the 25th or 75th percentile. Outliers and extreme values are also depicted in the figures, values that are more than 1.5 box-lengths from the 25th or 75th percentiles are identified as outliers and are denoted by an open circle; extreme values are more than 3 box-lengths and are denoted by an asterisk.

In general, water quality comparisons of storm-event data shown in the tables are for a small number of sampling events for the 2013/2014 sampling period; the historical data set for the Chambers at 18th and W. 5th at Seneca sites consists of between 12 and 15 events for the full suite of water quality parameters. Thus, the observed water quality changes may appear to exhibit large changes over short time periods; however, when these data are compared to ambient historical monitoring data – spanning 16 years – the storm-event data tend to be within the observed range of ambient water quality. Exceptions will be described in the sections below. Note that Willow Creek is an exception – surface water samples collected during storm events are indicative of stream water quality and are directly comparable to the ambient historical data set.

4.4.2.1. Willow Creek – Background Location – Surface Water

One storm event was sampled for an abbreviated suite of water quality analytes during the 2013/2014 monitoring period (see Figure 4-5d for the sampling location). *Escherichia coli*, fecal coliform and temperature were greater than historical values (see Appendix A, Table A.1). The value for E. coli is greater than 75th percentile of historical ambient water quality data (see Appendix B, Figure B.145), pH and temperature is less than the 25th percentile (Figures B.148 and B.149 respectively). The differences observed for the recent storm-event data compared to the historical data set are perhaps indicators of overall water quality changes observed for the Willow Creek drainage basin area where increasing concentration trends are observed for lead and zinc, which is described in a later section of this report.

Comparisons of the Willow Creek stormwater data to state water quality standards indicate copper and lead values (Figures B.4 and B.5) exceed the State's chronic criterion for fish; TDS and bacteria values (Figures B.15 and B.16) also exceed the associated water quality standard; occasionally dissolved oxygen (Figure B.11) is lower than the minimum standard. For pH, multiple values are below the minimum freshwater criterion of 6.5 and one at the maximum criterion of 8.5 (Figure B.14). Turbidity (Figure B.15) values are compared to an estimated flow-based turbidity target defined in the Willamette Basin TMDL, which is derived for Amazon Creek using Long Tom River flows near Noti as a reference river discharge. Flow data are not available for Willow Creek so stormwater data in this instance are compared to the highest turbidity standard of 27 NTU for Amazon Creek. In general, on occasion stormwater turbidity data exceed the Amazon Creek criterion at this highest turbidity standard and, as the boxplot suggests, would likely exceed the turbidity standard during lower stream flows.

4.4.2.2. Chambers & West 18th Avenue, NE Lot: MH 55404 – MS4 Piped System

This drainage basin includes commercial properties, portions of Westmoreland Park, and Jefferson Middle and Magnet Arts schools (see Figure 4-5b). Impervious surfaces, including rooftops and paved parking areas at these properties, as well as a section of West 18th Avenue, a

minor arterial roadway, are sources of stormwater runoff influencing water quality characteristics at this MS4 piped system monitoring location (MH 55404). Three flow-proportional storm events were sampled for the full suite of water quality analytes, 23% of which had geomean concentrations modestly lower than or equal to historical values. Arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, fecal coliform, chemical oxygen demand, nitrogen, phosphorus, hardness (calcium and magnesium), solids, conductance, turbidity, and dissolved oxygen were greater than historical values; *E. coli*, biochemical oxygen demand, silver pH, and showed modest decreases. Decreases for chlorinated hydrocarbons are less significant because of lower reporting limits during this reporting period. Table A.2 summarizes these stormwater quality results.

Comparison of stormwater quality values for this piped system location to state water quality standards indicate concentrations of arsenic, cadmium, copper, lead, mercury, zinc, and dissolved solids, turbidity, bacteria, and chlorinated hydrocarbons in stormwater are greater than the lowest listed acute, chronic or human health criterion (see Figures B.1 through B.19). Amazon Creek, which is the receiving water body for stormwater from this location, frequently exceeds applicable state water quality standards for the same pollutants both upstream and downstream of the outfall to which this stormwater monitoring site discharges. In addition, statistically significant concentration increases occur for most of these pollutants in the reach of Amazon Creek 2.5 miles upstream to the 29th Avenue monitoring site and 4.5 miles downstream to the Railroad Track Crossing monitoring site with respect to the location of this MS4 outfall. Later sections of this report discuss significant water quality trends for stormwater receiving water bodies in the ambient monitoring program.

Three storm events were sampled at this location for dissolved and total methyl mercury; the maximum observed dissolved methyl mercury concentration was reported at 0.126 ng/L with a reporting limit of 0.0249 ng/L. The maximum total methyl mercury was reported at 0.0.298 ng/L, also with a reporting limit of 0.0249 ng/L.

Chlorinated hydrocarbons were also analyzed for the three storm events at this piped system location, including 1,1-dichloroethene, trans-1,2-dichloroethene, trichloroethene (TCE), and tetrachloroethene (PCE); dichloroethene is a degradate of TCE. Amazon Creek is impaired for these pollutants (2004 303(d) listed). One value for PCE was J-flagged, that is, analysis indicated the possible presence of these compounds; the detected concentration was less than the reporting limit of 5 µg/L. While J-flagged values are lower than the criteria and the waterbody is not presently used for fish and water consumption by humans, the presence of these pollutants in stormwater may contribute to degradation of Amazon Creek. A second sample had a PCE concentration of 0.140 µg/L. Note that the human health criterion for TCE is 1.4 µg/L and that for PCE is 0.24 µg/L for fish and water consumption; these pollutants have no toxics criteria for fish. Reporting limits for chlorinated compounds were significantly reduced beginning in 2014 to enable valid comparisons with water quality criteria.

No land use activities typically associated with these types of pollutants are located within the drainage basin area. However, consumer products such as cleaners and solvents containing small amounts of these chlorinated hydrocarbons may be available to the public from

commercial businesses within the basin. Businesses within the basin also may utilize these consumer products for operations/maintenance purposes.

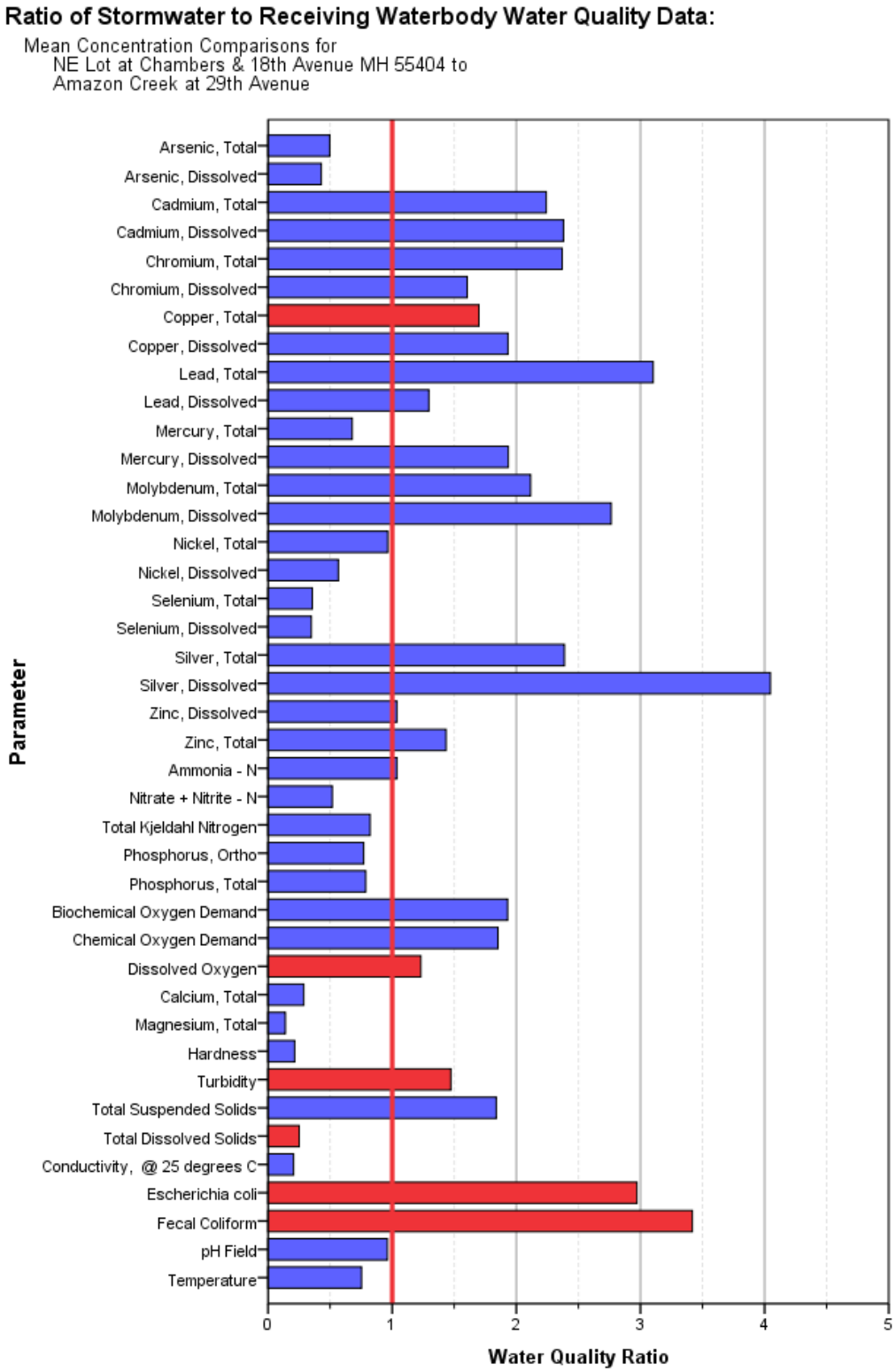
Comparison of MS4 stormwater quality to ambient receiving water body quality is useful in assessing relative pollutant loading. Figure 4-1 compares mean stormwater quality data for the site to the historical means at the nearest upstream ambient monitoring site, in this case Amazon Creek at 29th Avenue. Multiple analytes exceed an equivalence ratio of one, that is, the concentration ratio of the stormwater analyte value to that of the receiving water body value.

Red bars represent analytes measured in the respective receiving water body exceed applicable Oregon water quality standards for ambient monitoring samples. Given the magnitude of the concentration ratios, it can be presumed stormwater pollutant loads contribute toward exceedance of water quality standards.

The equivalent ratios are useful in terms of assessing which pollutants are of potential concern in stormwater runoff when compared to receiving water body quality. Additional sampling events conducted over the course of the permit term will be evaluated to refine pollutant mass loading estimates and BMP strategies that target activities and/or sources for these and other pollutants of concern. Water quality ratios obviously depend on the relative analyte concentrations in the water bodies being compared. Pollutant loads are calculated for the drainage basin areas as defined by the sampling location within the MS4 (see Figures 4-5a and 5b). Charts in Figures B.26 through B.35 present boxplots of pollutant loads for the NE lot at Chambers & 18th sampling location, in units per acre, for all storm event sampling performed since 2010. Bacteria and turbidity pollutant load contributions to Amazon Creek appear to be significant given the stream is water-quality impaired for these two parameters; the median bacteria loading is about 800 million per acre for *E. coli*, and turbidity loading is nearly 90,000 NTU per acre. Pollutant loads for the remaining analytes at this site are below estimates documented in the City's September 2008, Permit Renewal Report.

One storm event hydrograph for the MS4 piped system was recovered for flow proportional sampling at this site and is shown in Figures B.198. Unfortunately, data could not be recovered for other flow-proportional storm events to generate storm hydrographs; only total sampled volumes could be recovered from the chain-of-custody forms to enable calculation of pollutant loads.

Figure 4-1



Red Analytes = Water quality criterion exceeded in receiving waterbody during 2013/2014 monitoring period.

4.4.2.3. Copping Street – MS4 Piped System

Two storm events were sampled at this residential MS4 site during the 2013/2014 monitoring season for an abbreviated suite of conventional pollutants (see Figure 4-5a for the location and areal extent of this drainage basin). Bacteria counts were significantly greater than the historical data set, and dissolved oxygen concentrations decreased slightly. Table A.3 summarizes stormwater quality data for this sampling site.

While state water quality standards are not directly applicable to stormwater data, comparisons here are helpful in assessing whether stormwater pollutants contribute toward exceedance of a water quality standard for an impaired water body (see Figures B.1 through B.19). The Willamette River was listed in the 2004/2006 303(d) as impaired for dioxin, and currently as water quality limited for mercury, bacteria, and temperature. Loading calculations for the abbreviated conventional pollutant list was not be determined for the two sampling events; however, storm event data suggest that the Copping drainage basin area is not a significant source of listed pollutants, nor a source of significant pollutant loads to the Willamette River, as estimated in Figures B.26 through B.35.

The results of these storm event studies will be used to assess development and implementation of appropriate BMPs focusing on pollutant contributions from the MS4 identified as potentially effecting impairment of water bodies within the NPDES permit area.

4.4.2.4. W 5th Avenue at Seneca: MH 63693 – MS4 Piped System

Two storm events were sampled at this monitoring location for the full suite of metals, field measurements, conventional analytes, and chlorinated hydrocarbons; additionally, one storm event was sampled for dissolved and total mercury and methyl mercury (see Table A.4 for a summary of stormwater quality results). The W 5th Avenue at Seneca site was selected to assess pollutant sources of 1,1-dichloroethene (DCE), trans-1,2-dichloroethene and tetrachloroethene (PCE) to the A3 Channel because it is on Oregon's 303(d) list of impaired water bodies for these pollutants. Dichloroethene is a degradate of trichloroethene. One value each of DCE and PCE were J-flagged, that is, analysis indicated the possible presence of these compounds; the concentrations were 0.06 µg/L and 0.66 µg/L respectively, less than the reporting limit of 5 µg/L. Beginning in 2014, samples were analyzed using more sensitive analytical techniques; the maximum observed concentration of DCE was 1.2 µg/L, indicating the presence of TCE, and 14 µg/L for PCE. Additionally, trans-1,2-Dichloroethene was detected at 0.040 µg/L, just above the analytical method reporting limit of 0.032 µg/L. As stated in the section above, the human health criterion for PCE is 0.24 µg/L for fish and water consumption; the observed concentration of PCE in stormwater is six times greater than the criterion. While the water body is not presently used for fish and water consumption by humans, the presence of these pollutants in stormwater may contribute to degradation of the A3 Channel, as well as Amazon Creek immediately downstream.

Potential sources of chlorinated hydrocarbons within this industrial and commercial drainage basin area include multiple businesses. Recent revisions to General 1200 Z stormwater discharge permits require permittees to monitor for chlorinated hydrocarbons and institute compliance benchmarks. The combination of industrial, stormwater, and ambient monitoring efforts will greatly assist in minimizing release of these pollutants to Oregon's waterbodies.

Of the 47 analytes tested on the three sets of stormwater samples, 24 percent of results had geomean concentrations that were equal to or lower than historical data for this site. Overall, changes were mostly modest with the exception of cadmium, selenium, zinc, bacteria, suspended solids, and turbidity where concentrations for the 2013/2014 monitoring period were between two and nearly three times greater than historical values.

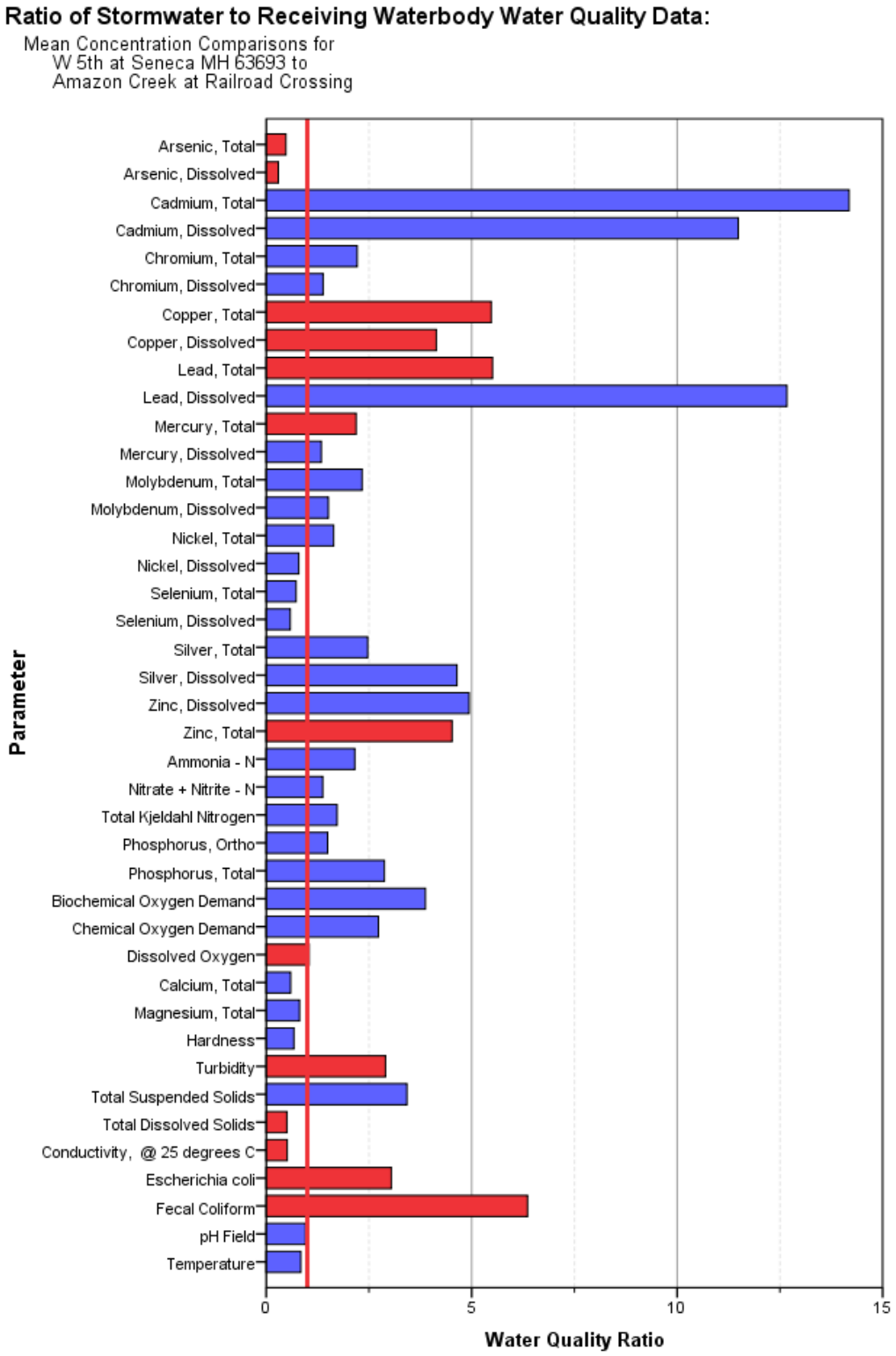
Two storm events were sampled at this location for dissolved and total methyl mercury; the maximum observed concentration for dissolved methyl mercury was 0.083 ng/L with a reporting limit of 0.0249 ng/L. The maximum observed concentration for total methyl mercury was 0.211 ng/L, also with a reporting limit of 0.0249 ng/L.

Comparison of stormwater runoff from this MS4 piped system to state water quality standards indicates concentrations of arsenic, cadmium, copper, lead, mercury, silver, zinc, dissolved solids, turbidity, and bacteria in stormwater are greater than state water quality criteria (see Figures B.1 through B.20).

The nearest ambient monitoring location on the A3 Channel at Terry Street is downstream of the W 5th and Seneca MS4 monitoring site so a comparison would include the pollutant contributions from this MS4 site. Instead, a comparison of stormwater quality from this industrial and commercial MS4 to ambient water quality as measured on Amazon Creek at the Railroad Crossing, which is upstream of the confluence with the A3 Channel. Figure 4-2 indicates that the geomean stormwater concentration of cadmium and lead is over 10 times the ambient concentration in Amazon Creek. Multiple other pollutant ratios are nearly five times greater, including copper, silver, zinc; bacteria concentrations in stormwater are about seven times greater than the receiving water body..

Currently, stormwater runoff from the W 5th and Seneca location likely contributes toward exceedance of water quality standards in the Amazon Creek for copper, lead, mercury, zinc, ammonia, bacteria, and turbidity (see applicable Figures B.110 through B.149). Pollutant loads are calculated for the drainage basin areas as defined by the sampling location within the MS4 (see Figure 4-5a). Charts in Figures B.26 through B.35 present boxplots for pollutant loads at the W 5th and Seneca sampling location, in units per acre, for all storm events sampled since 2010. Bacteria and turbidity pollutant load contributions to the A3 Channel appear to be significant given Amazon Creek, to which the A3 Channel discharges, is water-quality impaired for these two parameters. Fecal coliform bacteria loading is 100 billion per acre (*E. coli* loading is about 60 billion per acre), turbidity is about 400,000 NTU per acre. Pollutant loads for the remaining analytes at this site are below estimates documented in the City's Permit Renewal Report.

Figure 4-2



Red Analytes = Water quality criterion exceeded in receiving waterbody during 2013/2014 monitoring period.

4.4.2.5. Altura: MH99365 – MS4 Piped System

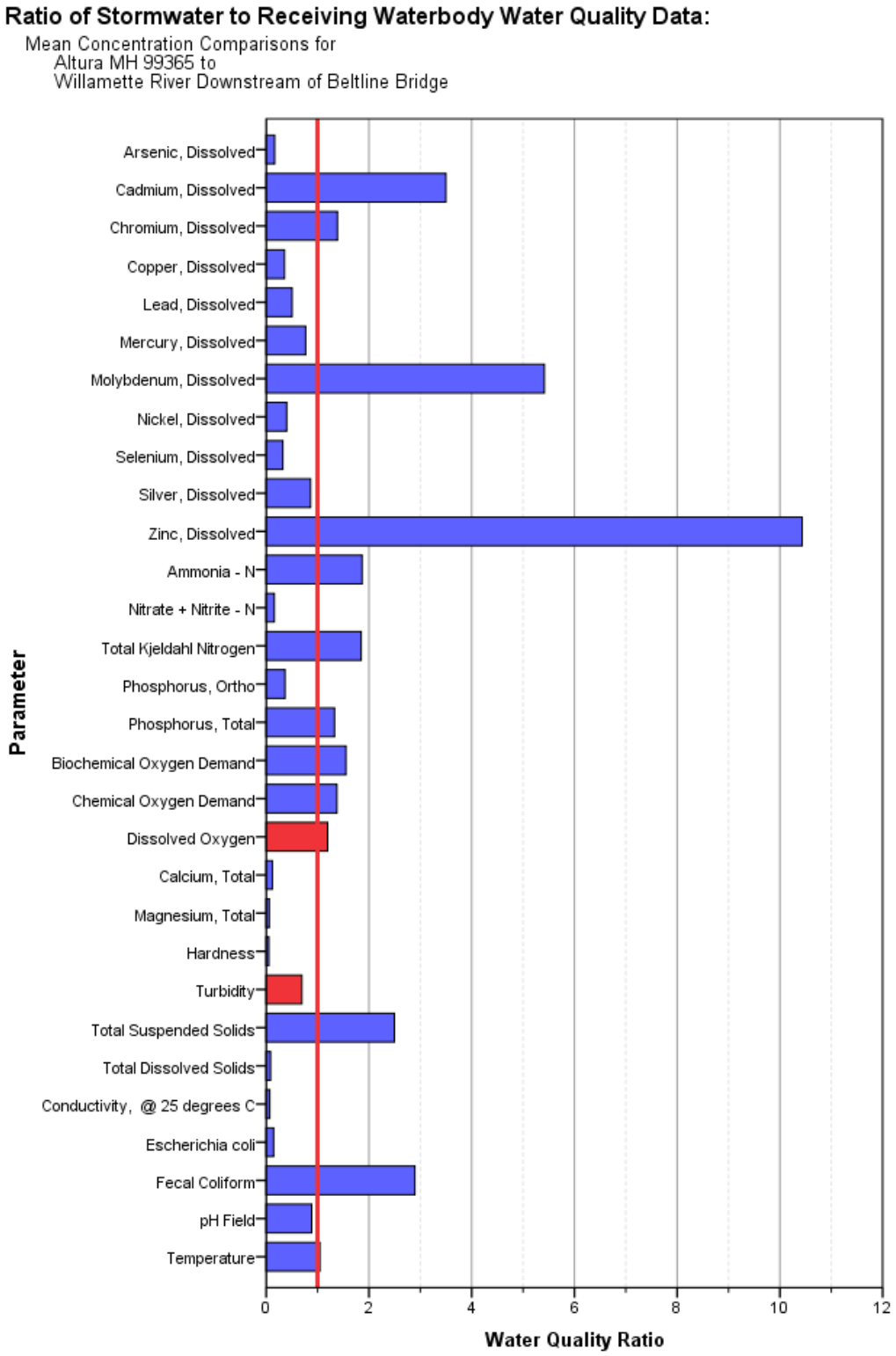
One storm event was sampled at this residential MS4 site during the 2013/2014 monitoring season for the full suite of metals and conventional pollutants (see Figure 4-5a for the location and areal extent of this drainage basin). No historical data have been generated to make water quality comparisons for samples collected during this monitoring period. Table A.4 summarizes stormwater quality data for this sampling site. A laboratory error precluded testing of the stormwater sample for total metals.

While state water quality standards are not directly applicable to stormwater data, comparisons here are helpful in assessing whether stormwater pollutants contribute toward exceedance of a water quality standard for an impaired water body (see Figures B.1 through B.18). The Willamette River was listed in the 2004/2006 303(d) as impaired for dioxin, and currently as water quality limited for mercury, bacteria, and temperature. Storm event data suggest that the Altura drainage basin area is not a significant source of listed pollutants. Loading could not be determined for the single sampling event at the Altura location because electronic flow data were inadvertently erased before downloading.

While the Altura drainage basin area flows into Spring Creek, the receiving water body is eventually the Willamette River. Figure 4-3 is a comparison of the water quality ratio between stormwater samples from the Altura site to the Willamette River downstream of Beltline Bridge. The concentration of dissolved zinc at 137 µg/L is over 10 times higher than those measured in the Willamette River and is nearly five times the average concentration observed in Spring Creek at Beacon Drive East (see Table A.12). Zinc is commonly used as a moss control agent in the Willamette valley and concentrations at several ambient monitoring locations are trending upward, as discussed in the trends section below.

The results of these storm event studies will be used to assess development and implementation of appropriate BMPs focusing on pollutant contributions from the MS4 identified as potentially effecting impairment of water bodies within the NPDES permit area.

Figure 4-3



Red Analytes = Water quality criterion exceeded in receiving waterbody during 2013/2014 monitoring period.

4.4.3. Bacteria Study – Westmoreland Park, Polk Sub-Basin

The A3 Channel, Amazon Diversion Channel, and Amazon Creek are water quality limited for bacteria and in 2006 the State of Oregon issued the Willamette Basin TMDL for Bacteria. It specifies bacteria load reductions for these water bodies which range from 33% in the A3 Channel to 84% in Amazon Creek. Stormwater monitoring data analysis suggests bacteria concentrations in Eugene's stormwater contribute toward exceedance of the state water quality criterion; hence the City has implemented a number of measures focused on identifying bacteria sources and reducing bacteria loads.

Under ideal conditions a multitude of variables would be measured to enable assessment of bacteria source contributions adequately, including stream flow, stormwater runoff flow from various land use types, storm event magnitude and duration, MS4 basin characteristics, focused land use sampling, and, among others, an ability to predict precisely storm event properties to enable collection of representative stormwater samples. Recognizing resource constraints and the complexity of collecting this information, the City of Eugene has focused on specific drainage basin areas with known characteristic from which information can be acquired while minimizing project complexity.

Our bacteria study was first outlined in the December 2005, Second Annual Report. Goals of the study include: 1) to better understand bacteria source contribution areas through observation and monitoring; 2) design and implement BMPs to reduce bacteria loads to stormwater; and 3) assess through additional monitoring BMP effectiveness in reducing bacteria loads to stormwater and, ultimately, to Amazon Creek. The most effective BMPs would likely be considered for other areas within the Amazon basin with the objective of reducing bacteria in the A3 Channel, Amazon Diversion Channel, and Amazon Creek. During the 2013/2014 permit year our investigations continued with sampling and analysis of bacteria in stormwater from piped and open channel systems, as well as Amazon and Willow Creeks, and an unnamed creek flowing through the Morse Ranch Dog Park. Field surveys were also performed to characterize field conditions that might provide insights to bacteria sources. Additionally, BMPs were initiated to mitigate bacteria sources as described in previous sections of this report.

Figures 4-5, 4-5b through 4-5d delineate drainage basin areas and sampling locations. The Willow Creek drainage comprises the largest area at about 1200 acres; the smallest delineated area is a portion of the Westmoreland Park at 6.1 acres. Non-delineated areas include two catch basins with limited areal extent in a commercial business parking lot located at NE Chambers & 18th Avenue. A third site was located on W 18th Avenue immediately south of the commercial business; flow from the road surface was collected before it entered the catch basin.

In addition to sampling for *Escherichia coli* and fecal Coliform from the three piped-system locations within the study area, stream samples were collected upstream and downstream Morse Ranch Dog Park. Flow from this stream enters the MS4 piped-system a short distance downstream and eventually enters Amazon Creek above an ambient monitoring location on 29th Avenue. Lastly, Willow Creek at 18th Avenue was sampled for background comparison purposes.

Bacteria data for the storm events and investigative sampling are summarized in Table 4-3 and coded to indicate percent change of the 2013/2014 geometric mean compared to historical data. Boxplots of all bacteria data are presented in Figure B.24, including previously monitored locations within the Westmoreland Park study area, for comparison purposes; field measures of dissolved oxygen, pH and temperature associated with the bacteria sampling events are presented in Figure B.25. The vertical line in the box marks the median of the sample set; the median splits the ordered sample set in half. Each box represents the central 50 percent of data values; the outer edges of the box mark the 25th and 75th percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the 25th or 75th percentile. Values that are more than 1.5 box-lengths from the 25th or 75th percentiles are identified as outliers and are denoted by an open circle; extreme values are more than 3 box-lengths and are denoted by an asterisk.

Escherichia coli and/or fecal Coliform data for the 2013/2014 monitoring period (see Table 4-3 and Figure B.24) with few exceptions have bacteria geomeans that exceed the bacteria human health water quality criterion of 406 colonies per 100 mL, except that for Willow Creek at 18th Avenue.

Geometric means for bacteria at Morse Ranch suggest bacteria counts increase as the stream flows through the dog park (see Figure 4-5c). During winter months when precipitation events are more frequent, field observations have found that the upslope area in the dog park west of the stream becomes saturated and overland flow occurs from seeps – this flow likely transport bacteria to the creek causing in increase in *E. coli* and fecal Coliform bacteria counts. During dryer periods overland flow from the seeps does not occur and bacteria counts are often lower downstream than at the upstream monitoring site. The stream is fenced off to protect the riparian area surrounding the stream; however, the seeps are outside the protected area and dog fecal matter is commonly observed, as documented in bacteria field assessment surveys.

Several sites were selected at Chambers and W 18th Avenue to assess bacteria contributions from a commercial area (see Figure 4-5b for monitoring locations delineation of catch basin areas). Bacteria geometric mean counts for the MH 55402/55404 site combines the data for two catch basins but they are sampled for different storm events. No measurable change has occurred at these two sites and the bacteria counts are three to four times higher than the Oregon human health water quality criterion; the historical data set includes as many as 42 separate bacteria sampling events.

The bacteria loads calculated for the Chambers and 18th, MH 55404 site, suggest bacteria contributions from this drainage basin may be significant source, estimated at about 800 million bacteria per acre based on flow-proportional sampling for other water quality parameters. The receiving water body, Amazon Creek, is water quality limited for bacteria and under the 2006 TMDL, bacteria loads must be reduced by 84%.

Additional site characterization monitoring occurred at the Chambers & W 18th Avenue site, including two catch basins, one each in a parking lot and loading dock area; these private catch basins are connected to the City's MS4. Geometric means for *E. coli* at 3300 counts per 100/mL and fecal coliform at 8600 counts per 100/mL from the loading dock catch basin are potentially

significant in terms of bacteria loads to the MS4 but load calculations cannot be estimated because flow-proportional sampling has not occurred at this site.

Bacteria counts for the single sampling event from the commercial parking lot catch basin were significantly less than the loading dock site. Likewise, stormwater runoff from W 18th Avenue contained relatively small numbers of bacteria. Sampling from these sites was discontinued because the areas are believed to contribute relatively low amounts of bacteria to Amazon Creek. Outreach to the commercial business at Chambers & 18th Avenue has been ongoing to mitigate potential bacteria loads from the loading dock catch basin.

Table 4-3
Bacteria & Field Data
2013/2014 Monitoring Period
Westmoreland Park and Polk Sub-Basin Sites

Location	Parameter	N	GeoMean	Mean	Mean Std. Deviation	Median	Minimum	Maximum	% Change from Historical GeoMean
Willow Creek at W 18th Ave	Dissolved Oxygen	1	10.3	10.3		10.3	10.3	10.3	21
	Escherichia coli	1	160	160		160	160	160	315
	Fecal Coliform	1	60	60		60	60	60	130
	pH Field	1	6.7	6.7		6.7	6.7	6.7	-5
	Temperature	1	11.1	11.1		11.1	11.1	11.1	40
Morse Ranch Downstream	Dissolved Oxygen	3	9.2	10.0	4.7	10.8	5.0	14.2	13
	Escherichia coli	3	5120	9067	9793	6100	1100	20000	412
	Fecal Coliform	3	5695	13533	19461	2700	1900	36000	469
	pH Field	3	6.9	6.9	0.2	6.9	6.7	7.1	-9
	Temperature	3	10.5	11.2	4.8	10.3	6.9	16.4	22
Morse Ranch Upstream	Dissolved Oxygen	3	8.9	9.7	4.4	11.0	4.8	13.4	1
	Escherichia coli	3	5721	9967	12190	3900	2000	24000	565
	Fecal Coliform	3	6372	26933	43362	2400	1400	77000	624
	pH Field	3	6.8	6.8	0.2	6.8	6.6	6.9	-2
	Temperature	3	10.7	11.3	4.8	10.2	7.2	16.6	15
Chambers & W 18th Ave, NE: MH 55402/55404	Dissolved Oxygen	9	8.9	9.3	2.8	10.4	5.5	13.3	-1
	Escherichia coli	9	1318	1741	1143	1400	230	3200	-12
	Fecal Coliform	9	2064	3122	3005	1700	400	10000	96
	pH Field	9	6.9	6.9	0.3	6.8	6.5	7.6	-2
	Temperature	9	11.3	11.8	3.7	11.9	7.3	17.4	8
Chambers & W 18th Ave, NE: NE Loading Dock Catch Basin	Dissolved Oxygen	4	9.0	9.2	2.2	9.4	6.9	11.1	New Data
	Escherichia coli	4	3316	7868	10934	3450	570	24000	New Data
	Fecal Coliform	4	8554	24200	39251	6000	1800	83000	New Data
	pH Field	4	6.8	6.8	0.1	6.8	6.7	6.9	New Data
	Temperature	4	10.2	10.9	5.0	9.7	6.4	18.0	New Data
Chambers & W 18th Ave, NE: Parking Lot Catch Basin	Dissolved Oxygen	1	5.8	5.8		5.8	5.8	5.8	New Data
	Escherichia coli	1	98	98		98	98	98	New Data
	Fecal Coliform	1	2700	2700		2700	2700	2700	New Data
	pH Field	1	7.6	7.6		7.6	7.6	7.6	New Data
	Temperature	1	14.3	14.3		14.3	14.3	14.3	New Data
W 18th Ave; E Side Storm Runoff to MH 67386	Dissolved Oxygen	2	5.9	6.0	0.5	6.0	5.6	6.3	New Data
	Escherichia coli	2	375	375	7	375	370	380	New Data
	Fecal Coliform	2	1273	1350	636	1350	900	1800	New Data
	pH Field	2	8.2	8.2	0.7	8.2	7.7	8.7	New Data
	Temperature	2	15.4	15.4	0.7	15.4	14.9	15.9	New Data

Units:		
	mg/L	Dissolved Oxygen
	MPN	Escherichia coli
	col./ 100 mL	Fecal Coliform
	Std. Units	pH Field
	˚C	Temperature

In summary, geometric means summarized in Table 4-2 indicate that most of the storm event samples collected for the 2013/2014 monitoring period exceed the state's water quality criterion for bacteria of 406 organisms per 100 mL; only Willow Creek – the relatively undeveloped background site – has consistently had means that are less than the criterion. All bacteria data were used to generate the boxplots in Figure B.24 and are compared to the state water quality criterion, which is marked by the vertical green line.

Six field condition assessment surveys for bacteria were done during the 2013/2014 monitoring period. These surveys are used to document basin conditions such as amount, type, and location of wildlife and domestic pets; human behaviors; location and number of wildlife and domestic animal waste; conditions within commercial loading areas, recycling areas, and garbage dumpster areas, etc. At this time bacteria field surveys have been focused within a portion of the Polk Street sub-basin and the Morse Ranch dog park. A semi-quantitative review of all the surveys has been done of the field observations. At this time the review suggests there is likely a combination of field conditions that contribute toward high bacteria counts/loads, although the predominant source of bacteria appears to be avian.

Restoration of riparian habitat along sections of Amazon Creek and grassy parklands adjacent to the water body has attracted populations of nesting ducks and geese. Field survey findings indicated areas along Amazon Creek with significant amounts of avian waste which contributes to bacteria loads in the water body and exceedance of Oregon's bacteria water quality standard. Other sources of avian waste bacteria noted during field surveys include populations of swallows, starlings, gulls, crows, and sparrows, and large numbers of their waste deposits on sidewalks and parking lots, and even rooftops. These impervious surfaces within the bacteria study area are easily flushed by seasonal rains and directly transported via the MS4 to Amazon Creek. Over time, outreach to commercial businesses such as that done at Chambers & W 18th Avenue to improve waste handling and disposal to reduce bacteria vectors should help reduce loads.

Nutria have also been observed within urban riparian areas, and evidence of beaver activity was recently noted. Within the Tiara drainage basin wild turkey, deer, and domestic fowl have been observed along the small urban stream. Domestic animal waste has also been noted within the study area, both canine and feline, and on occasion illegal camping was observed in dense woods and shrubs along the creek.

In summary, field surveys suggest sources of bacteria to Amazon Creek within the study area are predominantly avian, followed by domestic animals, other wildlife, and potentially some human contributions. Field surveys will continue and will be assessed in combination with quantitative bacteria studies, including ambient and stormwater monitoring programs. We anticipate the combined information will prove helpful in adaptively managing Eugene's existing BMPs to improve their effectiveness. One such program is the city's Canines for Clean Water outreach program implemented citywide several years ago. A description of this educational outreach BMP can be found under the BMP section of this report.

4.4.4. Ambient Water Quality Monitoring

Ambient water quality monitoring has continued at twelve monitoring locations, including six within the Willamette River basin; four sites on the Willamette River, one near the Delta Ponds outlet, one on Spring Creek; and six in the Amazon Basin, three on Amazon Creek, and one each on Willow Creek, the A3 Channel, and the Amazon Diversion Channel. Surface flows through the Delta Ponds, which consists of sloughs and former aggregate excavation sites, are to the Willamette River. Extensive riparian restoration efforts were made by the US ACOE and the City of Eugene to create and enhance riparian habitat for fish spawning and rearing. The Delta Ponds also receives stormwater discharges from surrounding development; thus assessment of water quality from this area is important to determine the effects of stormwater on Delta Ponds and the Willamette River. The ambient sampling sites are listed in Table 4-3 below and locations shown in Figures 4-6 and 4-7. Sampling is generally conducted at each site every other month such that sampling events are representative of both the rainy season (October through April), and drier months (May through September). All ambient sampling is conducted utilizing clean sampling techniques; both total and dissolved metals are analyzed as well as conventional water quality parameters.

Analytical results and statistical analyses characterizing receiving water quality at the monitored sites are described here. For the most part grab samples collected every other month represent snapshots of ambient water quality – analytical results may not necessarily represent average water quality, or the full range of water quality variability. Six additional sampling events were done since the last annual reporting period, although a few locations could not be sampled because of dry streambeds. Data generated for these latest sampling events have been added to the historical data set that begins in January 1997. For the current permit year sampling events occurred between July 2013, and June 2014.

Table 4-4 **Ambient Water Quality Monitoring Sites**
Amazon Creek Basin Sampling Sites: Amazon Creek at 29th Avenue Willow Creek 450 feet north of 18th Avenue Amazon Creek at Railroad Track Crossing Amazon Diversion Channel at Royal Avenue A3 Channel at Terry Street Amazon Creek at Royal Avenue
Willamette River Basin Sampling Sites: Upstream of Urban Growth Boundary (River Mile 186.9) At Knickerbocker Bridge (RM 183.9) At Owosso Bridge (RM 178.6) Delta Ponds North of Beltline Bridge & Upstream of Willamette River Confluence Downstream of Beltline Bridge (RM 176.8) Spring Creek at Beacon Drive East

4.4.4.1. Results

Ambient water quality data were screened for outliers before applying statistics tests. In general, outliers are anomalous measurements that do not appear to be within the bounds of an historical data set. Outliers may result from any number of factors, including sample collection and handling procedures, analytical methodologies, transcription error, etc. Inclusion of anomalous measurements in statistical tests used to assess water quality characteristics can skew results and lead to erroneous conclusions. However, distinguishing anomalous measurements from an actual elevated pollutant concentration due to some site disturbance can be difficult if methodical evaluation of all probable factors is not performed. The methods commonly used to test for outliers include skewness, kurtosis, and Shapiro-Wilk assume normal distribution of water quality measurements; it was found, however, that most of the analytes did not follow a normal distribution. Identification of an outlier using these methods does not preclude investigation into the anomaly and its possible cause. Outliers were investigated and corrected if possible, including traceable error such as transcription and dilution error.

For data sets whose distributions are not normal, best professional judgment was applied when selecting outliers to exclude from further statistical analysis. Best professional judgment may include reanalysis of the sample provided the holding time has not been exceeded.

Multiple outliers were identified in the 2013-2014 ambient dataset; copper and zinc values, were found to be inconsistent with historical data. Multiple values for dissolved oxygen were identified as outliers and attributed to instrument malfunction. Additionally, multiple total dissolved solids were identified as outliers and attributed to sample labelling errors. Excluded values are denoted as “Outlier” in report tables. Outliers were also identified in the historical data set, and while these are ultimately excluded from final statistical analysis results, the outliers are only temporarily excluded; they are added to the data pool at the beginning of each annual data analysis for distribution tests as applicable. Analytical data for the most recent monitoring period are presented in Tables A.9 through A.11. Note there are no data for one or two sampling dates at the A3 Channel at Royal, Amazon Creek at Royal, Willow Creek, Delta Ponds, and Spring Creek because these sites were dry at the time of sample collection.

Censored data, those values reported as less than the reporting limit, are included in the summaries utilizing the restricted maximum likelihood estimation technique for miscellaneous parameters, and the delta distribution estimator for the metals data. These estimators reduce the problems associated with censored data when calculating mean and standard deviation, and are superior to substitution of censored data with one-half the reporting limit. Means and standard deviations for the ambient historical data set are summarized in Tables A.12 and A.13.

4.4.4.2. Seasonal Trends

The Seasonal Kendall statistic, Z, is used here to describe long-term analyte trend with consideration given to seasonal variation. This trend estimator is free of distributional

assumptions. Developed by the U.S. Geological Survey[1], the Seasonal Kendall statistic is the most frequently used test to assess trend in environmental data. In assessing analyte trends, we presume in-stream flow is the result of multiple water pathways in the hydrologic cycle, including overland flow, ground-water discharge, and precipitation; precipitation directly and indirectly influences the concentration of analytes as measured in samples collected from the Amazon and Willamette basins, and may also contribute trace amounts of pollutants through atmospheric deposition, such as mercury. The temporal distribution of the precipitation events, including intensity and duration, influences analyte concentration; however, data for these factors are not available, are not easily obtained, and their effects on seasonal pollutant concentration difficult to assess.

Our simplified approach assumes these factors are intrinsic to the period during which the sampling event occurs. Average monthly precipitation for Eugene was divided into four "seasons," or periods, based on average monthly precipitation and trend increase or decrease. The periods should help to identify seasonal variations in analyte concentration. The wet season (Period 1: November, December, January) is followed by a drying trend extending into July. The drying trend is subdivided into Period 2 (February, March, April) and Period 3 (May, June, July), the latter being the driest period. Months leading to the wet season comprise Period 4 (August, September, October) and are progressively wetter. Precipitation data is from the Eugene, Oregon airport weather station (#352709) with a period of coverage from 1939 to 2011. Each sampling event for the entire data set (historical and current year data) is assigned to a period based on the sampling date.

The USGS has developed a DOS-executable program to run the Seasonal Kendall test statistic. In this application, rejection of the null hypothesis of no trend is calculated at $2\rho = 1\%$, that is, a 2ρ value of 0.01 indicates there is a 1% probability of the observed trend due to random sample variability. Program output includes slope estimator, *m*, to describe the overall analyte trend.

Results of trend analysis using the Seasonal Kendall test statistic indicate significant trends at 9 of 12 monitoring locations, including Willow Creek, Amazon Creek at 29th Avenue, Amazon Creek at the Railroad Crossing, the Amazon Diversion Channel at Royal Avenue, the A3 Channel at Terry Street, Amazon Creek at Royal Avenue, and the Willamette River Upstream at the Knickerbocker Bridge, downstream of the Beltline Bridge, and the Delta Ponds sites. No significant water quality trends were observed for Spring Creek, the Willamette River at Upstream of the Urban Growth Boundary, and the Owosso Bridge.

Water quality trends for the water bodies tend to be subtle; hence, those noted in previous reports but not observed here and vice versa are commonly influenced by the most recent water quality data such that statistical significance of the trend changes upon addition of new analyte results.

Figures B.36 through B.92 (Appendix B) show the historical data sets plotted against time with trend lines, which are averages of the four differentiated seasons based on precipitation; a summary of the program output is presented in Table A.14 in Appendix A. All significant long-term concentration trends are summarized in Table 4-5 below. A number of pollutants listed are

[1] Dennis R. Helsel, Mueller, David K., and Slack, James R., Computer Program for the Kendall Family of Trend Tests: U.S. Geological Survey SIR 2005-5275.

on Oregon's 2004 303(d) list and several have approved TMDLs. Results of the Seasonal Kendall test statistic indicate significant progress is being made to reduce pollutants in the listed impaired water bodies.

We noted long-term decreasing concentration trends for at least some analytes at most monitoring locations; these sites are located upstream, downstream or within the urban environment and are influenced by the sum of human activities that occur within respective drainage basin areas. We attribute the decreasing pollutant trend to the sum of stormwater program BMPs applied within these drainage basins to control stormwater pollutants caused by human activities within the urban environment. Decreasing trends in the Amazon and Willamette basins are primarily observed for metals, including arsenic, cadmium, chromium, lead, mercury, molybdenum, nickel, and silver. Nutrients (nitrogen and phosphorus), suspended solids, turbidity, biochemical oxygen demand, and temperature also showed decreasing trends at a few monitoring sites.

Arsenic is naturally occurring in Willamette valley soils due to their volcanic origin, and is commonly mobilized through soil disturbance and other anthropogenic activities. Decreasing concentration trends at the A3 Channel site, whose drainage basin primarily consists of industrial and commercial properties, is positive progress, however, observed concentrations (see Table A.9) tend to exceed the human health water quality criterion of 2.1 µg/L. The decreasing arsenic trend observed at the Amazon Diversion Channel site is perhaps indicative of the effectiveness of the West Eugene Wetlands in trapping suspended particulate; arsenic concentrations, however, also tend to exceed the water quality criterion and emphasize the need for continued progress applying sediment control BMPs.

Mercury also occurs naturally in Willamette valley soils and accounts for about 48% of the mercury load to Willamette basin water bodies. The next largest source of mercury in Willamette valley is atmospheric deposition to land; at 42%, a significant portion of this load originates in China, but also originates locally from the combustion of fossil fuels, forest fires, and anthropogenic activities. Mobilization of land-deposited atmospheric mercury occurs readily during precipitation events. About 5.9% of atmospheric mercury is deposited directly into water bodies. Sources of mercury were assessed in the 2006 Willamette Basin TMDL for Mercury. As with arsenic, effectual sediment control BMPs are perhaps the best tools for mercury reduction in Eugene's urban waterways.

Other trace metals with significant decreasing concentration trends in Eugene's waterways such as cadmium, chromium, lead, molybdenum, nickel, and silver, are commonly associated with automobiles, as well as some industrial and commercial activities. Of these metals cadmium and lead have been found to exceed chronic toxicity criterion in samples collected nearly all Amazon Basin ambient monitoring locations; samples collected for total lead analysis during the 2013/2014 monitoring period from the A3 Channel, Amazon Diversion Channel, and Amazon Creek have exceeded the chronic toxicity (see Table A.9 and Figure B.119); fewer historical water quality exceedances and no current data were observed to exceed the chronic criterion for the more bioavailable dissolved lead fraction. Current BMPs minimizing road grit from the MS4 and maintenance of the MS4, and industrial source control establishing pollutant benchmarks

and permit required monitoring, have proven effective mechanisms in reducing these metals in water bodies receiving stormwater flow.

Table 4-5
Summary of Seasonal Kendall
Water Quality Analyte Trend Analysis [1]

Monitoring Location	Trend of Water Quality Analyte	
	Decreasing Concentration Trends	**Increasing Concentration Trend**
Amazon Creek Basin Sites:		
Willow Creek	Total Kjeldahl Nitrogen	Lead, Dissolved Zinc, Dissolved & Total
Amazon Creek at 29th Avenue	[2] Lead, Total	Zinc, Dissolved & Total Chemical Oxygen Demand
Amazon Creek at Railroad Tracks	Cadmium, Total Chromium, Dissolved & Total [2] Lead, Total Mercury, Dissolved & Total Nickel, Dissolved	Zinc, Dissolved & Total
Amazon Diversion Channel at Royal Avenue	[2] Arsenic, Dissolved & Total [2] Mercury, Dissolved Molybdenum, Dissolved Nickel, Dissolved & Total Biochemical Oxygen Demand Total Kjeldahl Nitrogen	Zinc, Total
A3 Channel at Terry Street	[2] Arsenic, Dissolved& Total Cadmium, Total Chromium, Dissolved & Total [2] Lead, Total [2] Mercury, Dissolved & Total Molybdenum, Dissolved Nickel, Dissolved & Total Silver, Total Biochemical Oxygen Demand Phosphorus, Total Temperature Total Kjeldahl Nitrogen	None
Amazon Creek at Royal Avenue	Chromium, Dissolved & Total [2] Lead, Total Mercury, Total Nickel, Total Temperature Total Suspended Solids Turbidity	Zinc, Dissolved & Total
Willamette River Basin Sites:		
Knickerbocker Bridge	Ortho Phosphorus	Specific Conductance
Downstream of Beltline Bridge	Ortho Phosphorus	None
Delta Ponds	Molybdenum, Dissolved & Total	[2] Dissolved Oxygen

[1] Significant at $2\rho = 0.01$
[2] On Oregon 2004/2006 303(d) list.

An increasing trend is observed zinc at multiple locations, including Willow Creek, Amazon Creek at 29th Avenue, the Railroad Crossing, and Royal Avenue, and within the Amazon Diversion Channel at Royal Avenue. Zinc concentrations at all Amazon Basin monitoring sites as well as Delta Ponds and Spring Creek, have exceeded the acute or chronic water quality criteria (see Figures B.130, B.131, B.170, and B.171). Data for the 2013/2014 for all locations except Amazon Creek at 29th, also had reported concentrations above the water quality criteria (see Table A.9). Zinc is a widely used agent for moss control in the Pacific northwest and increasing concentration trends for this metal in local water bodies is being actively addressed through educational BMPs that provide property owners with information on alternative products for moss control. Interestingly, chemical oxygen demand in Amazon Creek at 29th Avenue also is trending upward; this analyte measures oxygen depletion due to chemical oxidation processes.

The trend for dissolved lead also is increasing in Willow Creek. At this time the causes of this increasing trend is unknown.

A slight increasing trend for conductance in the Willamette River at the Knickerbocker could be related to a combination of factors, such as weathering and dissolution processes of soils. An increasing trend is also noted for dissolved oxygen in Delta Ponds and is likely due to regulated Willamette River diversions of flow through the ponds. We also noted a decreasing trend for molybdenum.

Water quality trends are often associated with anthropogenic activities; however, in some instances measurement technique and/or instrumentation can influence trends. For example, instrument sensitivity for the testing of trace metals and other analytes has increased significantly over the years since monitoring was begun in 1997. This instrument sensitivity evolution may in part explain a discernible change in data variability, which is noticeably more pronounced in early sampling events when compared with those taken later.

There is a small probability that some decreasing or increasing metals trends may not have been identified by the Seasonal Kendall test because the laboratory used to perform the metals analysis was changed in February 2007, though after careful review of the data it is believed all likely and significant trends have been summarized. Beginning with the February 2007 sampling event, the Eugene/Springfield Water Pollution Control Facility (E/S WPCF) Laboratory performed all metals analysis. While the laboratory uses the same analytical methodology, specifically, EPA 200.8, the reporting limits are somewhat greater than those observed prior to February 2007, when a contract laboratory performed the analyses. Analytical results reported since early 2008 indicate that the E/S WPCF laboratory was able to achieve lower reporting limits for nearly all metals when compared to the first few sampling events in 2007. The facility continues to review its analytical procedures to ensure optimum instrumentation performance is attained so that continuity of historical trends observed in previous years is maintained to the fullest extent possible.

4.4.4.3. Water Quality Changes: 2013/2014 Permit Year vs. Historical Data Set

The Mann-Whitney test statistic is used here to assess whether any water quality changes have occurred over the most recent monitoring period compared to the historical data compiled for each sampling location. Mann-Whitney is a nonparametric calculation based on the sums of ranks for independent samples and is suitable for censored data sets. Table A.15 in Appendix A summarizes significant water quality changes, which consists of comparing sampling events for the 2013/2014 period to historical data. For comparison purposes, averages are reported for the recent monitoring data and the historical data set; data comparisons are statistically significant at $\alpha = 0.05$. The full program output for the statistic is shown in Tables A.16 and A.17.

Note that some analytes in Table A.15 are annotated, indicating that the data set includes some censored values which have been set at one-half the reporting limit. In general, mean corrected averages cannot be reasonably estimated on small data sets with a large number of censored values. For example, with few exceptions cadmium and selenium values for Amazon Basin and Willamette River sites consist of censored values, hence the statistical significance of annotated means if the population of censored values is greater than 50 percent is somewhat questionable and therefore generally excluded from tables summarizing statistically significant comparisons. Consult Tables A.12 and A.13 for all analytes and those reported as INS, that is, insufficient uncensored data available to compute the statistic.

Examination of water-quality changes that have occurred during the most recent monitoring period are helpful in identifying those drainage basin areas where land use activities have had, either directly or indirectly, a significant influence on water quality – either resulting in improved water quality or degradation. A third outcome of this examination is that no water quality change occurs, which is also a significant finding in that this enables assessment of the effectiveness of applied best management practices within specific drainage basin areas.

The city's ambient monitoring program includes 41 regular analytes plus a few special organics at select sites. An ideal outcome of the statistical tests would be that, for all those analytes present above natural or background conditions, an improvement occurs for the recent monitoring year when compared to the historical water quality data – a somewhat unrealistic scenario. In general, water quality improvement of urban streams is achieved gradationally over an extended period of time as is shown by the trends described in the previous section. The following sections assess ambient water quality data and identify basin areas for review consideration of best management practices.

Amazon Basin Sites

Five samples were collected from Willow Creek, A3 Channel at Terry Street, Amazon Creek at Royal Avenue, Delta Ponds, and four samples from Spring Creek during the monitoring year, one or two less samples than planned because the stream was dry for the July or September sampling event. An extended dry period has been observed in Willamette valley during the fall and winter of 2013, and spring of 2014; similarly dry conditions occurred on at least six other occasions since ambient monitoring began in 1997 precluding sample collection due to lack of stream flow.

Willow Creek originates just south of a preserve held by The Nature Conservancy and has similar geomorphologic characteristics to the upper reaches of Amazon Creek; its headwaters flow through some rural residential properties and the creek receives some stormwater from the former Hynix facility (a silicon chip manufacturer whose operations ceased during the 2007/2008 period although maintenance of stormwater facilities and monitoring continue). The water quality characteristics of Willow Creek, which is for the most part a local, minimally-urbanized stream, has served as a reasonably good baseline for comparing the water quality characteristics observed for Amazon Creek; however, recent water quality trends indicate some degradation, specifically dissolved lead, and total and dissolved zinc.

Referring to Table A.15 in Appendix A, all six Amazon basin monitoring sites, including Willow Creek have recent analyte averages that differ from historical means. Overall 14 of 28 analytes, or about 48%, show statistically significant concentration decreases. All six sites had statistically significant analyte values that are higher in 2013/2014 than observed historical means. Dissolved lead, and dissolved and total zinc concentrations are frequently higher; total lead is lower. Zinc concentration differences are the most pronounced in this comparison, although differences for lead are also notable. The statistically significant two to three-fold increase in zinc concentrations in Amazon and Willow Creeks, in addition to increasing concentration trends, indicates mobilization of soluble zinc within the urban area during the 2013/2014 monitoring period was greater than the historical average concentration.

Hardness (calcium and magnesium) decreased in lower Amazon Creek and Diversion Channel but increased in the upper Amazon and A3 Channel. A few other analytes also showed statistically significant change, including cadmium, chromium, nickel, chemical oxygen demand, and dissolved oxygen.

Willamette River Sites

Analyte comparisons summarized in Appendix A Table A.15 show that all four sites on the Willamette River, Delta Ponds, and Spring Creek had recent analyte averages differing significantly from historical means. Overall, 18 of 20 analyte values show statistically significant decreases during the 2013/2014 monitoring period compared to historical averages.

Phosphorus, suspended solids and turbidity showed modest decreases at nearly all sites on the Willamette River; additionally, lead, chemical oxygen demand, and Kjeldahl nitrogen decreased slightly at the Beltline Bridge site. At the Delta Ponds site, calcium, Kjeldahl nitrogen and turbidity decreased slightly. At Spring Creek, lead decreased while calcium and magnesium (hardness) increased slightly. The range of water quality variability is unfolding as the database for the Spring Creek site becomes established.

The improving water quality trends described above for the Amazon and Willamette basin sites, and to some extent the improvements of recent water quality data when compared to historical data, are positive indicators that BMPs applied within the permit area are effective and have resulted in measurable pollutant decreases in receiving water bodies that have approved TMDLs or that are on the state's 303(d) list.

4.4.4.4. Intra-Basin Water Quality Differences

In addition to temporal changes in water quality, intra-basin differences are of interest because water quality comparisons are made between an upstream and downstream monitoring site, which provides a means of assessing whether urban activities affect a waterbody as the water flows through the urban area. The Mann-Whitney test statistic is used here to assess water quality differences between any two sites within the same stream basin or between drainage basin areas. Mann-Whitney is a nonparametric calculation based on the sums of ranks for independent samples and is suitable for censored data sets. Comparisons described utilize the all data for each monitoring location, including the data recently acquired in 2013/2014. Table A.18 and A.19 in Appendix A summarize significant average analyte values; comparisons are significant at $\alpha = 0.05$. The full program output for the statistic is shown in Tables A.20 and A.21.

Amazon Basin Monitoring Locations

Intra-basin comparisons include the analysis of the 29th Avenue site on Amazon Creek compared to the site on Willow Creek (see Figure 4-6 for sampling locations and basin extent), streams which originate in the same low hills south of Eugene but drain different sub-basins. In addition, the 29th Avenue site, comprised predominately of residential land use, is compared to Spring Creek at Beacon Drive East, also comprised of mostly residential land use but originating within the urbanized Santa Clara – River Road stormwater basin.

The concentration of metals, nutrients and bacteria are higher in Amazon Creek at the 29th Avenue site in comparison to Willow Creek. Of the 41 water quality analytes monitored, the concentrations of 16 analytes were found to be statistically higher in Amazon Creek at the 29th Avenue site, including total cadmium, dissolved and total copper, lead, molybdenum, and zinc, as well as *E. coli*, fecal Coliform, nitrate+nitrite as nitrogen, ortho and total phosphorus, total magnesium, and field pH. Total arsenic, and total and dissolved chromium, are higher at the Willow Creek site.

Relative percent concentration differences (the difference divided by the mean of the two values) range from 1% for total cadmium, to 107% for total zinc; for non-metal parameters the relative percent difference ranges from 1% for total magnesium, to 140% for *E. coli*. Total cadmium is 80% higher in Amazon Creek at 29th Avenue, dissolved and total copper are 37 and 38% higher, dissolved and total lead are 36 and 75% higher, dissolved and total molybdenum 81 and 85% higher, and dissolved and total zinc 98 and 107% higher, respectively, at the Amazon Creek at 29th Avenue site. Only total arsenic is higher in Willow creek by 25%, as is dissolved and total chromium at 1% and 88% respectively.

Nutrients and bacteria are also greater at the 29th Avenue site; fecal Coliform and *Escherichia coli* averages are 3 and 5 times greater than, respectively, bacteria counts observed at Willow Creek. These bacteria ratios have decreased from previous reporting periods; as mentioned above, bacteria counts in Willow Creek have been noticeably higher over the last few years. Ortho and total phosphorus, nitrate+nitrite, and pH are also higher at the Amazon Creek site. The higher metal, nutrient and bacteria concentrations observed in Amazon Creek are pollutants

commonly associated with urbanized environments. These comparisons are summarized in Table 4-6 below.

Intra-basin comparisons are also shown for the 29th Avenue site and Spring Creek at Beacon Drive East; statistically significant differences were found for 20 of 41 analytes, including metals, nutrients, calcium, pH, and dissolved solids. For the 13 metals, all values except one are higher in Amazon Creek at 29th Avenue, including dissolved and total fractions for arsenic, chromium, copper, lead, mercury, and nickel. Relative percent differences range from 49% for dissolved lead to 156% for dissolved mercury. The average dissolved zinc concentration in Spring Creek is more than twice that of Amazon Creek at 29th. Amazon Creek has a slightly higher pH, higher concentrations of total calcium, dissolved solids, and bacteria than Spring Creek, the latter having higher concentrations of nutrients (nitrate+nitrite as nitrogen.

Comparing water quality data for at Amazon basin monitoring sites we generally find that as stream flow passes through the urban environment the concentrations of metals, oxygen demand, suspended solids, turbidity, and temperature <u>increase</u> at respective downstream monitoring sites; dissolved oxygen, *E. coli*, fecal Coliform, NO_3+NO_2, ortho phosphorus, and dissolved zinc concentrations tend to <u>decrease</u> at respective downstream monitoring sites. The 29th Avenue site is the uppermost monitoring location on Amazon Creek, followed by Amazon Creek at the Railroad Crossing; the Amazon Diversion Channel at Royal Avenue and Amazon Creek at Royal Avenue are farthest downstream monitoring sites. The A3 Channel at Terry Street drains into the lower Amazon Creek (see Figure 4-6). There are a few notable exceptions to these water quality characteristics:

- A3 Channel at Terry Street (upstream) compared to Amazon Creek at Royal Avenue (downstream)
    - 22 of 24 analytes having statistically significant difference have historical averages that are greatest <u>upstream</u> at the Terry Street site, including BOD, COD, hardness (calcium and magnesium), conductivity, TDS, and nutrients (nitrate+nitrite as nitrogen, Kjeldahl nitrogen, and ortho and total phosphorus); metals include total and dissolved cadmium, molybdenum, nickel and zinc, and total copper, lead and mercury.
    - Dissolved mercury and arsenic averages are greater <u>downstream</u> at the Amazon Creek Royal Avenue site.
- Amazon Creek at 29th Avenue (upstream) compared to Amazon Creek at Railroad Track Crossing (downstream)
    - 11 of 30 analytes having statistically significant difference have historical averages that are greatest <u>upstream</u> at the Amazon Creek at 29th Avenue. Dissolved zinc is greatest upstream, as are DO, hardness (calcium and magnesium), pH, nutrients (nitrate+nitrite as nitrogen and ortho phosphorus), and bacteria (*E. coli* and fecal Coliform).

- COD, temperature, TSS, and turbidity, as well as total and dissolved arsenic, lead, mercury, molybdenum, and nickel, as well as total cadmium, copper, selenium, silver, and zinc average concentrations are greatest downstream at the Railroad Track Crossing monitoring site.

- Amazon Creek at 29th Avenue (upstream) compared to Amazon Diversion Channel at Royal Avenue (downstream)

  - 3 of 26 analytes having statistically significant difference have historical averages that are greatest upstream at the Amazon Creek at 29th Avenue site. Dissolved zinc is greatest upstream, as are bacteria (*E. coli* and fecal Coliform).

  - Total and dissolved arsenic, cadmium, copper, lead, molybdenum, nickel, and total chromium, mercury, selenium, and silver have higher average concentrations at the downstream monitoring location. COD, magnesium (hardness), total phosphorus, Kjeldahl nitrogen, TSS, and turbidity are also greater downstream.

- Amazon Creek at Railroad Track Crossing (upstream) compared to Amazon Diversion Channel at Royal Avenue (downstream)

  - 4 of 19 analytes having statistically significant difference have historical averages that are greatest upstream at the Amazon Creek at Railroad Track Crossing, including dissolved mercury and arsenic, and bacteria (*E. coli* and fecal Coliform).

  - Total and dissolved copper, molybdenum, nickel, and total cadmium and mercury, as well as COD, hardness (magnesium), total phosphorus, Kjeldahl nitrogen, TSS, and turbidity are greater downstream.

Average concentrations for analytes with statistically significant differences are summarized in Tables A.14 and A.15 in Appendix A.

Table 4-6
Intra-Basin Water Quality Comparison of Willow, Amazon, and Spring Creeks [1] Using Mann-Whitney Statistic [2]

Analyte	Units	Willow Creek	Amazon Creek at 29th Avenue	Spring Creek at Beacon Drive East
Arsenic – Total	(*µg/L*)	1.41	1.09	0.392
Arsenic - Dissolved			0.888	0.329
Cadmium – Total		0.00256	0.00598	
Chromium – Total		0.885	0.344	0.287
Chromium – Dissolved		0.600	0.592	0.151
Copper – Total		2.30	3.38	1.05
Copper – Dissolved		1.21	1.76	0.663
Lead – Total		0.270	0.595	0.342
Lead – Dissolved		0.0269	0.0389	0.0235
Mercury - Total			0.00254	0.00078
Mercury – Dissolved			0.00099	0.00012
Molybdenum – Total		0.114	0.284	
Molybdenum – Dissolved		0.115	0.271	
Nickel – Total			2.06	0.826
Nickel - Dissolved			1.43	0.701
Zinc – Total		6.87	22.7	
Zinc – Dissolved		4.40	12.9	28.9
Escherichia coli	(*Col./100 mL*)	147	830	328
Fecal Coliform		116	362	
Calcium - Total	(*mg/L*)		24	17
Magnesium - Total		8.2	8.3	
Nitrate+Nitrite – as Nitrogen	(*mg/L*)	< 0.05	0.31	2.05
Phosphorus – Ortho		0.02	0.05	0.07
Phosphorus – Total		0.06	0.10	0.15
Field pH	(*Units*)	7.1	7.6	6.9
Total Dissolved Solids	(*mg/L*)		153	100

[1] Comparisons made: Willow Creek ↔ Amazon Creek; Amazon Creek ↔ Spring Creek. For either comparison, shaded cells (red or blue) indicate the higher analyte concentration of the two being compared.
[2] Mann-Whitney test statistic comparisons significant at $\alpha = 0.05$.

Willamette River Monitoring Locations

Results of the Mann-Whitney test statistic applied to historical data for the Willamette River monitoring locations indicate that analytes statistically significant at $\alpha = 0.05$, had concentrations that were greater at downstream sites than at corresponding upstream sites. Most of these water quality differences occur at two monitoring locations, upstream of the Urban Growth Boundary and downstream of Beltline Bridge (see Figure 4-7). Of the 41 analytes compared between these two sites, 27 are statistically different, 26 of which have higher average concentrations downstream of Beltline Bridge. Table 4-7 below summarizes those pollutants whose concentrations increase as the Willamette River flows through the urban growth area. Increases include total and dissolved arsenic, copper, lead, mercury, nickel, and zinc, as well as total silver. Bacteria counts (*E. coli* and fecal Coliform), as well as hardness (calcium and magnesium), dissolved solids and conductance, and nutrient (nitrate+nitrite as nitrogen, and ortho and total phosphorus) concentrations also increase as the Willamette River courses through the urban area. The pH decreases slightly.

An examination of water quality changes over shorter stream reaches indicates fewer statistically significant differences in analyte concentrations. Comparing data sets for the uppermost site above the Urban Growth Boundary to the Knickerbocker Bridge resulted in nine statistically significant differences among the analytes tested, including total and dissolved arsenic and copper, conductivity, calcium (hardness), and bacteria (*E. coli* and fecal Coliform), all of which have higher values downstream.

Between the Knickerbocker Bridge and the Owosso Bridge, the concentration of total lead, and *E. coli* and fecal Coliform increase over the stream reach.

Between the Owosso Bridge and the site downstream of Beltline Bridge above the McKenzie River confluence, nine analytes have statistically significant values, all of which are greater at the downstream monitoring location, including total and dissolved copper and zinc, conductivity, and nutrients (Kjeldahl nitrogen, nitrate+nitrite as nitrogen, and ortho and total phosphorus).

Tables A.18 and A.19 in Appendix A includes a summary of all Willamette River monitoring site analytes having statistically significant differences using the Mann-Whitney test statistic; Tables A.20 and A.21 present the full program output.

A final comparison is between Delta Ponds and the Willamette River at the Owosso Bridge; 16 of 22 analytes having statistically significant differences are associated with higher concentrations at the Delta Ponds site. Average values for total and dissolved arsenic, lead, nickel and zinc, dissolved copper, as well as total phosphorus, Kjeldahl nitrogen, dissolved solids, hardness (calcium and magnesium), and conductance values are also higher for the Delta Pond site. Average dissolved oxygen, pH, and interestingly, total and dissolved chromium and mercury values were higher in the Willamette River at the Owosso Bridge site. As mentioned in a previous section, flow management of the Delta Ponds along with extensive restoration of riparian habitat has been conducted by the City of Eugene and the US Army Corps of Engineers. The effect of these activities has been to alter the water quality characteristics of Delta Ponds, particularly during periods when flow management through Delta Ponds provides for higher flows to simulate more closely seasonal changes.

Table 4-7
Comparison of Willamette River Average Analyte Concentrations Upstream and Downstream of the Urban Growth Boundary Using Mann-Whitney Statistic [1]

Analyte	Units	Upstream of Urban Growth Boundary (RM 186.9)	Downstream of Beltline Bridge (RM 176.8)
Arsenic – Total	(*µg/L*)	0.268	0.330
Arsenic – Dissolved		0.203	0.245
Copper – Total		0.569	0.794
Copper – Dissolved		0.301	0.439
Lead – Total		0.0805	0.107
Lead – Dissolved		0.00655	0.0171
Mercury – Total		0.00161	0.00188
Mercury - Dissolved		0.00073	0.00086
Nickel – Total		0.308	0.360
Nickel - Dissolved		0.191	0.230
Silver – Total		0.00201	0.00525
Zinc – Total		1.34	1.88
Zinc – Dissolved		0.397	0.997
Escherichia coli	(*col./100 mL*)	20	43
Fecal Coliform		15	37
Nitrate+Nitrite – as Nitrogen	(*mg/L*)	< 0.05	0.11
Total Kjeldahl Nitrogen		< 0.2	0.2
Phosphorus – Ortho		0.02	0.05
Phosphorus – Total		0.04	0.08
Total Dissolved Solids		40	42
Total Suspended Solids		4.3	5.1
Turbidity	NTU	6.8	7.3
Calcium - Total	(*mg/L*)	4.6	5.1
Magnesium – Total		1.5	1.7
Hardness	(*mg eq $CaCO_3$/L*)	18	20
Specific Conductance	(*µmhos/cm*)	47	54
pH	Standard Units	7.4	7.1

[1] Mann-Whitney test statistic comparisons significant at $\alpha = 0.05$.
Shaded cells indicate analyte value at downstream monitoring site greater than upstream site.

The Willamette River was 303(d) listed in 2004 for dioxin (2,3,7,8-TCDD) and ambient samples were collected at two locations during the 2013/2014 monitoring period; all results were reported as not detected (see Table A.10) with reporting limits ranging from 5 to 10 pg/L.

4.4.4.5. Comparison of Ambient Water Quality Data to Oregon Standards

Water quality standards and beneficial uses for surface waters are defined in Chapter 340, Division 41 of the Oregon Administrative Rules (OAR). Analytical results for surface water samples collected from Amazon Basin and Willamette River sites are assessed in this section for overall conformance to Oregon water quality standards.

Boxplot charts are shown in Appendix B Figures B.93 through B.109 of water quality data from the Amazon Basin and Willamette River monitoring sites and compared to Oregon standards. The horizontal line in the middle of the box for each analyte marks the median of the sample set; the median splits the ordered sample set in half. The box represents the central 50 percent of data values; the outer edge of each box mark the 25th and 75th percentiles. Whiskers extending from the box mark the range of values that fall within 1.5 box-lengths from the 25th or 75th percentile. Outliers and extreme values are also depicted in the figures and are defined using different criteria than those used to identify anomalous measurements. Values that are more than 1.5 box-lengths from the 25th or 75th percentiles are identified as outliers and are denoted by an open circle; extreme values are more than 3 box-lengths and are denoted by an asterisk.

All six monitoring stations in the Amazon Basin are grouped together to obtain a visual synopsis of the analytical data, as are the data for the Willamette River, Spring Creek, and Delta Ponds. Note that all total and dissolved metals values are grouped together for each analyte. The boxplots provide a means of quickly characterizing the data sets graphically in terms of the types of analytes and percentile of sampling events exceeding the applicable water quality standard. Appendix B (Figures B.110 through B.197) presents boxplots for all data charting each water quality parameter by individual monitoring location. Boxplots also depict applicable Oregon water quality standard for each analyte. The water quality standard is defined by a vertical line through the concentration axis with the applicable criterion listed at the top of the chart. Metals toxicity criteria are adjusted for hardness using the equations of Table 20 in OAR 340-041. In all instances the lowest criterion is indicated.

In the case of arsenic (Figure B.93), Amazon Basin monitoring locations about 40 percent of the values exceed the human health criterion, which is 2.1 μg/L; the highest observed concentrations from Amazon basin sites exceed the standard by about seven times, while data for Willamette basin sites exceeded the standard in one instance, an extreme value from Delta Ponds where the concentration was about 2.5 μg/L. Willamette valley soils are volcanic in origin and contain relatively high concentrations of naturally occurring arsenic; in some locations total arsenic concentrations in soil can be as high as 20 mg/kg.

Cadmium concentrations exceeded the chronic toxicity criterion in both Amazon and Willamette basin monitoring sites, all of which are identified as extreme values. Most of the Amazon basin exceedances are associated with total values from the A3 Channel at Terry Street, while a

handful of values scattered at the three Willamette River sites within the urban area accounted for exceedances in the Willamette basin. Cadmium data for Amazon basin sites are up to three times greater than the chronic criterion Unlike previous reports where cadmium data were evaluated against a higher toxicity standard effective at that time, no water quality exceedances were observed. The cadmium toxicity criterion was recently updated by the Oregon DEQ, which has resulted in multiple exceedances (Figure B.94).

Copper concentrations measured at monitoring sites from the Willamette Basin (Figure B.97) are for the most part less than the chronic criterion with the exception of a few extreme values. In the Amazon Basin about 30% of values in the data set exceed the chronic criteria by up to seven times the 3.5 μg/L chronic criterion; values within 1.5 times the 75th percentile as defined by the extent of the whisker (about 7.0 μg/L) exceed both the chronic and acute toxicity criteria.

About 40% of the stream samples collected from the Amazon Basin exceed the chronic criterion for lead at 0.54 μg/L (Figure B.97). For the Willamette Basin monitoring sites a few extreme values exceed the chronic criterion.

Multiple extreme values and outliers at Amazon Basin sites exceed the mercury criterion of 0.012 μg/L (see Figure B.98); the extent of the whisker at 1.5 times the 75th percentile is near the mercury criterion. At the Willamette Basin sites a couple of extreme values exceed the chronic criterion for mercury.

The chronic criterion for silver is 0.085 μg/L and is exceeded by a few extreme values in the Amazon Basin; no Willamette Basin values exceed this water quality standard (Figure B.102).

Amazon Basin samples occasionally exceed both the acute and chronic criteria for zinc (Figure B.103), which are 36.2 μg/L and 36.5 μg/L, respectively. The extent of the whisker exceeds both criteria. A few samples collected from the Willamette Basin sites exceed both water quality criteria for zinc.

Exceedances of non-metal water quality standards are also observed for samples collected from the Amazon and Willamette Basins. These included DO, bacteria, pH, temperature, and turbidity. Minimum DO criteria are not met at either the Amazon or Willamette Basin sites for at least some periods of the year. For the Amazon Basin samples this would typically occur during summer months when water temperatures are warmer and stream flows are lower. Boxplots in Figure B.104 indicate that over a quarter of samples from the Amazon Basin may not meet the 6.5 mg/L minimum DO criterion. Sampling protocol does not strictly meet the 30-day mean definition of the criterion given a sampling frequency of six times per year; however, the values are strong evidence that depleted oxygen conditions may persist in the waterbody. The DO criterion for the Willamette River is for the period extending from October 15 to May 15 (the spawning period for salmonids); about 60% of the samples measured at Willamette Basin sites did not meet the 11.0 mg/L minimum DO criterion, though this may be somewhat skewed by the Delta Ponds and Spring Creek samples which, on average, have 5.9 and 8.1 mg/L DO, respectively. Boxplots in Figure B.179 indicate that only about half of the samples collected from Willamette Basin sites met the 11.0 mg/L DO criterion during the spawning period. Note that half of the samples did not meet the DO criterion at the site upstream of the urban growth

boundary, thus the Willamette River was found to be oxygen depleted even before passing through Eugene urban area. Median DO concentrations are lowest near the Owosso Bridge monitoring site but improve somewhat downstream of Beltline Bridge. Pollutants transported by stormwater likely contribute to oxygen depletion of the river through biological and chemical processes.

Escherichia coli counts exceed the criterion of 406 organisms per 100 mL in about 30 percent of samples collected from the Amazon Basin sites (Figure B.105); a few outliers exceeded the criterion from Willamette Basin sites, primarily from the Spring Creek site (see Figure B.187). The magnitude of exceedance for outliers and extreme values at the Amazon Basin sites is nearly two orders greater than the criterion. Unlike the Amazon Basin sites where bacteria counts tend to decrease downstream, bacteria counts in samples from the Willamette River increase slightly as the river flows through the urban growth area (see Table 4-7 above); however, values for monitoring sites on the Willamette River did not exceed the water quality criterion for bacteria. Fecal Coliform values exceed the criterion less frequently as shown in Figure B.106; the few outliers for the Willamette Basin are associated with the Spring Creek site (see Figure B.188), samples from the Willamette River did not exceed the bacteria criterion.

Field pH measurements from Amazon Basin sites sometimes exceed both the minimum and maximum pH criteria of 6.5 and 8.5 pH units respectively; some samples from the Willamette River sites exceed the minimum pH criterion (Figure B.107). Most of these exceedances are associated with field measurements performed during the early years of the monitoring program where greater pH variability is observed. In addition to the influences of natural conditions and anthropogenic activities, the greater variance may be associated with sampling technique and/or instrumentation used at that time.

Nearly 60% of the samples collected from the Amazon Basin exceed the salmon and trout rearing and migration temperature criterion of 18 ˚C (Figure B.109), effective from May 16th through October 14th; a few samples from the Willamette Basin also exceed this criterion. The salmon and steelhead spawning temperature criterion of 13 ˚C (Figure B.108) is applicable to the Willamette River and is effective from October 15th through May 15th; samples collected from the four main-stem monitoring sites occasionally exceed this criterion.

Figures B.192 through B.197 in Appendix B are boxplots of turbidity measurements compared to the applicable flow-based turbidity target defined in Chapter 10 on page 212 of the Willamette Basin TMDL; boxplots in Figure B.192 summarize the data by criterion. DEQ derived the Amazon Creek turbidity targets using Long Tom River flows near Noti as a reference river discharge. Collection dates for historical turbidity values measured under the ambient monitoring program were correlated to river flows on the Long Tom recorded by the USGS. The applicable turbidity target was then derived for each turbidity value; boxplots of the data sets are grouped by the applicable turbidity target, as defined on each chart. Most of the turbidity values exceed the applicable criterion, though it is instructive to note that the median of turbidity values for Willow Creek tends to center on the target at higher turbidity values. Turbidity values for Amazon Creek at 29th Avenue are comparable to – and often times less turbid than – Willow Creek, suggesting the upper reach of Amazon Creek may already exhibit turbidity levels that are similar to a relatively undisturbed stream originating within this basin. Additional efforts will be

needed at downstream sites to improve water quality such that it meets the turbidity targets required by DEQ.

OAR 340-041-0036 describes the turbidity criterion applicable to the Willamette River, which states that no more than a ten percent cumulative increase in natural stream turbidities may be allowed as measured relative to a control point immediately upstream. A statistically significant difference was observed for turbidity between the uppermost monitoring site on the Willamette River upstream of the urban growth boundary, and the lowermost site downstream of the Beltline Bridge (see Tables 4-7 above). Figure B.185 presents turbidity boxplots for the Willamette River sites.

Figures 8a through 8c and 9a through 9c, graphically summarize trends and water quality criteria for each monitoring location within the Amazon and Willamette Basins. Figures 8a and 9a summarize the Seasonal Kendal trends, green text analytes indicate decreasing trends while analytes in red text indicate an increasing trend. Green may be presumed to be a "good" indicator, while red a "poor" indicator, with the exception of Dissolved Oxygen in Figure 9a, in this instance decreasing trends are not desired and are indicative of water quality degradation.

Figures 8b and 9b compares water quality data for the most recent monitoring period (2012/2013) to Oregon water quality standard; all analytes listed indicate an exceedance of a water quality standard, green text analytes indicate the analyte has a decreasing concentration trend for the entire data set, red text indicates an increasing trend, and black text indicates no trend in the data set.

Finally, Figures 8c and 9c compare statistically significant water quality changes across the Amazon and Willamette drainage basins. Each analyte is color coded to its respective drainage basin area; for example, in the comparison of Amazon Creek at 29th Avenue to Amazon Creek at the Railroad Crossing, analytes in brown text indicate concentrations are greater at the 29th Avenue site, while those analytes in blue text indicate concentrations are greater at the Railroad Crossing site. Comparisons are for the entire water quality data set.

4.4.4.6. Water Quality Correlations

Factor analysis of the ambient water quality data was done to study the interrelated water quality analytes at each monitoring location. This concept is important because it may provide important characteristics of the water body and the types of pollutants detected both during dry and wet seasons. For example, suspended solid and turbidity increases in a water body may be associated with increases of other pollutants, hence application of specific BMPs to control solids and turbidity would prove beneficial in controlling other pollutants that are problematic in the same water body.

Our analysis consisted of reviewing the entire water quality data set using commercially available software to perform factor analysis. In addition to the 41 water quality analytes, three additional variables were added to the analysis; precipitation, river flow, and seasonality. River flow for sites other than the Willamette River utilizes flow measurements in the Long Tom River

near Noti, and seasonality is as defined in the Seasonal Trends section above. While derivation of a model summarizing the many analytes into a few factors is possible, our interest at this initial stage of review was generation of a correlation matrix of all analytes and their interrelationships. Correlations, or r values, measure the strength of linear associations between each analyte. Upon obtaining the correlations, all analyte pairs exceeding an r value of 0.3 and whose comparison was significant at $\alpha = 0.05$, were selected as "significant" analytes. A simple correlation index was developed whereby the sum of significant analyte pairs is divided by the total number of possible significant pairs. The index was calculated for four analyte groupings including; all analytes, metals, nonmetals, and metal-nonmetal correlations. If all analytes are linearly correlated within their respective group, an index of 1 (one) would be observed.

Figure 4-4 summarizes the correlation indexes for each ambient monitoring location. In general, the lowest correlation indexes are located at Willow Creek and Willamette River sites; by comparison, Amazon Creek, the A3 and Diversion Channels, Spring Creek, and Delta Ponds had significantly higher indexes. The highest correlation index observed for all analytes was 0.46 for Amazon Creek at the Railroad Crossing, followed closely by Spring Creek with a 0.44 correlation index.

Spring Creek had the highest metals correction index at 0.52, followed closely by Amazon Creek at the Railroad Crossing at 0.50. At Spring Creek, copper, zinc, chromium, lead, molybdenum, and cadmium had the greatest number of metal-metal correlations. For the non-metals, rainfall, nitrate+nitrite as nitrogen, and hardness (calcium and magnesium) had the greatest number of correlations.

Amazon Creek at the Railroad Crossing had the highest non-metal correlation index at 0.45, including hardness (calcium and magnesium), conductivity, dissolved oxygen, suspended solids, and temperature. For metals, the greatest number of correlations occurs for arsenic, copper, lead, molybdenum, nickel, and selenium. Total lead had the highest number of significant correlations at 33 analyte pairs, followed by total arsenic at 31, and total nickel at 30 analyte pairs; dissolved oxygen had 31 analyte pairs, temperature and suspended solids 30 pairs, and calcium 28 analyte pairs.

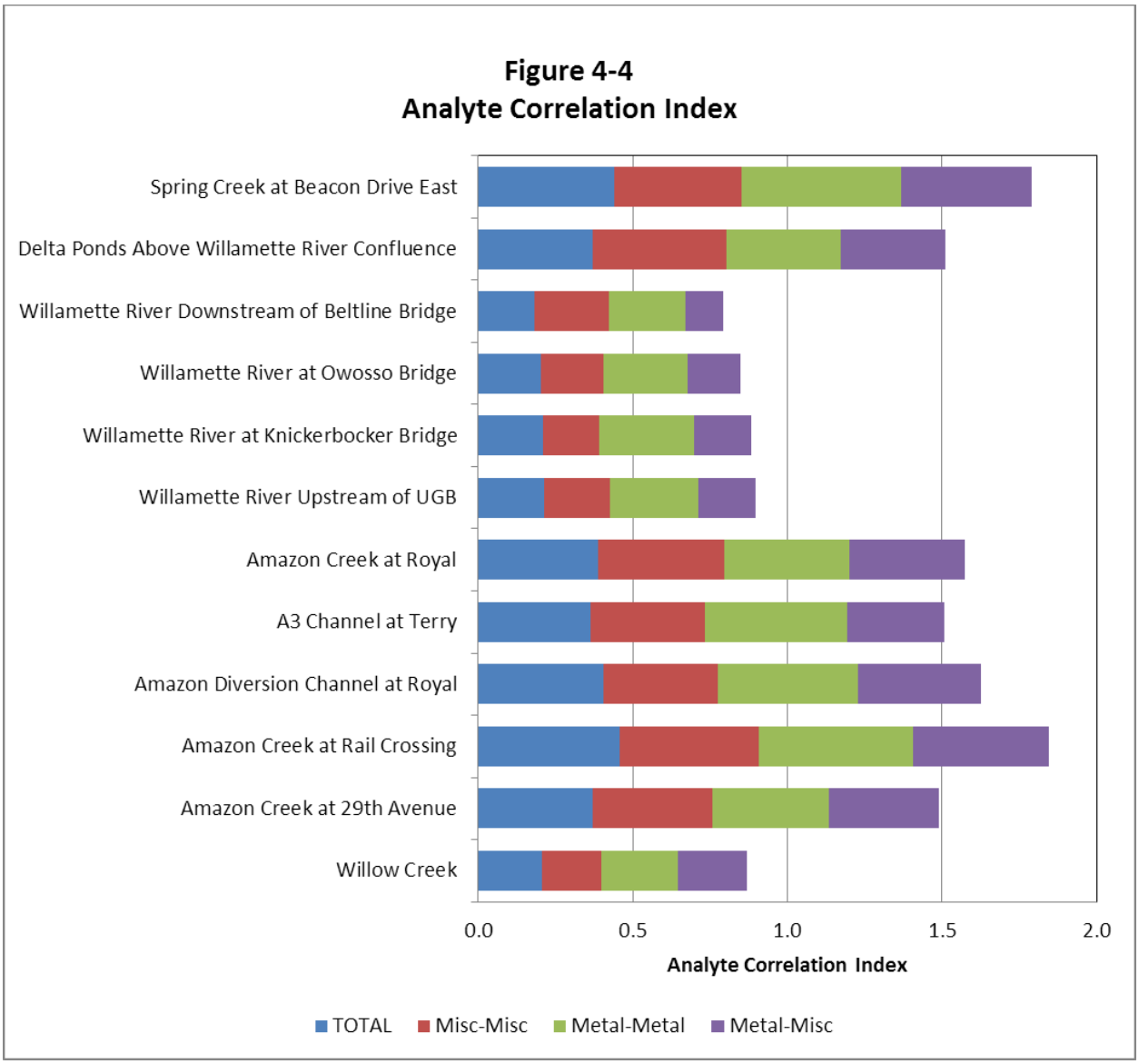
The Willamette River at Knickerbocker Bridge had the highest correlation index at 0.31 for the metal group. The correlation matrix for this group indicates copper, arsenic, zinc, mercury, nickel and chromium had the highest number of significant correlations.

A final comparison was made to evaluate the metal-nonmetal relationships. Once again, the Amazon Creek at the Rail Crossing had the highest correlation index at 0.44, followed closely by Spring Creek at 0.42. Analyte pair combinations in this group with the highest number of correlations include arsenic, lead, nickel, copper, molybdenum, selenium, zinc, temperature, suspended solids, dissolved oxygen, hardness (calcium and magnesium), and conductivity.

Additional review of the data will be done during the next few monitoring periods to better characterize the types of correlations observed. For example, there is a strong negative correlation between arsenic and dissolved oxygen, and a strong positive correlation with

hardness at the Rail Crossing site, that is, as dissolved oxygen decreases and water hardness increases, the arsenic concentration increases.

A review the correlation analysis data is planned to assess whether a distillate of indicator analytes can be used as a broad indicator of BMP effectiveness, particularly in stormwater drainage basins where storm event sampling is being done, and within basins defined by ambient monitoring sites. Correlation analysis of the stormwater data is planned as additional storm event data is acquired, thereby providing a more robust data set upon which to perform the analysis and improving the predictive capabilities of models.



4.4.5. Data Management, Documentation and Record-Keeping

Laboratory analysis performed at the Eugene/Springfield Water Pollution Control Facility is performed under an Environmental Management System (EMS) for which the facility has earned certification under the International Organization for Standardization (ISO). Organizations that earn ISO certification under the 14001:2004(E) standard commit to develop an environmental policy, establish objectives and processes to achieve policy commitments, take action as needed to improve its performance and demonstrate the conformity of the system to the requirements of the ISO standard. ISO 14001 elements include establishing, implementing and maintaining procedures applicable to legal requirements, documentation and records determined to be necessary to ensure effective planning, operation and control of processes, control of records and documents, evaluation of legal compliance, defining roles, responsibilities and authority of staff, competence and training requirements, and management review. In addition, the E/S WPCF's EMS is audited by internal and external auditors on a frequent basis to ensure conformance and compliance to the policies and objectives established by and applicable to the E/S WPCF.

As such, all sampling and analysis of stormwater, stream, and MS4 samples performed by staff at the E/S WPCF falls under the umbrella of the EMS program. Documents and records associated with stormwater monitoring elements are readily available through the E/S WPCF electronic document control system, including the facility's QAP and all SOPs associated with sample collection, handling, analysis, and reporting. All laboratory and field measurements collected to meet the stormwater NPDES monitoring requirements is controlled through the E/S WPCF's Laboratory Information Management System (LIMS), which has strict controlled data entry requirements and access restrictions.

The Stormwater Monitoring Plan documents the sampling and analysis protocol followed the requirements specified in Schedule B of the city's NPDES MS4 discharge permit. At this time no substantive revisions have been made to the SMP. Any modifications to the SMP will be documented under revision history at the end of the document. Revision 1.0 is the latest and current plan version and is available to the public at any time via the City of Eugene's Stormwater Program internet web site.

All water quality data collected during this monitoring period as well as historical data, are also posted to the City's Stormwater Program internet web site at http://www.eugene-or.gov/index.aspx?nid=476 .

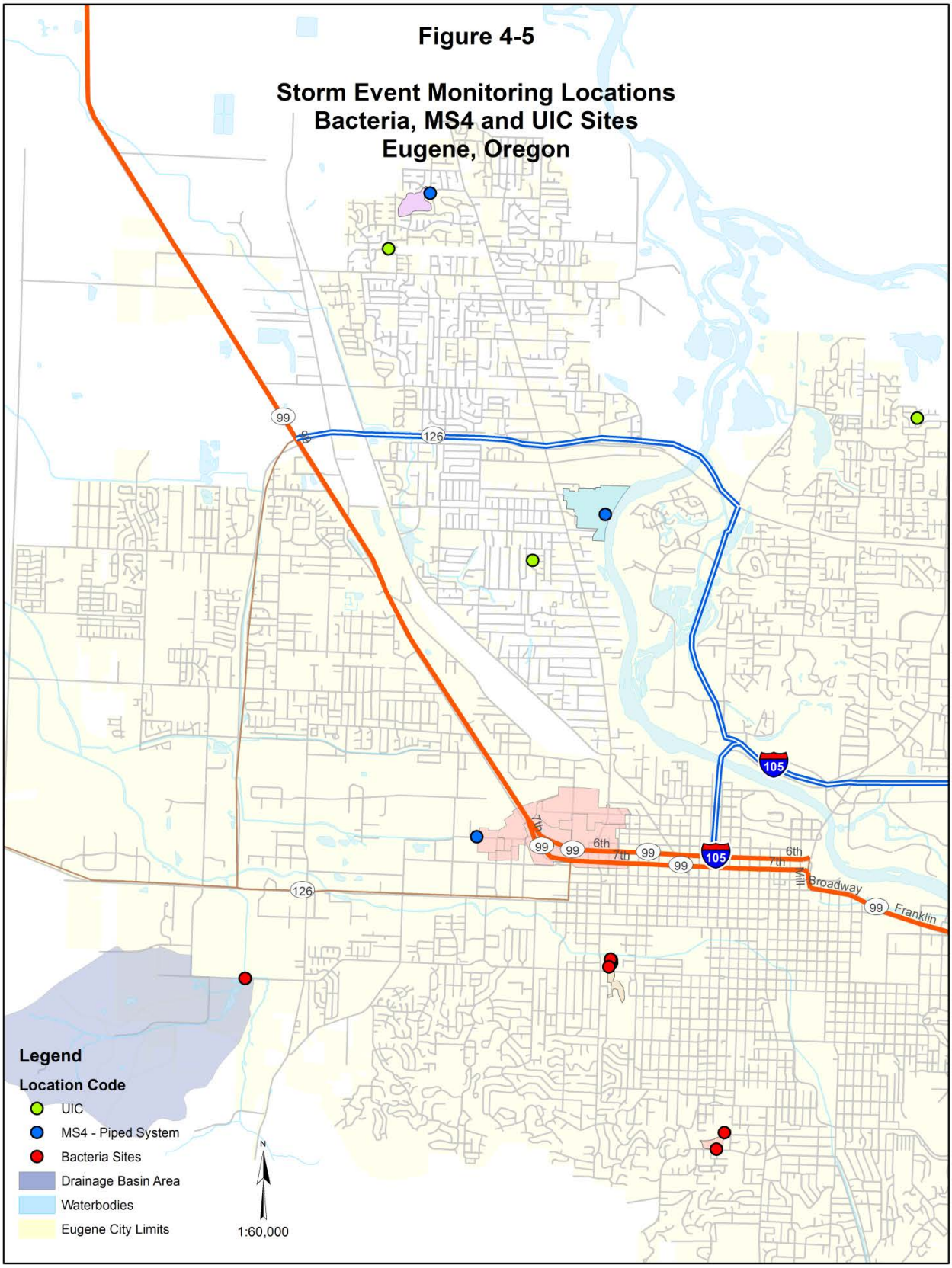


Figure 4-5
Storm Event Monitoring Locations
Bacteria, MS4 and UIC Sites
Eugene, Oregon
99
126
105
6th
7th
Broadway
Franklin
Legend
Location Code
UIC
MS4 - Piped System
Bacteria Sites
Drainage Basin Area
Waterbodies
Eugene City Limits
N
1:60,000

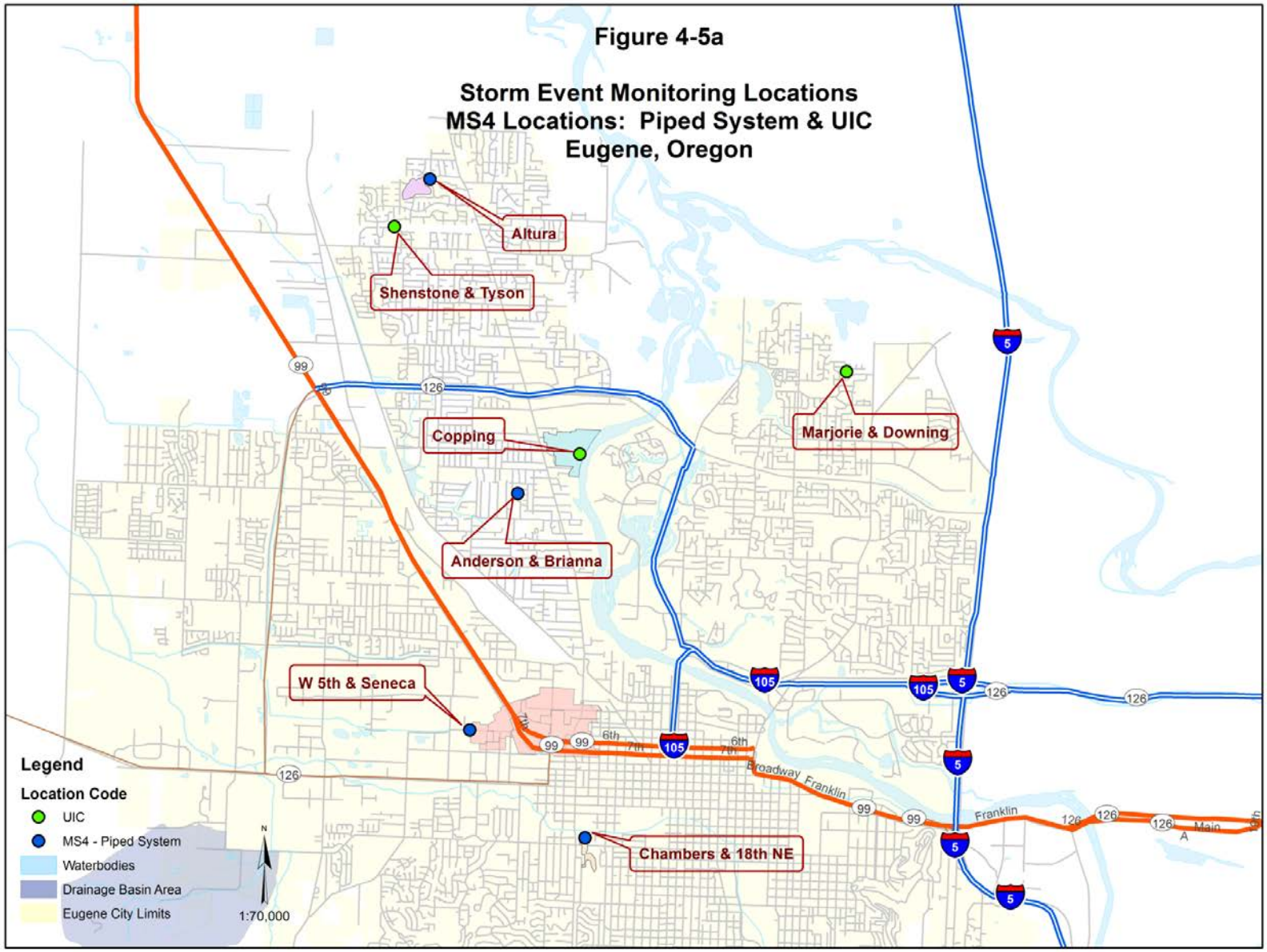


Figure 4-5a
Storm Event Monitoring Locations
MS4 Locations: Piped System & UIC
Eugene, Oregon
Altura
Shenstone & Tyson
Copping
Marjorie & Downing
Anderson & Brianna
W 5th & Seneca
Chambers & 18th NE
Legend
Location Code
UIC
MS4 - Piped System
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000
N
99
126
105
5
6th
7th
Broadway
Franklin
Main

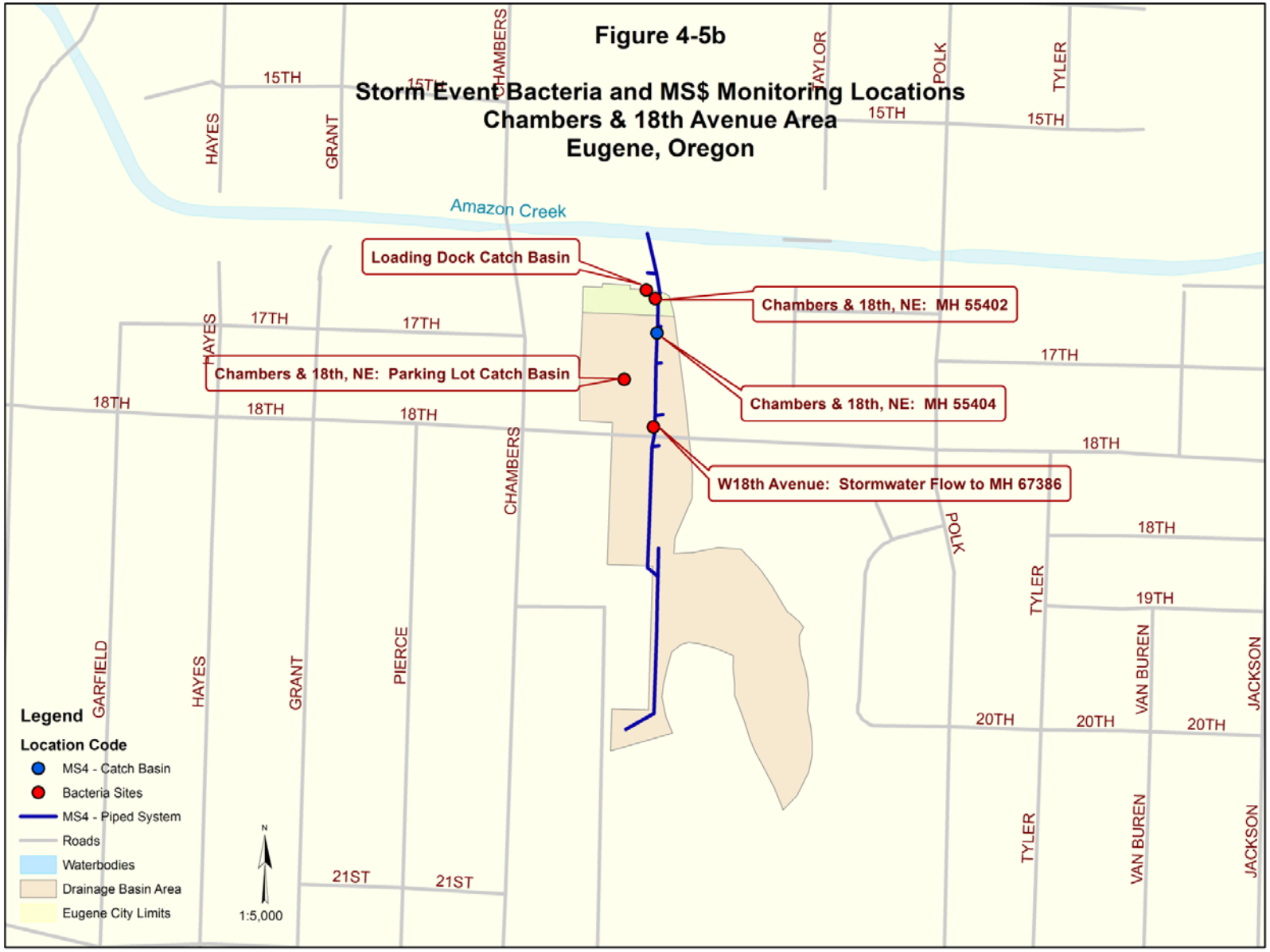


Figure 4-5b
Storm Event Bacteria and MS$ Monitoring Locations
Chambers & 18th Avenue Area
Eugene, Oregon
Amazon Creek
Loading Dock Catch Basin
Chambers & 18th, NE: MH 55402
Chambers & 18th, NE: Parking Lot Catch Basin
Chambers & 18th, NE: MH 55404
W18th Avenue: Stormwater Flow to MH 67386
15TH
17TH
18TH
19TH
20TH
21ST
HAYES
GRANT
CHAMBERS
TAYLOR
POLK
TYLER
GARFIELD
PIERCE
VAN BUREN
JACKSON
Legend
Location Code
MS4 - Catch Basin
Bacteria Sites
MS4 - Piped System
Roads
Waterbodies
Drainage Basin Area
Eugene City Limits
N
1:5,000

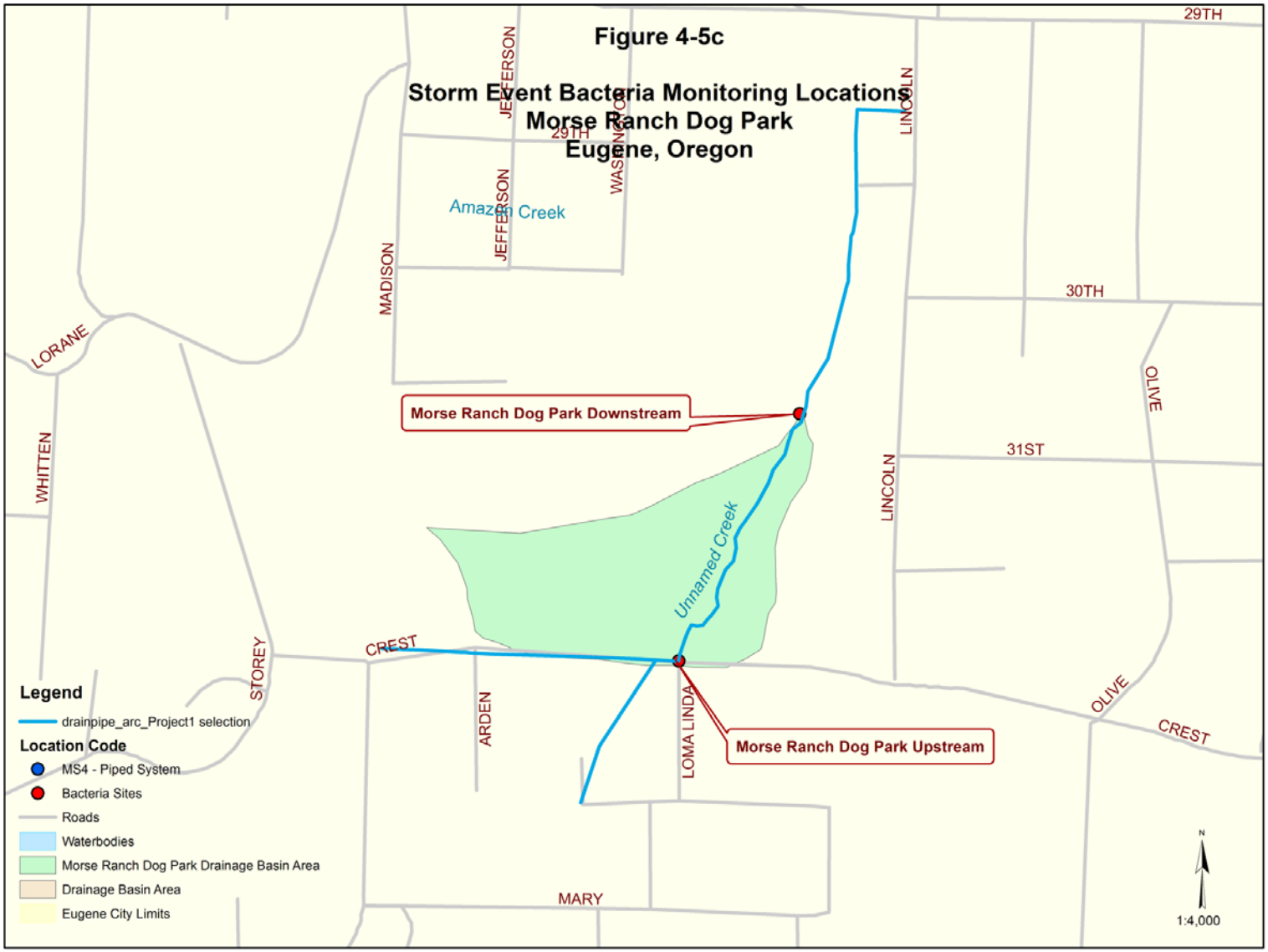


Figure 4-5c
Storm Event Bacteria Monitoring Locations
Morse Ranch Dog Park
Eugene, Oregon
29TH
JEFFERSON
WASHINGTON
LINCOLN
Amazon Creek
MADISON
30TH
LORANE
OLIVE
Morse Ranch Dog Park Downstream
WHITTEN
31ST
Unnamed Creek
CREST
STOREY
ARDEN
LOMA LINDA
Morse Ranch Dog Park Upstream
MARY
Legend
drainpipe_arc_Project1 selection
Location Code
MS4 - Piped System
Bacteria Sites
Roads
Waterbodies
Morse Ranch Dog Park Drainage Basin Area
Drainage Basin Area
Eugene City Limits
N
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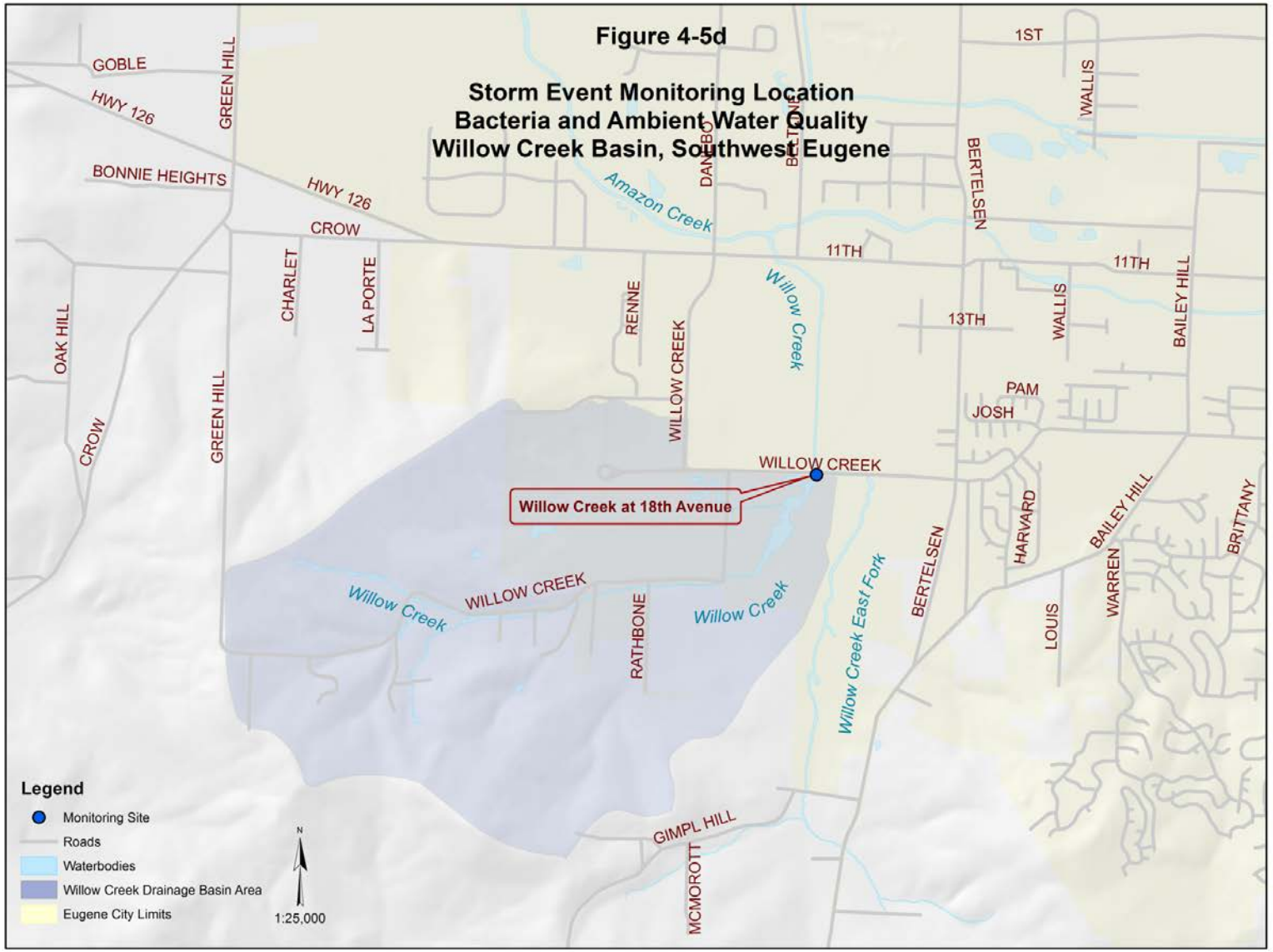
Figure 4-5d
Storm Event Monitoring Location
Bacteria and Ambient Water Quality
Willow Creek Basin, Southwest Eugene
GOBLE
HWY 126
GREEN HILL
BONNIE HEIGHTS
HWY 126
CROW
Amazon Creek
DANIELSON
BERTELSEN
1ST
WALLIS
BERTELSEN
11TH
11TH
13TH
WALLIS
BAILEY HILL
CHARLET
LA PORTE
RENNE
WILLOW CREEK
Willow Creek
OAK HILL
CROW
GREEN HILL
PAM
JOSH
WILLOW CREEK
Willow Creek at 18th Avenue
HARVARD
BAILEY HILL
BRITTANY
BERTELSEN
Willow Creek
WILLOW CREEK
RATHBONE
Willow Creek
Willow Creek East Fork
LOUIS
WARREN
GIMPL HILL
MCMOROTT
Legend
Monitoring Site
Roads
Waterbodies
Willow Creek Drainage Basin Area
Eugene City Limits
N
1:25,000

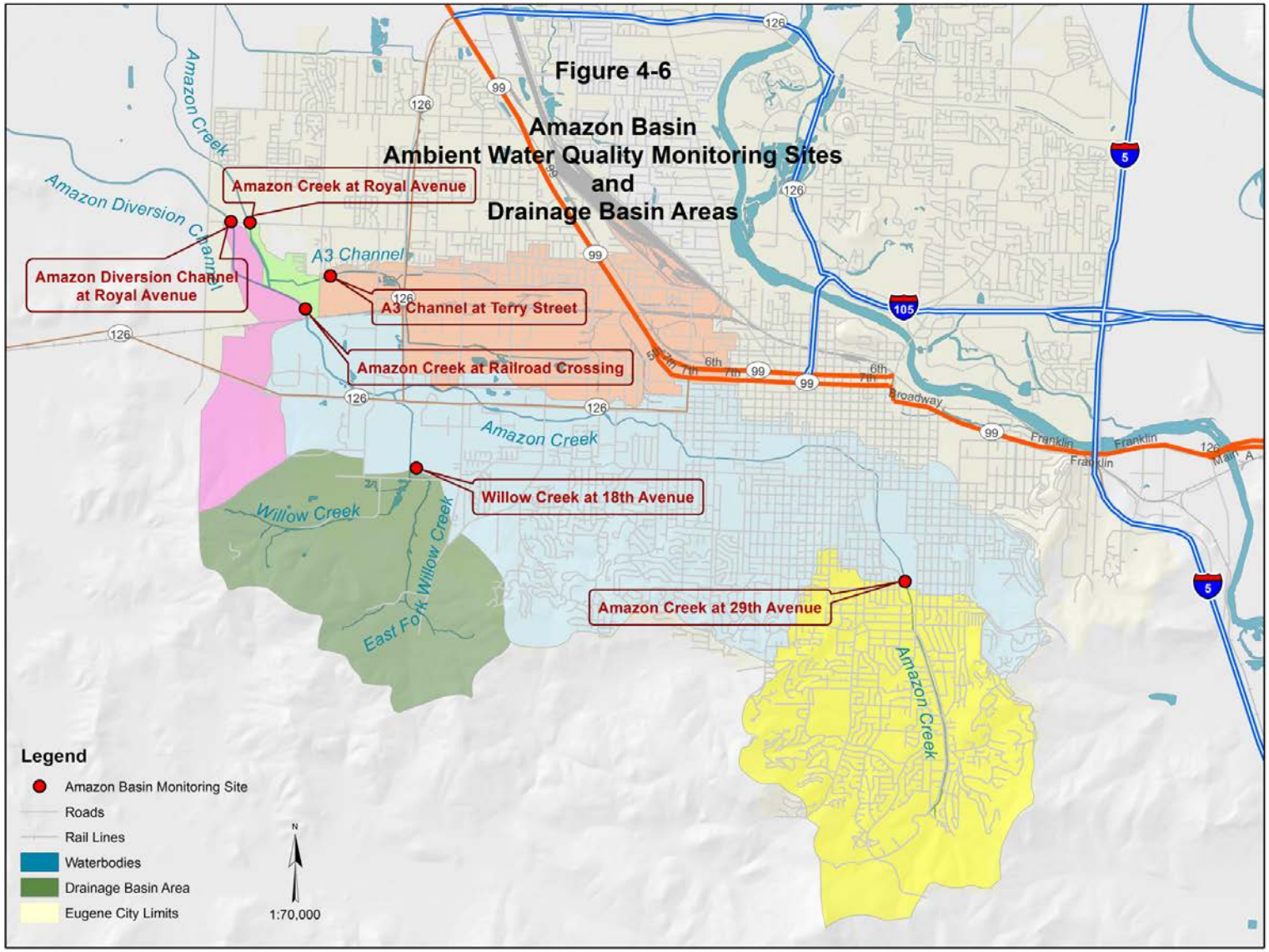
Figure 4-6
Amazon Basin
Ambient Water Quality Monitoring Sites
and
Drainage Basin Areas
Amazon Creek at Royal Avenue
Amazon Diversion Channel
Amazon Diversion Channel at Royal Avenue
A3 Channel
A3 Channel at Terry Street
Amazon Creek at Railroad Crossing
Amazon Creek
Willow Creek at 18th Avenue
Willow Creek
East Fork Willow Creek
Amazon Creek at 29th Avenue
Amazon Creek
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
N
1:70,000

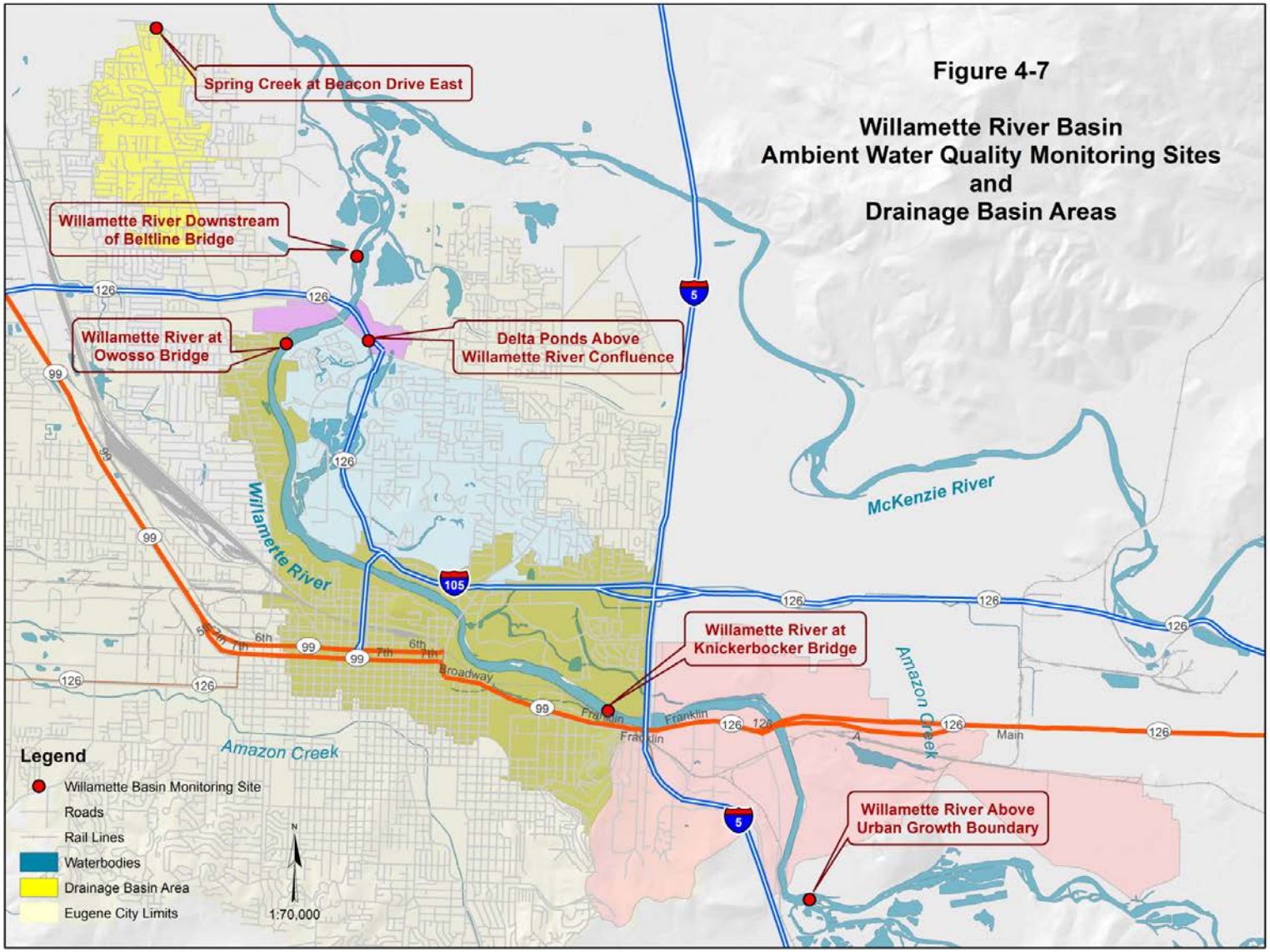
Figure 4-7
Willamette River Basin
Ambient Water Quality Monitoring Sites
and
Drainage Basin Areas
Spring Creek at Beacon Drive East
Willamette River Downstream of Beltline Bridge
Willamette River at Owosso Bridge
Delta Ponds Above Willamette River Confluence
Willamette River at Knickerbocker Bridge
Willamette River Above Urban Growth Boundary
Willamette River
McKenzie River
Amazon Creek
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

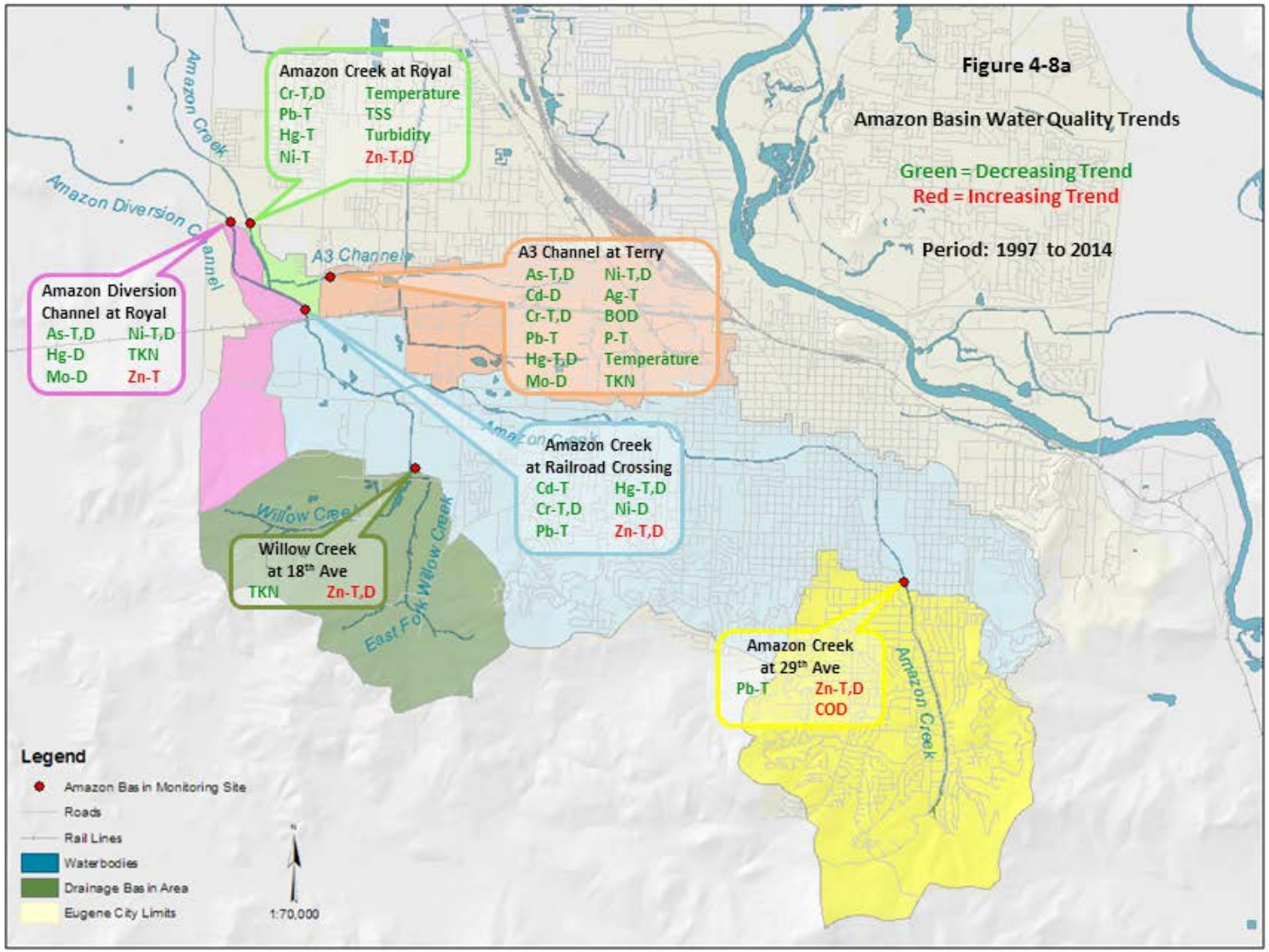
Figure 4-8a
Amazon Basin Water Quality Trends
Green = Decreasing Trend
Red = Increasing Trend
Period: 1997 to 2014
Amazon Creek at Royal
Cr-T,D Temperature
Pb-T TSS
Hg-T Turbidity
Ni-T Zn-T,D
Amazon Diversion Channel at Royal
As-T,D Ni-T,D
Hg-D TKN
Mo-D Zn-T
A3 Channel at Terry
As-T,D Ni-T,D
Cd-D Ag-T
Cr-T,D BOD
Pb-T P-T
Hg-T,D Temperature
Mo-D TKN
Amazon Creek at Railroad Crossing
Cd-T Hg-T,D
Cr-T,D Ni-D
Pb-T Zn-T,D
Willow Creek at 18th Ave
TKN Zn-T,D
Amazon Creek at 29th Ave
Pb-T Zn-T,D
COD
Amazon Creek
Amazon Diversion Channel
A3 Channel
Willow Creek
East Fork Willow Creek
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

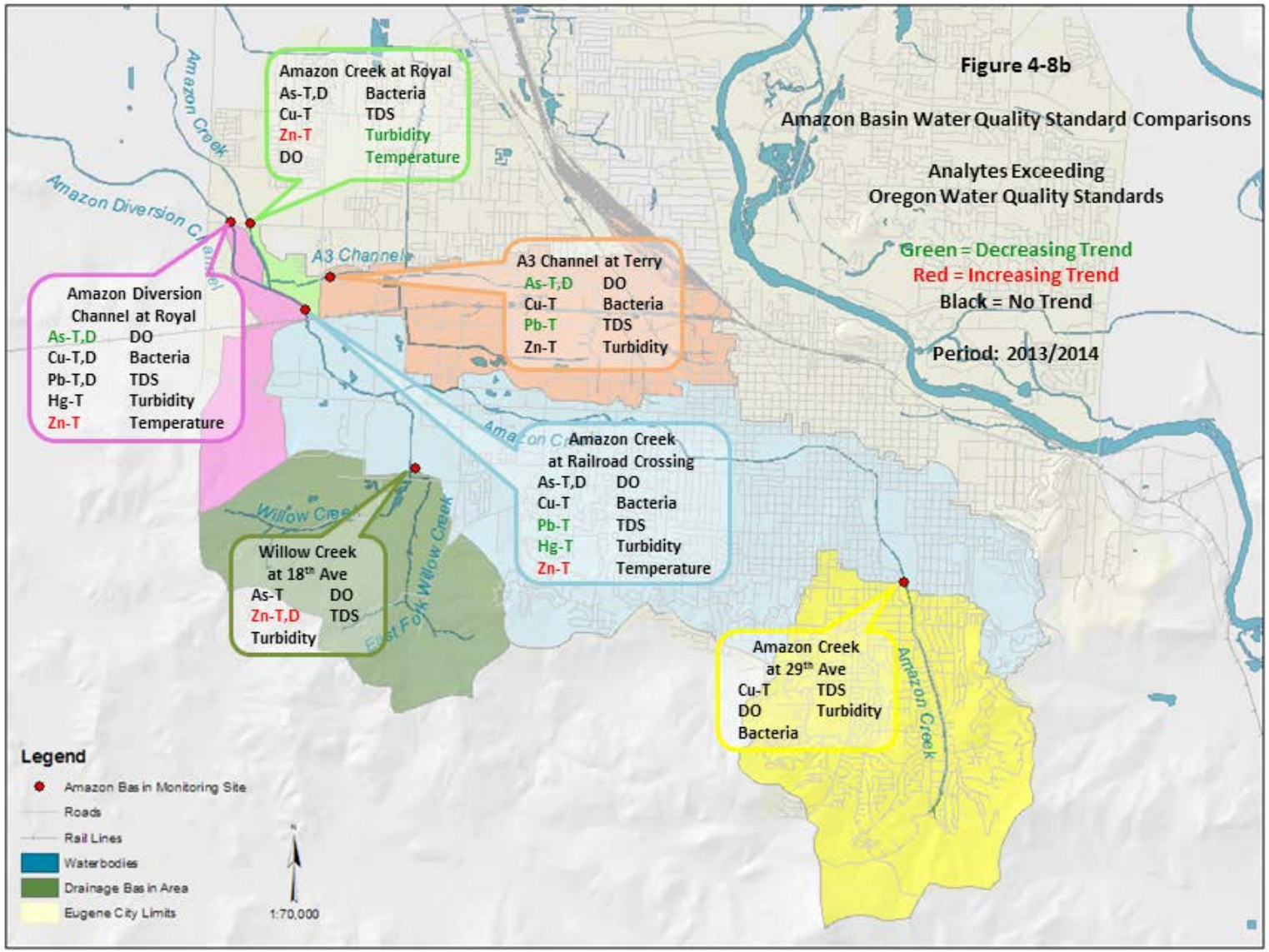
Figure 4-8b
Amazon Basin Water Quality Standard Comparisons
Analytes Exceeding
Oregon Water Quality Standards
Green = Decreasing Trend
Red = Increasing Trend
Black = No Trend
Period: 2013/2014
Amazon Creek at Royal
As-T,D Bacteria
Cu-T TDS
Zn-T Turbidity
DO Temperature
Amazon Diversion Channel at Royal
As-T,D DO
Cu-T,D Bacteria
Pb-T,D TDS
Hg-T Turbidity
Zn-T Temperature
A3 Channel at Terry
As-T,D DO
Cu-T Bacteria
Pb-T TDS
Zn-T Turbidity
Amazon Creek at Railroad Crossing
As-T,D DO
Cu-T Bacteria
Pb-T TDS
Hg-T Turbidity
Zn-T Temperature
Willow Creek at 18th Ave
As-T DO
Zn-T,D TDS
Turbidity
Amazon Creek at 29th Ave
Cu-T TDS
DO Turbidity
Bacteria
Amazon Creek
Amazon Diversion Channel
A3 Channel
Willow Creek
East Fork Willow Creek
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

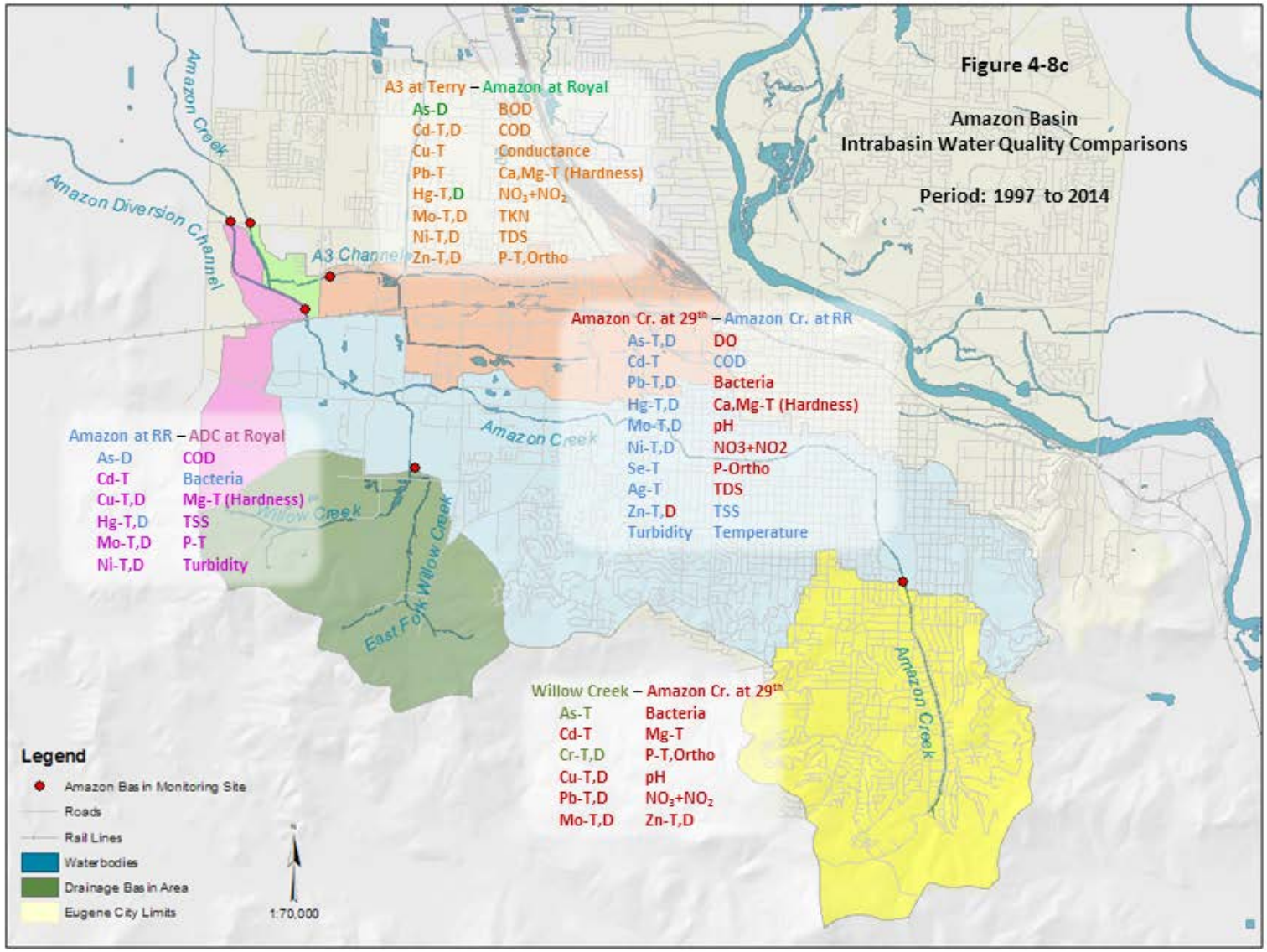
Figure 4-8c
Amazon Basin
Intrabasin Water Quality Comparisons
Period: 1997 to 2014
A3 at Terry – Amazon at Royal
As-D BOD
Cd-T,D COD
Cu-T Conductance
Pb-T Ca,Mg-T (Hardness)
Hg-T,D NO_3+NO_2
Mo-T,D TKN
Ni-T,D TDS
Zn-T,D P-T,Ortho
Amazon Cr. at 29th – Amazon Cr. at RR
As-T,D DO
Cd-T COD
Pb-T,D Bacteria
Hg-T,D Ca,Mg-T (Hardness)
Mo-T,D pH
Ni-T,D NO3+NO2
Se-T P-Ortho
Ag-T TDS
Zn-T,D TSS
Turbidity Temperature
Amazon at RR – ADC at Royal
As-D COD
Cd-T Bacteria
Cu-T,D Mg-T (Hardness)
Hg-T,D TSS
Mo-T,D P-T
Ni-T,D Turbidity
Willow Creek – Amazon Cr. at 29th
As-T Bacteria
Cd-T Mg-T
Cr-T,D P-T,Ortho
Cu-T,D pH
Pb-T,D NO_3+NO_2
Mo-T,D Zn-T,D
Amazon Creek
Amazon Diversion Channel
A3 Channel
Willow Creek
East Fork Willow Creek
Legend
Amazon Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

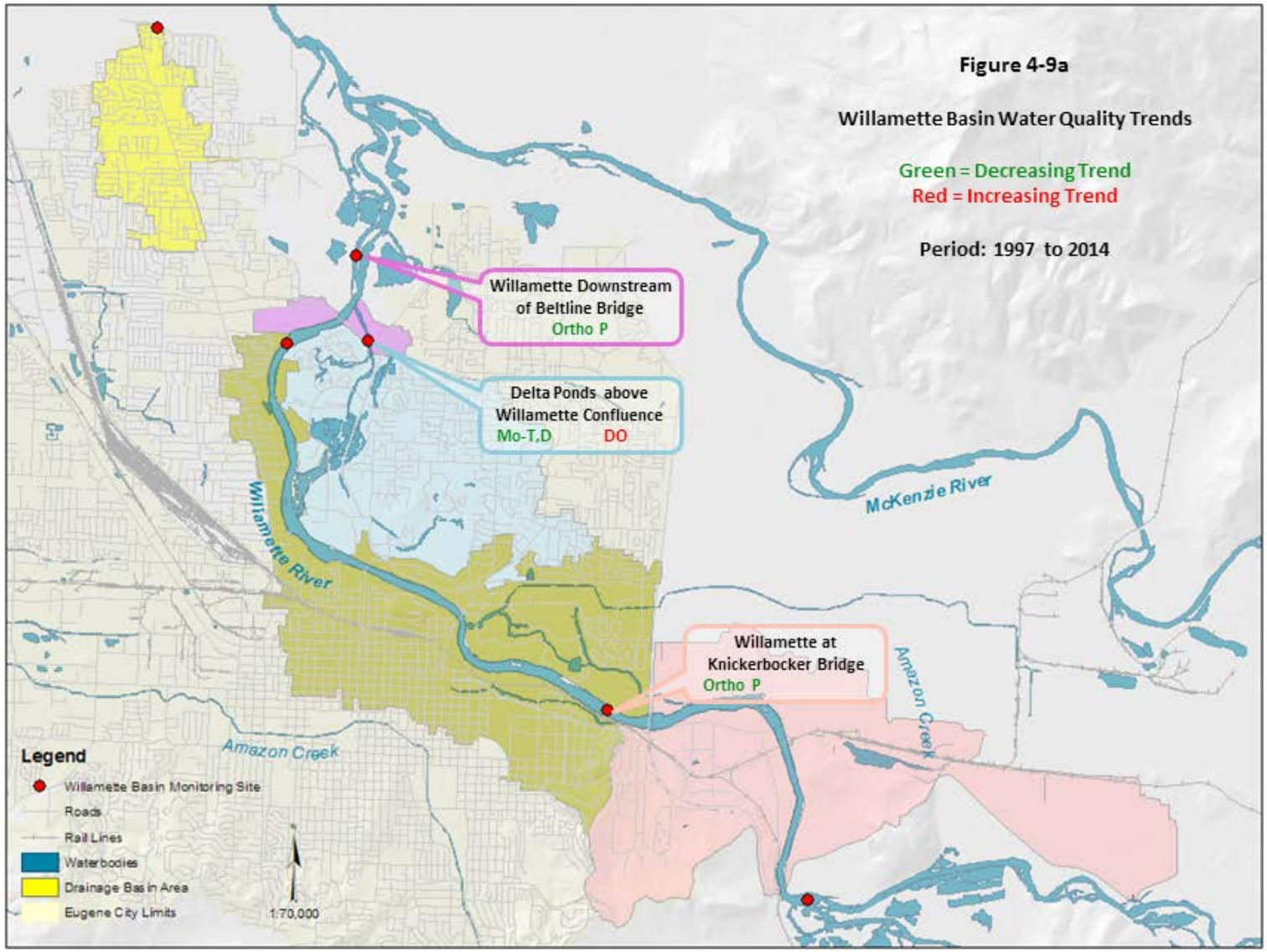
Figure 4-9a
Willamette Basin Water Quality Trends
Green = Decreasing Trend
Red = Increasing Trend
Period: 1997 to 2014
Willamette Downstream of Beltline Bridge
Ortho P
Delta Ponds above Willamette Confluence
Mo-T,D DO
Willamette at Knickerbocker Bridge
Ortho P
Willamette River
McKenzie River
Amazon Creek
Amazon Creek
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

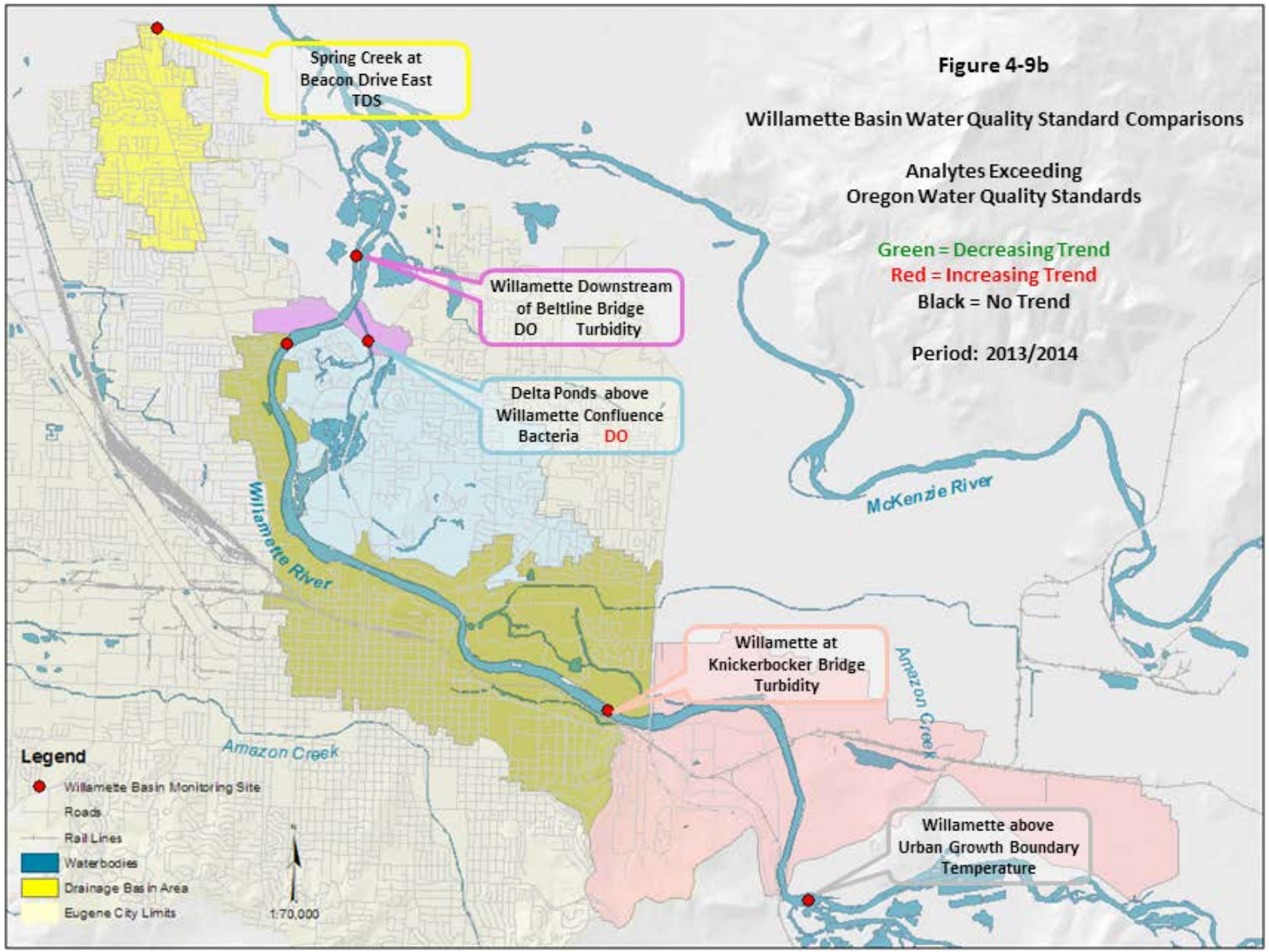
Figure 4-9b
Willamette Basin Water Quality Standard Comparisons
Analytes Exceeding
Oregon Water Quality Standards
Green = Decreasing Trend
Red = Increasing Trend
Black = No Trend
Period: 2013/2014
Spring Creek at
Beacon Drive East
TDS
Willamette Downstream
of Beltline Bridge
DO Turbidity
Delta Ponds above
Willamette Confluence
Bacteria DO
Willamette at
Knickerbocker Bridge
Turbidity
Willamette above
Urban Growth Boundary
Temperature
Willamette River
McKenzie River
Amazon Creek
Amazon Creek
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000

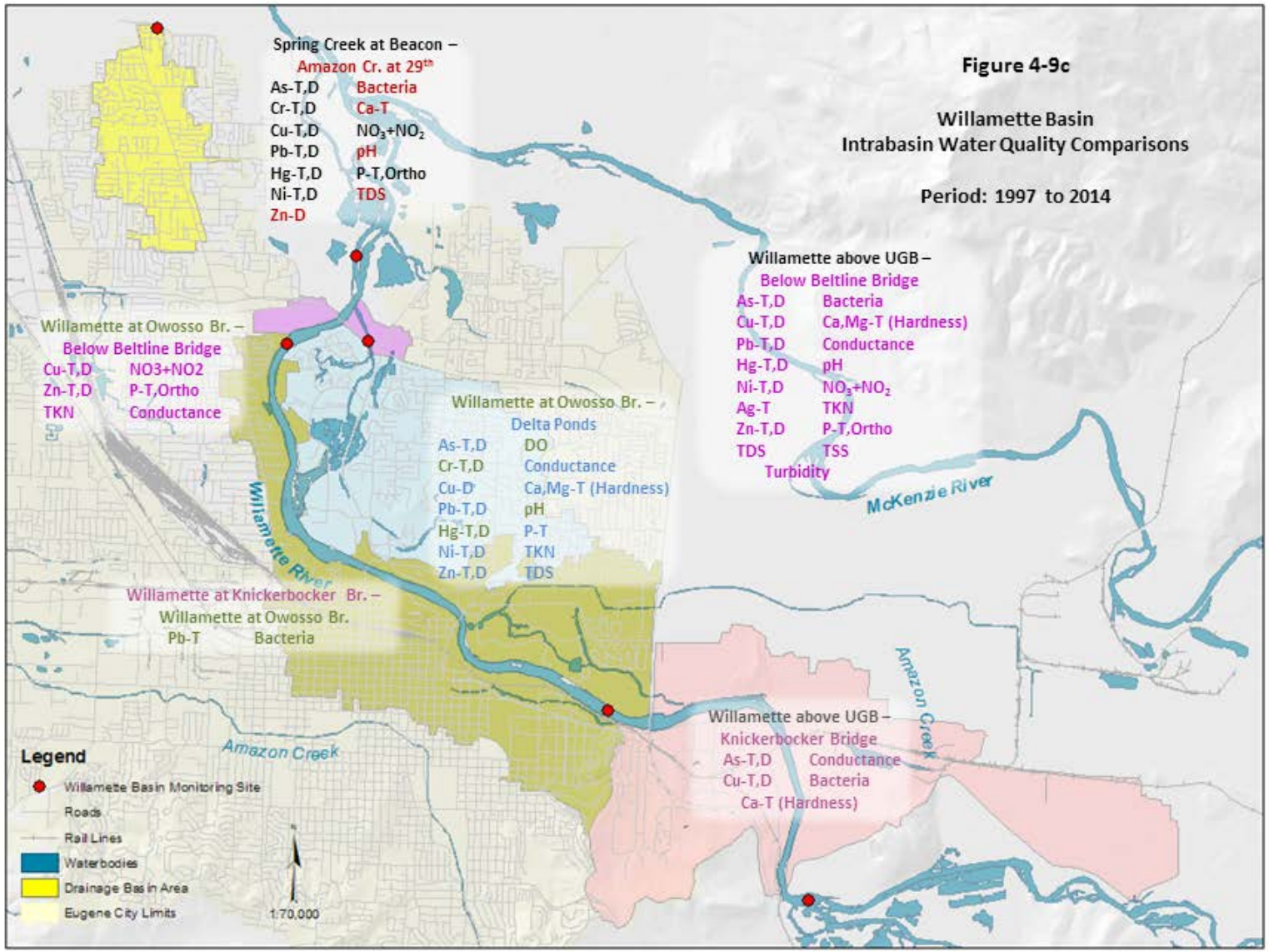
Figure 4-9c
Willamette Basin
Intrabasin Water Quality Comparisons
Period: 1997 to 2014
Spring Creek at Beacon –
Amazon Cr. at 29th
As-T,D Bacteria
Cr-T,D Ca-T
Cu-T,D NO3+NO2
Pb-T,D pH
Hg-T,D P-T,Ortho
Ni-T,D TDS
Zn-D
Willamette above UGB –
Below Beltline Bridge
As-T,D Bacteria
Cu-T,D Ca,Mg-T (Hardness)
Pb-T,D Conductance
Hg-T,D pH
Ni-T,D NO3+NO2
Ag-T TKN
Zn-T,D P-T,Ortho
TDS TSS
Turbidity
Willamette at Owosso Br. –
Below Beltline Bridge
Cu-T,D NO3+NO2
Zn-T,D P-T,Ortho
TKN Conductance
Willamette at Owosso Br. –
Delta Ponds
As-T,D DO
Cr-T,D Conductance
Cu-D Ca,Mg-T (Hardness)
Pb-T,D pH
Hg-T,D P-T
Ni-T,D TKN
Zn-T,D TDS
Willamette River
McKenzie River
Willamette at Knickerbocker Br. –
Willamette at Owosso Br.
Pb-T Bacteria
Amazon Creek
Willamette above UGB –
Knickerbocker Bridge
As-T,D Conductance
Cu-T,D Bacteria
Ca-T (Hardness)
Legend
Willamette Basin Monitoring Site
Roads
Rail Lines
Waterbodies
Drainage Basin Area
Eugene City Limits
1:70,000