CITY OF SALEM, OREGON

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMIT

(Permit Number 101513, File Number 108919)

ANNUAL REPORT
FY 2014-15

October 29, 2015

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Peter Fernandez, Public Works Director

10/29/2015

Date

Prepared by
City of Salem Public Works Department

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ACWA	Association of Clean Water Agencies
BMP	Best Management Practice
CFR	Code of Federal Regulations
CIP	Capital Improvement Plan
COE	U.S. Army Corps of Engineers
CON	Construction-related BMPs
DEQ	Oregon Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
ES	Environmental Services (City of Salem)
FEMA	Federal Emergency Management Act
GIS	Geographic Information System
IDEP	Illicit Discharge Elimination Program
IGA	Inter-governmental Agreement
ILL	Illicit discharge-related BMPs
IND	Industrial-related BMPs
MEP	Maximum Extent Practicable
mg/L	Milligrams per liter
MOA	Memorandum of Agreement
MS4	Municipal Separate Storm Sewer System
MWOG	Mid-Willamette Valley Outreach Group
ODA	Oregon Department of Agriculture
ODOT	Oregon Department of Transportation
ppm	Parts per million
RC	Residential and commercial area-related BMPs
SDC	System Development Charge
SRC	Salem Revised Code
SSORP	Sanitary Sewer Overflow Response Plan
SWMP	Stormwater Management Plan
TMDL	Total Maximum Daily Load

1 INTRODUCTION

1.1 Background

In 1990, the United States Environmental Protection Agency (EPA) published its Phase I regulations governing stormwater discharges under the National Pollutant Discharge Elimination System (NPDES) program of the Clean Water Act. In Oregon, EPA has delegated the permitting of NPDES municipal separate storm sewer system (MS4) discharges to the Oregon Department of Environmental Quality (DEQ).

Under EPA's initial Phase I implementation of the program, municipalities having a population greater than 100,000 were required to obtain an NPDES MS4 Permit. The City of Salem (the City) passed that threshold with the 1990 Census and was included in the program by the DEQ, with the Oregon Department of Transportation (ODOT) originally designated as a co-permittee with Salem.

The regulations established a two-part application process for obtaining an NPDES Permit to discharge municipal stormwater to "waters of the state." The City submitted the Part 1 NPDES Stormwater Permit Application in April 1994. The supplemental Part 2 Application and associated Stormwater Management Plan (SWMP) were subsequently finalized and submitted to DEQ in July 1996. DEQ issued the City's initial MS4 Permit in December 1997, with an expiration date of September 2002.

In April 2002, the City submitted an application for renewal of its NPDES MS4 Permit, along with a revised SWMP that outlined the City's stormwater management efforts for the next five-year permit period. The DEQ issued the renewed MS4 permit in March 2004. In accordance with that permit's conditions, the City evaluated and updated the SWMP in conjunction with the 2nd Annual Report submitted to DEQ on November 1, 2005. The 2004 MS4 permit (and updated 2005 SWMP) expired on February 28, 2009, and was administratively extended by the DEQ.

The City submitted its NPDES MS4 permit renewal application to DEQ on September 2, 2008. Along with other required documents for the permit renewal process, the application included a revised SWMP. This SWMP (2008 SWMP) was developed in part using the EPA document *Municipal Separate Storm Sewer System Program Evaluation Guidance* (January 2008), followed by continued evaluation and revision of the 2005 SWMP. Following permit negotiations, this updated SWMP was further revised and submitted to the DEQ on August 13, 2010.

The City of Salem received a renewed MS4 permit on December 30, 2010. Consistent with requirements of Schedule D.6 of the renewed MS4 permit, the City re-submitted the SWMP (revised 2010 SWMP) to the DEQ on March 17, 2011. This Annual Report (FY 2014-15) describes the status of BMP-related activities in the 2010 SWMP. The renewed MS4 permit and revised 2010 SWMP are available on the City's website (www.cityofsalem.net).

The Environmental Protection Agency (EPA) conducted an inspection of the City's MS4 and SWMP from July 31, 2012, through August 2, 2012, to assess compliance with the NPDES MS4 Permit. The results of the audit were released during the FY 2013-14 reporting period, and indicated that the City was deficient in meeting its construction site runoff control requirements. An EPA Administrative Compliance Order by Consent (Consent Order) was issued for the City of Salem to: 1) develop and document its construction site plan review procedures; 2) develop and document inspection procedures for construction sites; and 3) submit a separate report of all construction site inspections annually through the expiration of the current MS4 permit. The City remedied the deficiencies in its construction site erosion control program within 90 days of the Consent Order, submitted its first annual construction site inspection report on November 1, 2013, and continues to meet the requirements of the NPDES MS4 Permit and the EPA Consent Order.

1.2 Purpose and Scope

The MS4 permit area is defined as being within the current City Limits, as exhibited in Figure 1. Land use within this permit area is exhibited in Figure 2.

This NPDES MS4 Annual Report summarizes stormwater-related activities listed in the 2010 SWMP that were completed during the period of July 1, 2014, through June 30, 2015, to address the requirements of the City's current MS4 permit. The information presented in this report is based on the requirements listed in Schedule B.5 of the renewed MS4 Permit (see Table 1).

Table 1. Annual Reporting Requirements for the MS4 Permit		
Permit Section	**Reporting Requirement**	**Location in Annual Report**
B(5)(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 2
B(5)(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 2 (RC 5-1)
B(5)(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 1.3
B(5)(d)	Any proposed changes to SWMP program elements that are designed to reduce TMDL pollutants.	Section 1.3
B(5)(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 3
B(5)(f)	A summary of monitoring program results, including monitoring data that are accumulated throughout the reporting year and/or assessments or evaluations.	Section 2 (MON 1-1, 1-2, and 1-3), Appendix B
B(5)(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.	Appendix B
B(5)(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.	Section 2 (ILL 2-4), Section 4, Appendix A, Appendix B, Appendix C
B(5)(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 5
B(5)(j)	Results of ongoing field screening and follow-up activities related to illicit discharges.	Section 2 (ILL 2-4), Appendix B

1.3 Adaptive Management

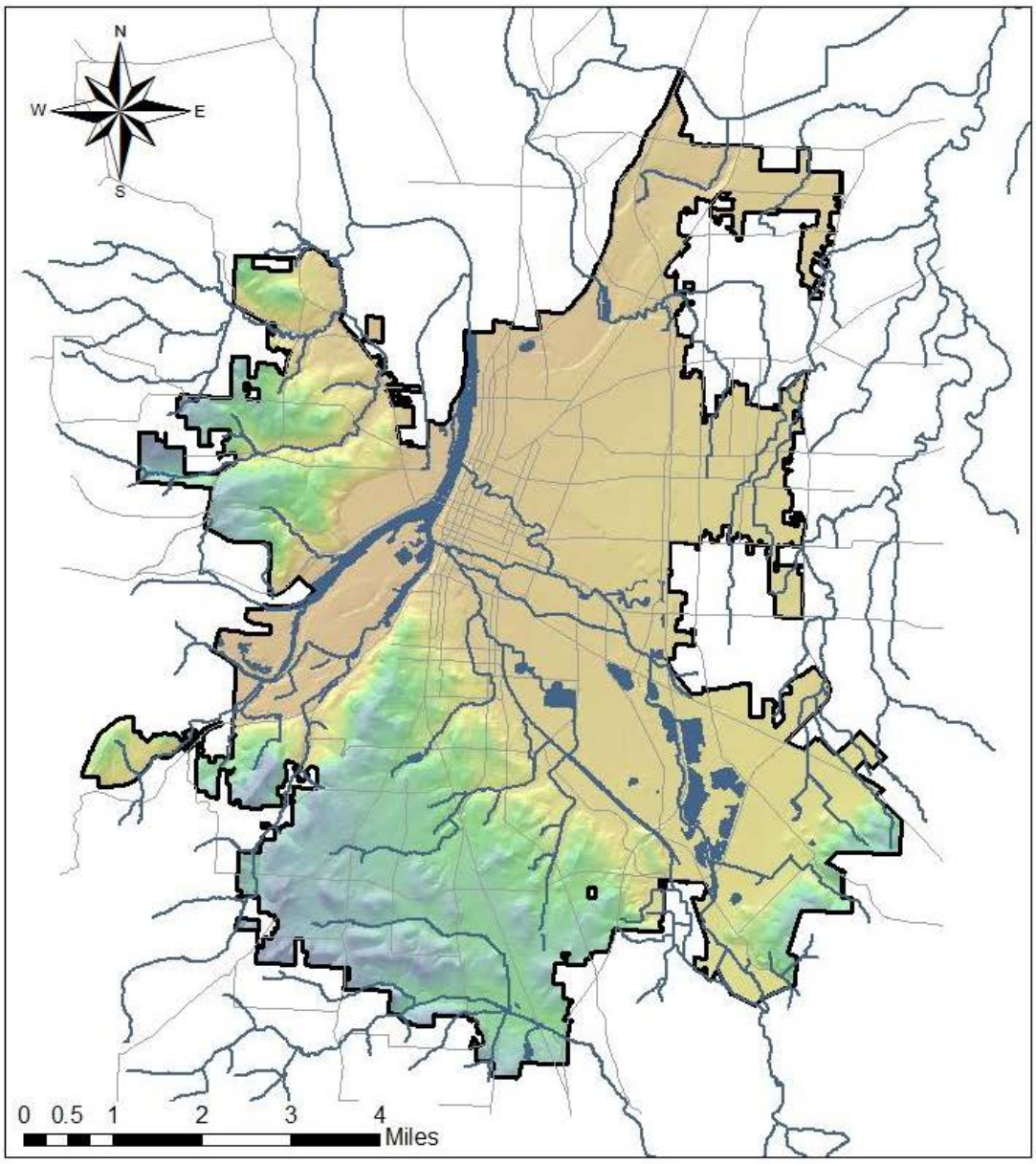
The stormwater management program that is described in the City of Salem's current SWMP is the result of adaptively managing (e.g., implementing, evaluating, and adjusting) the program since first being issued an MS4 permit in 1997. The history of this adaptive management approach may be found in Section 2 of the City of Salem's "National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit Renewal (September 2, 2008)," and describes how the current DEQ-approved SWMP meets the 'maximum extent practicable' requirement. By adaptively managing its stormwater management program, the City of Salem continues to reduce the discharge of pollutants from its stormwater system.

Consistent with Schedule D.4 of the renewed MS4 permit, City staff submitted an "Adaptive Management Approach" to the DEQ on October 24, 2011, that will be adhered to through expiration of the MS4 permit on December 29, 2015. This approach involves both an annual review of BMP activities and collected data, as well as a comprehensive assessment of BMP activities in preparation for MS4 permit renewal.

In preparation of this annual report and as described in the Adaptive Management Approach, City staff were asked to consider if changes in BMP activities were anticipated in the next fiscal year (FY 2015-16). In March 2015, the City submitted a letter to the DEQ requesting to extend the deadline for submitting the MS4 Renewal Package as per Schedule F.A.4 of the Permit. This request was approved by the DEQ (letter dated April 13, 2015), with the new submittal date of December 29, 2015.

Per the Adaptive Management Approach, a series of 12 meetings were held with staff across the City to review BMP activities completed over the permit term, information received through the annual adaptive management process, and to complete a comprehensive assessment of BMP activities listed in the 2010 SWMP. Information collected through this comprehensive assessment will inform the proposed SWMP modifications that are submitted to the DEQ as part of the MS4 Permit Renewal Package. Per the requirements of the current Permit, proposed revisions will be posted on the City's website for an open public comment period prior to submittal to DEQ.

Figure 1. Permit Area Map



Legend

City Limit/MS4 Permit Boundary

City Limits

Waterbodies

Major Roadways

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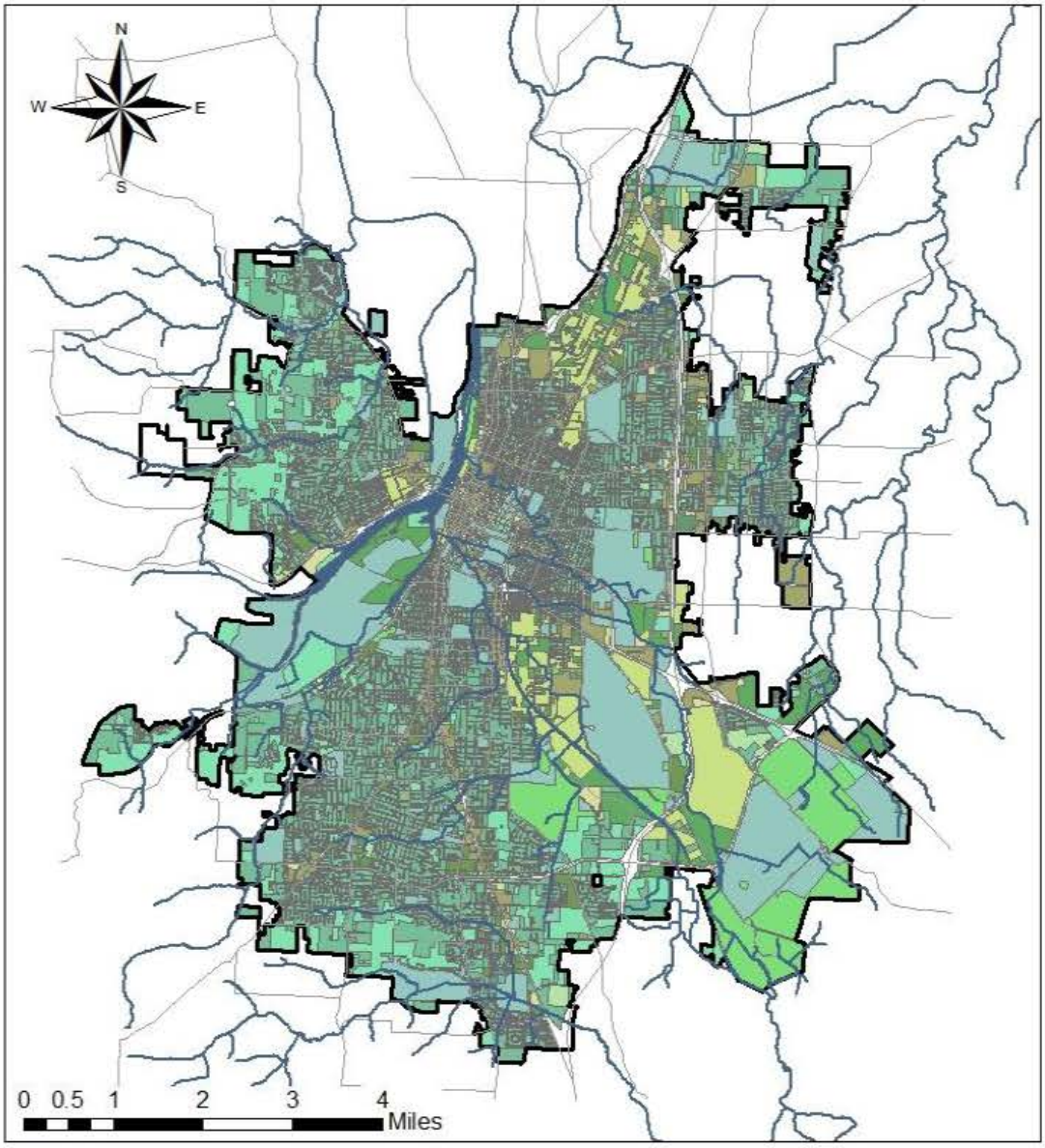
Figure 2. Land Use



Legend

City Limit/MS4 Permit Boundary
City Limits
Waterbodies
Major Roadways
Duplexes
General Commercial
General Office Complex
Industrial
Mixed Commercial
Mobile Home Park
Multi-Family
Public Land
Religious - Church Property
Single Family
Vacant Commercial
Vacant Industrial
Vacant Public
Vacant Residential

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2 STATUS OF THE STORMWATER MANAGEMENT PLAN

The primary objective of the SWMP is to provide an outline of City activities that will satisfy the NPDES Phase I stormwater regulatory requirements (the MS4 permit) [40 CFR 122.26(d)(2)(iv)]. The intent of the regulations is to allow each permittee the opportunity to design a stormwater management program tailored to suit the individual and unique needs and conditions of the permit area, and reduce the discharge of pollutants from the stormwater sewer system to the maximum extent practicable.

The status of BMP activities listed in the 2010 SWMP is discussed in this section of the Annual Report. BMPs within the SWMP have been categorized into five types:

1. Structural and source controls for residential and commercial areas (RC);
2. A program for the control of illicit discharges and improper disposal into the storm drainage system (ILL);
3. A program to monitor and control pollutants from industrial facilities, hazardous waste treatment, storage and disposal facilities, and municipal landfills (IND);
4. A program to implement and maintain structural and non-structural BMPs to reduce pollutants from construction sites (CON); and
5. A program to conduct water quality monitoring activities within the MS4 drainage system and City waterways (MON).
6. Each BMP identified in the 2010 SWMP is discussed in this report with the following information:
    - A table describing BMP tasks, associated measurable goals, and tracking measures as stated in the 2010 SWMP.
    - A summary of activities completed during fiscal year 2014-2015 (July 1, 2014 through June 30, 2015) that demonstrates progress toward meeting the measurable goals and tracking measures.

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Table 2. RC1 - Planning

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 1-1: Provide City-wide Master Planning for stormwater to address both water quality and water quantity. As part of master planning efforts, continue to evaluate new detention and water quality opportunities within the Urban Growth Boundary (UGB), and consider sites in upstream areas that may affect Salem, and in downstream areas that may be affected by runoff from Salem.	Maintain Master Plan and complete next update within the MS4 permit cycle.	Track schedule for updating Master Plan. Report on Master Plan update actions.	A consultant team was selected in early June 2014 to support the next update to the City's 2000 Stormwater Master Plan. The project was formally kicked off on June 30, 2014, with a meeting of City staff and the consultant team. This City-wide Stormwater Master Plan will eventually incorporate multiple volumes of comprehensive plans for each creek basin with the city. Detailed analysis of each basin is now scheduled to occur over the next several years. As data collection and modeling for each basin is completed, each individual basin plan will be appended to the updated Master Plan. Per RC1 Task 1, an update to the Stormwater Master Plan must be completed within the current MS4 permit cycle (December 29, 2015). In order to satisfy this requirement, City staff and the consultant team collaborated with a citizen advisory committee to finalize the methodology for the development of the revised Stormwater Master Plan. A subsequent update to the Master Plan was then completed that sets the regulatory context, describes the planning area, and provides a history of stormwater planning in Salem. A set of comprehensive goals and objectives that address capital improvement planning, stormwater quantity and quality, operations and maintenance, intergovernmental coordination, financing, and flood risk reduction have also been developed and incorporated. Extensive data collection and detailed modeling have been completed for the first creek basin in the planning cycle (Battle Creek), with additional data collection and modeling efforts in other creek basins already underway. A concerted public engagement effort for this update to the Stormwater Master Plan will be completed in 2015.
RC 1-2: Develop and maintain watershed management plans by developing a prioritized schedule and implementing watershed management plans based on available funding. Develop the Pilot Pringle Creek Watershed Management Plan as a model for the City's other prioritized urban watersheds. Identify capital improvement needs and potential "early action" activities and projects to ensure that the plan has a strong implementation component.	Complete a hydromodification study and retrofit plan by November 1, 2014. Incorporate recommendations and early action items of watershed management plans with completion of hydromodification study and retrofit plan. Develop strategy for completing future watershed management plans by November 1, 2014.	Report on completion of hydromodification study. Report on completion of retrofit plan. Track implementation actions of Pringle Creek Watershed Management Plan. Report on strategy for completing future watershed management plans.	The City of Salem completed the Hydromodification Assessment and stormwater retrofit plan, and submitted them to the DEQ on October 28, 2014. Data, information, and lessons learned from the Pilot Pringle Creek Watershed Management Plan, Hydromodification Assessment, and stormwater retrofit plan will be used in the update of the City's Stormwater Master Plan, starting with the Battle Creek basin plan (see RC 1-1). Hydromodification and retrofit data will inform the identification and prioritization of capital improvement needs and potential "early action" activities and projects in the development of individual basin plans.
RC 1-3: City staff will continue to update the official "waterways" map for use by City staff in applying various regulations and standards. As studies are performed that warrant the revision of the designated waterways, including groundtruthing, that information will be incorporated into the update process.	Compile database of maps and waterways references. Complete field groundtruthing by end of FY 2011-12. Update map by end of FY 2012-13.	Track completion of groundtruthing and map updates.	Minor edits were made to the waterways GIS map in the 2014-2015 reporting year as errors were brought to the attention of GIS staff. At this time, no additional errors are known to exist.
RC 1-4: City staff will meet a minimum of once per year to discuss coordination of efforts relating to stormwater. Topics may include the following, as they are applicable: grant funding, outreach, program review, annual report, monitoring, sharing of data, adaptive management, review/update of documents and programs, training needs, documentation of protocols, coordination of databases, involvement of inspections, maintenance, and operations in plan review and program development, checklists, effective Erosion Prevention and Sediment Control Program including enforcement, strategizing addressing hotspots, plan review, stormwater BMPs, and development of written enforcement strategy. Provide factsheets/manuals to new employees at the City to inform them about the City's efforts for pollution prevention. At least annual trainings will be provided to specified City of Salem employees involved in MS4-related activities regarding the permit, including its intentions and their responsibilities in relation to the MS4. Feedback for improving processes will be encouraged and brought to the coordination meeting(s). Training needs will be determined by City staff meeting mentioned above. Consider adding stormwater pollution prevention training as an action item of the FY 2011-12 Environmental Action Plan	Conduct annual formal coordination meetings for stormwater, more often if necessary. Conduct annual training of employees involved in MS4-related positions, more often if necessary.	Prepare an annual meeting summary. Track changes made to the implementation of the stormwater program based on coordination discussions. Track major items of coordination. Track training attendance. Share and document training suggestions for MS4 implementation changes.	Employees from across the City continued to participate in smaller workgroup meetings throughout this reporting year to coordinate the completion of MS4 Permit deliverables and measurable goals identified in the 2010 SWMP. These coordination meetings included but were not limited to the following MS4 related efforts: 2014 MS4 Permit Deliverables - Staff from a wide variety of workgroups met frequently in the beginning of this reporting period to discuss and finalize the Hydromodification Assessment, Retrofit Plan, TMDL Pollutant Load Reduction Evaluation, Wasteload Allocation Attainment Assessment, 303(d) Evaluation, and Public Education Effectiveness Evaluation. These deliverables were submitted to the DEQ by their respective November 1, 2014, deadline. Education and Outreach – multiple staff continued to participate in routine coordination meetings for the annual "Mid-Valley Erosion Control and Stormwater Summit" and "Howl-a-Palooza" outreach events. Operations & Maintenance – staff met on multiple occasions to review progress made on catch basin and storm line cleaning, stormwater facility inspections, and stormwater facility maintenance needs.

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
that addresses pollution prevention on a city-wide level.			MS4 Reporting Staff - 12 separate meetings were held with MS4 reporting staff during this reporting period to discuss the MS4 permit renewal process and proposed modifications to 2010 SWMP BMPs based on information collected this permit term through the annual Adaptive Management process. A City of Salem Shops Complex Stormwater Pollution Control Plan (SWPCP) was completed in September of 2012 (see ILL1 Task 4). As a result of this plan, Operations employees now receive annual training covering spill prevention and response, good housekeeping, and chemical storage. An "Employee Guide for Pollution Prevention" has been developed that is now distributed to all new employees during employee orientation. Public Works staff continued to participate in Oregon Association of Clean Water Agencies (ACWA) MS4 Phase I and Stormwater subcommittees this last year (see RC1 Task 8) and continue to attend internal safety/training meetings every two weeks (see RC4 Task 4).
RC 1-5: Coordinate with other agencies such as NGOs, private environmental groups, and watershed councils.	Develop a list of contacts and identify issues of coordination.	Document any MOAs.	During this reporting period, the City continued coordination efforts with the following watershed councils and NGOs: Glenn-Gibson Watershed Council: Staff participated in the monthly watershed council meetings and provided coordination, support, and information when requested. Items of coordination included the following: • A tour of watershed council projects: West Salem Fire Station #11, the Oak Savanna restoration site, the Van Kleeck riparian restoration site, and the Wallace Marine Park rain garden; • SOLVE work event at the Wallace Marine Park rain garden; • Fall Leaf Haul preparation; • Wallace Marine Park rain garden drainage/maintenance issues; • The use of goats for targeted grazing; • Building a relationship with Salem Audubon Society; • City presentations on the Hydromodification Assessment and on the Mid-Willamette Valley High Water Watch website; and, • A request to the City to partner for the UPRIVER movie premiere and Willamette River Report Card. No Ivy Coalition (NIC): Two City staff attended regularly scheduled NIC meetings to provide support for the organization's ivy removal efforts on City property. Items of coordination included the following: • Planning of regularly scheduled ivy pulls (6) with designation of crew leads, planning for Earth Day event, and presentations to neighborhood associations; • Providing updates on efforts to use goats as targeted grazers; • Employing tree services for removing ivy from difficult trees; • Developing a backyard habitat program; • Revisiting structure and function of NIC; • Receiving requests for assistance on private property; • Developing presentation and outreach materials to neighborhood associations (8); and, • Removing ivy from 347 trees without the use of pesticides. Oregon Green Schools (OGS) One City staff member is on the Oregon Green School Board and attends regularly scheduled meetings to provide coordination and support for the organization's goal of waste reduction through education. Items of support included the following: • Planning of and fundraising for the Oregon Green School Summit; • Approving the 2015 budget; • Revamping and approving the certification/recertification process for schools,; • Planning for the Association of Oregon Recyclers (AOR) Conference in June 2015; and, • Planning for the 2015-16 school year On June 4, 2015, lawmakers in Salem passed HB 2762 that requires school districts to eliminate use of polystyrene foam (Styrofoam) plates, trays, food containers, and food packaging for any meal unless a school district recycles the polystyrene foam. OGS advocated for this bill.

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
			Pringle Creek Watershed Council Staff attended the monthly meetings and provided information about City activities or practices when requested. Coordination efforts included the following: • Arranging for the City staff to present on the Fairview mitigation wetland project; • Discussions of the North Santiam Watershed Council extending its border to include the Pringle Creek watershed; and, • Discussion of possible future projects for the Council. Straub Environmental Center One City staff member is on the Straub Environmental Center's Board and Executive Board, and attends monthly meetings to provide coordination and support. This organization's mission is to create "awareness and understanding of our relationship to the environment, working in partnership with our community. Our environmental education programs teach and motivate people to become active stewards of our environment." This year the Center coordinated 80 outreach and education programs/activities, reaching an audience of 7,180 people. There were no MOAs developed during this reporting period.
RC 1-6: The City will work with Marion and Polk Counties and the City of Keizer to coordinate stormwater management programs and activities within the greater Salem-Keizer Urban Growth Boundary. Coordination may include the establishment of appropriate intergovernmental agreements (IGAs) regarding potential uniform stormwater design standards, operations and maintenance activities, and public education and involvement efforts within the UGB.	Review and update the October 2000 SKAPAC Stormwater Management Agreement by the end of the permit term to reflect each jurisdiction's respective MS4 Permit and SWMP.	Report on significant coordination activities or programs. Report on completion of SKAPAC Agreement and other IGAs.	The City of Salem, Marion County, and the City of Keizer made a collective decision during the last reporting period that the existing SKAPAC Agreement adequately addresses any concerns the jurisdictions may have regarding potential development in the identified Stormwater Agreement Areas. No updates to the agreement are needed. SKAPAC participants will continue to meet if there are any concerns regarding public or private development projects that may impact the agreement. Intergovernmental coordination will be addressed in the updated Stormwater Master Plan (see RC 1-1). Stormwater staff continued to work with Marion County, the Marion Soil and Water Conservation District, and the City of Keizer through the Mid-Willamette Valley Outreach Group (MWOG) to coordinate outreach events pertaining to turbidity and E. coli (see RC 5 and CON 1). There were no new IGAs developed during this reporting period.
RC 1-7: Evaluate existing detention facilities and potential new detention sites for potential conjunctive uses (as water quality facilities and for retrofitting opportunities). Continue to perform facility site searches to locate ponds, wetlands, vegetated swales and other water quality facilities as existing water quantity and quality facilities are evaluated and potential new sites are identified. Coordinate with RC1-1 and RC1-2.	Complete a retrofit plan before end of year four of the MS4 permit cycle. Develop a strategy to identify and prioritize potential retrofit projects by November 1, 2013. Identify a minimum annual budget for stormwater retrofit projects as part of the retrofit strategy by November 1, 2014.	Report on available budget and completion of retrofit project efforts.	The Stormwater Retrofit Team – consisting of representatives from the City's Engineering, Stormwater O&M, Stormwater Quality, and Public Works Operations sections – met regularly during the reporting period and developed the City's Stormwater Retrofit Plan, which was submitted to the DEQ before the November 1, 2014, deadline. A total of $180,000 was budgeted in the CIP for the retrofit design and construction of a stormwater treatment facility located at the City-owned Eola Ridge Park in West Salem. The project calls for the installation of a new Contech CDS Hydrodynamic Separator and the retrofit of an existing flow through detention basin into a subsurface treatment wetland. This stormwater retrofit project is one component of a larger Parks Capital Improvement Project at the same location. A letter identifying this as the City's retrofit project was sent to the DEQ on October 28, 2013. Site preparation work commenced during this reporting period, and construction is scheduled to be completed before the end of the permit cycle.
RC 1-8: The City will continue to be an active member of the Oregon Association of Clean Water Agencies (ORACWA). The City will use this medium to obtain copies of materials that have been produced by others. City staff will stay current on latest available educational and technical guidance materials.	Attend a minimum of one stormwater-related workshop or conference annually. Attend groundwater-related workshops and conferences as funds allow. Make information obtained at these events available to other City staff.	Report on City participation with ORACWA events.	Public Works staff continued to participate in the Oregon Association of Clean Water Agencies through attendance at regularly scheduled Stormwater Committee meetings and the Phase I subcommittee meetings, which are scheduled to address select permit requirements. Stormwater staff attended three Phase I subcommittee meetings focusing on the Phase I Permit Renewal during this reporting period. One Stormwater staff member attended the ACWA Stormwater Summit on May 13, 2015. Three City staff attended the Annual Conference that was held in Bend on July 22-24, 2015. Information acquired through ACWA meetings/events is shared with other City staff.

Table 3. RC2 - Capital Improvements

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 2-1: **Implement stormwater projects (including stormwater conveyance, quantity, quality, and stream/habitat improvement) based on priorities established under the Capital Improvement Program (CIP) and the Stormwater Master Plan consistent with available funding.**	Include a funding line item for CIPs in proposed stormwater budget. Review and prioritize CIPs and budget annually. Implement CIPs based on prioritization and available funding.	Track number and description of projects completed. Report updated CIP list annually.	The adopted CIP Plan for FY 2014-15 can be found on the City's website at the following location: http://www.cityofsalem.net/Departments/AdministrativeServices/Finance/capital-improvememts-program-cip/Pages/default.aspx All of the Streets and Bridges Bond projects with a focus on new street construction included stormwater treatment. In addition, certain Urban Renewal Agency projects managed by Public Works Engineering also incorporated stormwater treatment facilities. The City continued to work with ODOT in FY 2014-15 to install treatment facilities on the Marion and Center Street Bridges across the Willamette River. These facilities contain and treat the stormwater runoff from the entire length of these bridges. This project has been funded by an ODOT Retrofit Program Grant. Stormwater quality and quantity facilities were incorporated into the design and construction of Public Works projects during FY 2014/15 as follows: • Marion/Center St. Bridges – Stormwater quality and detention (completed in 2014); • Commercial St SE Bridge Replacement over Pringle Creek – Stormwater quality (completed in 2014); • Eola Drive NW, Kingwood to Gehlar Rd Corridor Improvements – Stormwater quality and detention (completed in 2014); • Waln Drive Street Improvements – Stormwater quality (completed 2014); • Hawthorne/Hyacinth Ave NE Corridor Improvements – Stormwater quality and detention (completed 2014); • Rosemont/Edgewater Off-ramp Improvements – Stormwater quality (completed 2014); • Glen Creek Rd NW at Wallace Rd NW Street Widening – Stormwater quality (completed in 2015); • Market/Swegle NE Corridor Improvements – Stormwater quality and detention (completed in 2015); • 22nd St, 25th St, and Madrona Ave SE Improvements – Stormwater quality and detention (design 2014 & 2015); • Campbell/Cranston St. Drainage and Street Improvement Package – Stormwater quality (design in 2015); • Brown Rd NE, San Francisco to Sunnyview Corridor Improvement – Stormwater quality and detention (design 2015); • Skyline Rd S, Liberty Rd to Kuebler Blvd Corridor Improvements – Stormwater quality and detention (construction in 2015); • Eola Ridge Park Bacteria Retrofit – Stormwater quality and detention (construction in 2015); • Strong Rd/Lindberg Street Construction – Stormwater quality (construction 2015); • Winter St Bridge Replacement over Shelton Ditch – Stormwater quality (construction 2015); • Commercial St SE at Kuebler Blvd Intersection Improvement – Stormwater quality and detention (construction in 2015); • Minto Bike & Pedistrian Bridge Construction over Willamette Slough – Stormwater quality (construction 2015) • Kuebler Blvd, Commercial St SE to I-5 Interchange Street Widening – Stormwater quality and detention (design in 2015 & 2016)
RC 2-2: **Continue to coordinate capital improvement projects with the Water Resources Section to integrate multiple resource agency permitting needs. The review is intended to identify integrated opportunities and permitting needs to meet water quality-related requirements.**	Review and integrate multiple resource agency permitting needs, including MS4 permit requirements, into 100% of CIP projects.	Track number of projects reviewed. Track number of projects permitted.	City staff obtained permits for all the following projects: • Center Street Bridge Replacement • Marion Street Bridge Retrofit Project • High Street Bridge Repair • Waln Creek Culvert • Shelton Ditch Repair Project • Upper Bennett Dam Repair • Geren Island Flow Maintenance Project

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 2-3: **The City continues to acquire physical access-easements for public and private stormwater facilities. This is done by identifying existing facilities for which easements, rights-of-way, or permit-of-entry agreements are needed for stormwater facilities; and developing a plan for acquiring the same, given current funding limitations.**	Within one year of completion of the hydromodification study and retrofit plan, prioritize easement acquisitions for stormwater facilities. Following prioritization, identify funding source(s) for inclusion in budget.	Report on easement acquisition and prioritization process.	The Retrofit Plan and Hydromodification Assessment that were submitted to the DEQ by the November 1, 2014, deadline identified prioritized areas for stormwater improvement projects. Priorities will be further defined as part of the Stormwater Master Plan update currently underway. From these efforts, future easement acquisitions will be prioritized and pursued as projects are funded. Easement acquisition costs will be factored in and budgeted for along with all other associated project costs, and paid for through the identified funding source.

Table 4. RC3 - Update of Stormwater Design Standards

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 3-1: **Continue to encourage the use of structural BMPs for stormwater quality improvement and flood peak reduction opportunities. Develop stormwater quality design and associated maintenance standards for new and redevelopment. Continue to evaluate opportunities to provide incentives for alternative stormwater management practices, including Low Impact Development (LID). Maintain and update the Stormwater Management Design Standards after they are developed.**	Develop incentives for LID and other stormwater quantity and quality management practices. Develop updated stormwater design standards to include structural stormwater quality BMPs. Maintain Stormwater Management Design Standards and update as needed.	Document revisions made to Stormwater Management Design Standards. Document the development of any incentives for implementation of LID techniques.	Incentives for Low Impact Development (LID) have been incorporated into Salem's Stormwater Utility in the form of credits, which allow the impervious surface-based portion of the utility fee to be reduced based on the presence of stormwater quality and quantity facilities on the ratepayer's property. The first phase of the Stormwater Utility fee was implemented in January 2013 and the utility will be fully implemented by January 1, 2016. New Stormwater Design Standards were approved as Administrative Rules and have been in effect since January 1, 2014. These new standards are consistent with the stormwater regulations and include design criteria for green stormwater infrastructure. Staff will continue to review and update these standards as new information becomes available. To date, no revisions have been made to the stormwater standards.
RC 3-2: **Continue to implement process to identify and remove barriers for implementing LID techniques. Update the Stormwater Management Design Standards and associated Salem Revised Code (SRC) provisions as appropriate.**	Within three years of implementing the revised stormwater design standards, review and, as appropriate, modify design standards and SRC to minimize barriers to implementation of LID techniques.	Document the review of design standards and SRC to minimize barriers to implementation of LID techniques.	Barriers to implementing LID techniques have been identified, and recommended changes to the Salem Revised Code were approved by City Council (Ordinance Bill No. 34-13) in November 2013. Revised Stormwater Management Design Standards, which incorporate LID techniques and Green Stormwater Infrastructure (GSI) to the Maximum Extent Feasible, became effective on January 1, 2014 (see RC3-1).
RC 3-3: **City staff is implementing the Water Quality Development Standards set forth by SRC Chapter 141 for all development requiring a Willamette Greenway Permit.**	Implement Water Quality Development Standards in Willamette Greenway.	Track number of Willamette Greenway Permits issued and description of water quality measures employed. Track number of new facilities constructed.	Willamette Greenway permits are processed as either conditional uses or as administrative conditional uses, depending on their location. Greenway permits are tracked through AMANDA, the City's permit tracking system. No Greenway permit applications were received during this reporting period. Requirements from Salem Revised Code Chapter 71 (Stormwater) and associated Stormwater Design Standards are applicable citywide and consistent with the Willamette Greenway requirements.
RC 3-4: **Continue to review all residential, commercial, and industrial plans submitted for City-issued building permits for compliance with the City's Stormwater Management Design Standards. Conduct inspections of completed projects prior to the City's acceptance of those projects and project close-out to ensure work was done in accordance with approved plans. Maintain database of plans reviewed and final inspections conducted. See IND1-Task 2 for standards specific to industrial facilities.**	Review all residential, commercial, and industrial plans submitted for City-issued permits for compliance with the City's Stormwater Management Design Standards and associated SRC provisions. Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	Maintain database of plans reviewed and final inspections conducted.	All residential, commercial, and industrial plans submitted for City-issued permits are reviewed by Public Works staff for compliance with Stormwater Management Design Standards. Constructed stormwater facilities are inspected by Plumbing Inspectors within Community Development and/or Public Works to ensure that work is done in accordance with the Design Standards and approved plans. All plan reviews and inspections are tracked in AMANDA, the City's permit tracking database.

Table 5. RC4 – Operations and Maintenance

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 4-1: **Continue with the existing street sweeping schedule for all areas, maintaining the record of observations, quantity, and quality of material collected in the daily log books. Collect and compile this information for making recommendations for modified methods, schedules, and for NPDES MS4 permit annual reporting and overall program evaluation.**	Review street sweeping program annually for effectiveness and any necessary revisions to sweeping schedule. Continue sweeping City streets on four zone schedule, sweeping heaviest zone 8 times per year and lightest zone 2-3 times per year. Continue sweeping City-owned parking lots as needed.	Record quantity of material collected during sweeping operations. Record number of curb-miles of streets swept. Track and report changes made to sweeping schedule, if any.	The City continued to utilize two regenerative air sweepers during this reporting year to sweep residential and collector streets that have been categorized as having *High, Medium*, or *Light* debris accumulation, as well as those within the Central Business District zone. A third sweeping machine is operated during the peak leaf drop season (fall/winter) or when one of the other machines is unavailable. Two operators sweep residential and collector streets during the day and two operators sweep arterial streets at night. City-owned parking lots are swept on an as-needed basis. The City does not sweep any commercial parking lots, which are the responsibility of the private property owner. During this reporting year the City swept a total of 13,459 miles, collected approximately 1,620 tons of street sweeping debris, and removed approximately 5,260 cubic yards of leaves.
RC 4-2: **The City will continue to perform de-icing operations in a way that minimizes stormwater pollution through: conducting annual inspections and training to ensure proper operation of the de-icing chemical storage facility; training and verification that application equipment is applying deicer at 1/2 to 1/3 the industry standard; construction of an expanded covered storage area for de-icing aggregate materials combined with FEMA floodgates to mitigate migration of aggregates (2011); maintaining proper function of adjacent sediment traps and catch basins in the storage yard; sweeping removal of operational de-icing aggregate spillage; and coordinating de-icing activities with Airport Operations and their 1200-Z permit.**	Continue current de-icing operations to prevent stormwater pollution. Investigate potential cost-effective recycling opportunities for de-icing sand material.	Document review of recycling opportunities. Document dates of activities for annual inspections and training. Document de-icing quantities applied annually.	Staff continued to research recycling opportunities for used deicing sand material but no options have yet been found. The sand cannot be reused because as soon as it is applied it begins to lose the angular surfaces that provide traction to vehicles on the road. When this material is recovered by street sweepers other debris/contaminants are also captured from street surface (heavy metals, petro-chemicals, trash, etc.). At present, used sanding material can only be utilized as fill in approved locations; depending on levels of intermingled debris or contaminants. Deicing material usage is documented on time sheets as well as the liquid deicing storage facility log book. The total number of lane miles treated each year is also documented in a separate Unit Of Accomplishment report. During the FY 2014-15 reporting year, 855 lane miles were treated with liquid deicer. This equates to approximately 6,840 gallons of applied deicer.
RC 4-3: **Continue to review and update the O&M practices and activity schedules defined in the Drainage Program Evaluation Notebook (DPEN) (including updating GIS database). Utilize Hansen IMS data to develop and refine work programs. This review will serve as a basis for budgeting and allocating resources; scheduling work; and reporting on and evaluating the performance and costs for the overall O&M program and specific activities.**	Update DPEN and IMS database activities and schedules. Create line items in budget for specific O&M activities. Review and update O&M practices and activity schedules every 3 years.	Track revisions made to O&M practices and activity schedules.	During FY 2014-15 Operations & Maintenance staff conducted inspections of stormwater quality facilities, detention basins, catch basins, ditches, and stream crossings. The associated asset/inspection information was entered into the City's Hansen and GIS databases for work order record keeping and inventory purposes. The linking of the GIS and Hansen databases for workflow and record keeping efficiencies requires the need for an accurate inventory of all stormwater assets. Significant technical work occurred during the reporting period in order to update the City's asset inventory and GIS maps of roadside and drainage ditches, water quality facilities, and stormwater control structures.
RC 4-4: **Continue to improve the O&M training program and activities especially with regards to safety and protection of water quality.**	Conduct O&M safety meetings twice per month. Attend ACWA committee meetings and workshops as scheduled. Conduct weekly tailgate meetings with Operations crews.	Document reviews and modifications to the O&M training program. Record O&M training activities completed. Document ACWA meetings and workshops attended.	To ensure consistent application of requirements related to erosion and sediment control on private as well as public projects, City of Salem conducted a series of presentations to educate and inform the managers, supervisors, and field staff of the City's expectations for managing erosion and sediment issues on routine maintenance projects. Educational information was provided to staff, which included regulatory requirements, definitions, and the type of projects which may cause erosion. City staff were provided simple tools to plan, track, and report on the activities that had the potential to cause erosion. A variety of structural BMPs and their appropriate uses were discussed with field crews. Training will be provided annually for existing crew members, and as needed for new employees. City staff continued to conduct safety meetings on a biweekly basis during this reporting period. The following topics were covered during this reporting period: MS4 spill prevention, Confined Space, Chemical/Gas Safety, Natural Gas, Hand Tool Safety, Environmental Hazards,

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
			Power Tools, Gas Detectors, Blood Borne Pathogens, Alcohol/Drug Awareness, Erosion Control, Haz-Mat Refresher, Excavations, Lifting/Back Safety, Heat Stress, Housekeeping (slips, trips, falls), Heavy Equipment, Self Defense, Personal Protection Equipment, Chainsaw Safety, Fire/Electrical Safety, Bypass Pumping, Lockout/Tag-out, Asbestos, and Vehicle Operation. There were no significant modifications to the O&M Training program during the reporting period. An attendance sheet for all biweekly O&M training activities is kept on file. In addition, Public Works staff continued to participate in ACWA Phase I, Stormwater and Water Quality Committee meetings during the 2014-15 reporting year (see RC1 Task 8).
RC 4-5: **Integrated Pest Management (IPM) Program: Salem Parks Operations Division will continue their program for careful monitoring and management of pesticides, herbicides and fertilizers, and will provide public information. Review and refine the IPM Program during the permit cycle, ensuring proper handling and storage of pesticides, herbicides, and fertilizers.**	Review and refine IPM Program during the MS4 permit cycle. Routine inspections of storage facilities for proper storage of materials and chemicals.	Document revisions made to IPM Program. Document inspections of storage facilities.	In FY 2014-15, staff reviewed the current Parks IPM Plan, solicited input from staff across the City on current and anticipated pesticide applications, and will update this plan by the end of the permit term to incorporate use by all City Departments. Funds were requested and approved for the FY 2015-16 budget to acquire professional services assistance with this next IPM Plan update. Staff continued to perform and document routine inspections of material/chemical storage facilities during this reporting period.
RC 4-6: **Continue the storm sewer cleaning and TV inspection program, concentrating on known areas of localized flooding complaints (this alerts the City to locations of debris build-up and minimizes erosion potential) and persistent operation and maintenance problems, and looking for potential illicit discharges and seepage from sanitary sewers, see ILL2. Also focus on significant industrial/commercial areas where potential illicit discharges may be of concern.**	Concentrate storm sewer cleaning and TV inspection on areas with historical problems and high potential for illicit discharges. Inspect 120,000 LF of conveyance system annually.	Track number of inspections; identify areas with persistent O&M problems. Track number of cross-connections found. Track length of conveyance system cleaned and inspected.	Accomplishments during this reporting period include: • 94,890 linear feet of storm mainlines were cleaned using vactor trucks; • 25,664 linear feet of storm mainlines were root cut; • 11,628 catch basins were inspected/cleaned; • 495.5 cubic yards of material was removed from the stormwater system as a result of the activities listed above; and, • 252,420 linear feet of storm mainlines were inspected using CCTV.
RC 4-7: **Continue supporting annual Stream Cleaning Program. More than one half of the stream miles in the City of Salem are inspected annually by walking each stream segment. Using summer interns the City inspects the riparian areas and streams, picks up litter and garbage, inspects for illicit discharges (ILL2), addresses potential conveyance concerns, and evaluates areas for stream restoration.**	Walk 50% of the waterways within the City each year for stream cleanup and enhancement. Complete one stream restoration project each year.	Track length of waterways walked each year. Document stream restoration projects completed each year. Document the amount of litter and garbage removed each year.	The 2014 Stream Cleaning Crew inspected and cleaned 45.31 miles of Salem's waterways removing trash, debris jams, recyclable materials, and invasive vegetation. With a crew of 10 people, the Stream Crew removed from Salem's waterways: • 11,122 pounds of trash; • 3,297 pounds of recyclable material; • 3,855 pounds of yellow flag iris; and, • 88.5 cubic yards of vegetative debris Every year since 2000, the Stream Crew has completed one riparian restoration project. These projects help provide bank stabilization, shade, wildlife habitat, and increase native plant diversity. The first restoration project completed by the 2014 Stream Crew was located across Gilgamesh, near Pringle Creek, and the second project was located off of Indiana Court along West Fork Little Pudding.
RC 4-8: **Continue to regularly inspect and maintain public structural stormwater control facilities. Coordinate with RC4 Task 9.**	Regularly inspect all public detention and water quality facilities.	Track number of public facilities inspected and maintained. Track amount of sediment and debris removed from all facilities.	During this reporting period, staff conducted 487 public water quality facility inspections, and removed a total of 25.1 cubic yards of sediment/debris resulting from City maintenance activities on these facilities. The breakdown of water quality facility inspections and debris removed through maintenance activities is listed below: WQ Manholes: 52 inspections / 13.5 cubic yards removed; WQ Catch Basins: 22 inspections / 0.5 cubic yards removed WQ Tree Boxes: 144 inspections / 0.28 cubic yards removed WQ Planters: 198 inspections / 7.72 cubic yards removed

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
			WQ Vegetated Facilities (rain garden, bioswale, etc.): 71 inspections / 3.1 cubic yards removed In addition to the aforementioned facilities, field crews inspected 53 detention basins and associated control structures and removed a total of 58.5 cubic yards of accumulated sediment. Detention basin inspections and prioritized maintenance for debris removal is planned for the fall and winter in FY 2015-16.
RC 4-9: **Develop and implement a long-term maintenance strategy for public and private stormwater control facilities. This strategy will identify procedures and/or priorities for inventorying, mapping, inspecting, and maintaining facilities.**	Document and implement a long-term maintenance strategy for public and private stormwater control facilities during the MS4 permit cycle.	Track number of private facilities located, mapped, and inspected. Track progress toward developing a facility long-term maintenance strategy.	During the reporting period, the City continued implementation of its Stormwater Facility Inventory, Inspection, and Maintenance program for private and public water quality facilities. This program outlines the City's process for mapping public and private stormwater facilities in GIS, as well as the asset tracking methodology used in the Hansen database. Since implementation, the City has inventoried, mapped, inspected, and maintained all of its 154 public vegetative (e.g. bioswales) and 160 public mechanical (e.g. water quality manholes) treatment facilities through a quarterly inspection process. Since implementation, the City has inventoried, mapped, and inspected 214 private vegetative and 254 private mechanical treatment facilities. Stormwater and GIS technical staff have completed a full inventory of all public and private water quality facilities, and continue to update the list as new plans are approved, old plans are reviewed, and field crews discover previously unknown facilities in the field.
RC 4-10: **Ditch maintenance is performed to assure adequate conveyance, and consists of two components: (1) Ditch Cleaning – Cleaning consists of removal of sediment in the bottom of roadside ditches only as needed for proper conveyance, with limited vegetation disturbance and the use of straw wattles to reduce sedimentation and erosion within the ditch. (2) Ditch Mowing – Mowing is typically conducted by inmate crews using hand-held equipment. Vegetation cutting facilitates conveyance and reduces the risk of potential fires in summer months.**	Regularly inspect and maintain 100% of City ditches using appropriate water quality BMPs.	Track length of ditch maintenance performed (cleaning and mowing). Track amount of sediment and debris removed.	During FY 2014-15 City crews: • Inspected and mowed 28.6 miles of roadside ditches (ditches along roadways); • Inspected and cleaned 11.5 miles of roadside ditches; • Removed 548 cubic yards of accumulated sediment/debris from roadside ditches During FY 2014-15 City and Inmate crews: • Inspected and mowed 37 miles of drainage ditches (ditches nonadjacent to roadways, and commonly located on private property); • Removed 753 cubic yards of grass and vegetative debris from drainage ditches
RC 4-11: **Public catch basins are cleaned on a regular basis with a Vactor truck. During catch basin cleaning activities, inspections are done and repairs are scheduled if needed.**	Clean and inspect 75% of catch basins annually. Periodically analyze the material removed from the catch basins.	Track the number and percent of catch basins cleaned annually. Report on any analysis of removed material.	During FY 2014-15, City crews inspected and cleaned 11,628 (75.3%) of the 15,435 public catch basins that were present in the city at the start of the fiscal year. Through this process, a total of 141 cubic yards of sediment/debris was removed from these structures using a Vactor truck and/or hand tools. As resources allow, staff anticipate utilizing GIS to map debris accumulations throughout the city, so that a prioritization scheme may be developed for future inspections and cleanings. During this reporting period, stormwater monitoring staff implemented its Catch Basin Sediment Sampling Plan, which included the sampling of nine representative catch basins throughout the City. A summary table and lab results from CH2M and the City's Willow Lake Laboratory can be found in the Monitoring Appendix of the MS4 Annual Report.

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 4-12: **Continue to refine the maintenance program for public and private stormwater detention and water quality facilities. The City maintains an informational packet outlining ownership and maintenance responsibilities and compliance assurance procedures to encourage owners of private detention and water quality systems to perform maintenance. Coordinate with RC 4 Task 9.**	Maintain informational package for ownership maintenance responsibilities for detention and water quality facilities. Implement maintenance activities and requirements identified in long-term maintenance strategy (RC4 Task 9).	Track number of information packets distributed regarding private stormwater control facilities. Track maintenance requirements of long-term maintenance strategy.	City staff have inventoried 480 private water quality facilities on 202 private property taxlots, and created a dynamic GIS database for tracking purposes. This database is updated with new public and private stormwater quality facilities as new construction plans are approved and as-builts are received. During the reporting year, City staff made contact with roughly 50 private water quality facility owners, distributed 26 packets, and continued efforts to create new packets for the additional 103 private properties on which stormwater quality facilities have been recently discovered or have been recently installed. The purpose of the packets are to provide private facility owners with information on the number of facilities on their site, the type of facilities, maintenance procedures and/or checklists, an inspection log, and other resources to help them keep facilities operational. As adopted in the 2014 Stormwater Design Standards, owners of newly installed private water quality facilities will be required to inspect each facility, at a minimum, quarterly for the first two years, and two times per year thereafter, unless otherwise stated in the manufacturer's maintenance specifications. This is to ensure proper functioning of the facility for maximum pollutant removal.

Table 6. RC5 – Public Education and Participation

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 5-1: **Develop and implement a public outreach and education strategy with goals, objectives, identified target audiences, partners, identified target contaminants, and messaging. Conduct a public education program effectiveness evaluation of outreach procedures/efforts. Adjust the program based on the results in year five. (See Table A.1 – Public Outreach Program Matrix, June 2008).**	Create two (2) public education campaigns* from the Public Outreach Program Matrix. Support outreach and educational activities for other divisions**. Conduct an effectiveness evaluation of the outreach program before the end of year four of the MS4 permit cycle.	Document public outreach and involvement activities for two (2) education campaigns. Document outreach activities for other divisions. Document the results of the effectiveness evaluation and subsequent changes to the outreach procedures/efforts.	The pet waste (E.coli) campaign in previous years has focused on targeted outreach to an audience of approximately 620 people. During this reporting year, the focus changed towards enhancing partnerships to carry the same message. The importance of using partnerships to assist with outreach efforts was highlighted in the Public Education Effectiveness Evaluation that was submitted to the DEQ in 2014. Current partners include retail pet stores, veterinarian offices, and dog daycare centers. Each potential new partner receives a letter, an informational poster regarding pet waste, and information on joining the Capital Canine Club (CCC). Twenty-two business establishments have been identified as potential partners in the next round of outreach. The following outreach tools were also used to provide education about E. coli: • Radio Advertisements: 5 weeks (9%) of the year to promote the clean streams connection, the CCC, and outreach events. • Website - CCC: 195 dogs (and their owners) have taken the pledge to pick up pet waste. The Capital Canine Club is a joint effort of the Mid-Willamette Outreach Group (MWOG), and includes the City of Salem, Marion County, and the City of Keizer. • Event Coordination: MWOG hosted the third Howlapalooza event to promote stormwater education to pet owners and to provide dog-related community resources. Attendance included approximately 700 people. In addition, staff also attended Saturday Markets, and the Walk N Wag event, which approximately 300 people attended. • Social Media: 12 posts on Facebook promoting outreach events and the CCC. • Signs & Dispensers in Parks: The City maintains 96 mutt mitt dispensers (pet waste bags) in 47 of its parks. Three of the five recommendations in the Public Education Effectiveness Evaluation for pet waste were continued or initiated: • Continued to provide mutt mitt dispensers in parks and in new pet adoption kits; • Continued general outreach that connects family, pet, and stream health; and, • Initiated partnerships with veterinarians and retail stores to help share the message The recommendations from the Effectiveness Evaluation will be reviewed again in FY 2015-16 for continued implementation and/or the initiation of new programs. Activities that support this BMP can be found in Appendix C.

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 5-2: **Coordinate activities of various groups within the Public Works Department and other City departments assigned responsibility for public outreach and citizen contacts on stormwater matters.**	Quarterly meetings of various groups assigned responsibility for public outreach and citizen contacts on stormwater matters.	Document quarterly meetings and outcomes.	The City works with internal and external staff in the following stormwater-related groups: Mid-Willamette Outreach Group (MWOG): During FY 2014-15, the City continued regional coordination of stormwater matters through this group that includes staff from Marion County, the Marion Soil and Water Conservation District, and the cities of Keizer, Albany, and Corvallis. The primary goal for the group was to host the fourth annual Erosion Control and Stormwater Management Summit in January 2015. The 2015 event was the best attended summit event to date with 110 participants. The group generally meets on a monthly basis to coordinate its two main events, the Summit and Howlapalooza. Howlapalooza was held on October 5, 2014, and is an educational event for pet owners, which provides community resources, information, and stormwater education. Howlapalooza reached an audience of about 500 -750 people. Friends of Trees: FY 2014-15 was the second year that the City of Salem contracted with Friends of Trees for stream and upland planting and the associated public outreach involved with the events. This work is currently funded through a neighborhood planting contract, an upland planting contract, and a riparian planting contract. Contract administrators and outreach staff work with Friends of Trees to coordinate and implement these contracts. Statistics for trees planted through neighborhood planting events in the NESCA-Lansing Neighborhood in FY 2014-15 are as follows: • 50 trees were planted (22 street trees, 26 yard trees, and 2 replacement trees); • 60 volunteers provided a total of 254.5 volunteer work hours; and • Three types of locations (residential, school and church) were planted with upland trees. Statistics for the riparian projects are as follows: • November 15, 2014 – 87 volunteers planted 34 trees at Cascade Gateway Park; • February 28, 2015 – 98 volunteers planted 1,200 trees and shrubs at Woodmansee Park; and • May, 3, 2015 – 38 volunteers applied 15 cubic yards of mulch to trees at Clark Creek Park in preparation for the summer. • A total of 223 volunteers provided 850 hours of labor to install 1,234 trees and shrubs. Strategic Communications Group: This group generally meets on a monthly basis to discuss communications issues (such as changes to the city newsletter, website, social media accounts, etc.), that influence how information in the city is communicated both internally and externally. This group also provides suggestions to the management team on Citywide communications. Meetings were held in July, August 21, October 30, November 20, December 18, April 20, and June 4. Stormwater and Outreach: Staff from various City Divisions/Departments meet to discuss project planning and resident inquiries. On July 10, a group met to discuss natural resource related issues including trees in riparian areas and the use of goats to clear vegetation.

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
			Other issues that were discussed by staff throughout the year included the following: • Outreach concerning vegetation maintenance in riparian areas; • Inquiries regarding stream bank erosion on residential property; • Planning projects; • Watershed preservation and protection grant applications; • The use of goats for targeted vegetation grazing; • Desired updates to the riparian canopy analysis; and, • E. coli source tracking
RC 5-3: **Increase the use of community partnerships to carry out outreach goals.**	Develop one new partnership per year to carry out outreach goals.	Document partnerships and outcomes of partnership activities.	During FY 2014-15, the City partnered with Straub Environmental Center to provide outreach at a new venue, the Salem Saturday Market. City staff promoted clean stream car washes and the Capital Canine Club at the July 12, 2014; August 9, 2014; and May 9, 2015 Saturday Markets. Earth 411: One goal to the outreach team is to have four outreach events per year to increase awareness of local environmental issues. This fiscal year, the City and Straub Environmental Center partnered with local environmental organizations to bring Earth Day to Salem. We received sponsorship from 10 local businesses, had 65 local exhibitors, and an estimated attendance of 850 -1000 people. The Regional Coalition for Clean Rivers and Streams: This year the City of Salem provided $2,000 to support larger-scale efforts of the KOIN "Water: Do Your Part" television campaign. The campaign, which ran from September 2014 through July 2015, provided 7,223,394 impressions and covered the following topics: fall lawn tips, being rain ready, wildlife habitat yards, RV and hot tub water disposal, pesticide use, and invasive organisms. In addition, 22 businesses have been identified as potential partners for E. coli outreach, and they include veterinarians, pet supply stores, and dog daycare centers.

RC 5-4: **Investigate the use of a stormwater utility to provide an adequate funding base to support expanded public outreach (see RC6-2).**	Develop a yearly public education budget.
	
	Document public education and outreach needs in the Stormwater Utility Implementation Plan.
		Document public education budget and expenditures.
		
		Document Utility implementation plan showing public education and outreach needs.
			The outreach budget for FY 2014-15 was $43,390. The breakdown of budgeted expenses follows:
			Materials
			• Supplies: $4,000
			• Advertisement: $9,860
			• Other Professional Services:
			  ○ Erosion Control Summit: $3,500
			  ○ Effectiveness Evaluation: $20,780
			  ○ Adopt-A-Stream Field Trips: $1,000
			• Straub Environmental Center Membership: $250
			• Copy Services $4,000
			Personnel Services (1 Full Time Employee, 2 Seasonal Employees)
			• $171,340
			
			The stormwater utility was adopted by City Council in December 2010 (See RC 6-2).

Table 7. RC6 – Stormwater Management Program Financing

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 6-1: **In conjunction with the updated Stormwater Master Plan (RC1-1), review and update the Stormwater System Development Charge (SDC) methodology to address both stormwater quantity and quality.**	Adopt updated Stormwater SDC methodology by the end of the MS4 permit cycle.	Report on update to Stormwater SDC methodology.	Review and update of the Stormwater System Development Charge (SDC) methodology is being conducted in concert with updating the Stormwater Master Plan. (See Activities & Accomplishments under RC1 Task 1.) During the reporting period, City of Salem contracted with Galardi Rothstein Group to review system development charge (SDC) policies and administrative practices across the five infrastructure systems (water, sewer, stormwater, parks, and transportation). The purpose of the review was to identify opportunities to better align SDC-related policies and practices across the different systems, and consider how those policies align with the City's current goals and objectives. The goal of this phase of the SDC review project was to determine a list of systemwide and system-specific issues to be addressed, and whether resolving issues will require methodology updates (subject to notification and review provisions of Oregon Revised Statutes) or simply administrative action. The Stormwater SDC methodology was developed over a decade ago, and the consultant recommended incorporating new stormwater system planning information (e.g. Updated Stormwater Master Plan) into a comprehensive methodological update.
RC 6-2: **Implement a new stormwater utility capable of generating stormwater fees historically paid for by water and/or sewer utility customers. The new utility will include incentives to encourage users to implement alternative stormwater management practices such as LID.**	Adopt new stormwater utility by the end of the MS4 permit cycle.	Report on adoption of new stormwater utility.	The new Stormwater Utility was adopted by Salem City Council in December 2010, and the first of four phases implementing the stormwater fee took place in January 2013. The fee structure includes credits that provide for reductions in the impervious surface-based portion of the utility fee for non-single family ratepayers who have stormwater treatment and/or flow control facilities on their property. Generally, green stormwater infrastructures receive a higher stormwater credit than the more traditional stormwater facilities.
RC 6-3: **Identify and pursue grant opportunities for stormwater quality projects, including potential retrofit and LID project opportunities.**	Pursue grant opportunities as staff resources allow.	Track number of grants applied for each year. Track number of grants received each year.	During this reporting period, the City received an additional $127,200 in grant funding from ODOT for continued work on the Center and Marion Street Bridge Retrofit Project. This has been a multi-year effort designed to provide treatment to the stormwater runoff from the Center and Marion Street Bridges.

Table 8. RC7 – Maintain and Update GIS System

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 7-1: **Continue maintenance of the GIS database and Hansen IMS database. These on-going updates will also reflect completion of any stormwater Master Plan capital improvement projects, new facilities added to the system, potential "hot-spots" for illicit discharges, refinement of data for the existing system, updated information on wetlands, perennial streams, waterways, and floodplain/floodway designations, and information updated on a periodic basis for the City's Urban Growth Boundary. The GIS database will be accessible by City departments for review purposes.**	Continue performing database updates annually. Create record of GIS maintenance activities.	Record maintenance / updates made to database.	The GIS team worked on 96,070 linear feet of pipes in the sewer and stormwater system database during the 2014-2015 reporting period. This footage reflects both new line work created for permitted developments, capital improvement projects, and City Operations projects, as well as updates to existing lines to match as-built information for City-owned and certain privately-owned sewer and storm assets. The GIS section continues to enter stormwater quality features into the GIS database. During the 2014-2015 fiscal year, 189 storm water quality features were added to the storm system. In addition, the City continues to update wetland boundaries on a regular basis as delineation reports are received from the Oregon Department of State Lands. The City is working on implementing a way to map and track permitted mitigation sites.
RC 7-2: **Integrate the information in the GIS and IMS. The City plans to integrate the data from both the GIS and Hansen IMS databases so that information in the Hansen IMS database can be visualized using the GIS system.**	Create an action plan for how the GIS and IMS system will be integrated and updated. Implement action plan to integrate GIS and IMS.	Track completion of action plan items. Track implementation status of database integration.	During the 2014-15 reporting period, the City completed documentation of current workflows, roles of individual staff, and identified areas where improvements are needed in integrating GIS and the Hansen asset management system. The City assigned teams to implement systems integration and a technical team is now working on installing the latest version of Infor Public Sector software on a test environment. An asset management team has been assigned to work on asset ratings.

Table 9. RC8 – City Stormwater Grant Program

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 8-1: **Expand matching grant program for watershed protection and preservation to allow for funding of stormwater-related activities, such as promoting water-wise landscaping, reduction of stormwater discharges, restoring riparian areas, stormwater quantity reduction, stormwater quality/treatment, etc.**	Continue to fund $50,000 grant program. Expand matching grant program for watershed protection. Promote the grant program in conjunction with RC5 outreach activities.	Maintain a list of grant awards tracking funding and projects.	In FY 2014-15, the City budgeted $50,000 for the watershed preservation and protection grant. The approved grants for the year totaled $61,405. A total of 6 grants were awarded in FY 2014-15. The grant award list is below. • Project Type: Kooskooskee Stream Bank Restoration, Award $7,405.00. • Project Type: Cinnamon Lakes Dam Safety and Habitat Restoration (Phase 1), Award $26,500. • Cinnamon Lakes Dam Safety and Habitat Restoration (Phase 2), Award $10,000. • North Santiam Watershed Council Project Implementation, Award $7,500. • Straub Environmental Center Summer Camp, Award $5,000. • Straub Environmental Center Teacher Development Project, Award $5,000.

Table 10. RC9 – Legal/Ordinances

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
RC 9-1: **In process of revising the Stormwater Management Design Standards (RC 3 Task 1) and developing a stormwater-dedicated chapter to the SRC (RC 9 Task 3), coordinate with Community Development's effort to adopt a Unified Development Code (UDC). It is envisioned that the stormwater dedicated SRC would be integrated into the UDC framework.**	Adopt the UDC and integrate stormwater-related revisions to the SRC by the end of the MS4 permit cycle.	Report on progress for adoption of UDC and integration of stormwater-related SRC.	City staff have incorporated selected chapters of the Salem Revised Code (SRC) into a single, Unified Development Code (UDC). Led by the Community Development Department, the effort involved grouping related sections and subsections of existing chapters of the SRC into the more cohesive UDC format. The new Unified Development Code went into effect on May 14, 2015. Additional information and details are provided on the City's website at: http://www.cityofsalem.net/Departments/CommunityDevelopment/Planning/Documents/Unified-Development-Code_Ord-No-31-13.pdf
RC 9-2: **Continue to enforce the SRC and review and revise it as necessary to reflect the updated Stormwater Management Design Standards that principally focus on requirements associated with on-site water quality facilities for new development or redevelopment (RC3).**	Revise SRC (as needed).	Track any MS4 stormwater pertinent revisions made to the SRC.	Salem Revised Code (SRC) Chapter 20J (Administrative Rule Making and Contested Case Procedures) contains provisions for enforcement proceedings and civil penalties. Subsections in SRC Chapter 70 (Utilities General) were adopted by City Council in December 2012 that clarify inspection procedures for enforcing the Utility Code and establishes operation and maintenance requirements for owners/operators of private stormwater facilities.
RC 9-3: **Develop a new SRC chapter dedicated solely to stormwater management. It is currently envisioned that this will be done after the City's renewed MS4 Permit is issued, and in conjunction with implementation of the new stormwater utility and updated Stormwater SDC Methodology (RC6) and the updated Stormwater Master Plan (RC1).**	Adopt the new SRC chapter for stormwater by the end of the MS4 permit cycle.	Report on adoption of the new SRC chapter for stormwater, and processes/milestones enroute to formal adoption of the SRC revisions.	A new chapter of the Salem Revised Code (SRC) specific to Stormwater was adopted in December 2013 and became effective January 1, 2014. An update to City's Public Works Design Standards was completed in December 2013 and became effective January 1, 2014.

Table 11. ILL1 – Spill Prevention and Response Program

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
ILL 1-1: **Continue to review and refine the existing spill prevention and emergency response program to protect ground and surface water quality. New activities will be proposed and implemented as appropriate, and coordination and cooperation among other relevant agencies and ODOT will be maintained and improved. This review will be coordinated with the de-icing activities of the Airport Operations and their 1200-Z permit, and possibly the Oregon Air National Guard.**	Continue to implement the spill prevention and emergency response program and review and revise as needed.	Document refinements to cleanup procedures for vehicular accidents and structural fires.	Salem Fire continues to respond to emergencies related to vehicular crashes, structural fires, and hazardous materials incidents utilizing Salem Fire Standard Operation Guideline (SOG) Tactical Guideline #4.16 – Minor Spill Response. This Tactical Guideline provides guidance on Best Management Practices (BMPs) for preventing discharge into storm drains. Salem Fire will continue to respond to any spill or leak of de-icing material at the Salem Airport, and continues to use Standard Operation Guideline (SOG) #2.6.3 – Live Fire Training to incorporate BMPs related to the prevention and/or control of materials related to firefighter training. This guideline includes site surveys and procedures to eliminate runoff/discharge from firefighter training exercises into storm drain systems.
ILL 1-2: **Continue to coordinate timely responses to, and clean-up of emergency response sites and structural fires among Fire, Building and Safety, Development Services, and Environmental Services staff. The Fire Department has the lead role for response at emergency response and structural fire sites and all major vehicular accidents. Environmental Services (ES) staff will provide assistance when requested by the on-scene incident commander. One of the ES responsibilities is to make sure that the cleanup activities are conducted in an environmentally sensitive manner.**	Develop a review schedule with a checklist for the spill response plan.	Track the number and category of spill events responded to, including an estimate of the amount of spilled materials collected and any associated enforcement actions.	Salem Fire Department staff responded to spills from the following categories during the 2014-15 reporting period: • Chemical spills/leaks = 27 • Vehicle accidents = 1032 • Fuel or oil spills = 149 Salem Fire continues to respond to hazardous/chemical spills as requested by our emergency dispatch center. If spills and/or leaks are beyond our capability or exceed the amount of equipment carried on our response vehicles, the Fire Department incident commander will request assistance from Environmental Services.
ILL 1-3: **Continue to conduct daily City vehicle and equipment inspections for leaks and repairs as needed. Staff will review current procedures on an ongoing basis and implement improvements as necessary.**	Continue to implement the daily equipment inspection program.	Report revisions to the daily inspection program.	Staff continued to stress the importance of completing daily vehicle inspections and submitting the inspection forms during monthly safety committee and routine workgroup meetings. These inspection forms were revised during the previous reporting period to reflect updated OSHA requirements.
ILL 1-4: **Develop an updated Operations Pollution Prevention Plan; incorporating new/expanded/relocated Operations-oriented facilities.**	Update the Operations Pollution Prevention Plan by the end of the MS4 permit cycle. Implement the updated Operations Prevention Plan upon completion.	Track progress toward updating the Operations Pollution Prevention Plan. Track implementation of the Operations Pollution Prevention Plan.	During this reporting period, Stormwater Quality staff started to distribute (via email) to all Shops managers and supervisors, the Shops Complex Monthly Inspection Report, which identifies observed housekeeping practices (positive and negative) to encourage compliance with City policies that protect the stormwater system, and to hold accountable those responsible for changing undesirable behaviors. This new approach has proven successful and will continue into the foreseeable future, because it provides managers and supervisors relevant examples for protecting stormwater at municipal operations facilities. Stormwater Staff is on track for updating the Operations Pollution Prevention Plan before the end of the permit cycle.

Table 12. ILL2 – Illicit Discharge Elimination Program

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
ILL 2-1: **Continue to respond to reports of unusual discharges or suspicious water quality conditions within the stormwater system and urban streams. Where able, identify sources/causes and implement appropriate corrective actions. Utilize database to document associated activities.**	Respond to reports of illicit discharges and suspicious water quality conditions. Maintain database to document unusual/suspicious discharges, sources found, and corrective actions taken.	Track calls and mitigation actions taken in database.	Environmental Services continued to provide staff to respond, 24/7, to reports of unusual discharges or suspicious water quality conditions. Staff responded to 80 water quality related responses during the reporting year. All responses and corrective measures are tracked in the Hansen Integrated Management System database. A summary of enforcement actions and inspections is provided in Section 4 of this report. Appendix A contains a complete list of MS4 violations for FY 2014-15.
ILL 2-2: **Environmental Services staff will continue inspections of the City's wastewater users, through the pretreatment program, verifying the proper handling and disposal of both wastewater and stormwater.**	Inspect City's wastewater users for proper management of wastewater and stormwater.	Track number of inspections and associated findings.	During the 2014-15 reporting period, Environmental Services staff continued to inspect wastewater dischargers for proper handling and disposal of wastewater and stormwater. Staff screened 622 industrial/commercial facilities this reporting year. Total number of wastewater discharge inspections/business contacts was 1,070.
ILL 2-3: **Work with Wastewater Collection Services to identify and correct cross-connections between the sanitary sewer and stormwater systems.**	Review stormwater and ambient stream monitoring data to identify possible cross-connection discharges into the stormwater system. Maintain communications with Wastewater Collections and other City staff to identify any system cross connection problems.	Document number of cross-connections identified and corrective actions taken.	When stream water quality data from flow monitors indicate a rapid change in PH, conductivity, turbidity, etc. (particularly during dry weather) personnel are dispatched to the location to determine the cause. Dry weather outfall inspections conducted annually can also show signs of possible cross- connections through the presence of sanitary sewer material. If evidence of cross connections is witnessed by any City staff, Environmental Services is notified. Environmental Services will investigate, log, and track the issue in their database. Wastewater Collections also provides smoke and dye test inspections of sewer and storm lines to identify cross connections when a cross connection is suspected. No cross-connections were identified during the 2014-15 reporting period.
ILL 2-4: **Develop and update a storm sewer outfall dry weather inspection and monitoring prioritization plan.**	Prioritize outfalls for storm sewer outfall inspection and monitoring, and inspect annually. Coordinate prioritization process with ILL 2 Task 5.	Document review of outfall monitoring plan. Document priorities established for monitoring and inspection. Track dry weather inspections conducted and results of inspection.	In FY 2014-15, dry weather inspections included a total of 34 structures (outfalls and manholes). All 34 structures inspected were identified in the "City of Salem's Dry Weather Outfall and Illicit Discharge Screening Plan". For further information on the results of the inspections, refer to Appendix B. For coordination with ILL2 Task 5, a GIS shapefile was created for the priority outfall locations. All analytical test results were included in the attribute table of this shapefile.
ILL 2-5: **Identify and map contaminated sites in the GIS system. With input from other City departments, identify a list of areas where there either has been a substantial spill or there is the potential for a spill or illicit discharge. These areas are identified based on activities on site, history of problems, or specific industry, for example. These areas will be mapped in the GIS system for use across City departments.**	Continue to identify and map contaminated sites in the GIS system.	Track number of contaminated sites added to the GIS system.	Environmental Services provides information on any newly discovered contaminated sites to the Public Works GIS Supervisor in the Engineering Division. This Division adds new sites to the City GIS mapping system used throughout the City. A variety of sources/activities can lead to site contamination, such as leaks from storage tanks and process lines, releases during loading or off-loading activities, or discharges during accidents or emergencies. During FY 2014-2015 there was one site added to Public Works GIS that was contaminated with PCB oils.

Table 13. ILL3 – Illegal Dumping Control Program

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
ILL 3-1: **Continue to sponsor the Adopt-a-Street Program. The program is an effective way to get residents involved in keeping the community's streets clean and consequently preventing trash and debris from entering the storm drainage system.**	Continue to support the Adopt-a-Street Program.	Record the miles of adopted streets, number of participating groups, and volume of litter collected through the Adopt-a-Street Program.	The City continued to sponsor the Adopt-a-Street Program during this reporting year and utilized an internal database to track active/inactive volunteer group activity, dates of cleanup activities, total pounds of trash removed, and miles of street right-of-way maintained. During FY 2014-15, there were 90 different participating groups, 2,200 total volunteers, 180 street miles maintained, and 10,500 pounds of litter removed through this program.
ILL 3-2: **Continue to provide the 24-hour Public Works Dispatch Reporting Center to receive and respond to calls regarding illegal dumping and other environmental complaints/problems and responses thereto. Continue to advertise hotline on City website, utility bill inserts, business cards, public brochures, and consumer confidence reports. As circumstances warrant, publicly report illicit discharges through use of various media outlets.**	Continue to operate the 24-hour Public Works Dispatch Reporting Center. Assign reports to appropriate City staff for action, including actions taken under ILL2-1.	Record number and types of reported illegal dumping incidents. Track media outreach when a discharge warrants.	Environmental Services provides staff to respond, 24/7 to reports of illegal dumping and environmental complaints received through the Public Works Dispatch Center. The Stormwater Section provides public education and outreach to inform the public of environmental issues. Actions taken when responding to calls include the completion of "Service Requests" – a computerized record of calls received and actions taken. This database is housed in the Public Works Dispatch Center. Staff responded to 3 prohibited discharge violations during this reporting period. Refer to Section 4 and Appendix A for a list of MS4 related enforcement actions during the reporting year.
ILL 3-3: **Continue to support the Adopt-a-Stream program, which involves teachers and students in gathering water quality data from streams, thereby providing water resource education to students through experience. The City supports the program by facilitating projects and providing technical assistance and resources.**	Continue to support the Adopt-A-Stream Program.	Maintain a descriptive list of adopt a stream program projects, objectives, outcomes upon completion, and number of participants.	Staff continued to support the Adopt-A-Stream (AAS) Program during the 2014-15 school year by providing presentations and basic program assistance. A budget of $1,500 is maintained to assist with projects and to provide field trips.
ILL 3-4: **Continue to support Marion County in their efforts to provide convenient alternatives for legal disposal of household hazardous wastes and other recyclable materials.**	Continue to support Marion County in providing alternatives for household hazardous waste disposal.	Document frequency and type of support activities.	The City continued to help advertise Marion County programs and/or proper disposal through the following methods: • 10 weeks of radio advertisements. The topics/ pollutants that were addressed were as follows: • 1 week on proper oil disposal (heavy metals); • 2 weeks on the annual fall leaf haul volunteers/event (trash/solid waste); • 2 weeks on proper electronics recycling (heavy metals); • 1 week on Adopt-A-Storm Drain (trash/solid waste); • 1 week on the Green Awards event (general stormwater); • 1 week on battery recycling (heavy metals); • 1 week on poison prevention (household hazardous waste); and, • 1 week on the prescription drug take-back program (household hazardous waste). Staff also continued to post articles in the Community Connection Newsletter as follows: • Articles on the fall leaf haul (trash/solid waste); and, • 1 article on poison prevention (household hazardous waste) • One article was posted in the Salem Weekly that covered electronics recycling (heavy metals). The City's Facebook posts included the following: • 2 posts on alternatives to pesticides (Household Hazardous Waste); • 1 post on the prescription drug take back program (Household Hazardous Waste); • 1 post on From Cart to Art event (trash/solid waste); • 5 posts on proper leaf disposal/Fall Leaf Haul event (trash/solid waste);

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
			• 1 post on electronics recycling (heavy metals); • 1 post on battery recycling (heavy metals); • 1 post on poison prevention (Household Hazardous Waste). The City's drug take back program resulted in 847.6 pounds of medication (and packaging) being kept out of the environment during this reporting period.
ILL 3-5: **Continue to support the annual yard debris cleanup effort.**	Support the annual yard debris cleanup effort.	Record amount of debris cleaned up and level of participation.	The annual Fall Leaf Haul (yard debris clean up event) was held on December 6, 2014. The City had three sites again for this event: Sprague High School, Wallace Marine Park, and the State Fairgrounds. A cumulative total of 210 cubic yards of yard debris was collected from the three locations. This event was supported by the City, Marion County Environmental Services, Salem garbage/recycling haulers, and an additional 40 community volunteers.

Table 14. IND1 – Industrial Stormwater Discharge Program

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
IND 1-1: **Environmental Services will inspect stormwater systems while conducting inspections of City-permitted industrial wastewater users, and work with DEQ to coordinate the permitting and compliance processes for industrial users in the Salem area, including DEQ-issued 1200-Z permitted sources, underground storage tank (UST) removal, and site remediation permits issued by DEQ for sources/sites within the City. Coordination options include: receiving information on proposed 1200-Z permits, commenting on proposed permits, and meeting periodically with DEQ on coordination efforts.**	Inspect stormwater systems while conducting inspections of City-permitted wastewater users. Develop process to coordinate with DEQ on industrial permits within the City.	Track coordination efforts with DEQ. Include stormwater observations as appropriate on inspection reports and follow-up actions.	Environmental Services continued to inspect area stormwater systems as part of facility inspections performed under the industrial pretreatment program. Inspection records are maintained in the Environmental Services database. The DEQ includes Salem in notification of DEQ regulated remediation of contaminated sites affecting the Salem area. Salem is not a permitting agent for DEQ's 1200-Z program but has been developing a process (consistent with the MS4 permit) to notify the DEQ when a site in Salem is undergoing development which may be subject to State permitting. Environmental Services notifies the facility owner or contact person by letter. Regional staff from the DEQ Western Region are then contacted by email with a scanned copy of the letter that is sent to the facility. Refer to ILL2 Task 2 for a summary of facility inspections, and IND1 Task 2 for a summary of facility plans reviewed.
IND 1-2: **During plan review, review industrial facilities for the potential of requiring pretreatment of stormwater prior to discharge based on the industrial activities of the specific facility. Conduct inspections of industrial facilities requiring stormwater pretreatment to ensure structural controls have been built according to approved plans.**	Review industrial plans as necessary for additional stormwater treatment. Conduct inspections once construction is completed to ensure work was done in accordance with approved plans.	Maintain database of plans reviewed and final inspections conducted.	Environmental Services continued to participate in the plan review and inspection process to help ensure appropriate treatment is included during construction or remodel of industrial sites. All plans reviewed and inspections completed are tracked in the Amanda database. Staff reviewed 392 industrial plans and performed 226 post-construction inspections during this reporting year.
IND 1-3: **Surveys are sent to applicable business classes (restaurants, metal finishers/platers, radiator shops, dry cleaners, printing shops, photo processors, etc.) as part of the pretreatment business survey database, part of the industrial pretreatment program for wastewater. Customers will be surveyed on major on-site activities to identify potential locations for public education, future sampling, and tracking down illicit discharges. Illicit stormwater discharges from these business groups are address in ILL2.**	Send surveys to new customers as accounts are opened. Enter survey results into database – on-going as surveys are returned.	Track number of surveys sent out. Track number of surveys returned and entered into database. Track targeted public education activities for specific industries.	Environmental Services continues to send or deliver surveys to newly identified targeted businesses. Businesses failing to return the survey were visited by an inspector to obtain the necessary information. Of the 38 surveys that were distributed this year, 35 were returned and entered into the pretreatment database.
IND 1-4: **Continue the semi-annual Technical Bulletin for the City's industrial users and produce other materials for these users. This activity is principally associated with the City's wastewater Pretreatment Program, but will be used as a vehicle to address stormwater related issues as well.**	Produce two technical bulletins for industrial users each year.	Track published technical materials prepared for industrial users each year.	Permitted users continued to be contacted and reminded during this reporting period of their obligations and of BMPs to maintain their discharge locations and ensure compliance with pretreatment and stormwater regulations.

Table 15. CON1 – Construction Site Control Program

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
CON 1-1: **Continue implementation of the Erosion Prevention and Sediment Control program for developments that meet or exceed the threshold indicated in SRC Chapter 75, which includes the submission of erosion prevention and sediment control plans with structural and non-structural BMPs. Review program experiences annually and implement improvements as appropriate including Code amendments if needed.**	Implement SRC 75. Conduct annual program reviews. Implement appropriate improvements and/or Code amendments. Perform plan reviews for erosion control requirements.	Track number of erosion control plans reviewed for compliance with SRC 75.	SRC 75 continued to provide the basis for Erosion Prevention and Sediment Control (EPSC) plan review, inspection procedures, and enforcement. An internal program review was conducted February 10-11, 2014, which revealed that additional staffing was needed for plan review activities. Additional professional engineering staff was dedicated in March 2014 to provide 100% plan review availability. During this reporting period, 107 EPSC plans were reviewed by City staff. In addition, 413 single family applications were reviewed.
CON 1-2: **Continue to train and educate City staff and private contractors about stormwater pollution at construction sites, with an emphasis on prevention and control BMPs. Provide notice to construction site operators concerning where education and training to meet erosion and sediment control requirements can be obtained.**	Provide annual erosion control training to City staff and private contractors.	Track education and training programs conducted and number of staff/public trained.	The annual Mid-Willamette Erosion Control and Stormwater Management Summit (coordinated through MWOG – see RC 5-2) training took place on January 27, 2015, and provided training to regional area contractors and design consultants. Another training was conducted on April 28, 2015, to City Engineering Division staff concerning EPSC design and construction processes to ensure compliance with 1200-CA and MS4 permits. City staff continued outreach to home builders, contractors, and material suppliers concerning concrete truck washout training and requirements.
CON 1-3: **Document and streamline site plan review, inspection, and enforcement procedures for the construction site runoff control program.**	Complete documentation of site plan review, inspection, and enforcement procedures before the end of year four of the MS4 permit cycle.	Track completion of documented procedures.	Site plan review procedures and checklists are in place and actively used. Staff continue to update the checklists as procedures change. Inspection procedures and reports are in place and actively being followed by Public Works Inspectors. Training on inspection documentation details and photo integration is ongoing. Enforcement procedures are adopted and implemented when appropriate. Training on procedures and practices is ongoing.

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
CON 1-4: **Continue to review and update the Erosion Prevention and Sediment Control Technical Guidance Handbook.**	Update Technical Guidance Handbook before the end of year four of the MS4 permit cycle.	Track updates made to the Technical Guidance Handbook.	City Design Standards were updated and adopted on January 1, 2014. These include a complete section devoted to EPSC. City Standard Construction Specifications for erosion prevention and sediment control were developed for implementation on August 1, 2015. EPSC Standard Plans were updated and adopted on March 10, 2014. These three items implemented have systematically replaced the need for the Technical Guidance Handbook.
CON 1-5: **Continue to coordinate with the City's 1200-CA Permit for City construction projects subject to its program.**	Requirements for 1200-CA compliance incorporated into City construction plans, specifications, and contract documents. Make erosion prevention and sediment control a key agenda item at all pre-construction conferences. Include inspection of all site erosion prevention and sediment control measures as part of City projects.	Track renewal of 1200-CA permit.	1200-CA Permits are included in City contract documents. 1200-CA Permit and EPSC enforcement is key discussion point at pre-construction conferences. Designated EPSC Inspector inspects all City 1200-CA permitted projects. During this reporting period, City staff contacted and met with DEQ staff concerning renewal requirements for the City's 1200-CA permit.

Table 16. MON1 - Monitoring

Task Description	Measurable Goals	Tracking Measures	FY 2014-15 Activities
MON 1-1: **Continue to install and maintain flow and water quality monitoring stations in City waterways to support selection of capital improvement projects, update the hydrologic-hydraulic computer model, and help direct policies to protect the health of these water bodies. The actual rate of installation and the total number of stations will be based on the maintenance requirements of the stations, available funding, and coordination with urban watershed assessments/plans.**	Install additional monitoring stations. Monitor the station alarms in conjunction with the illicit discharge control program (ILL2, Task 1). Follow up on potential hotspots or problem areas as may be identified through data analyses.	Track number of additional monitoring stations implemented.	During the 2014-2015 reporting period, the City installed two continuous stream gaging stations in the eastern half of the Mill Creek watershed, and assisted the City of Turner with the placement of a continuous stream gaging station on Mill Creek (just outside the city of Salem). All three of the stations were installed as part of the Mid-Willamette Valley High Water Watch, which is an early flood warning system for the Mill Creek Watershed. No additional continuous water quality monitoring stations are planned for installation at this time. Environmental Services staff responded to 30 station alarms during this reporting period. Of the 30 alarms, 1 was deemed erroneous due to instrument error. Of the remaining 29 alarms, 21 occurred during storm conditions and 8 occurred during dry conditions. Some alarms were caused by permissible activities, (e.g., in-water work permits, water main breaks/emergency repairs), and some were the result of wildlife and/or kids playing in the creek. Each of the 8 alarms elicited some type of follow-up response. All alarms that occurred during dry conditions were considered hotspot/problem areas that prompted field investigation. When dry condition alarms show a recurring pattern, some form of source tracking activity was conducted, which included TV inspection and/or smoke testing.
MON 1-2: **Continue the urban stream and Willamette River water quality sampling program, with emphasis on reviewing and evaluating sampling data to prioritize investigations and improvement/maintenance projects. This sampling augments the monitoring plan included in the City's 2008 NPDES MS4 Permit Renewal application.**	Update database for collected data. Review collected data for purposes of trending and benchmarking by the end of the permit term. Follow-up on potential hotspots or problem areas as may be identified by the data review.	Document findings regarding trends.	All data collected has been verified for accuracy and imported into the Aquarius Database. Once in the database, the data were verified by a second person and marked as approved/usable data. The urban stream data (called Monthly Instream in the City's NPDES MS4 Permit) was used for a time trend analysis that was provided to the DEQ as part of the City's TMDL Pollutant Load Reduction Evaluation. The data will be further used and submitted as a spatial trends analysis with the City's permit renewal package. The City has been exploring microbial source tracking as an option to help identify the source of E. coli bacteria, particularity in the Clark Creek drainage. In addition, the Clark Creek drainage area continues to be a focus area of the City's dry weather outfall screening activities.
MON 1-3: **Continue to implement all components (MS4 outfall, instream, pesticide, and macro-invertebrate) of the City's "Surface Water and Stormwater Monitoring Plan."**	Implement the City's Stormwater Monitoring Plan, including MS4 outfall, instream, pesticide, and macro-invertebrate monitoring components.	Provide summary statistics for sampling results from each wet-weather season. Track any modifications to the monitoring plan.	During the 2014-15 reporting period, Stormwater Services Monitoring staff completed 4 Instream Storm, 1 Stormwater, and 1 Pesticides sampling events. The pesticides monitoring requirement is now complete. Appendix B contains summary statistics for all sampling that was conducted during this reporting year.

3 PROGRAM EXPENDITURES AND FUNDING SOURCES

Stormwater-related program costs in Salem have been historically funded through wastewater rates, which are comprised of a water consumption (flow) component and a fixed user charge. In December of 2010, Salem City Council approved the adoption of a separate stormwater service charge or utility. Initial implementation of the stormwater utility began on January 1, 2013, and will be phased in over a period of four rate cycles.

The stormwater utility has been developed to provide an equitable way of paying for Salem's stormwater programs by more accurately and fairly linking the stormwater impacts of the ratepayer's property to the rate paid by each ratepayer. The stormwater service charge is based on each property's impervious surface and an assessment of stormwater programmatic costs that are shared equally among all ratepayers. Additionally, properties that take steps to reduce their impervious surface areas, or that have onsite facilities that reduce stormwater impacts, have an opportunity to reduce their stormwater service charge. There currently is no mechanism for residential ratepayers to reduce their stormwater service charge.

Table 2 provides a summary of the total stormwater program expenditures for the current reporting year, as well as those anticipated through the next (FY 2015-16) as identified in the adopted budget.

Table 17. Stormwater Expenditures		
Stormwater Operating Costs	**FY 2014-15 Budget**	**FY 2015-16 Budget**
Stormwater Operations & Maintenance	$2,164,930	$2,602,320
Stormwater Quality	$2,010,870	$1,904,310
Cleaning	$386,432	$381,540
T.V. Inspection	$233,992	$325,211
Water and Environmental Resources	*$0	$0
Environmental Services	$296,213	$297,129
Planning & Development	$990,278	$880,797
Laboratory	$28,970	$40,908
Operations Administration	$207,124	$328,539
Utility Billing	$361,884	$622,690
Dispatch	$72,963	$92,660
Debt for Capital	$738,138	$740,090
Department Administration and Indirect Costs (Nondivisional)	$2,035,822	$1,632,222
Nondivisional (Street Sweeping, Watershed Grants, HazMat/Emergency Management)	$1,377,770	$1,399,130
Budgeted Capital Improvements	$5,981,470	$4,803,080
TOTAL:	**$16,886,855**	**$16,050,626**

*The Water and Environmental Resources Section was eliminated at the end of last fiscal year.

4 ENFORCEMENT ACTIONS, INSPECTIONS, AND OUTREACH

Environmental Services staff responded to 80 water quality related issues and reported six prohibited discharge violations during this reporting period. Enforcement actions related to these violations included warnings, notice of violations, and citations (refer to Appendix A).

Erosion control and 1200-CA Permit requirements are an integral part of all City-issued construction plans and specifications. The City of Salem continues to coordinate efforts with Department of Environmental Quality (DEQ) staff regarding 1200-C permitted sites. During the FY 2014-15 reporting period 4,955 erosion control-related inspections were conducted by Public Works Development Services Inspectors, 23 erosion related correction notices issued, and a total of 505 erosion control permits issued (refer to CON 1 Task 1 through 5).

A complete description of outreach activities that occurred during this reporting year can be found in Section 2 of this report.

5 PLANNING, LAND USE CHANGES, AND DEVELOPMENT

Revisions to the City of Salem Public Works Department Stormwater Management Design Standards (Design Standards) to reflect the post-construction requirements presented in the MS4 Permit were completed during this reporting period. Before these updates were adopted via the City's relatively new administrative rule process, a new stand-alone stormwater chapter (SRC 71) also had to be developed and approved. This new stormwater dedicated chapter was adopted by City Council in December 2013. SRC 71 and the updated Design Standards became effective on January 1, 2014.

The City's Community Development Department completed a multi-year effort in FY 2013-14 to develop a Uniform Development Code (UDC). Development of the UDC principally focused on revisions to the City's Zoning Ordinance as set forth by Salem Revised Code (SRC) Title X, Chapters 110 through 166. The UDC was adopted by City Council in April 2014.

5.1 Land Use Changes

There were two approved annexations or changes (1.7 acres of land zoned Multi-family Residential) to city limits during this reporting period.

5.2 New Development

The City of Salem has continued to see a steady stream of new projects at all phases of development. During the FY 2014-15 reporting period, there was an addition of 1,347,121 square feet (30.9 acres) of new or replaced impervious surface area related to development projects in Salem. Below are several noteworthy projects that were recently completed or are moving forward in the development process:

Under Construction/Recently Completed:

- Boise North and South - 315 Commercial St. SE. Will reuse existing Boise Cascade Building for mixed use development. Near completion of South Block Apartments.
- Salem Hospital - 650-700 Church St. SE. New Rehabilitation Center and parking lot at former School for the Blind site. Near completion.
- Salem Clinic/PAC Trust - 4826 Battle Creek Rd. SE. Medical office and shopping center. Medical office has been completed – future retail development anticipated.
- Lithia Motors – Salem Parkway and Cherry Ave. NE. Three new car dealerships. Construction completed.
- Firehouse Crossing – 4405-4415 Commercial St. SE. Multi-tenant retail complex. Near completion.
- Hawks Ridge Apartments – 1505-1569 Whitaker Dr. SE. 180-unit multi-family development. Construction completed.
- Aspen Grove Apartments – 1936-1980 Wallace Rd. NW. 102-unit multi-family development. Construction completed.
- River Bend Apartments – 642-750 River Valley Dr. NW. 60-unit multi-family development. Under construction.
- Bella Rosa Subdivision – 2300 Michigan City Ln. NW. 38-lot subdivision. Under construction.
- Garmin At, Inc. – 2345 Turner Rd. Expansion of existing business and parking area. Construction completed.

Estimate of Potential Future Development:

- Cash and Carry – 1410 Barnes Rd. SE. Grocery store and parking area. Building permit has been issued.
- Skyline Apartments – 4857-4895 Skyline Rd. S. 69-unit multi-family development. In review.
- Battle Creek Apartments – 6161 Commercial St. SE. 201-unit multi-family development. In review.
- Cottonwood Lakes/Phase 3 – 3295 River Rd. S. 75-lots in Phase 3. Plat approved.
- Brush College Subdivision – 2825 Brush College Rd. NW. 140-lot phased subdivision. Plat for Phase 1 in review.

- Liberty Road Subdivision – 5782 Liberty Road S. 69-lot subdivision. Tentative approval granted.
- Mossy Ridge/Landau Subdivision – 2526 Landau St. SE. 29-lot subdivision. Tentative approval granted.
- Sunnyside Subdivision – 7002-7028 Sunnyside Rd. SE. 137-lot subdivision. Tentative approval granted.
- Kurth Meadows – 6000 Block of Lone Oak Rd. SE. 26-lot subdivision. Tentative approval granted.
- North Campus of the State Hospital – 2600 Center St. NE. Potential redevelopment.

APPENDIX A. MS4 VIOLATIONS FY 2014-15

MS4 Violations Issued July 1, 2014 to June 30, 2015

Business Name	Date	Violation	Action Taken	Discharge	SRC1
Azure Enterprises Inc	01/26/2015	Prohibited Discharge To The Storm Sewer	Citation	Wash Water	73.160
Cinebarre Theater	02/10/2015	Prohibited Discharge To The Environment	Warning	Compactor Leakage	73.160
Contractor CoastCom Inc	07/22/2014	Prohibited Discharge To The Storm Sewer	Warning	Muddy Water	73.160
Starbucks Coffee	10/03/2014	Prohibited Discharge To The Environment	Notice of Violation	Wastewater	73.160
TNT Homes LLC	09/24/2014	Prohibited Discharge To The Storm Sewer	Warning	Dirt and Rock	73.160
X-Stream Mobile Power Washing	08/05/2014	Prohibited Discharge To The Environment	Warning	Soapy Water	73.160

APPENDIX B. SUMMARY OF WATER QUALITY DATA FOR FISCAL YEAR 2014-15

City of Salem
National Pollutant Discharge Elimination System (NPDES)
Municipal Separate Storm Sewer System (MS4)

Summary of Water Quality Data
For Reporting Year 2014/2015

Prepared by:
City Salem Public Works Department
Stormwater Services
Stormwater Monitoring Staff

November 1, 2015

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1.0 Introduction

This document provides all monitoring data collected for the reporting year of July 1, 2014, to June 30, 2015 (RY 2014/15), in accordance with the City of Salem's NPDES MS4 permit requirements listed in Schedule B(5)(f)&(g). It also includes any additional data collected beyond the environmental data requirements in Table B-1, as required in Schedule F, Section C. A background narrative for each monitoring element for which data were collected for RY2014/15 is provided below, and all collected data are provided in the attached tables and figures[1].

2.0 Monitoring Elements

Specific details for each monitoring element can be found in the City's *Stormwater and Surface Water Monitoring Plan*. Progress toward meeting the monitoring requirements defined in Table B-1 of the City's MS4 Permit are summarized in Table 1. Monitoring site locations are described in Table 2 and denoted in Figure 1, and each parameter analyzed for each different monitoring element are described in Table 3.

2.1 Monthly Instream Monitoring

Sampling of designated urban streams for the Monthly Instream[2] monitoring element is conducted on a predetermined monthly schedule. This monitoring element includes the collection of grab samples and field measurements on 11 of Salem's MS4 stormwater runoff receiving streams and the Willamette River. Ten of these streams are paired with upstream (at or near where the stream enters the City's jurisdiction) and downstream (at or near where the stream exits the City's jurisdiction or enters a receiving stream) site locations. The eleventh stream, the West Fork Little Pudding River, only has a downstream site location, because the West Fork Little Pudding River starts in the greater Salem area and runs dry during the summer months. The Willamette River has three sites located upstream, mid-way, and downstream of city limits.

The general locations of all sites are provided in Table 2 and Figure 1.

A general suite of water quality parameters are collected for each site, with additional water quality parameters analyzed for the sites within the Pringle Creek Watershed (PRI1, PRI5, CLA1, and CLA10), West Fork Little Pudding River (LPW1), and the Willamette River (WR1, WR5, and WR10); these additional parameters are denoted with parentheses in the list below.

Water quality parameters collected include:

- Temperature
- Turbidity
- Specific Conductivity
- pH
- Dissolved Oxygen (DO)

[1] All tables, figures, and attachments are at the end of this document and are not discussed in the order in which they appear.

[2] Identified as "Urban Streams monitoring" in the City of Salem Stormwater Management Plan 2010.

- Nitrate + Nitrite as Nitrogen (NO_3+NO_2-N)
- *Escherichia coli (E. coli)*
- Biochemical Oxygen Demand (BOD_{stream})
- Zinc -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Copper -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Lead -total recoverable and dissolved (CLA1, CLA10, PRI1, PRI5 only)
- Hardness (CLA1, CLA10, PRI1, PRI5only)
- Total Suspended Solids (TSS) (LPW1, WR1, WR5, WR10 only)
- Alkalinity (WR1, WR5, WR10 only)
- Ammonia (WR1, WR5, WR10 only)
- Total Phosphorus (TP) (WR1, WR5, WR10 only)
- Total Solids (TS) (WR1, WR5, WR10 only)
- Total Dissolved Solids (TDS) (WR1, WR5, WR10 only)

Data for this monitoring element are provided in Tables 5 through 8, and Figures 2 and 3.

2.2 Continuous Instream Monitoring

The City maintains a network of Continuous Instream water quality monitoring sites and stream gauging sites on seven different urban streams within the city. There are currently 11 water quality and stream gauging sites and two stream gauge-only sites (PRI4 and LPW1) within city limits. The City added three stream gauge-only sites to the existing network last year as part of a flood warning system for the Mill Creek Watershed, all of which reside outside of Salem city limits. Figure 1 denotes the locations of each site that resides within city limits.

The monitoring sites for this monitoring element are positioned in an upstream/downstream configuration. The upstream sites are adjacent to where the stream enters the City and the downstream sites are either above the confluence with another stream or where the stream exits the City's jurisdictional boundary.

Continuous data collected includes:

- Turbidity
- Specific Conductivity
- Temperature
- pH
- DO
- Stage

All data are recorded in 15-minute intervals. All continuous statistical data summaries presented in the various tables and figures were computed using grade A and/or grade B data. Qualifications for what constitutes grade A and grade B data are provided in Table 9.

The Continuous Instream monitoring element incorporates an alarm system that supports the City's Illicit Discharge Detection and Elimination (IDDE) program. The alarm system is used to record, notify, and prompt investigation of water quality abnormalities that may be indicative of illicit discharges. It serves as an important tool to aid in the elimination of periodic illicit

discharges, helps to prioritize dry weather outfall screening activities (see section 2.6), and serves as an outreach/education opportunity for residents.

Monthly medians for collected data are summarized in Table 10. Plots of continuous data and a summary of system alarms are provided in Figures 4 through 7.

2.3 Instream Storm Monitoring

Instream Storm refers to the monitoring of MS4 receiving streams during defined storm events. Sampling occurs at three sites in the Pringle Creek Watershed (continuous instream monitoring sites PRI12, PRI3, and CLK1). Data collected are used to increase understanding of receiving waters within the Pringle Creek Watershed and help guide Salem's stormwater management strategies in watersheds throughout the city. This monitoring element was initiated this permit cycle and is expected to continue beyond the current MS4 permit; ultimately providing a dataset for long-term trending and spatial analyses.

Sampling consists of flow weighted composite samples, grab samples, and field measurements. Parameters include:

- *E. coli*
- Dissolved Oxygen
- pH
- Temperature
- Specific Conductivity
- Copper (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Hardness
- Ammonia Nitrogen (NH_3)
- NO_3+NO_2-N
- Ortho Phosphorus
- Total Phosphorus (TP)
- BOD_{stream}
- TSS

Data for this monitoring element are provided in Table 11.

2.4 Stormwater Monitoring

The City has collected water quality samples from a number of sites throughout the piped MS4 system since 1995. Three monitoring sites are identified in the current monitoring plan, one each for residential, commercial, and industrial land use. The commercial and industrial sites are new sites for this permit cycle, while the residential site was sampled during the previous MS4 Permit. Data from this monitoring element will be aggregated with previous data collected from similar land use types. The aggregated datasets will be used to characterize Salem's MS4 stormwater runoff pollutant concentrations by land use and compare them with the ACWA characterized land use concentrations.

Sampling consists of flow weighted[3] composite samples, grab samples, and field measurements.

Parameters include:

- *E. coli*
- Dissolved Oxygen
- pH
- Temperature
- Specific Conductivity
- Copper (Total Recoverable and Dissolved)
- Zinc (Total Recoverable and Dissolved)
- Lead (Total Recoverable and Dissolved)
- Hardness
- Ammonia Nitrogen (NH_3)
- NO_3+NO_2-N
- Ortho Phosphorus
- Total Phosphorus (TP)
- $BOD_{5\text{-day}}$
- TSS
-

Data for this monitoring element are provided in Table 12.

2.5 Pesticide Monitoring

Staff collected the fourth and final sample to fulfill the pesticide monitoring element requirement this reporting year. At the request of the DEQ, a summary of all pesticide results was submitted to the Oregon DEQ in August 2015.

Data for this monitoring element are provided in Table 13, and the analytical report from the laboratory is included at the end of this report as Attachment A.

2.6 Priority Dry Weather Outfall/Manhole Screening

For RY 2014/2015, dry weather inspections were completed at the 34[4] structures (outfalls and manholes), identified in the City of Salem's *Dry Weather Outfall and Illicit Discharge Screening Plan*. The plan also identifies action levels (i.e. level that triggers a source investigation by City staff of a suspected illicit discharge) for all observed and analytical data collected.

Observational data collected did not produce any direct indication of the presence of an illicit discharge at any of the 34 priority structures.

Field screening pollutant parameters include temperature, pH, specific conductivity, turbidity, and chlorine. Only chlorine had concentration levels above the action level (> 0 mg/L), which occurred at 9 of the 34 sites. Based on the presence of chlorine, seven of these locations were selected for further analytical testing for detergents, fluoride, potassium, sodium, ammonia, and

[3] Due to hydraulic conditions, accurate flow pace sampling is not achievable at the residential land use site (Electric), therefore the City has employed a time paced sampling protocol for this site.

[4] The plan had identified a total of 35 structures; however, staff were unable to locate one of the structures.

E. coli. The results of this additional screening did not show any conclusive evidence that an illicit discharge was present. The other two sites with detectable chlorine concentrations did not have additional analytical testing done, because it was determined during the RY 2013/2014 sampling efforts that a drinking water main leak was the source of the water/chlorine.

Data collected for this permit requirement are provided in Table 14.

3.0 Additional Sampling Efforts RY 2014/15

3.1 Additional E. coli sampling Efforts

3.1.1 Priority Dry Weather Screening – Follow Up *E. coli* Sampling

The *City of Salem's Dry Weather Outfall and Illicit Discharge Screening Plan* states additional sample analysis for bacteria, metals, or nutrients may be conducted at staff discretion. The presence of *E. coli* above the 406 MPN/100 mL acute water quality criterion in previous years within the Clark Creek watershed prompted further field sampling in RY 2014/15 in an attempt to identify the source(s) of bacteria. An additional area of focus for further *E. coli* sampling was an area in North Salem near the outfall to the Willamette River.

Data collected for this effort are provided in Table 15. See 3.1.2 below for information on additional sampling that was done as part of this effort.

3.1.2 Microbial Source Tracking Pilot Study

During RY14/15, the City contracted with an outside laboratory to perform quantitative Polymerase Chain Reaction (qPCR) analytical testing. This testing was completed as part of a Microbial Source Tracking (MST) pilot study to determine the viability of using qPCR analytical testing to help indentify sources of E. coli bacteria found during dry weather inspections.

The *City of Salem's Microbial Source Tracking Using qPCR Pilot Project Plan*, which details the purpose, background, objectives, study design, sample locations, collection method, analysis, and interpretation of results, can be found at the end of this document as Attachment B. Results from the laboratory can be found as Attachment C.

3.1.3 Pringle Creek Pilot Project – Goats for Weed Control in Riparian Area

In RY 2014/2015 the City approved Salem Revised Code (SRC400.120(d)(3))) allowing targeted short term grazing with goats within city limits for invasive weed control, including within the riparian zone. In order to assess potential impact to receiving streams, E. coli samples were collected above and below a stream reach on Pringle Creek where goats were used for weed control. Samples were collected before the goats arrived, during their stay, and immediately after the goats' departure. Of the 14 samples collected at 2 locations, none had E. Coli concentrations exceeding the 406 MPN/100 mL acute water quality criterion.

The requirements of this new code are included as Attachment D at the end of this document. Data collected are provided in Table 16.

3.2 Catch Basin Sediment Sampling (SWMP Requirement)

As stated in RC4 Task 11 of the City of Salem's Stormwater Management Plan (SWMP), the City must "periodically analyze the material removed from catch basins". During RY 2014/15, the City analyzed sediment from nine different catch basins around the City of Salem. Each of the nine sites were chosen based on land use type and street usage. The *City of Salem Catch Basin Sediment Sampling Plan Standard Operating Procedures (SOP)* which includes information on site selection, sampling design and collection, and QA/QC and data procedures is included at the end of this Appendix as Attachment E.

All data collected for this SWMP requirement are provided in Table 17, and the analytical report from the laboratory is included at the end of this report as Attachment F.

3.3 Saddle Club Subsurface Gravel Treatment Wetland

In addition to the required environmental monitoring data collected, the City also chose to continue to monitor the stormwater entering and leaving the Saddle Club subsurface gravel treatment wetland, as outlined in the Performance Monitoring Strategy. This monitoring has been conducted in conjunction with the Stormwater and Instream Storm monitoring, and follows the same criteria for storm event size, as well as analysis of the same parameters.

Data collected are provided in Table 18.

4.0 Conclusion

The City completed all MS4 Permit monitoring requirements for this reporting year, and, weather permitting, is on track to meet all of the minimum monitoring requirements outlined in the MS4 Permit before its expiration on December 29, 2015. Cumulatively, data collected throughout this MS4 Permit cycle will be used to meet monitoring objectives identified in the City's monitoring plan, while also supporting data analyses that will be included in the City's MS4 Permit renewal package.

Table 1.

Progress Towards Completion of Table B-1 Environmental Monitoring Elements

Monitoring Type	# of sites	Total "Events" Needed	Completed 2010/2011	Completed 2011/2012	Completed 2012/2013	Completed 2013/2014	Completed 2014/2015	Remaining "Events" Needed
Monthly Instream	21	48 / site	12[1]	12[1]	12[1]	12[1]	12[1]	NA
Continuous Instream	10	On going	NA	NA	NA	NA	NA	NA
Instream Storm	3	25 / site	0[2]	6	6	5	4	4
Stormwater (MS4)	3	15 / site	0[2]	4	4	4	1	2
Pesticides	3	4 / site	0[2]	1	2	0	1	COMPLETE
Mercury	2	2 / site / year	0[2]	2	1	1		COMPLETE[3]
Macroinvertebrates	3	2 / site	0[2]	1	1			COMPLETE

[1] Due to no flow or access issues, several of the sites had less than 12 data collection events; however, all sites are on track to meet the minimum permit requirements.

[2] The City's monitoring plan was not approved by the Department until June 29th, 2011; therefore, no sampling was conducted during this year for this element.

[3] Following Table B-1 Special Condition #6 of the City's NPDES MS4 permit, the City requested and received approval from Department to eliminate the mercury and methyl mercury monitoring requirement after completing the required two years of monitoring.

Table 2.

Site Locations for Each Monitoring Element

Monthly Instream	
Site ID	Site Location
BAT 1	Commercial St SE
BAT 12	Rees Hill Rd SE
CGT 1	Mainline Dr NE
CGT 5	Hawthorne St NE @ Hyacinth St NE
CLA 1	Bush Park
CLA 10	Ewald St SE
CRO 1	Courthouse Athletic Club
CRO 10	Ballantyne Rd S
GIB 1	Wallace Rd NW
GIB 15	Brush College Rd NW
GLE 1	River Bend Rd NW
GLE 10	Hidden Valley Dr NW
LPW 1	Cordon Rd NE
MIC 1	Front St Bridge
MIC 10	Turner Rd SE
MRA 1	High St SE
MRA 10	Mill Race Park
PRI 1	Riverfront Park
PRI 5	Bush Park
SHE 1	Church St SE
SHE 10	State Printing Office
WR1	Sunset Park (Keizer)
WR5	Union St. Railroad Bridge
WR10	Halls Ferry Road (Independence)

Continuous Instream	
Site ID	Site Location
BAT3	Commercial St SE
BAT12	Lone Oak Rd SE
CLK1[1]	Bush Park
CLK12	Ewald St SE
GLE3	Wallace Rd NW
GLE12	Hidden Valley Dr NW
LPW1[2]	Cordon Rd
MIC3	North Salem High School
MIC12	Turner Rd SE
PRI3[1]	Pringle Park
PRI4[2]	Salem Hospital Footbridge
PRI12[1]	Trelstad Ave SE
SHE3	Winter St. Bridge

Stormwater / Pesticides / Mercury	
Site Id	Site Location
Electric[3]	Electric St. SE and Summer St. SE
Hilfiker[3]	Hilfiker Ln. SE and Commercial St. SE
Salem Industrial	Salem Industrial Dr. NE and Hyacinth St. NE

[1] Instream Storm sampling done at these sites. [2] Stage-only gauging station. [3] Mercury monitoring conducted at these sites.

BAT = Battle Creek, CGT = Claggett Creek, CLA / CLK = Clark Creek, CRO = Croisan Creek, GIB = Gibson Creek, GLE = Glenn Creek, MIC = Mill Creek, MRA = Mill Race, PRI = Pringle Creek, SHE = Shelton Ditch, LPW = West Fork Little Pudding River, WR = Willamette River

Table 3.
Parameters for Each Monitoring Element

Parameter	Units	Monitoring Element			
		Instream Storm	Stormwater	Monthly Instream	Continuous Instream
Alkalinity	mg/L			x[1]	
Biological Oxygen Demand (BOD_{stream})	mg/L	x		x	
Biological Oxygen Demand (BOD_{5day})	mg/L		x		
Specific Conductivity (Sp. Cond)	µS/cm	x	x	x	x
Copper (Total Recoverable and Dissolved)	mg/L	x	x	x[2]	
Dissolved Oxygen (DO)	mg/L	x	x	x	x
E. coli	MPN/100 mL	x	x	x	
Hardness	mg/L	x	x	x[2]	
Lead (Total Recoverable and Dissolved)	mg/L	x	x	x[2]	
Ammonia Nitrogen (NH_3-N)	mg/L	x	x	x[1]	
Nitrate and Nitrite (NO_3.NO_2)	mg/L	x	x	x	
pH	S.U.	x	x	x	x
Total Dissolved Solids (TDS)	mg/L			x[1]	
Temperature	˚C	x	x	x	x
Total Phosphorus (TP)	mg/L	x	x	x[1]	
Ortho Phosphorus	mg/L	x	x		
Total Solids (TS)	mg/L			x[1]	
Total Suspended Solids (TSS)	mg/L	x	x	x[1],[3]	
Turbidity	NTU			x	x
Zinc (Total Recoverable and Dissolved)	mg/L	x	x	x[2]	

[1] Willamette River sites only (WR1, WR5, and WR10).

[2] Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10).

[3] West Fork of Little Pudding River site only (LPW 1).

Table 4.
Water Quality Criteria for Monitored Streams

Parameter	Season	Criteria	Applicable Waterbody
Dissolved Oxygen	January 1-May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Battle Creek*, Claggett Creek*, Clark Creek*[3], Croisan Creek*, Glenn Creek*, West Fork Little Pudding River*
	October 1- May 31	Spawning: Not less than 11.0 mg/L or 95% saturation	Gibson Creek*□ , Glenn Creek, Willamette River
	October 15 - May 15	Spawning: Not less than 11.0 mg/L or 95% saturation	Mill Creek*, Pringle Creek*[1], Shelton Ditch*
	Year Around (Non-spawning)	Cold water: Not less than 8.0 mg/L or 90% saturation	Battle Creek*, Croisan Creek*, Clark Creek, Glenn Creek*[4], Pringle Creek[2]
		Cool water: Not less than 6.5 mg/L	Claggett Creek*, Glenn Creek*, Mill Creek, Pringle Creek[1], Shelton Ditch, West Fork Little Pudding River
pH	Year Around	Must be within the range of 6.5 to 8.5 pH units	All Monitoring Streams
Temperature	October 15 - May 15	Salmon and steelhead spawning: 13˚C 7-day average maximum	Mill Creek, Shelton Ditch
	October 1- May 31	Salmon and steelhead spawning: 13˚C 7-day average maximum	Gibson Creek□
	Year Around (Non-spawning)	Salmon and trout rearing and migration: 18˚C 7-day average maximum	All Monitoring Streams
E. coli	Fall-Winter-Spring	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
	Summer	30 day log mean of 126 E. coli organisms per 100 ml (or) no single sample > 406 organisms per 100 ml	All Monitoring Streams
Biological Criteria	Year Around	Waters of the state must be of sufficient quality to support aquatic species without detrimental changes in the resident biological communities.	Claggett Creek*, Clark Creek*, Croisan Creek*, Glenn Creek*, Pringle Creek Trib*, Willamette River*
Copper	Year Around	Freshwater Acute and Chronic Criteria: 18 and 12 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*
Lead	Year Around	Freshwater Acute and Chronic Criteria: 82 and 3.2 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*
Zinc	Year Around	Freshwater Acute and Chronic Criteria: 120 and 110 µg/L respectively with values calculated for a hardness of 100 mg/L	Pringle Creek*

Note: All waterbodies in this table are included under the Willamette Basin or Molalla-Pudding Subbasin TMDL for Temperature and E. coli.

* Oregon's 2010 Integrated Report Section 303(d) listed.

□ Gibson Creek is referred as Gibson Gulch in Oregon's 2010 Integrated Report.

[1] Applies to Pringle Creek from river mile 0 to 2.6.

[2] Applies to Pringle Creek from river mile 2.6 to 6.2.

[3] Applies to Clark Creek from river mile 0 to 1.9.

[4] Applies to Glenn Creek from river mile 4.1 to 7.

Table 5.
Median Values for Monthly Instream Sites (RY 2014/15)

Station	Number of Samples	Temperature (C)	DO (mg/L)	Sp. Cond (µS/cm)	Turbidity (NTUs)	pH (S.U.)	E. Coli (MPN/100 mL)	NO_3 NO_2 (mg/L)	BOD_{stream} (mg/L)
BAT 1	12	11.9	10.0	50.0	10.4	6.6	128.0	0.77	0.98
BAT 12	12	11.4	10.3	45.8	8.1	6.9	298.5	0.68	0.88
CGT 1	12	14.6	9.7	181.2	10.1	7.3	162.0	0.37	1.57
CGT 5	12	14.8	9.9	153.9	22.7	7.4	460.5	0.54	1.87
CLA 1	12	12.7	10.0	91.8	3.9	7.1	495.0	0.92	0.98
CLA 10	12	12.6	9.4	71.4	4.2	6.6	160.5	1.40	0.86
CRO 1	12	11.6	10.3	70.0	8.2	7.0	82.0	0.47	1.08
CRO 10	12	11.5	9.6	51.7	9.5	6.7	41.5	0.40	0.88
GIB 1	12	12.7	9.7	83.4	11.2	6.9	115.5	1.00	1.06
GIB 15	12	13.2	9.9	95.9	11.1	7.1	121.0	1.74	0.86
GLE 1	12	12.9	9.8	93.1	10.9	7.1	172.0	1.13	0.86
GLE 10	10	10.8	10.6	61.6	9.3	7.0	51.0	1.47	0.75
LPW 1	9	11.6	9.7	204.8	7.3	7.0	249.0	1.29	1.14
MIC 1	12	13.9	10.0	78.1	4.3	7.0	131.0	1.09	0.98
MIC 10	12	12.8	10.8	68.2	5.4	7.3	147.5	1.03	1.06
MRA 1	12	13.7	10.1	74.8	5.1	7.1	202.5	1.08	1.13
MRA 10	12	13.4	9.5	75.6	5.2	6.9	161.0	1.05	1.07
PRI 1	11	13.9	10.2	64.4	5.6	7.1	110.0	0.55	1.09
PRI 5	12	14.3	10.0	87.7	6.3	7.1	98.0	0.99	1.60
SHE 1	12	13.3	10.2	73.3	5.2	7.2	94.5	1.08	1.07
SHE 10	12	13.3	10.3	72.4	5.3	6.9	108.0	1.09	1.07
WR1	12	14.6	11.1	69.9	4.5	7.7	25.0	0.25	0.88
WR5	12	14.3	10.0	69.5	4.6	7.2	25.0	0.23	0.88
WR10	12	14.7	10.5	67.7	4.5	7.3	8.5	0.20	0.97

Table 6.

Number of Water Quality Criteria Exceedances for Monthly Instream Sites (RY 2014/15)

Station	Number of Samples	Dissolved Oxygen	pH	E. Coli[5]			Copper[6]		Lead[6]		Zinc[6]	
				Total #	Dry[2]	Rain[3]	Total	Dissolved	Total	Dissolved	Total	Dissolved
BAT 1	12	8	4	4	1	3						
BAT 12	12	3	2	5	3	2						
CGT 1	12	6	0	5	2	3						
CGT 5	12	3	0	8	5	3						
CLA 1	12	4	0	8	5	3	2	2	0	0	1	1
CLA 10	12	0	4	5	2	3	1	0	0	0	1	1
CRO 1	12	7	1	3	0	3						
CRO 10	12	7	2	3	1	2						
GIB 1	12	5[1]	0	2	0	2						
GIB 15	12	5	0	4	2	2						
GLE 1	12	5	0	4	1	3						
GLE 10[4]	10	6	0	3	1	2						
LPW 1[4]	9	5	0	3	1	2						
MIC 1	12	2	0	2	0	2						
MIC 10	12	1	2	0	0	0						
MRA 1	12	NA	0	4	2	2						
MRA 10	12	NA	0	4	2	2						
PRI 1[4]	11	3	0	2	0	2	0	0	0	0	0	0
PRI 5	12	5	0	3	1	2	0	0	0	0	0	0
SHE 1	12	2	0	1	0	1						
SHE 10	12	3	0	2	1	1						
WR1	12	2	0	1	1	0						
WR5	12	4	2	1	1	0						
WR10	12	7	0	1	1	0						

Note: Copper, lead, and zinc collected at Pringle Creek Watershed sites only (PRI1, PRI5, CLA1, and CLA10).

NA = Not available (No dissolved oxygen water quality criteria associated with this waterbody).

[1] No year-round dissolved oxygen water quality criteria associated with this waterbody.

[2] Dry is < 0.05 inches of rainfall in previous 24 hours.

[3] Rain is ≥ 0.05 inches of rainfall in previous 24 hours.

[4] Unable to sample all 12 due to lack of flow/too high of flow.

[5] Single sample criterion of > 406 organisms per 100 mL used.

[6] Exceedences calculated based on hardness concentration for each event.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name:	BAT1								
Site Description:	Commercial St								
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 11:25	18.2	7.31	64.1	15.3	6.73	>2420	0.65	4.39	0.06
8/19/2014 11:15	20	7.02	62	10.9	6.94	387	0.32	1.38	0
9/16/2014 11:00	15.9	6.82	64.2	59.5	6.69	980	0.26	1.42	0
10/14/2014 11:45	14.2	6.62	47.8	14.5	6.57	>2420	0.32	3.08	0.38
11/18/2014 10:20	5.7	11.18	51.1	6.75	6.42	66	0.94	0.68	0
12/16/2014 11:00	9.4	10.28	48.9	7.3	6.76*	44	1.57	0.83	0.075
1/20/2015 10:35	8.9	10.8	64	15.6	6	41	1.98	0.79	0
2/17/2015 11:45	9	11.05	46.4	8.41	6.39	20	1.63	0.92	0
3/17/2015 11:15	9.7	10.79	48.3	9.81	6.47	225	1.33	0.81	0
4/21/2015 11:35	12.2	10.25	46.2	5.26	6.68	128	0.88	0.7	0
5/12/2015 11:20	11.5	9.65	36.2	15.1	6.6	>2420	0.38	2.65	0.35
6/16/2015 11:12	15.9	8.26	54.6	9.41	6.83	345	0.35	1.03	0
Median	**11.85**	**9.95**	**50.0**	**10.355**	**6.60**	**128**	**0.77**	**0.98**	

Site Name:	BAT12								
Site Description:	Rees Hill Rd.								
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 11:00	18.2	8.42	60.1	15.8	7.21	387	0.19	0.83	0.06
8/19/2014 11:00	18.7	7.21	71.1	13.8	7.27	517	0.25	1.09	0
9/16/2014 10:40	13.6	8.6	70.9	9.83	6.92	579	0.15	1.15	0
10/14/2014 11:08	13.1	8.62	66.5	9.46	6.97	>2420	0.16	3.5	0.38
11/18/2014 10:00	4.2	12.07	43.5	4.68	6.58	58	0.89	0.72	0
12/16/2014 10:50	9.1	10.61	45.7	4.78	6.7*	29	1.71	0.71	0.075
1/20/2015 10:20	8.4	11.08	45.9	10.5	6.02	NA	2.16	0.7	0
2/17/2015 11:30	8.9	11.07	43.6	4.49	6.45	24	1.69	0.91	0
3/17/2015 10:55	8.9	11.13	43.3	7.87	6.64	210	1.36	0.54	0
4/21/2015 11:15	11.4	10.45	42.2	4.04	6.7	46	0.96	0.84	0
5/12/2015 11:00	11.3	10.22	42.8	7.4	6.97	687	0.46	1.05	0.35
6/16/2015 10:51	16	9.25	50.9	8.29	7.05	921	0.11	0.97	0
Median	**11.35**	**10.34**	**45.80**	**8.08**	**6.92**	**298.5**	**0.68**	**0.88**	

Site Name:	CGT1								
Site Description:	Mainline Dr S								
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 13:35	23.4	7.27	97.9	15.7	7.25	2420	0.06	4.68	0.06
8/19/2014 13:05	24.4	6.2	231	3.92	7.62	517	0.05	1.19	0
9/16/2014 12:45	19.1	5.15	176.6	5.36	7.36	80	0.07	1.4	0
10/14/2014 13:35	15.7	6.55	59.3	20.4	6.56	>2420	0.37	4.99	0.38
11/18/2014 12:10	5.1	12.26	176.3	8.42	6.82	155	0.49	1.14	0
12/16/2014 13:20	8.8	8.15	183.3	12.1	7.37*	118	1.16	1.11	0.075
1/20/2015 12:30	8.8	10.18	179.1	11.3	6.93	89	1.75	1.24	0
2/17/2015 13:31	10.9	10.17	204	8.1	7.23	31	0.95	1.05	0
3/17/2015 13:15	12.6	11.02	186.7	16.9	7.46	222	0.98	1.95	0
4/21/2015 13:25	17.2	10.04	208.2	8.88	7.63	162	0.17	1.73	0
5/12/2015 13:15	13.5	9.4	77.5	21.8	7.14	1986	0.32	4.01	0.35
6/16/2015 12:53	22.7	10.12	219.1	6.1	7.93	1414	<0.05	2.52	0
Median	**14.60**	**9.72**	**181.20**	**10.09**	**7.25**	**162**	**0.37**	**1.57**	

* pH field sensor malfunction, reading taken with laboratory equipment.

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name: CGT5
Site Description: Hawthorne Ave

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 13:20	21.3	5.29	156.1	21.8	7	>2420	0.51	>7.39	0.06
8/19/2014 12:45	23.7	7.49	151.7	23.5	7.57	2420	0.12	2.86	0
9/16/2014 12:25	19.1	8.74	125.5	57.1	7.41	>2420	0.09	2.3	0
10/14/2014 13:25	15.4	7.6	73.4	27.3	6.64	>2420	0.56	4.22	0.38
11/18/2014 11:55	3.7	11.46	143.9	43.5	7	153	0.58	2.54	0
12/16/2014 12:55	9.7	10.07	177.7	9.64	7.51*	114	1.61	1.31	0.075
1/20/2015 12:15	9.2	10.8	183.8	20.3	6.96	308	2.53	1.08	0
2/17/2015 13:15	10.9	11.48	213.7	13.9	7.66	53	1.54	1.15	0
3/17/2015 12:55	12.4	11.14	184.2	18	7.67	613	1.57	1.09	0
4/21/2015 13:10	16	11.65	221	6.3	8.13	687	0.2	1.34	0
5/12/2015 13:00	14.2	8.64	61.8	54.3	6.98	>2420	0.25	5.63	0.35
6/16/2015 12:40	20.5	9.73	118.2	25.9	7.79	1046	0.06	1.87	0
Median	**14.80**	**9.90**	**153.90**	**22.65**	**7.41**	**460.5**	**0.54**	**1.87**	

Site Name: CLA1
Site Description: Bush Park

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/22/2014 10:00	17.6	8.39	93.6	7.47	6.82	2420	0.83	5.66	0.06	0.005	0.0041	<0.0005	<0.0005	0.0155	0.0105	40
8/19/2014 10:25	18.8	8.73	90.8	4.12	7.24	122	0.54	0.71	0	<0.0025	<0.0025	<0.001	<0.001	0.0045	0.0052	31
9/16/2014 10:05	16	9.51	89.6	3.75	7.1	411	0.5	0.85	0	<0.0025	<0.0025	0.0005	<0.0005	0.0038	0.0045	27
10/14/2014 10:17	15.5	8.96	58.5	6.37	7.02	>2420	0.59	2.54	0.38	0.004	0.0034	<0.0005	<0.0005	0.014	0.0111	18
11/18/2014 10:36	8.5	11.35	95.1	2.08	7.21	613	1.21	0.94	0	<0.0025	<0.0025	<0.001	<0.001	0.0051	0.0049	NA
12/16/2014 10:46	11	10.55	92.7	2.91	7.07	365	1.52	1.02	0.075	<0.0025	<0.0025	<0.001	<0.001	0.0085	0.0074	32
1/20/2015 10:30	10.7	10.9	98.2	9.67	7.05	579	2.14	0.99	0	<0.0025	<0.0025	0.0009	<0.0005	0.0132	0.0103	31
2/17/2015 10:20	10	11.02	95.8	2.95	6.93	248	1.65	0.74	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0072	0.0058	33
3/17/2015 10:15	11.4	10.64	93.2	7.8	7.13	161	1.73	0.97	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0108	0.0076	30
4/21/2015 10:20	12.7	10.25	90.9	2.58	7.19	649	1	0.97	0	<0.0025	<0.0025	<0.0005	<0.0005	0.005	0.0098	30
5/12/2015 10:00	12.6	9.8	41.5	18.1	6.68	>2420	0.36	3.32	0.35	0.0053	0.0034	0.0014	<0.0005	0.0425	0.0301	18
6/16/2015 9:55	15.2	9.49	90.6	2.98	7.13	830	0.76	1.12	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0056	0.0057	35
Median	**12.65**	**10.03**	**91.80**	**3.94**	**7.09**	**495**	**0.92**	**0.98**		**NA**	**NA**	**NA**	**NA**	**0.0075**		**31**

Site Name: CLA10
Site Description: Ewald Ave

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/22/2014 10:00	16.7	8.24	72.4	5.98	6.75	>2420	1.19	3.05	0.06	0.0031	<0.0025	<0.0005	<0.0005	0.0127	0.0082	24
8/19/2014 9:40	17.3	8.65	67.9	4.03	6.95	1553	1.05	1.04	0	<0.0025	<0.0025	<0.001	<0.001	0.0058	0.0043	21
9/16/2014 9:45	16.4	8.84	68.4	4.27	6.82	2420	0.95	1.03	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0046	0.0051	19
10/14/2014 10:05	15.7	8.26	68.7	5.66	6.53	>2420	0.97	1.2	0.38	<0.0025	<0.0025	<0.0005	<0.0005	0.0103	0.0079	20
11/18/2014 9:20	11.7	9.59	71.1	2.21	6.45	135	1.45	1.56	0	<0.0025	<0.0025	<0.001	<0.001	0.006	0.0076	NA
12/16/2014 9:35	11.9	9.8	75.3	2.85	6.52	66	2.03	0.53	0.075	<0.0025	<0.0025	<0.001	<0.001	0.0093	0.0086	21
1/20/2015 9:20	11.1	10.45	80.3	5.65	6.27	12	2.66	0.66	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0084	0.0082	22
2/17/2015 10:10	11.1	10.4	77.1	2.22	6	22	2.29	0.59	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0071	0.0063	22
3/17/2015 9:55	11.8	10.21	75.6	6.24	6.58	186	2.1	0.57	0	<0.0025	<0.0025	<0.0005	<0.0005	0.015	0.0146	22
4/21/2015 10:10	12.6	9.82	71.6	2.31	6.69	12	1.74	0.64	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0074	0.0074	22
5/12/2015 9:48	12.5	9.2	45.6	16.7	6.29	2420	0.79	3.88	0.35	0.0038	0.0026	0.0005	<0.0005	0.0328	0.0282	17
6/16/2015 9:50	14.8	9.3	67.2	3.02	6.93	228	1.35	0.69	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0049	0.0044	17
Median	**12.55**	**9.45**	**71.35**	**4.15**	**6.56**	**160.5**	**1.40**	**0.86**		**NA**	**NA**	**NA**	**NA**			**21**

* pH field sensor malfunction, reading taken with laboratory equipment.

NA=Medians not calculated for copper and lead due to the large number of censored values.

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli. Metals exceedances were calculated based on hardness results by site.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name: CRO1
Site Description: River Rd S

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 10:15	17.7	6.76	95.6	8.68	7.11	770	0.4	1.87	0.06
8/19/2014 10:10	19.4	4.84	103.1	6.44	7.08	184	0.26	1.27	0
9/16/2014 10:00	15.2	6.1	103	7.64	7.07	276	0.26	1.14	0
10/14/2014 10:20	13.8	7.96	80.6	28	6.93	>2420	0.4	3.25	0.38
11/18/2014 9:30	4.2	12.15	74.5	2.83	6.7	72	0.86	0.76	0
12/16/2014 9:50	8.8	11.03	64.3	5.48	7.06*	26	1.56	0.81	0.075
1/20/2015 9:40	8.6	11.42	62.4	13.6	6.27	42	1.95	0.89	0
2/17/2015 10:25	7.8	11.72	61.3	6.66	6.56	17	1.28	1.34	0
3/17/2015 10:13	8.9	11.42	61.8	15.9	6.91	82	1.14	0.78	0
4/21/2015 10:30	11.6	10.54	64.6	6.03	7.06	17	0.54	0.85	0
5/12/2015 10:10	11.5	10.06	65.4	12.3	6.98	1733	0.33	2.04	0.35
6/16/2015 10:00	15	7.5	87.2	12.5	6.98	249	0.29	1.02	0
Median	**11.55**	**10.30**	**69.95**	**8.16**	**6.98**	**82**	**0.47**	**1.08**	

Site Name: CRO10
Site Description: Ballantyne Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 10:45	17	6.99	73.6	9.94	7.02	435	0.35	0.87	0.06
8/19/2014 10:45	18.4	3.83	93.3	25.2	6.89	1046	0.33	1.25	0
9/16/2014 10:15	13.6	7.52	79.8	14.7	6.57	156	0.25	1.18	0
10/14/2014 10:45	13.3	7.12	84.2	13.7	6.76	613	0.31	3.02	0.38
11/18/2014 9:50	5	11.12	51	3.55	6.38	126	0.84	0.65	0
12/16/2014 10:10	8.7	10.46	51.5	4.68	6.74*	23	1.58	0.63	0.075
1/20/2015 10:00	8.3	11.2	50.9	11.4	6.1	9	1.97	1.15	0
2/17/2015 10:55	8.6	11.16	47.6	5.77	6.52	5	1.39	0.78	0
3/17/2015 10:35	9.1	10.93	47.1	13.2	6.7	24	1.09	0.65	0
4/21/2015 11:00	11.6	9.98	46	6.04	6.67	17	0.45	0.83	0
5/12/2015 10:45	11.3	9.29	51.9	6.7	7.88	25	0.3	1.08	0.35
6/16/2015 10:26	14.1	8.43	59.1	9.03	6.73	58	0.27	0.89	0
Median	**11.45**	**9.64**	**51.70**	**9.49**	**6.70**	**41.5**	**0.40**	**0.88**	

Site Name: GIB1
Site Description: Wallace Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 11:00	19.7	6.92	97.2	14.6	6.68	330	0.71	>7.81	0.06
8/19/2014 12:20	21.8	4.3	117.7	10.2	6.97	138	0.36	1.46	0
9/16/2014 10:45	16.3	5.62	108.4	11.2	6.92	126	0.27	0.68	0
10/14/2014 11:00	14.7	7.52	84.6	14.5	6.9	2420	0.34	2.86	0.38
11/18/2014 11:50	4.4	11.85	93.6	6.31	6.81	58	1.3	1.03	0
12/16/2014 11:42	8.8	10.82	80.3	7.45	6.92	60	2.09	0.99	0.075
1/20/2015 11:10	8.4	11.14	77.6	30	6.89	71	2.4	1.09	0
2/17/2015 11:08	9.1	11.12	76.7	17.2	6.91	75	2.16	0.85	0
3/17/2015 11:02	10.3	10.82	78.5	23.8	6.89	238	1.66	0.88	0
4/21/2015 11:15	12.8	9.91	82.1	6.99	7.1	71	1.25	1.06	0
5/12/2015 11:00	12.6	9.48	81.6	9.42	6.92	770	0.74	1.58	0.35
6/16/2015 10:50	16.9	7.69	100.3	11.2	7.24	105	0.56	1.15	0
Median	**12.70**	**9.70**	**83.35**	**11.20**	**6.92**	**115.5**	**1.00**	**1.06**	

* pH field sensor malfunction, reading taken with laboratory equipment.

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name: GIB15
Site Description: Brush College Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 11:15	19.2	8.16	108.2	11.8	7.22	816	1.08	0.55	0.06
8/19/2014 12:35	21.4	7.21	115.2	38.3	7.31	>2420	0.72	1.52	0
9/16/2014 11:10	14.9	8.61	113.5	17.6	7.29	>2420	0.5	0.83	0
10/14/2014 11:20	14.5	8.64	115	7.72	7.36	1553	0.91	1.62	0.38
11/18/2014 12:06	4.5	11.85	97.7	4.81	6.79	111	1.86	1.24	0
12/16/2014 12:00	9.3	10.6	85.5	6.67	6.88	36	2.44	0.81	0.075
1/20/2015 11:25	9	11.07	81.8	16.7	6.98	42	2.62	0.8	0
2/17/2015 11:24	9.6	11	83.6	34	6.91	152	2.48	0.8	0
3/17/2015 11:18	10.4	10.73	81.8	17.5	6.83	93	1.76	0.84	0
4/21/2015 11:30	13.3	10.01	85.7	8.06	7.08	86	1.8	0.99	0
5/12/2015 11:10	13	9.74	94.1	10.4	7.04	131	1.72	1.35	0.35
6/16/2015 11:04	15.9	8.91	101	8.96	7.45	196	1.23	0.88	0
Median	**13.15**	**9.88**	**95.90**	**11.10**	**7.06**	**121**	**1.74**	**0.86**	

Site Name: GLE1
Site Description: River Bend Rd.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 10:45	17.8	8.34	112.8	65.5	7.13	>2420	1.01	>7.86	0.06
8/19/2014 11:10	20	6.99	124.6	8.62	7.19	236	0.55	1.06	0
9/16/2014 10:30	15.2	7.7	129.4	13.2	7.02	517	0.58	1.03	0
10/14/2014 10:50	14.8	8.89	65.4	17.7	7	2420	0.42	2.59	0.38
11/18/2014 11:36	6.2	11.61	105.2	3.08	6.98	91	1.52	0.75	0
12/16/2014 11:26	9.8	10.7	93.2	5.49	7.1	146	2.23	0.86	0.075
1/20/2015 11:00	9.3	11.08	90.4	16	6.97	60	2.75	0.73	0
2/17/2015 10:55	9.4	11.05	83.8	8.01	6.99	133	2.17	0.56	0
3/17/2015 10:50	10.2	10.87	90.1	16.3	7.1	172	1.98	0.63	0
4/21/2015 11:05	13.4	9.81	92.9	5.91	7.22	93	1.24	0.61	0
5/12/2015 10:50	12.3	9.88	80.8	20.8	7	1046	0.69	2.02	0.35
6/16/2015 10:30	15.2	8.63	114.2	7.12	7.38	172	0.79	0.88	0
Median	**12.85**	**9.85**	**93.05**	**10.91**	**7.06**	**172**	**1.13**	**0.86**	

Site Name: GLE10
Site Description: Hidden Valley Dr.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 11:30	17	8.83	81.8	10.4	7.26	>2420	0.47	<0.5	0.06
8/19/2014 13:00	No Flow								0
9/16/2014 11:30	No Flow								0
10/14/2014 11:30	13.9	8.92	80.8	7.21	6.91	548	0.08	1.61	0.38
11/18/2014 12:35	6.4	11.39	69.7	2.41	6.78	13	1.83	0.66	0
12/16/2014 12:21	9.4	10.74	65.9	7.28	6.81	51	2.58	0.7	0.075
1/20/2015 11:40	8.9	11.23	63	19.99	6.9	10	2.79	0.75	0
2/17/2015 12:05	10.1	10.87	57.8	11.3	6.94	3	2.17	0.56	0
3/17/2015 11:39	10.6	10.85	60.1	19	6.97	61	2.01	0.71	0
4/21/2015 11:45	12.5	10.19	58.7	8.18	7.14	55	1.11	0.84	0
5/12/2015 11:25	11	10.47	59.7	10.4	7.14	51	0.66	1.13	0.35
6/16/2015 11:20	13.8	9.84	59.5	7.73	7.26	435	0.42	0.97	0
Median	**10.80**	**10.61**	**61.55**	**9.29**	**6.96**	**51**	**1.47**	**0.75**	

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name:	LPW1									
Site Description:	Cordon Rd.									
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	TSS
7/22/2014 13:00	20.4	1.07	113.4	12	6.54	579	0.12	5.15	0.06	14.4
8/19/2014 12:00	21.7	0.43	108.3	5.08	6.57	26	0.05	2.55	0	5.3
9/16/2014 12:05	No Flow									
10/14/2014 13:00	No Flow									
11/18/2014 11:20	3.1	9.69	170.4	6.72	6.61	236	1.29	1.14	0	3.4
12/16/2014 12:10	9.2	9.48	219.8	7.34	7.22*	276	3.33	0.66	0.075	7
1/20/2015 12:00	8.7	10.61	204.8	16.8	6.86	249	3.95	0.87	0	15.1
2/17/2015 12:55	9.7	11.47	240	16.9	7.17	179	2.66	1.46	0	20
3/17/2015 12:30	11.6	12.04	205.9	11.5	7.38	921	2.41	0.83	0	5.6
4/21/2015 12:50	15.3	10.79	252	3.65	7.15	167	0.64	1.07	0	2.7
5/12/2015 12:00	12.4	7.66	188	7.26	7.11	2420	0.32	1.99	0.35	7.6
6/16/2015 12:18	No Flow									
Median	**11.60**	**9.69**	**204.80**	**7.34**	**6.99**	**249**	**1.29**	**1.14**		**7.0**

Site Name:	MIC1								
Site Description:	Front St.								
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 8:30	18.8	8.94	56.7	4.34	7.33	140	0.2	0.99	0.06
8/19/2014 8:55	21.3	8.53	55.1	4.31	7.24	167	0.17	0.75	0
9/16/2014 8:45	15.8	9.62	49.6	3.91	7.26	326	0.09	0.98	0
10/14/2014 9:00	14.7	9.57	61.3	4.06	6.95	>2420	0.23	1.53	0.38
11/18/2014 8:25	4.8	12.39	114.6	3.77	6.69	99	4.28	0.61	0
12/16/2014 8:40	8.4	11.39	103	5.48	6.97	72	3.93	0.74	0.075
1/20/2015 8:40	8.7	11.43	93.9	21.9	6.62	115	3.58	0.97	0
2/17/2015 9:10	8.4	11.7	92.4	5.82	6.6	70	2.73	1.05	0
3/17/2015 8:50	10.2	11	96.3	14.4	6.77	387	2.64	1.01	0
4/21/2015 9:00	14.5	9.97	90.1	3.71	7.03	60	1.68		0
5/12/2015 8:50	13.2	9.93	66	5.42	6.89	770	0.5	1.71	0.35
6/16/2015 9:05	17.7	9.21	62.9	3.58	7.32	131	0.22	0.84	0
Median	**13.85**	**9.95**	**78.05**	**4.33**	**6.96**	**131**	**1.09**	**0.98**	

Site Name:	MIC10								
Site Description:	Turner Rd								
Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 11:55	19.3	9.25	58.3	7.52	6.5	192	0.29	1.23	0.06
8/19/2014 11:30	20.9	9.07	49	4.7	7.56	184	0.16	1.16	0
9/16/2014 11:50	16.1	10.09	46.2	5.1	7.61	96	0.11	1.08	0
10/14/2014 12:45	13.6	9.97	53.1	4.07	7.31	291	0.18	1.19	0.38
11/18/2014 10:45	4.9	12.35	109.4	3.79	7	102	4.43	0.8	0
12/16/2014 11:20	8.5	11.1	98.8	5.63	7.23*	51	3.86	0.9	0.075
1/20/2015 11:00	7.9	11.1	90.3	17.4	6.47	59	3.75	0.88	0
2/17/2015 12:35	8.9	11.58	83.9	6.52	7.06	23	2.97	0.9	0
3/17/2015 11:35	9.8	11.22	89.1	12.4	7.15	185	2.79	0.92	0
4/21/2015 12:25	13.7	12.4	74.2	5.25	8.38	185	1.5	1.23	0
5/12/2015 11:39	11.9	10.55	62.1	7.01	7.38	326	0.56	1.46	0.35
6/16/2015 12:00	17.9	10.06	59.2	4.44	7.78	111	0.26	1.04	0
Median	**12.75**	**10.83**	**68.15**	**5.44**	**7.31**	**147.5**	**1.03**	**1.06**	

* pH field sensor malfunction, reading taken with laboratory equipment.

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name: MRA1
Site Description: High St.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 9:15	18.8	9.18	55.2	8.96	7.33	365	0.22	0.79	0.06
8/19/2014 9:50	21.2	8.58	51.6	3.74	7.25	488	0.15	0.82	0
9/16/2014 9:43	15.6	10.08	46.6	5.99	7.05	1046	0.08	1.1	0
10/14/2014 9:50	14.2	9.48	55.8	3.27	7.16	921	0.16	1.34	0.38
11/18/2014 10:10	4.5	12.78	114.9	4.56	7.18	113	4.5	0.92	0
12/16/2014 10:03	8.3	11.48	101.6	10.8	6.96	111	4.13	0.98	0.075
1/20/2015 10:00	7.9	9.96	100.1	24.3	6.93	96	3.1	1.35	0
2/17/2015 9:55	8.6	11.71	90.1	5.67	7.06	51	2.91	1.09	0
3/17/2015 9:29	10.4	10.93	94.9	12.2	7.12	129	2.69	1.16	0
4/21/2015 9:40	14.5	10.54	86	3.98	7.58	119	1.66	1.27	0
5/12/2015 9:40	13.1	10.15	63.5	4.37	7.09	579	0.5	1.46	0.35
6/16/2015 9:30	18	9.4	59.3	3.74	7.22	276	0.2	1.25	0
Median	**13.65**	**10.12**	**74.75**	**5.12**	**7.14**	**202.5**	**1.08**	**1.13**	

Site Name: MRA10
Site Description: 19th St.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 8:40	18.7	8.23	58.2	6.39	7.05	276	0.26	0.84	0.06
8/19/2014 9:15	21.1	7.96	50.8	3.74	6.97	411	0.13	0.85	0
9/16/2014 9:08	15.2	9.54	46.7	4.93	6.85	488	0.1	1.18	0
10/14/2014 9:10	13.9	9.15	54.7	4.16	7.16	2420	0.18	1.36	0.38
11/18/2014 8:30	4.6	12.12	114.5	4.62	6.85	105	4.48	1.03	0
12/16/2014 9:15	8.2	11.05	101.3	6.61	6.75	84	3.84	1	0.075
1/20/2015 9:00	8.1	11.18	94.2	17.9	6.83	122	3.66	1.14	0
2/17/2015 9:00	8.3	11.3	89.9	6.54	6.83	62	2.93	0.81	0
3/17/2015 8:56	10.1	10.75	94	13.8	6.79	150	2.72	1.03	0
4/21/2015 9:05	14.1	9.38	85.8	4.97	6.97	127	1.58	1.16	0
5/12/2015 9:00	12.9	9.42	65.4	5.52	6.95	461	0.51	1.33	0.35
6/16/2015 9:00	17.8	8.5	59.6	4.11	6.76	172	0.17	1.1	0
Median	**13.40**	**9.48**	**75.60**	**5.25**	**6.85**	**161**	**1.05**	**1.07**	

Site Name: PRI1
Site Description: Waterfront Park

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/22/2014 9:00	18.7	9.24	56.4	6.7	7.35	261	0.28	0.92	0.06	<0.0029	<0.0025	<0.0005	<0.0005	0.0049	<0.0025	35
8/19/2014 9:35	20.8	8.9	52.7	4.26	7.28	81	0.15	0.88	0	<0.0025	<0.0025	<0.001	<0.001	<0.0025	<0.0025	23
9/16/2014 9:30	15.6	10.1	49.3	4.97	7.14	110	0.09	1.29	0	0.0026	<0.0025	<0.0005	<0.0005	<0.0025	0.0055	19
10/14/2014 9:35	14.1	9.98	56.9	4.9	7.16	921	0.19	1.41	0.38	<0.0025	<0.0025	<0.0005	<0.0005	0.0036	<0.0025	21
11/18/2014 0:00	Unable to sample due to high flows															
12/16/2014 9:39	8.5	11.26	102.2	6.74	6.79	56	3.57	1.01	0.075	<0.0025	<0.0025	<0.001	<0.001	0.0029	<0.0025	29
1/20/2015 9:35	8.3	11.41	93.2	18.6	6.94	119	3.62	1.03	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0054	0.0047	32
2/17/2015 9:30	8.4	11.64	89.3	5.58	7	43	2.82	0.99	0	<0.0025	0.0026	<0.0005	<0.0005	<0.0025	<0.0025	32
3/17/2015 9:11	10.2	10.89	92.8	13.3	6.98	228	2.51	1.22	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0034	<0.0025	35
4/21/2015 9:20	13.9	10.33	84.5	4.53	7.23	73	1.6	1.09	0	<0.0025	<0.0025	<0.0005	<0.0005	<0.0025	0.0036	31
5/12/2015 9:20	13	10.2	64.4	7.92	7.04	1046	0.55	1.85	0.35	<0.0025	<0.0025	<0.0005	<0.0005	0.0098	0.0057	24
6/16/2015 9:15	17.7	9.56	63.2	3.89	7.22	99	0.21	1.19	0	<0.0025	<0.0025	0.0011	<0.0005	<0.0025	<0.0025	23
Median	**13.90**	**10.20**	**64.40**	**5.58**	**7.14**	**110**	**0.55**	**1.09**		**NA**	**NA**	**NA**	**NA**	**0.0049**	**0.0051**	**29**

NA= Medians not calculated for copper and lead due to the large number of censored values.

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli. Metals exceedances were calculated based on hardness results by site.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name: PRI5
Site Description: Bush Park

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
7/22/2014 10:15	19.9	8.29	86.8	5.35	7.05	365	0.45	2.82	0.06	0.0031	<0.0025	<0.0005	<0.0005	0.0108	0.0054	45
8/19/2014 10:35	21.9	8.22	78.5	3.56	7.48	98	0.16	1.79	0	<0.0025	<0.0025	<0.001	<0.001	0.0037	0.006	33
9/16/2014 10:10	17.7	9.19	74	7.17	7.16	222	0.16	1.97	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0038	0.0082	26
10/14/2014 10:30	15.8	8.93	65.6	10.3	7.23	>2420	0.25	2.96	0.38	0.0028	<0.0025	<0.0005	<0.0005	0.011	0.0046	24
11/18/2014 10:44	6.5	11.6	95.2	4.08	7.05	29	1.27	1.46	0	<0.0025	<0.0025	<0.001	<0.001	0.0104	0.0047	NA
12/16/2014 11:00	9.7	10.73	94.1	4.51	7.13	41	1.9	1.21	0.075	<0.0025	<0.0025	<0.001	<0.001	0.0071	0.0058	35
1/20/2015 10:40	9.5	10.95	89.7	12.3	7.03	70	2.06	1.33	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0083	0.0064	32
2/17/2015 10:32	9.6	11.35	88.9	5.32	7.1	20	1.83	1.13	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0049	0.0035	31
3/17/2015 10:28	11.2	10.86	86	10.6	7.22	261	1.35	1.25	0	<0.0025	<0.0025	<0.0005	<0.0005	0.008	0.0051	33
4/21/2015 10:40	14.6	10.45	88.6	3.42	7.58	68	1.22	1.36	0	<0.0025	<0.0025	<0.0005	<0.0005	0.0036	0.004	33
5/12/2015 10:10	13.9	9.61	70.7	18.8	7.09	1414	0.75	2.48	0.35	0.0028	<0.0025	0.0008	<0.0005	0.0269	0.0126	27
6/16/2015 10:00	18	8.88	89.2	7.23	7.48	575	0.41	1.73	0	<0.0025	<0.0025	0.001	<0.0005	0.0208	0.0069	30
Median	**14.25**	**10.03**	**87.70**	**6.26**	**7.15**	**98**	**0.99**	**1.60**		**NA**	**NA**	**NA**	**NA**	**0.0082**	**0.0056**	**32**

Site Name: SHE1
Site Description: Church St.

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 9:30	18.6	9.01	53.3	5.63	7.29	147	0.26	0.53	0.06
8/19/2014 10:05	20.8	8.61	50.5	4.13	7.24	78	0.17	0.79	0
9/16/2014 9:50	15.4	9.87	47	3.89	7.07	93	0.09	1.11	0
10/14/2014 10:00	13.8	9.88	55	3.44	7.34	387	0.16	1.12	0.38
11/18/2014 10:20	4.7	12.6	113.3	3.66	7.24	96	4.53	1.27	0
12/16/2014 10:14	8.3	11.41	100.4	8.58	7.01	53	3.81	1.03	0.075
1/20/2015 10:10	8.1	11.49	92.8	18.7	6.97	96	3.76	0.96	0
2/17/2015 10:05	8.4	11.6	88.8	5.61	7	56	2.85	0.93	0
3/17/2015 10:00	10.1	11.08	92.3	14.7	7.12	345	2.74	1.15	0
4/21/2015 9:50	13.8	10.39	81.1	4.75	7.37	50	1.62	0.99	0
5/12/2015 9:50	12.8	10.07	65.4	10.1	7.12	411	0.54	1.34	0.35
6/16/2015 9:40	17.7	9.3	59.8	4.69	7.34	81	0.19	1.23	0
Median	**13.30**	**10.23**	**73.25**	**5.18**	**7.18**	**94.5**	**1.08**	**1.07**	

Site Name: SHE10
Site Description: Airport Road

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs
7/22/2014 8:25	18.8	9.14	53.3	6.22	7	124	0.3	0.75	0.06
8/19/2014 8:50	20.9	8.59	50	4.19	6.87	>2420	0.16	1.02	0
9/16/2014 9:00	15.4	9.9	45.9	5.17	6.91	142	0.09	1.1	0
10/14/2014 8:50	14.1	9.78	54.1	3.74	7.1	488	0.17	1.19	0.38
11/18/2014 8:50	4.7	12.61	112.8	4.4	7.1	69	4.41	0.75	0
12/16/2014 8:37	8.3	11.25	99.7	5.32	6.73	48	3.9	1.1	0.075
1/20/2015 8:40	8.4	11.28	91.9	18.8	6.67	62	3.69	0.98	0
2/17/2015 8:45	8.4	11.48	87.6	6.38	6.84	99	2.98	0.87	0
3/17/2015 8:42	9.9	10.98	91.6	13.6	6.65	249	2.78	1.04	0
4/21/2015 8:45	13.9	10.37	79.7	5.32	7.01	78	1.61	1.25	0
5/12/2015 8:45	12.7	10.3	65.1	6.85	7.07	214	0.56	1.22	0.35
6/16/2015 8:30	18	9.31	58.8	4.14	6.89	108	0.19	1.33	0
Median	**13.30**	**10.34**	**72.40**	**5.32**	**6.90**	**108**	**1.09**	**1.07**	

NA= Medians not calculated for copper and lead due to the large number of censored values.

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli. Metals exceedances were calculated based on hardness results by site.

Table 7.
Monthly Instream Data (RY 2014/15)

Site Name: WR1
Site Description: Sunset Park (Keizer)

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Alkalinity (mg/L)	Ammonia (mg/L)	TP (mg/L)	TDS (mg/L)	TS (mg/L)	TSS (mg/L)
7/22/2014 14:15	21.4	9.7	70	2.36	7.67	10	0.13	< 0.5	0.06	29	<0.05	0.037	58	63	4.8
8/19/2014 13:30	22.6	10.76	64.4	1.6	8.49	2	0.09	0.88	0	29	<0.05	0.031	56	59	2.8
9/16/2014 13:00	18	10.46	62.1	1.92	7.87	7	0.08	0.84	0	27	<0.05	0.029	58	62	4
10/14/2014 14:00	14.9	9.77	65.2	5.73	7.33	96	0.12	0.72	0.38	27	<0.05	0.05	66	72	6.4
11/18/2014 12:35	6.1	11.67	63.5	15.6	7.1	152	0.62	0.72	0	25	<0.05	0.073	67.6	78	10.4
12/16/2014 13:38	8	11.07	69.8	10.2	7.43*	34	0.74	0.84	0.075	26	<0.05	0.057	62	71	8.8
1/20/2015 13:10	8.3	11.11	64.8	34.7	6.79	131	0.9	0.97	0	24	<0.05	0.114	79	105	26.4
2/17/2015 14:10	9.6	11.04	78.8	9.73	7.14	14	0.79	0.68	0	29	<0.05	0.05	72	77	5.2
3/17/2015 13:40	11	10.64	80.6	19.1	7.36	722	0.77	1.06	0	29	0.082	0.082	82	95	13.2
4/21/2015 13:55	16.4	12.28	74.8	2.94	8.29	16	0.3	1.17	0	30	<0.05	0.036	59	62	2.8
5/12/2015 13:35	14.3	12.26	77.5	3.33	8.36	45	0.19	1.19	0.35	31	<0.05	0.026	71	76	5.2
6/16/2015 13:15	21.5	11.76	79.4	1.71	8.25	4	0.13	1.06	0	30	<0.05	0.039	58	61	3.2
Median	**14.60**	**11.06**	**69.90**	**4.53**	**7.67**	**25**	**0.25**	**0.88**		**29**	**0.082**	**0.0445**	**64**	**71.5**	**5.2**

Site Name: WR5
Site Description: Union Street Railroad Bridge

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Alkalinity (mg/L)	Ammonia (mg/L)	TP (mg/L)	TDS (mg/L)	TS (mg/L)	TSS (mg/L)
7/22/2014 9:10	19.6	8.86	70	2.61	7.42	7	0.15	<0.5	0.06	29	<0.05	0.037	65	71	6.4
8/19/2014 9:15	20.8	8.45	64.4	4.33	7.37	11	0.09	0.88	0	29	<0.05	0.039	65	69	3.6
9/16/2014 9:20	16.7	9.44	62.2	2.35	7.38	18	0.08	0.84	0	27	<0.05	0.03	55	60	5.2
10/14/2014 9:45	14.7	9.75	61.7	5.69	7.06	66	0.12	0.79	0.38	26	<0.05	0.049	61	68	7.2
11/18/2014 8:45	5.4	11.86	62.7	15.8	7.01	184	0.5	0.63	0	25	<0.05	0.081	63.4	75	11.6
12/16/2014 9:05	7.5	11.24	68.9	9.82	7.05	34	0.72	0.92	0.075	26	<0.05	0.057	66	74	8
1/20/2015 8:55	8	11.31	63.9	37.4	6.33	126	0.7	1.05	0	23	<0.05	0.117	78	104	26.4
2/17/2015 9:45	8.8	11.08	75.8	4.8	6.31	11	0.68	0.84	0	28	<0.05	0.048	72	78	6
3/17/2015 9:20	10.4	10.72	80.4	20.8	7.02	1203	0.64	1.62	0	28	0.087	0.086	77	93	15.6
4/21/2015 9:25	14.1	10.22	71.5	3.07	7.45	5	0.27	1.1	0	28	<0.05	0.036	63	68	5.2
5/12/2015 9:20	14.5	9.76	76.4	2.43	7.24	32	0.19	1.16	0.35	31	<0.05	0.029	70	77	6.8
6/16/2015 9:30	19.3	8.92	78	2.04	7.55	3	0.12	0.79	0	30	<0.05	0.041	59	64	4.8
Median	**14.30**	**9.99**	**69.45**	**4.57**	**7.15**	**25**	**0.23**	**0.88**		**28**	**0.087**	**0.0445**	**65**	**72.5**	**6.6**

Site Name: WR10
Site Description: Halls Ferry Road (Independence)

Collection Date/Time	Temp (°C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Rainfall previous 24 hrs	Alkalinity (mg/L)	Ammonia (mg/L)	TP (mg/L)	TDS (mg/L)	TS (mg/L)	TSS (mg/L)
7/22/2014 12:30	20.3	9.27	69	2.16	7.5	4	0.16	<0.5	0.06	29	<0.05	0.038	66	72	6.4
8/19/2014 13:20	24.2	9.13	65	1.89	7.79	3	0.09	1.67	0	29	<0.05	0.033	60	64	4
9/16/2014 12:35	17.7	10.1	61.9	2.85	7.58	3	0.08	0.9	0	27	<0.05	0.03	58	62	4.4
10/14/2014 12:30	14.9	9.55	62.3	5.61	7.38	14	0.13	0.93	0.38	27	<0.05	0.05	58	65	6.8
11/18/2014 12:56	6.2	11.82	60.5	15.6	6.96	158	0.48	0.62	0	25	<0.05	0.07	67.2	78	10.8
12/16/2014 13:20	8.2	10.9	66.3	10.2	7.13	25	0.6	0.94	0.075	27	<0.05	0.056	63	70	7.2
1/20/2015 12:45	8.6	10.92	62.6	34.2	7.14	111	0.66	1.12	0	23	<0.05	0.111	76	103	27.2
2/17/2015 12:26	9.2	10.82	75.8	9.6	7.03	5	0.7	<0.5	0	28	<0.05	0.052	71	79	8
3/17/2015 12:15	10.8	10.48	77.2	20.3	7.15	1553	0.62	1.3	0	28	0.085	0.085	72	85	13.2
4/21/2015 12:40	15.2	10.5	71.3	3.26	7.44	10	0.22	1	0	27	<0.05	0.041	65	67	2.4
5/12/2015 11:42	14.5	10.48	76	3.38	7.48	7	0.18	1.2	0.35	30	<0.05	0.034	70	75	4.8
6/16/2015 12:30	21.7	9.52	76.3	2.34	6.89	5	0.12	0.88	0	29	<0.05	0.038	60	64	4
Median	**14.70**	**10.48**	**67.65**	**4.50**	**7.27**	**8.5**	**0.20**	**0.97**		**27.5**	**0.085**	**0.0455**	**65.5**	**71**	**6.6**

* pH field sensor malfunction, reading taken with laboratory equipment.

Note: Data in red exceed applicable water quality criteria (see Table 4). Single sample criterion (406 organisms/100 mL) used for E. Coli.

Table 8.

Monthly Instream Data - Duplicates (RY 2014/15)

Site ID	Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	TSS	Total Copper (mg/L)	Dissolved Copper (mg/L)	Total Lead (mg/L)	Dissolved Lead (mg/L)	Total Zinc (mg/L)	Dissolved Zinc (mg/L)	Hardness
CLA1	7/22/2014 10:05	17.6	8.32	93.7	7.35	6.91	1986	0.8	5.52		0.0051	0.0041	<0.0005	<0.0005	0.016	0.0105	40
PRI5	07/22/2014 10:20	19.9	8.26	86.8	5.09	7.07	411	0.49	2.26		0.0027	<0.0025	<0.0005	<0.0005	0.0104	0.0051	43
CLA10	08/19/2014 09:45	17.2	8.68	68.1	4.52	6.91	2420	0.98	0.74		<0.0025	<0.0025	<0.001	<0.001	0.006	0.0043	21
CRO1	08/19/2014 10:20	19.3	4.85	103.2	7.07	7.09	411	0.26	1.21								
GLE1	08/19/2014 11:15	19.6	6.97	126.5	8.62	7.22	152	0.54	0.89								
CRO10	09/16/2014 10:16	13.5	7.61	80.5	13.1	6.82	162	0.28	2.56								
GIB1	09/16/2014 10:55	16.4	5.11	112.8	12.2	6.86	102	0.31	1.17								
GIB15	09/16/2014 11:14	14.7	8.55	113.9	17	7.3	>2420	0.52	1.19								
BAT12	10/14/2014 11:13	13.1	8.63	66.5	9.4	7.01	>2420	0.13	3.65								
GLE10	10/14/2014 11:35	13.9	8.91	80.9	7	6.92	613	0.09	1.21								
BAT1	10/14/2014 11:49	14.2	6.64	47.8	15	6.5	>2420	0.32	3.01								
SHE10	11/18/2014 08:58	4.7	12.61	112.9	4.22	7.04	83	4.6	0.56								
MIC10	11/18/2014 10:50	4.9	12.34	109.3	4	6.96	98	4.62	0.71								
SHE10	12/16/2014 08:38	NA	NA	NA	NA	NA	58	3.98	0.7								
LPW1	12/16/2014 12:14	9.3	9.55	220	7.45	7.25	225	3.37	1.12	6.8							
CGT5	12/16/2014 12:57	9.7	10.07	177.7	9.6	7.56	145	1.6	0.99								
MRA10	01/20/2015 09:01	8.2	11.17	94.1	17.5	6.77	64	3.47	0.86								
PRI1	01/20/2015 09:40	8.4	11.37	93.3	18.2	6.9	109	3.39	1.04		<0.0025	<0.0025	<0.0005	<0.0005	0.0044	0.0035	32
CGT1	01/20/2015 12:40	8.9	10.11	178.6	11.1	6.92	102	1.48	0.91								
MRA10	02/17/2015 09:04	8.3	11.32	90	6.26	6.86	75	2.89	1.03								
PRI1	02/17/2015 09:35	8.4	11.64	89.3	5.45	6.92	72	2.68	1.1		<0.0025	<0.0025	<0.0005	<0.0005	<0.0025	<0.0025	34
CGT1	02/17/2015 13:34	10.9	10.27	204.7	8.64	7.26	28	0.82	1.07								
MIC1	03/17/2015 08:55	10.2	11.03	96.4	15.5	6.8	205	2.6	0.76								
MRA1	03/17/2015 09:34	10.3	10.92	95	11.9	7.07	228	2.62	1.01								
SHE1	04/21/2015 10:00	13.8	10.42	80.9	4.69	7.37	49	1.57	1.16								
CLA1	04/21/2015 10:25	12.6	10.27	90.8	2.53	7.18	1046	1.06	0.95		<0.0025	<0.0025	<0.0005	<0.0005	0.0065	0.0048	32
CLA10	05/12/2015 09:55	12.6	9.14	46	16	6.32	2420	0.83	3.16		0.0037	0.0027	0.0005	<0.0005	0.0318	0.0292	17
PRI5	05/12/2015 10:15	13.9	9.58	70.6	20.7	7.08	1120	0.75	2.5		0.0027	<0.0025	<0.0005	0.0008	0.0271	0.0107	27
CRO1	05/12/2015 10:15	11.5	10.06	66.4	12.5	7	2420	0.33	1.69								
CRO10	06/16/2015 10:28	14	8.44	59.7	8.19	6.55	48	0.26	1.22								
GLE1	06/16/2015 10:35	15.1	8.65	114.2	7.69	7.41	238	0.8	0.79								
BAT12	06/16/2015 10:53	16	9.22	50.7	8.2	7.08	1203	0.14	1.05								

Willamette River Sites Duplicates (RY 2014/15)

Site ID	Collection Date/Time	Temp (C)	DO (mg/L)	Sp Cond (µS/cm)	Turb (NTUs)	pH (S.U.)	E-Coli (MPN/ 100 mL)	NO_3-NO_2 (mg/L)	BOD (mg/L)	Alkalinity (mg/L)	Ammonia (mg/L)	TP (mg/L)	TDS (mg/L)	TS (mg/L)	TSS (mg/L)
WR5	07/22/2014 09:10	19.6	8.86	70	2.61	7.42	11	0.15	<0.5	31	<0.05	0.034	62	65	3.3
WR10	11/18/2014 13:15	6.3	11.81	60.4	16.4	6.97	201	0.42	0.56	26	<0.05	0.071	60.8	72	11.2
WR1	03/17/2015 13:50	11	10.63	80.6	21.6	7.41	1733	0.82	1.03	29	0.082	0.08	79	92	12.8
WR5	04/21/2015 09:29	14.3	10.22	72.2	3.79	7.44	12	0.24	1.01	29	<0.05	0.037	59	62	3.2

Note: Duplicate field measurements and duplicate grab samples are taken at 10 percent of the sites each month. These sites are selected prior to sampling.

Table 9.
Continuous Instream Grade A and Grade B Data Qualifications

Grade Values	Temperature (˚C)	pH	Specific Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
A	± < 0.5	± ≤ 0.30	≤ 10%	± ≤ 3 or 5% (whichever is greater)	± ≤ 0.3
B	± 0.51 to 2.00	± > 0.3 to 0.50	> 10% to ≤ 15%	± ≤ 5 or 30% (whichever is greater)	± > 0.3 to ± ≤ 1.0

Note: As stated in the "Continuous Water Quality Monitoring Program Quality Assurance Project Plan", data grades are a result of the absolute difference (value or percent) of station instrument reading and audit instrument reading at the time of site audit.

Table 10.
Monthly Median Values for Continuous Instream Data (RY 2014/15)

Monthly Medians for **Turbidity** at Continuous Instream Sites

	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015
Station Name	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)	Turbidity (NTU)
BAT3	10.12	9.37	15.96	12.97	11.11	9.55	7.06	7.35	8.01	5.47	6.20	10.04
BAT12	8.30	5.90	5.30	NA	NA	7.00	3.76	4.01	4.01	3.47	4.69	5.51
CLK1	3.80	3.30	3.80	NA	2.30	4.00	6.20	3.70	2.80	2.10	2.00	1.70
CLK12	6.96	5.92	8.03	NA	NA	NA	3.80	1.70	2.20	1.35	1.50	1.80
GLE3	9.20	9.00	7.90	16.00	4.00	7.70	5.30	8.40	6.50	5.30	5.40	6.70
GLE12	14.55	54.40	1.70	1.80	NA	5.60	6.10	9.70	8.30	5.70	5.40	5.40
MIC3	8.59	6.82	6.49	3.58	8.10	9.04	4.94	6.36	5.33	4.33	3.83	4.30
MIC12	11.03	NA	5.41	4.66	7.52	9.03	5.46	7.48	6.73	6.03	4.95	4.79
PRI3	NA	7.52	9.01	NA	14.53	12.21	9.39	NA	NA	6.48	5.64	6.15
PRI12	10.26	9.74	11.06	15.10	10.92	11.09	11.87	21.19	10.94	9.30	13.70	15.45
SHE3	8.94	8.86	10.80	9.47	NA	NA	NA	No Sonde	No Sonde	No Sonde	No Sonde	No Sonde

Monthly Medians for **Specific Conductivity** at Continuous Instream Sites

	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015
Station Name	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)	Specific Conductivity (µS/cm)
BAT3	57.2	61.5	63.2	61.0	58.2	48.3	49.7	45.3	47.5	47.9	50.6	54.6
BAT12	52	65	68	NA	NA	NA	NA	NA	NA	51.49	No Sensor	51.26
CLK1	91	91	90	91	93	NA	92	95	93.0	92.0	92.0	92.0
CLK12	67.4	67.6	68.7	69.3	72.3	75.6	73.9	NA	77.0	73.0	68.0	69.0
GLE3	121.0	125.0	141.0	113.5	108.0	94.0	87.0	91.0	93.0	95.0	102.0	114.0
GLE12	82.0	120.0	107.0	89.0	72.0	68.0	63.0	63.0	62.0	61.0	63.0	71.0
MIC3	62.6	55.5	51.0	61.4	117.6	104.7	99.2	91.1	92.2	88.3	69.8	60.0
MIC12	51.6	NA	48.64	67.705	115.71	102.59	95.74	94.77	97.82	77.63	65.04	51.9
PRI3	97.4	90.1	84.7	82.4	97.6	93.9	95.7	92.1	93.7	93.2	96.9	97
PRI12	67	54.2	51.8	100.2	118.5	94.6	92.2	83.9	87	86.35	84	66.6
SHE3	52.4	49.6	45.8	54.5	112.15	97.5	NA	No Sonde	No Sonde	No Sonde	No Sonde	No Sonde

Presented median values consist of A and B grade data only. NA = 60% of the continuous record for a given month is not represented by A and B grade data.
No sonde = The WQ monitoring station did not have a sonde deployed during this time due to equipment malfunction.

Table 10.
Monthly Median Values for Continuous Instream Data (RY 2014/15)

Monthly Medians for **Temperature** at Continuous Instream Sites

	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015
Station Name	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)	Temperature (˚C)
BAT3	18.89	19.75	16.96	14.23	10.87	9.98	8.76	9.72	10.39	10.92	13.41	NA
BAT12	18.09	18.08	14.80	12.59	9.74	9.57	8.24	9.20	9.11	No Sensor	No Sensor	17.99
CLK1	18.13	18.83	17.30	15.43	12.09	11.43	10.25	11.03	11.70	12.00	14.15	16.86
CLK12	16.26	17.23	16.65	15.58	13.38	12.56	11.35	11.46	11.88	12.08	13.49	15.57
GLE3	18.12	18.57	16.38	14.53	11.09	10.13	8.95	10.15	10.99	11.45	13.96	16.74
GLE12	16.72	NA	15.53	13.25	10.11	9.54	8.26	9.39	9.95	10.00	12.18	15.16
MIC3	21.07	21.24	16.07	14.06	10.09	8.98	8.15	9.60	11.31	11.91	15.58	20.09
MIC12	20.35	20.62	15.36	13.63	10.13	8.98	8.15	9.52	10.88	11.67	15.04	19.34
PRI3	20.09	21.24	18.42	15.48	10.92	10.07	8.84	10.53	11.92	12.52	15.70	19.63
PRI12	19.96	20.28	16.48	14.39	10.82	8.49	7.83	9.91	10.77	11.34	14.83	19.14
SHE3	20.79	20.84	16.71	14.02	10.22	9.15	NA	No Sonde	No Sonde	No Sonde	No Sonde	No Sonde

Monthly Medians for **pH** at Continuous Instream Sites

	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015
Station Name	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)	pH (S.U)
BAT3	6.94	6.85	6.76	6.57	6.44	6.34	6.47	6.47	6.55	6.59	6.82	6.97
BAT12	7.35	7.19	7.09	7.23	7.02	6.70	6.92	7.02	7.11	7.20	7.48	7.64
CLK1	6.90	6.92	6.96	6.86	7.04	6.92	7.02	6.98	7.00	6.99	6.81	6.91
CLK12	6.63	7.00	7.04	6.47	6.21	6.43	6.64	6.59	6.52	6.52	6.73	6.75
GLE3	7.48	7.57	7.52	7.34	7.17	6.99	7.10	6.93	7.03	7.16	7.32	7.46
GLE12	7.08	6.92	7.07	6.98	6.89	6.91	6.98	7.00	7.10	7.22	7.30	7.39
MIC3	7.70	7.48	7.54	7.59	7.57	7.43	7.57	7.32	7.49	7.69	No Sensor	No Sensor
MIC12	7.53	7.56	7.38	7.40	7.26	7.14	7.27	7.32	7.44	7.18	7.26	7.34
PRI3	7.68	7.61	7.75	7.46	7.25	7.29	7.54	NA	7.26	7.14	7.31	7.46
PRI12	6.93	7.23	7.08	NA	NA	6.65	6.99	NA	NA	6.73	7.28	NA
SHE3	7.37	8.13	7.96	7.66	7.53	7.64	NA	No Sonde	No Sonde	No Sonde	No Sonde	No Sonde

Presented median values consist of A and B grade data only. NA = 60% of the continuous record for a given month is not represented by A and B grade data.
No sonde = The WQ monitoring station did not have a sonde deployed during this time due to equipment malfunction.

Table 10.
Monthly Median Values for Continuous Instream Data (RY 2014/15)

Monthly Medians for **Dissolved Oxygen** at Continuous Instream Sites

	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015
Station Name	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (mg/L)
BAT3	7.36	6.82	7.00	7.83	9.59	10.59	11.40	10.73	10.31	10.02	9.01	7.91
BAT12	9.02	7.70	7.70	9.82	11.49	11.73	11.90	11.41	11.20	11.11	9.01	8.76
CLK1	8.74	8.72	9.06	9.43	10.67	10.93	11.36	10.80	10.57	10.40	9.57	9.00
CLK12	8.66	8.62	8.88	8.51	9.25	9.68	10.38	10.23	10.13	9.93	9.58	9.06
GLE3	8.68	8.49	8.89	9.42	10.47	10.90	11.31	10.53	10.69	10.46	9.68	8.92
GLE12	7.86	5.51	7.80	9.26	10.27	10.53	11.45	11.20	11.12	11.11	10.52	9.71
MIC3	8.63	8.39	9.44	10.08	11.51	12.04	12.47	11.32	11.04	10.87	9.62	8.67
MIC12	7.69	NA	9.50	9.78	10.61	10.98	11.56	10.80	10.60	10.55	9.67	8.90
PRI3	7.98	7.99	8.48	9.03	10.12	10.41	11.07	10.69	10.29	9.70	8.90	7.91
PRI12	7.60	7.74	8.45	7.46	8.30	9.52	10.29	10.37	10.23	9.65	8.81	7.92
SHE3	8.48	8.61	9.31	9.71	10.74	11.14	NA	No Sonde	No Sonde	No Sonde	No Sonde	No Sonde

Monthly Medians for **Stage** at Continuous Instream Sites

	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Nov 2014	Dec 2014	Jan 2015	Feb 2015	Mar 2015	Apr 2015	May 2015	Jun 2015
Station Name	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)	Stage (ft)
BAT3	4.02	3.96	3.96	4.08	4.43	5.02	4.60	4.66	4.58	4.53	4.25	4.09
BAT12	4.73	4.62	4.58	4.71	5.04	5.33	5.13	5.14	5.11	5.02	4.87	4.77
CLK1	3.93	3.85	3.88	4.15	4.41	4.50	4.32	4.31	4.33	4.24	4.03	3.90
CLK12	3.97	3.94	3.93	4.01	4.16	4.26	4.07	4.10	4.11	4.09	3.96	3.93
GLE3	4.12	4.09	4.06	4.31	4.56	4.83	4.54	4.60	4.49	4.39	4.23	4.15
GLE12	0.71	NA	0.66	0.73	0.90	1.09	0.99	1.01	0.97	0.91	0.82	0.75
LPW1	No flow	No flow	No flow	No flow	1.70	2.04	1.68	1.72	1.70	1.80	1.54	No flow
MIC3	5.26	5.20	5.34	5.19	5.80	6.51	5.80	5.93	5.72	5.57	5.37	5.43
MIC12	7.20	7.10	7.10	6.90	7.49	8.15	7.66	7.70	7.54	7.43	7.18	7.05
PRI3	4.24	4.26	4.28	4.34	4.53	4.67	4.49	4.49	4.49	4.44	4.30	4.26
PRI4	7.44	7.49	7.50	7.58	7.89	8.17	7.84	7.92	7.89	7.83	7.61	7.56
PRI12	4.26	4.33	4.31	4.22	4.31	4.61	4.37	4.41	4.41	4.41	4.27	4.37
SHE3	5.68	5.60	5.57	5.40	5.95	6.65	6.12	6.15	6.02	5.98	No Sensor	No Sensor

Presented median values consist of A and B grade data only. NA = 60% of the continuous record for a given month is not represented by A and B grade data.
No sonde = The WQ monitoring station did not have a sonde deployed during this time due to equipment malfunction.

Table 11.
Instream Storm Monitoring Data (RY 2014/15)

Site Name:	CLK1																		
Site Description:	Lower Clark Creek just upstream of confluence with Pringle Creek																		
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO_3-NO_2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/23/2014 23:10	27000	8.85	6.86	18.28	54.71														
09/24/2014 10:15						50	0.0191	0.0036	0.14	0.027	0.0157	<0.0005	25	0.086	0.46	0.046	0.6	8.02	278
1/15/2015 20:17	1203	11.98	6.87	6.75	28.32														
1/16/2015 10:30						28.5	0.0098	<0.0025	0.104	0.0312	0.0063	<0.0005	18	<0.05	0.57	0.022	0.263	3.1	110
03/11/2015 18:59	1986	9.8	7.11	12.39	125.1														
03/12/2015 09:55						117	0.0078	0.0062	0.134	0.123	0.0008	<0.0005	45	0.301	1.2	0.03	0.078	3.2	8.8
5/11/2015 10:30	178	9.77	6.5	13.12	84.2														
5/12/2015 10:00	>2420																		
5/12/2015 13:05						47.8	0.0068	0.0038	0.0557	0.0296	0.0019	<0.0005	20	<0.05	0.54	0.029	0.132	3.5	31.2
Median	**1594.5**	**9.79**	**6.87**	**12.755**	**69.46**	**48.9**	**0.0088**	**0.0038**	**0.119**	**0.0304**	**0.0041**	**NA**	**22.5**	**0.1935**	**0.555**	**0.0295**	**0.1975**	**3.35**	**70.6**

Site Name:	PRI3																		
Site Description:	Lower Pringle Creek in Pringle Park, just upstream of confluence with Shelton Ditch																		
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO_3-NO_2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
9/23/2014 23:35	6867	8.34	7.09	18.37	72.57														
9/24/2014 10:40						51.5	0.0124	0.0032	0.0942	0.0096	0.0091	<0.0005	29	<0.050	0.34	0.03	0.426	6.38	154
1/15/2015 20:40	727	11.73	7.09	6.68	46.94														
1/16/2015 10:47						46.7	0.0066	<0.0025	0.0681	0.0174	0.0038	<0.0005	20	<0.050	0.9	0.016	0.206	2.9	76.8
3/11/2015 19:15	154	10.02	7.32	12.41	97.3														
3/12/2015 10:15						103	<0.0025	<0.0025	0.0064	0.0052	<0.0005	<0.0005	41	<0.050	1.71	<0.010	0.028	1.3	3.6
5/11/2015 11:23	228	9.64	6.9	14.07	91.4														
5/12/2015 13:30	1553																		
5/12/2015 13:30						76.6	0.0033	<0.0025	0.0248	0.0108	0.0013	<0.0005	29	<0.050	0.77	0.014	0.084	2.5	22.4
Median	**727**	**9.83**	**7.09**	**13.24**	**81.985**	**64.05**	**0.0066**	**NA**	**0.04645**	**0.0102**	**0.0038**	**NA**	**29**	**NA**	**0.835**	**0.016**	**0.145**	**2.33**	**49.6**

Site Name:	PRI12																		
Site Description:	Upper East Fork Pringle Creek																		
Sample Collection Date/Time	**E. Coli**	**Diss. Oxygen**	**pH**	**temp**	**Sp. Cond, field**	**Sp. Cond, comp**	**Cu**	**Cu diss**	**Zn**	**Zn diss**	**Pb**	**Pb diss**	**Hardness**	**NH3**	**NO_3-NO_2**	**Ortho P**	**TP**	**BODs**	**TSS**
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
9/24/2014 0:01	2420	8.09	6.75	15.69	58.93														
9/24/2014 11:20						57.8	0.0028	<0.0025	0.0505	0.0174	0.0005	<0.0005	28	<0.050	0.6	0.045	0.129	4.99	30.8
1/15/2015 21:11	156	10.32	6.7	6.92	89.73														
1/16/2015 9:35						77.2	<0.0025	<0.0025	0.0204	0.0066	0.0006	<0.0005	34	<0.050	2.33	0.011	0.095	<2.0	21.6
3/11/2015 19:49	22	9.67	7.03	12.19	89.1														
3/12/2015 9:15						92.6	<0.0025	<0.0025	0.0065	0.0044	<0.0005	<0.0005	71	<0.050	2.68	<0.010	0.033	<1.00	9.6
5/11/2015 12:05	147	9.47	6.89	13.17	90.97														
5/12/2015 13:55	1414																		
5/12/2015 13:55						83.1	<0.0025	<0.0025	0.0047	0.003	<0.0005	<0.0005	32	<0.050	1.36	<0.010	0.042	1.3	9.6
Median	**156**	**9.57**	**6.82**	**12.68**	**89.42**	**80.15**	**NA**	**NA**	**0.01345**	**0.0055**	**0.00055**	**NA**	**33**	**NA**	**1.845**	**0.028**	**0.0685**	**3.145**	**15.6**

NA= Median not calculated because ≥ 50% of values were censored values.

Data in red exceed applicable water quality criteria (see Table 4).

Table 12.
Stormwater Monitoring Data (RY 2014/15)

Site Name:	Electric[1]																	
Land use Type:	Residential																	
Sample Collection Date/Time	E. Coli	Diss. Oxygen	pH	temp	Sp. Cond, field	Sp. Cond, comp	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO_3-NO_2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/15/2015 19:35	1046	12.1	6.79	6.42	19.7	26.6													
1/16/2015 10:15							0.0054	0.0029	0.103	0.0603	0.0023	0.0005	14	0.05	0.56	0.043	0.175	2.7	47.2

Site Name:	Hilfiker																	
Land use Type:	Commercial																	
Sample Collection	E. Coli	Diss.	pH	temp	Sp. Cond,	Sp. Cond,	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO_3-NO_2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/15/2015 19:09	112	11.84	6.39	6.5	25.5														
1/16/2015 10:00						19	0.0075	0.0025	0.0702	0.0431	0.0031	0.001	6	0.107	0.2	0.01	0.097	2.8	34

Site Name:	Salem Industrial																	
Land use Type:	Industrial																	
Sample Collection	E. Coli	Diss.	pH	temp	Sp. Cond,	Sp. Cond,	Cu	Cu diss	Zn	Zn diss	Pb	Pb diss	Hardness	NH3	NO_3-NO_2	Ortho P	TP	BOD5	TSS
mm/dd/yyyy HH:MM	MPN/100 mL	mg/L	S.U	˚C	µS/cm	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1/15/2015 20:40	156	11.79	6.7	6	156														
1/16/2015 11:18						24.2	0.0066	0.003	0.155	0.13	0.001	0.0005	13	0.05	0.16	0.032	0.168	2	28.4

[1]Due to the velocity and lift of water coming through the pipe at this site, the flow module is unable to detect the height of the water and often doesn't sample; therefore a time paced sampling method is utilized.

Table 13.
Pesticide Monitoring Data (RY 2014/15)

Site Name	Land Use Type	Sample Date	Time	Analyte	Type of Pesticide	Amount Detected (µg/L)	Limit of Quantitation (µg/L)
Electric	Residential	12/4/2014	5:50	No Analytes were detected			
Hilfiker	Commercial	12/4/2014	5:34	No Analytes were detected			
Salem Industrial	Industrial	12/4/2014	6:25	Propiconazole	Halogenated Pesticide	0.64	0.15
Salem Industrial DUP	Industrial	12/4/2014	6:35	Propiconazole	Halogenated Pesticide	1.7	0.15

Note: Results only given for those analytes that were detected. See Attachment A for full suite of compounds that were analyzed.

Table 14.

Priority Dry Weather Outfall/Manhole Screening Data (RY 2014/15)

Site Info			Flow		Field Screening					Laboratory Testing						notes
Priority Outfall	Surogate Location	Date/Time	Flow Present?	Est. flow	Temp	pH	Specific Cond.	Turbidity	Chlorine (Cl)	E. coli	Fluoride (Fl)	Detergents	Potassium (K)	Sodium (NA)	Amonia (NH3)	
				gpm	°C	S.U	µS/cm	NTU	mg/L	(MPN/100 mL)	mg/L	mg/L	mg/L	mg/L	mg/L	
D51470205	D51470203*	09/10/2014 09:29	No	0	19.10	7.11	245.60	2.92	0.00							Stagnant Water
D54470205		09/10/2014 10:08	No													
D54486217		09/10/2014 10:30	Yes	500	17.10	7.35	71.00	2.58	0.00	365						Green/brown benthic growth
D51486216		09/10/2014 10:55	Yes	10	18.30	7.52	60.30	1.44	0.00	184						Brown benthic growth
D51488236		09/10/2014 11:23	No													
D51488203		09/10/2014 11:30	No													
D51486201	D51486211*	09/10/2014 11:50	No		19.80	6.80	90.60	6.76	0.50	133	1.13	< 0.25	1.84	7.73	< 0.5	Something living in pipe (rat?). Stagnant water- didn't call ES.
D48486207		09/10/2014 12:05	No		18.20	7.05	99.80	38.50	0.50	488	0.97	< 0.25	2.59	8.37	< 0.5	Stagnant Water
D42476203		09/10/2014 12:55	No													
D45476207		09/10/2014 13:05	Yes	250	17.60	7.95	270.00	16.80	0.80	517						Did not collect IDDE sample as 2012 sample did not reveal anything
D45466212		09/22/2014 09:00	Yes	<5	18.88	7.99	196.00	5.71	0.50	13	0.13		2.22	8.06	< 0.5	
D48464203		09/22/2014 09:40	No													
D48464249		09/22/2014 09:45	No													
D45464207	D45464206*	09/22/2014 10:00	Yes		17.70	7.67	69.80	5.41	0.50	< 1	0.58	< 0.25	0.78	6.52	< 0.5	
D42468235		09/22/2014 10:30	No													
D48460229	D48460230	09/22/2014 11:05	Yes	30	18.80	7.92	287.00	5.89			0.14		4	12.50	< 0.5	
D42468244		09/22/2014 12:05	Yes	100	19.00	7.61	110.10	9.31	0.50	42	0.16		0.73	6.69	< 0.5	
D42468232		09/22/2014 12:30	No													
D42466237	D42466227*	09/22/2014 12:45	Yes	25	20.80	7.25	81.00	3.32	0.50	< 1	0.47	< 0.25	0.74	7.43	< 0.5	
D54494201	D54494205*	09/22/2014 13:15	No													
D39460252		10/08/2014 08:45	Yes	<5	17.50	6.24	69.40	1.61	0.00	140						
D39456229		10/08/2014 09:30	Yes	<5	15.80	6.24	77.50	1.23								
D42480215		10/08/2014 10:15	Yes	30	17.50	6.69	56.00	0.92	4.00	< 1	0.76	< 0.25	0.48	6.15	< 0.5	
D42480223		10/08/2014 10:35	Yes	75	17.10	6.51	98.50	2.27	1.00	> 2420	0.73	< 0.25	1.42	8.50	0.98	Duplicate sample taken
D42480205		10/08/2014 11:00	No													
D42482223	D42482228	10/08/2014 11:30	Yes	<5	19.40	6.70	92.60	6.10	0.50	2420						
D42482212	D42482210	10/08/2014 11:45	No													
D42482224	D42482211	10/08/2014 11:50	No													
D36472203	D36472227	10/08/2014 12:15	No													
D30470203	D30470204	10/08/2014 13:00	No													
D42456216		10/09/0214 9:00														Could not locate w/o traffic control
D39478271		10/09/2014 09:40	No		17.10	6.85	126.80	11.60	0.00							Stagnant Water (Slight sheen on surface of water). Biofilm
D42476279	D39476232	10/09/2014 10:00	No													
D45476217		10/09/2014 10:50	Yes	10	18.20	7.21	194.60	4.63	0.00	144						
D45468241		10/09/2014 11:20	No													

Data in red exceed action levels, see Dry Weather Outfall and Illicit Discharge Screening Plan for more information.

* Stormwater Manhole.

Table 15.

Priority Dry Weather Screening Data - Follow Up *E. coli* Sampling (RY 2014/15)

Clark Creek			
Sample Location (Listed Upstream to Downstream)	**Sample Date**	**E.Coli (mpn/100mL)**	**Notes**
D42466226 (MH)	08/25/2014 08:32	<10	Directly upstream of Stormwater sampling manhole
D42466227 (MH)	08/25/2014 08:25	<10	Stormwater Sampling manhole (outfalls to creek shortly after this)
D42466226 (MH)	01/29/2015 10:23	<10	Directly upstream of Stormwater sampling manhole
D42466227 (MH)	01/29/2015 10:17	85	Stormwater Sampling manhole (outfalls to creek shortly after this)
Clark HS Upstream	01/29/2015 10:05	30	Sample taken from creek
Clark HS Downstream	01/29/2015 10:00	134	Sample taken from creek
D42468244	01/29/2015 10:10	187	Sample taken from outfall (outfall abt. 50 ft below Clark HS Downstream site)
CLK12	02/23/2015 10:15	10	Continuous WQ Monitoring station (sample taken from creek)
D42466221 (MH)	02/23/2015 10:45	<10	Just north of 226&227, different line that outfalls into creek above Clark HS Upstream site
D42466226 (MH)	02/23/2015 10:27	369	Directly upstream of Stormwater sampling manhole
D42466227 (MH)	02/23/2015 10:32	1022	Stormwater Sampling manhole (outfalls to creek shortly after this)
Clark HS Upstream	02/23/2015 10:55	30	Sample taken from creek
Clark HS Downstream	02/23/2015 11:00	395	Sample taken from creek
D42468244	02/23/2015 11:03	24200	Sample taken from outfall (outfall abt. 50 ft below Clark HS Downstream site)
CLK1	02/23/2015 11:22	1223	Continuous WQ Monitoring station (sample taken from creek)
D42466227 (MH)	03/04/2015 09:25	161	Stormwater Sampling manhole (outfalls to creek shortly after this)
Clark HS Upstream	03/04/2015 09:46	10	Sample taken from creek
Clark HS Downstream	03/04/2015 09:43	20	Sample taken from creek
D42468244	03/04/2015 09:40	<10	Sample taken from outfall (outfall abt. 50 ft below Clark HS Downstream site)
CLK1	03/04/2015 10:05	63	Continuous WQ Monitoring station (sample taken from creek)
D42466227 (MH)	03/10/2015 07:35	414	Stormwater Sampling manhole (outfalls to creek shortly after this)
Clark HS Downstream	03/10/2015 08:00	31	Sample taken from creek
D424468244	03/10/2015 07:50	355	Sample taken from outfall (outfall abt. 50 ft below Clark HS Downstream site)
CLK1	03/10/2015 08:25	20	Continuous WQ Monitoring station (sample taken from creek)
D42466227 (MH)	03/17/2015 08:07	487	Stormwater Sampling manhole (outfalls to creek shortly after this)
D42466227 (MH) Dup	03/17/2015 08:10	683	Stormwater Sampling manhole (outfalls to creek shortly after this)
CLK1	03/17/2015 08:20	233	Continuous WQ Monitoring station (sample taken from creek)
D42466226 (MH)	04/29/2015 10:08	683	Directly upstream of Stormwater sampling manhole
D42466227 (MH)	04/29/2015 10:18	691	Stormwater Sampling manhole (outfalls to creek shortly after this)
D42466226 (MH)	04/29/2015 10:24	754	Directly upstream of Stormwater sampling manhole
D42466227 (MH)	04/29/2015 10:32	1281	Stormwater Sampling manhole (outfalls to creek shortly after this)
D42466227 (MH)	06/18/2015 08:53	393	Stormwater Sampling manhole (outfalls to creek shortly after this)
D42468244	06/18/2015 09:00	97	Sample taken from outfall (outfall abt. 50 ft below Clark HS Downstream site)

MH = Manhole; HS = High School Data in red exceed single sample criterion of 406 MPN/100 mL. See Table 4 for more information.

Table 15.

Priority Dry Weather Screening Data - Follow Up *E. coli* Sampling (RY 2014/15)

North Salem - Willamette River Outfalls			
Sample Location (Listed Upstream to Downstream)	**Sample Date**	**E.Coli (mpn/100mL)**	**Notes**
D42480223	08/25/2014 09:00	250	IDDE priority outfall
D42480217 (MH)	08/25/2014 09:11	240	MH upstream of D42480222
D45478201 (MH)	08/25/2014 09:40	120	MH upstream of D42480217
D45478202 (MH)	08/25/2014 09:50	20	MH directly upstream of D45478201
D45478639	08/25/2014 10:25	<10	CB directly upstream of D45478202
D45478203 (MH)	08/25/2014 10:30	<10	MH directly upstream of D45478639
D45478205 (MH)	08/25/2014 10:36	<10	MH directly upstream of D45478203
D42480214 (MH)	01/29/2015 10:47	<10	Manhole directly upstream and in same apartment complex as 222
D42480222 (MH)	01/29/2015 10:40	408	Manhole in apartment complex, directly upstream of outfall into Willamette River
D42480222 (MH)	02/23/2015 12:15	1782	Manhole in apartment complex, directly upstream of outfall into Willamette River
D45476207	03/04/2015 10:35	1515	Outfall into Mill Creek, upstream of Willamette River
D42480222 (MH)	03/04/2015 10:50	5172	Manhole in apartment complex, directly upstream of outfall into Willamette River
D45476207	03/10/2015 08:50	110	Outfall into Mill Creek, upstream of Willamette River
D42480222 (MH)	03/10/2015 09:10	305	Manhole in apartment complex, directly upstream of outfall into Willamette River
D45476207	03/17/2015 08:55	368	Outfall into Mill Creek, upstream of Willamette River
D42480222 (MH)	03/17/2015 09:15	987	Manhole in apartment complex, directly upstream of outfall into Willamette River
D42480222 (MH) Dup	03/17/2015 09:20	2603	
D45476207	06/18/2015 09:20	146	Outfall into Mill Creek, upstream of Willamette River
D42480222 (MH)	06/18/2015 09:21	712	Manhole in apartment complex, directly upstream of outfall into Willamette River

MH = Manhole; CB = Catch Basin Data in red exceed single sample criterion of 406 MPN/100 mL. See Table 4 for more information.

Table 16.

Pringle Creek Pilot Project - *E. coli* Sampling (RY 2014/15)

Pringle Creek Pilot Projects - Goats			
Sample Location (Listed Upstream to Downstream)	**Sample Date**	**E.Coli (mpn/100mL)**	**Notes**
Pre- Goats			
Pringle Crk Community up 1	05/11/2015 08:25	20	
Pringle Crk community down 1	05/11/2015 08:38	119	
Pringle Crk Community up 2	05/11/2015 08:55	109	
Pringle Crk community down 2	05/11/2015 09:10	189	
Goats			
Pringle Crk Community up 1	05/15/2015 10:05	214	
Pringle Crk Community down 1	05/15/2015 10:32	96	
Pringle Crk Community up 2	05/15/2015 10:50	119	
Pringle Crk community down 2	05/15/2015 11:05	119	
Post-Goats			
PCC Up 1	05/26/2015 13:20	52	
PCC Up 1 Dup	05/26/2015 13:20	52	
PCC Up 1 Rep	05/26/2015 13:25	63	
PCC Down 1	05/26/2015 13:45	52	
PCC Up 2	05/26/2015 13:55	51	
PCC Down 2	05/26/2015 14:10	41	

Table 17.
Catch Basin Sediment Sampling Results (RY 2014/15)

Analyte	Units	Commercial			Residential			Industrial		
		minor street	moderate street	major street	minor street	moderate street	major street	minor street	moderate street	major street
Ag- Silver	mg/kg	**0.37**	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
As - Arsenic	mg/kg	**8.22**	**3.02**	**2.58**	**4.92**	**2.57**	**2.16**	**5.32**	**3.68**	**6.31**
Cd - Cadmnium	mg/kg	**1.3**	**0.5**	< 0.25	**1.38**	**0.3**	< 0.25	**0.46**	**0.8**	**0.64**
Cr - Chromium	mg/kg	**24.2**	**36**	**15.9**	**11.9**	**25.4**	**15.6**	**20.4**	**24.6**	**103**
Cu - Copper	mg/kg	**86.6**	**67.4**	**50.9**	**33.6**	**57.8**	**31.3**	**59.2**	**77.2**	**245**
K - Potassium	mg/kg	**380.1**	**566**	**397.9**	**525**	**817**	**372**	**442.6**	**582.5**	**761**
Mo - Molybdenum	mg/kg	**3.72**	**2.4**	**1.99**	**0.72**	**1.46**	**0.89**	**2.3**	**2.22**	**10.9**
Ni - Nickel	mg/kg	**17**	**18.1**	**16.2**	**15.4**	**16**	**15.6**	**18.5**	**23.1**	**72.2**
Pb - Lead	mg/kg	**69.2**	**97.6**	**14.8**	**56**	**42.2**	**9.02**	**19.8**	**73.2**	**39.3**
Se - Selenium	mg/kg	**1.81**	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	**1.24**	< 1.00
Zn - Zinc	mg/kg	**284**	**319**	**162**	**351**	**314**	**130**	**176**	**315**	**384**
Hg - Mercury	mg/kg	**0.0408**	**0.0295**	**0.04**	**0.054**	**0.0132**	**0.0107**	**0.018**	**0.0587**	**0.0294**
Total Solids	mg/kg	**359000**	**382000**	**688000**	**586000**	**691000**	**681000**	**718000**	**555000**	**744000**
Terphenyl-d14	PERCENT	49	127	112	139	315	107	129	0	112
Naphthalene	UG/KG	14.1	**101**	**62.7**	15.6	**39.2**	6.51	**25.7**	**298**	**123**
2-Methylnaphthalene	UG/KG	**67.2**	**173**	**21**	8.43	**19.6**	4.35	13.4	**242**	**36.5**
1-Methylnaphthalene	UG/KG	**41**	**106**	12.7	6.39	12.4	2.47	8.33	125	**16.5**
Acenaphthylene	UG/KG	14.1	**25**	10	3.46	**19.8**	2.58	8.22	**1710**	**40.7**
Acenaphthene	UG/KG	11.2	**67.1**	**47.2**	**31**	**30.7**	2.24	**42.1**	117	**38**
Fluorene	UG/KG	17	**131**	**40.2**	**33.3**	**34**	3.57	**34.3**	**231**	**38.4**
Phenanthrene	UG/KG	**28.7**	**440**	**237**	**336**	**243**	**31.9**	**122**	**825**	**238**
Anthracene	UG/KG	16.8	**112**	**29**	**43.6**	**40.2**	5.27	**28.2**	**498**	**45.8**
Fluoranthene	UG/KG	**44.6**	**534**	**271**	**426**	**752**	**58.2**	**308**	**5800**	**411**
Pyrene	UG/KG	**46.9**	**607**	**324**	**392**	**808**	**72**	**336**	**9880**	**556**
Benzo(a)anthracene	UG/KG	**19.6**	**85.1**	**78.8**	**118**	**272**	12	**133**	**2500**	**131**
Chrysene	UG/KG	**24.2**	**159**	**94.9**	**196**	**471**	**33.3**	**163**	**3250**	**162**
Benzo(b)fluoroanthene	UG/KG	**30**	**191**	**165**	**178**	**479**	4.94	**281**	**4470**	**303**
Benzo(k)fluoranthene	UG/KG	8.65	9.31	5.99	9.17	**171**	6.84	**106**	**1740**	6.75
Benzo(a)pyrene	UG/KG	**22.1**	**129**	**104**	**130**	**282**	3.38	**158**	**4600**	**181**
Indeno(1,2,3-c,d)pyrene	UG/KG	10.5	**49.1**	**52.2**	**45.3**	**112**	5.34	**74.4**	**3140**	**89.2**
Dibenzo(a,h)anthracene	UG/KG	6.2	6.67	4.29	6.57	4.85	4.9	4.72	**652**	4.84
Benzo(g,h,i)perylene	UG/KG	**19.3**	**119**	**114**	**64.2**	**166**	5.34	**127**	**4200**	**200**
TPH-Diesel	MG/KG	**1010**	**750**	**380**	418	**477**	**413**	242	**469**	**584**
o-Terphenyl	PERCENT	0	0	0	0	0	0	0	0	0
Octacosane	PERCENT	0	0	0	0	0	0	0	0	0
Percent Moisture	PERCENT	48.3	50.5	22.9	49.8	31.5	33.7	29.7	40.7	32.6

Results in **BOLD** exceed the reporting limit for that Analyte (reporting limits for each site vary based on dilution factor). See Attachment F for full analytical report. See Attachment E for Standard Operating Procedure which describes site information.

Table 18.
Saddle Club Subsurface Gravel Treatment Wetland Data (RY 2014/15)

Saddle Club- IN	E. coli	cond	DO	temp	pH	Cu	Zn	Cu (Dis)	Zn (Dis)	BOD5	Cond (comp)	Hard	NH3	NO3/NO2	Ortho P	Pb	(Pb Dis)	TP	TSS
Date/Time	MPN/100 mL	uS/cm	mg/L	°C	S.U	mg/L	mg/L	mg/L	mg/L	mg/L	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/23/2014 22:40	649	140.9	7.04	19.7	7.06														
09/24/2014 00:25	1439	19	9.16	18.6	6.81														
09/24/2014 11:40						0.0171	0.0296	0.0144	0.0233	5.1	35.4	19	0.132	0.25	0.244	<0.0005	<0.0005	0.158	89.6
01/15/2015 18:35	12	66.5	11.49	6.28	6.58														
01/15/2015 20:04	13	31.1	11.64	5.89	6.86														
1/16/2015 9:21						0.004	0.0528	<0.0025	0.0324	2.1	28.6	12	<0.05	0.48	0.018	0.0006	<0.0005	0.079	19.6

Saddle Club- OUT	E. coli	cond	DO	temp	pH	Cu	Zn	Cu (Dis)	Zn (Dis)	BOD5	Cond (comp)	Hard	NH3	NO3/NO2	Ortho P	Pb	Pb (Dis)	TP	TSS
Date/Time	MPN/100 mL	uS/cm	mg/L	°C	S.U	mg/L	mg/L	mg/L	mg/L	mg/L	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
09/24/2014 09:30	>2420	No Water in the Outlet																	
09/24/2014 09:35	>2420	No Water in the Outlet																	
09/24/2014 11:50	>2420					0.0264	0.017	0.0248	0.017	8.7	253	110	<0.05	0.05	0.059	<0.0005	<0.0005	0.095	4.2
01/15/2015 18:41	<1	117.6	1.27	7.5	6.32														
01/15/2015 20:15	<1	121.6	0.88	7.73	6.38														
01/16/2015 09:06	<1					0.0108	0.005	0.0098	0.0036	2	104	54	<0.05	0.06	0.141	<0.0005	<0.0005	0.208	0.4

Note: Results from 9/24/2014 show an increase in E. coli bacteria at the outlet; this is likely due in part to being a first flush event of the season and the basin was completely dry before the storm.

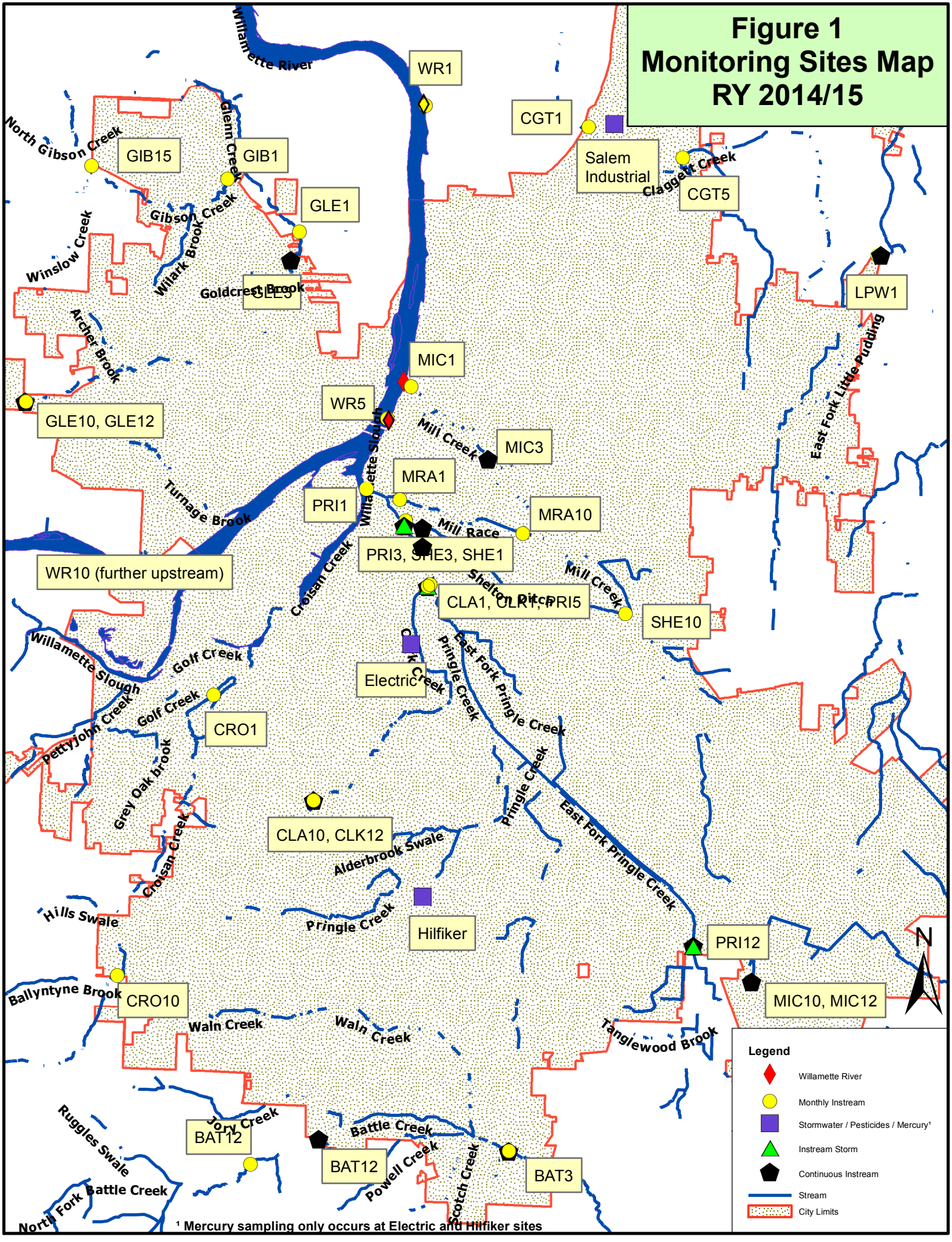
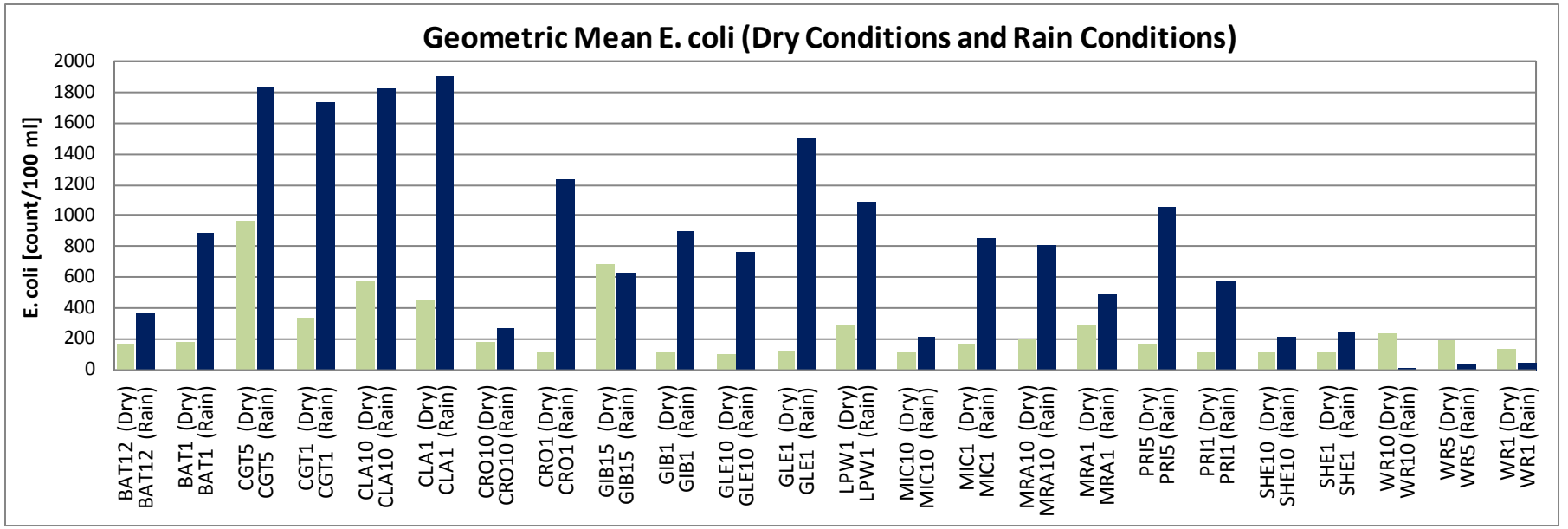
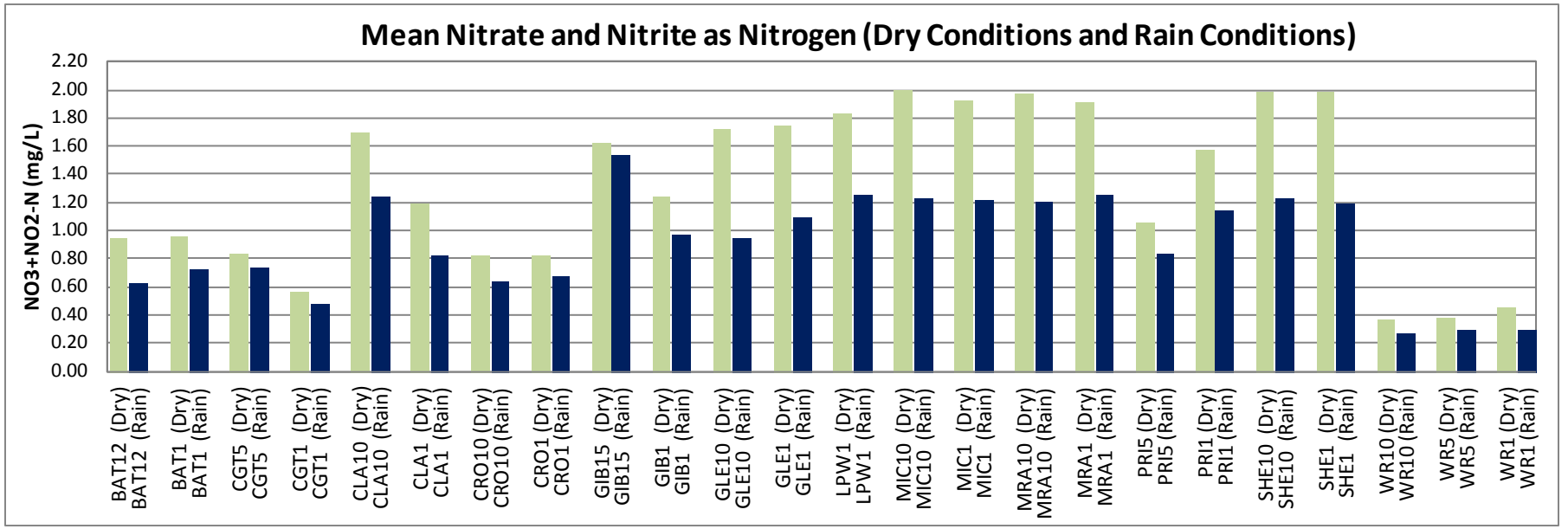


Figure 1
Monitoring Sites Map
RY 2014/15
Willamette River
WR1
CGT1
Salem Industrial
Claggett Creek
CGT5
North Gibson Creek
GIB15
Glenn Creek
GIB1
Gibson Creek
GLE1
Winslow Creek
Willark Brook
Goldcrest Brook
GLE5
LPW1
Archer Brook
East Fork Little Pudding
MIC1
WR5
GLE10, GLE12
Willamette Slough
Mill Creek
MIC3
MRA1
PRI1
Turnage Brook
MRA10
Mill Race
PRI3, SHE3, SHE1
WR10 (further upstream)
Croisan Creek
Shelton Ditch
CLA1, CLK1, PRI5
Mill Creek
SHE10
Willamette Slough
Golf Creek
Clk Creek
Pringle Creek
East Fork Pringle Creek
Electric
Golf Creek
CRO1
PettyJohn Creek
Grey Oak brook
Pringle Creek
East Fork Pringle Creek
CLA10, CLK12
Croisan Creek
Alderbrook Swale
Hills Swale
Pringle Creek
Hilfiker
PRI12
N
Ballyntyne Brook
CRO10
MIC10, MIC12
Waln Creek
Waln Creek
Tanglewood Brook
Legend
Willamette River
Monthly Instream
Stormwater / Pesticides / Mercury¹
Instream Storm
Continuous Instream
Stream
City Limits
Ruggles Swale
Jory Creek
BAT12
Battle Creek
BAT12
Powell Creek
Scotch Creek
BAT3
North Fork Battle Creek
¹ Mercury sampling only occurs at Electric and Hilfiker sites

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2014/15)

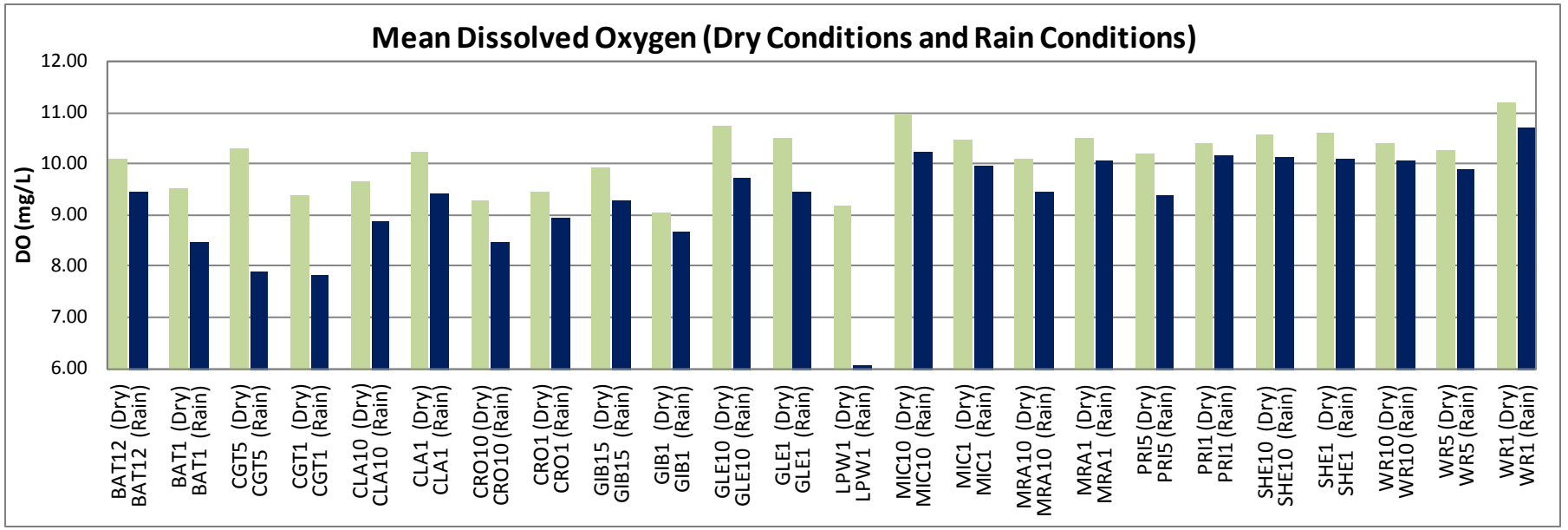


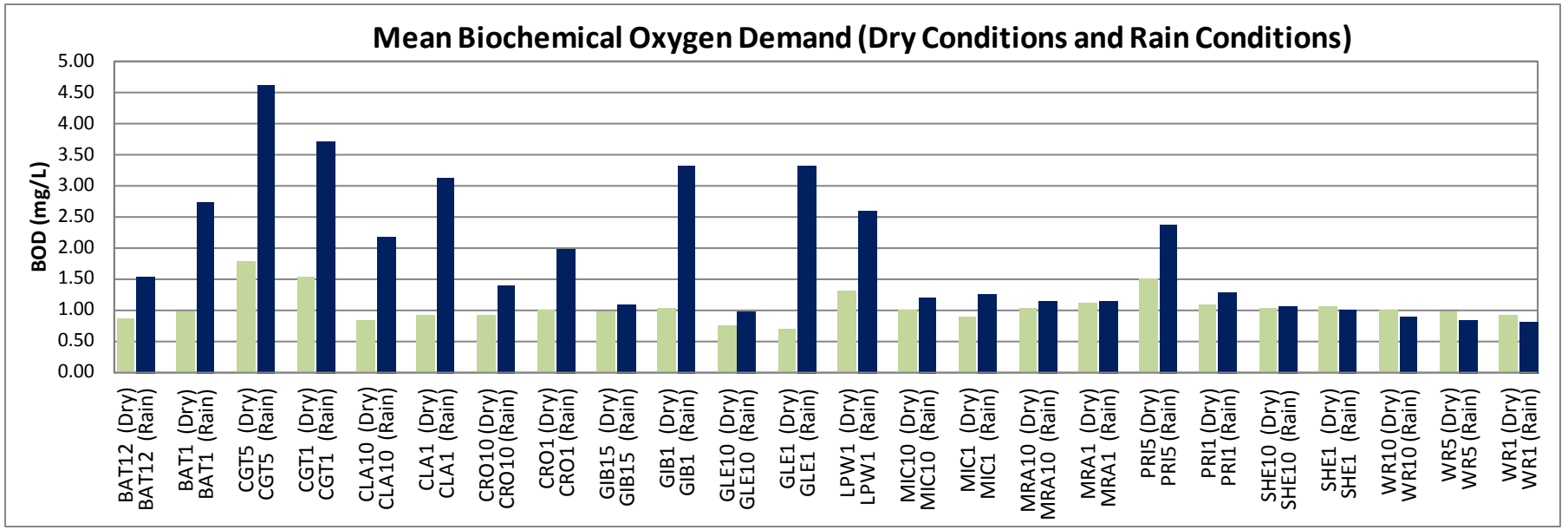


Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2014/15)

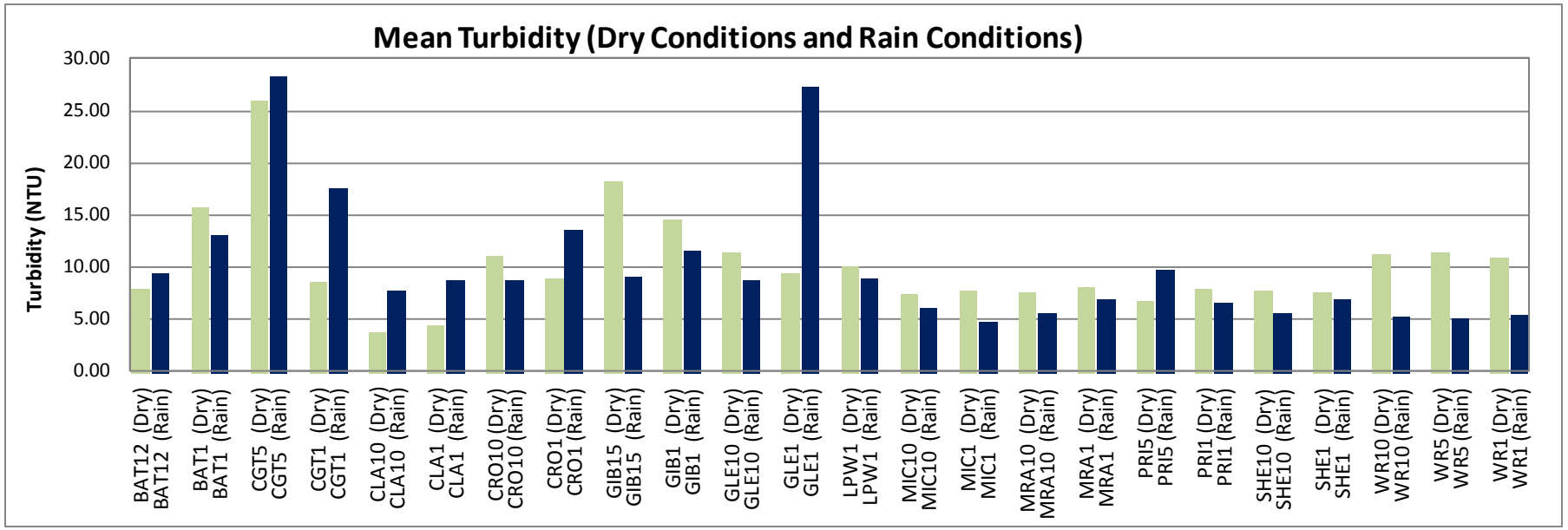


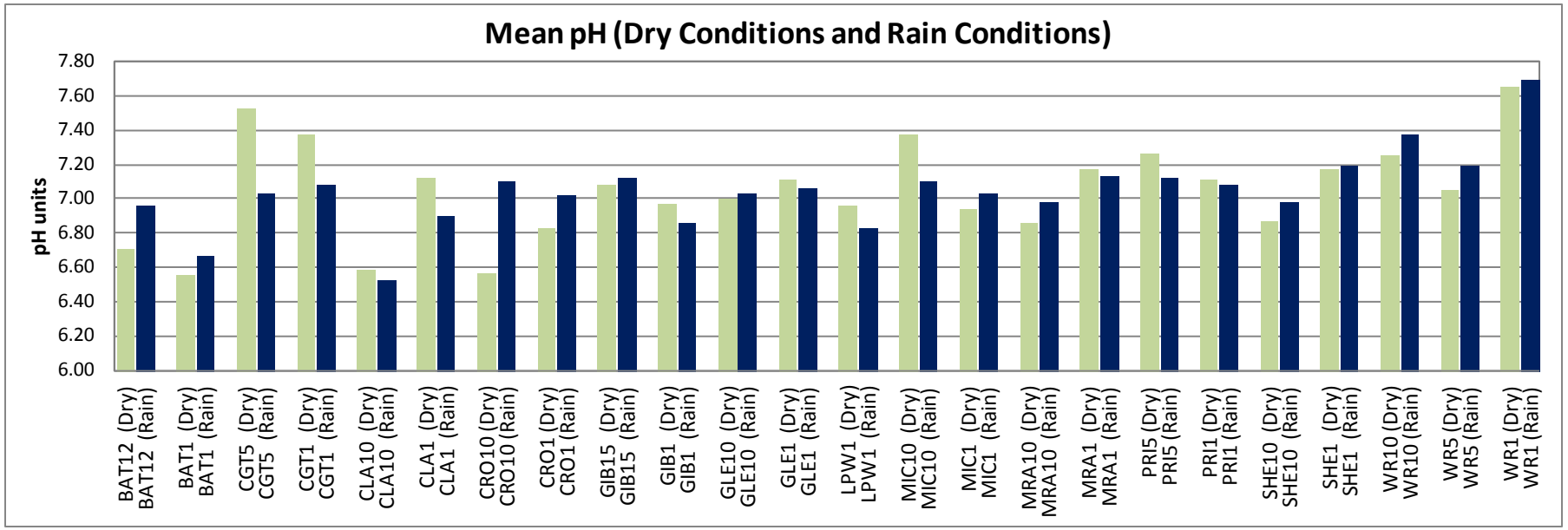


Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2014/15)

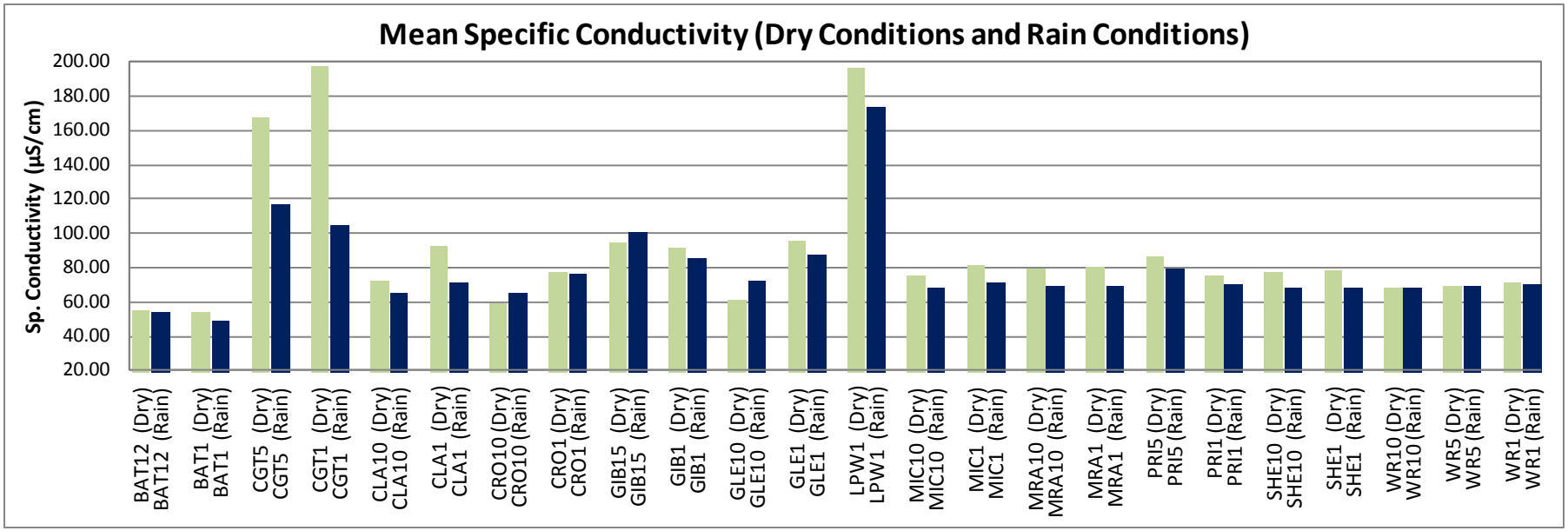




Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

Figure 2

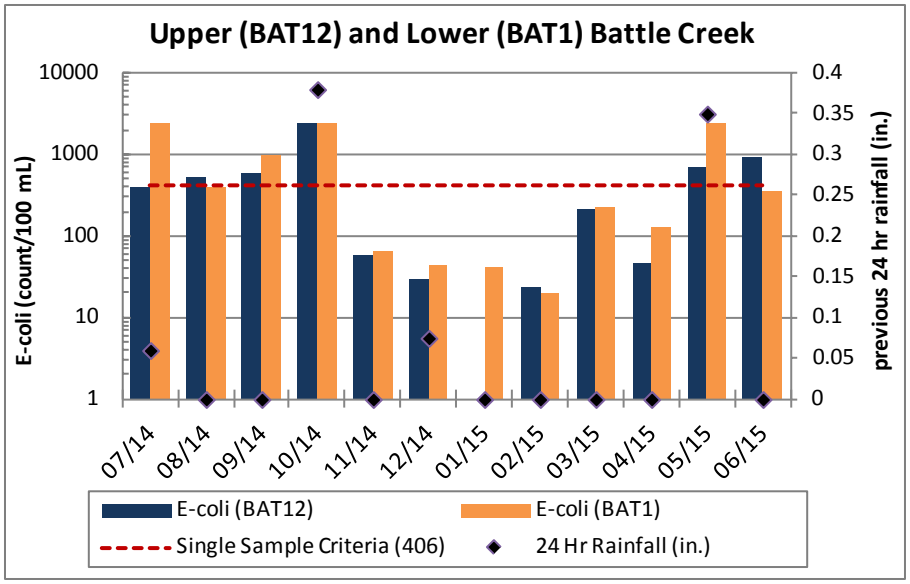
Monthly Instream Mean Value Comparison for Dry and Rain Conditions (RY 2014/15)

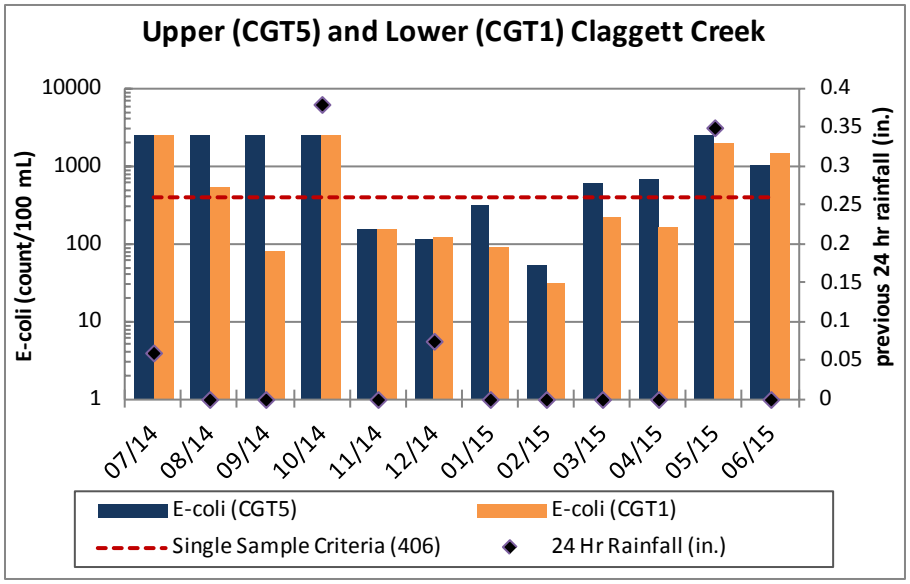


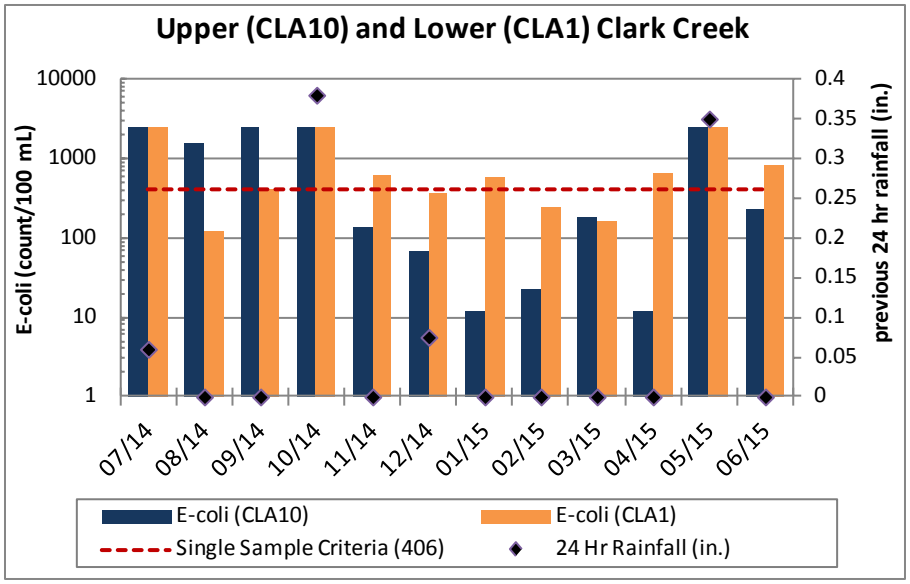
Dry conditions defined as less than 0.05 inches of rainfall in the 24 hours prior to sample collection; **rain** conditions defined as greater than or equal to 0.05 inches of rainfall in the 24 hours prior to sample collection.

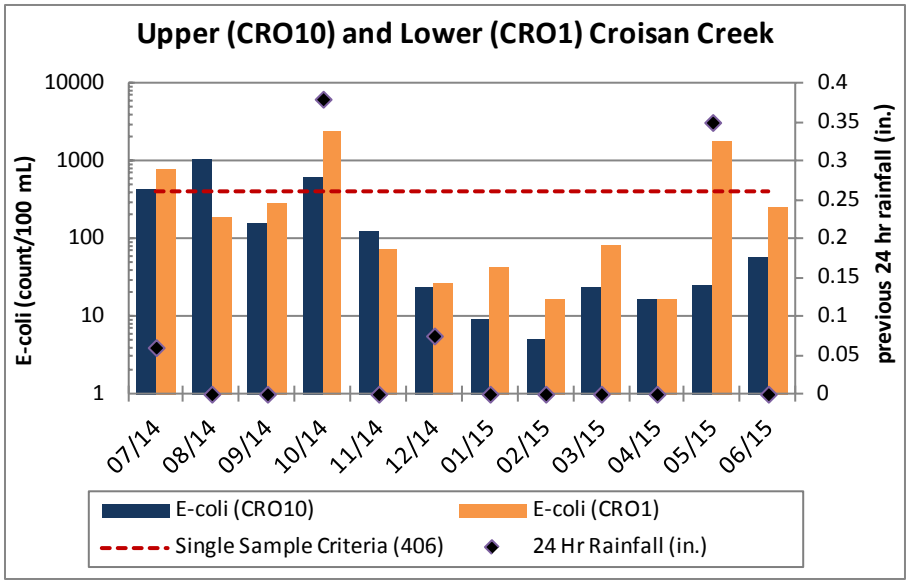
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (RY 2014/15)





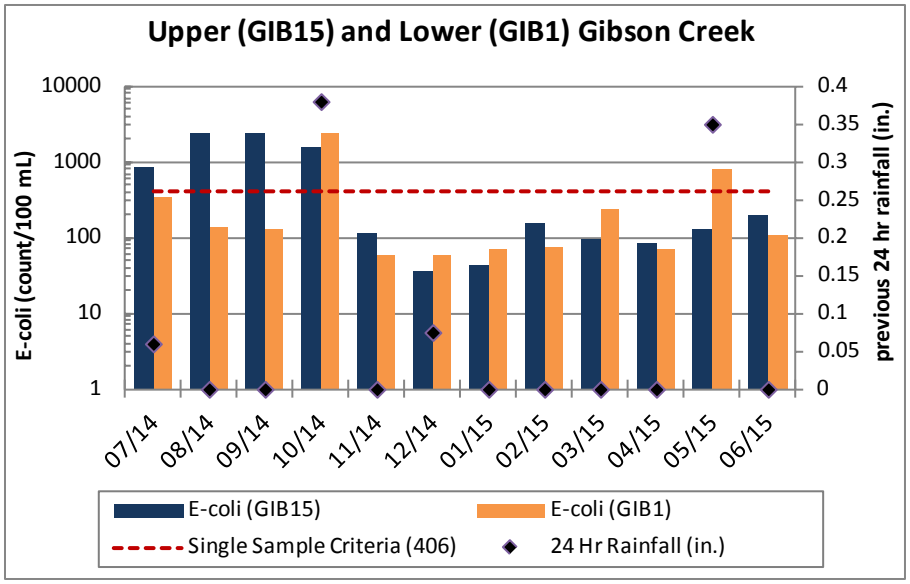


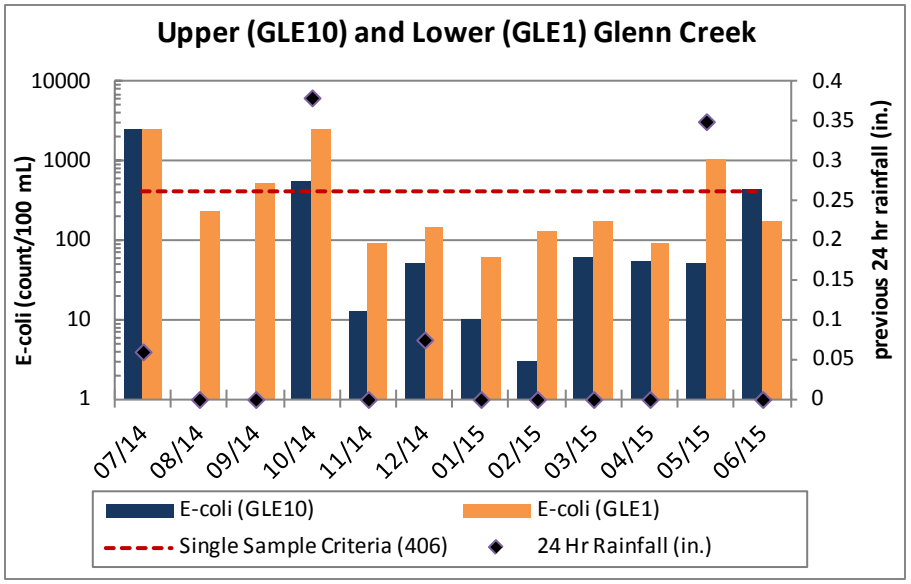


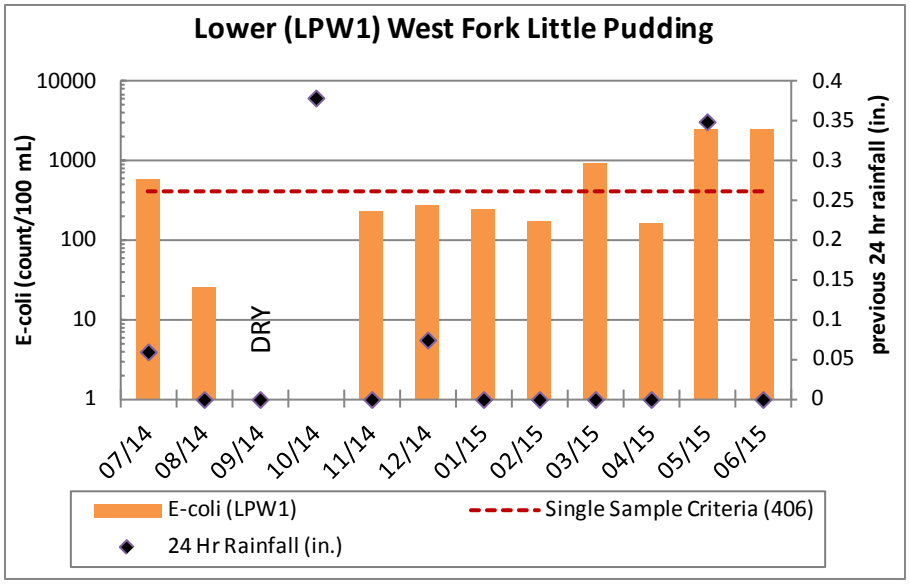
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

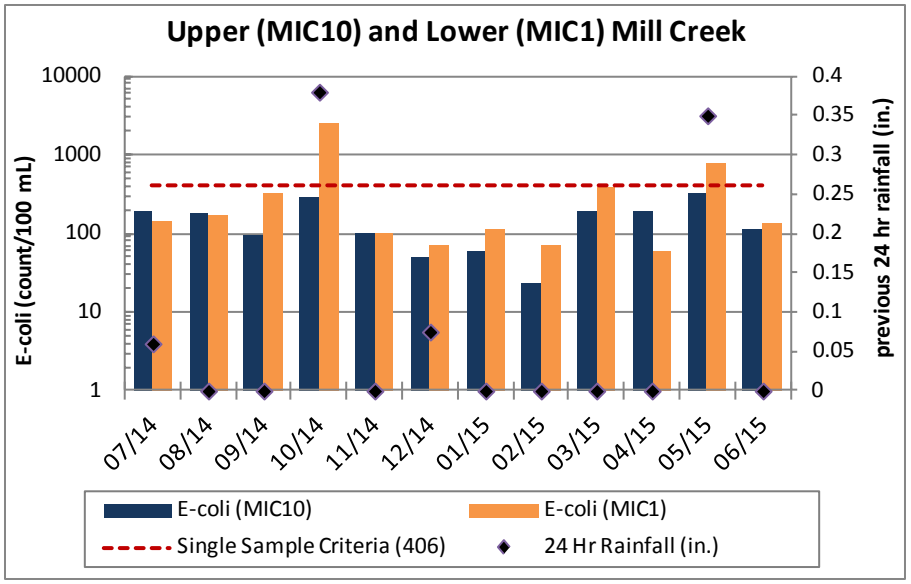
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (RY 2014/15)





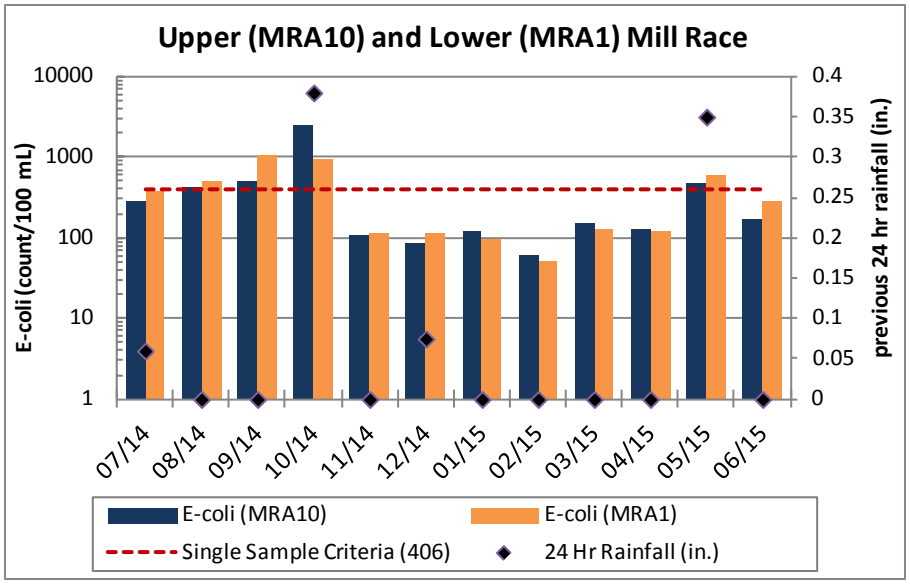


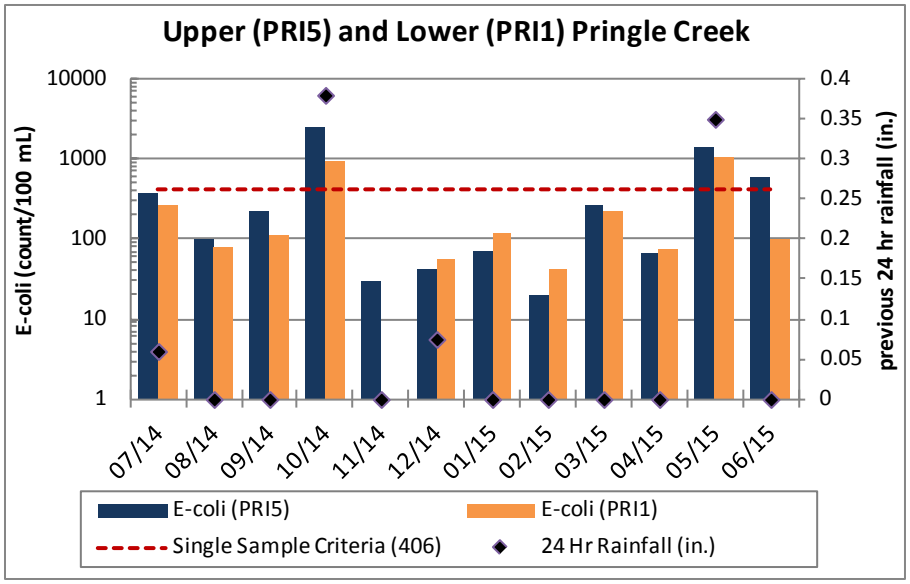


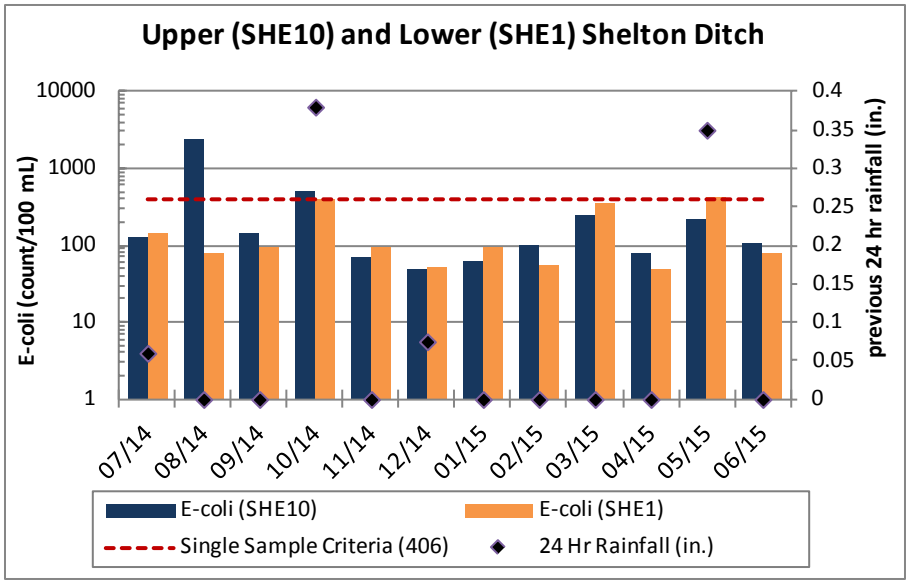
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

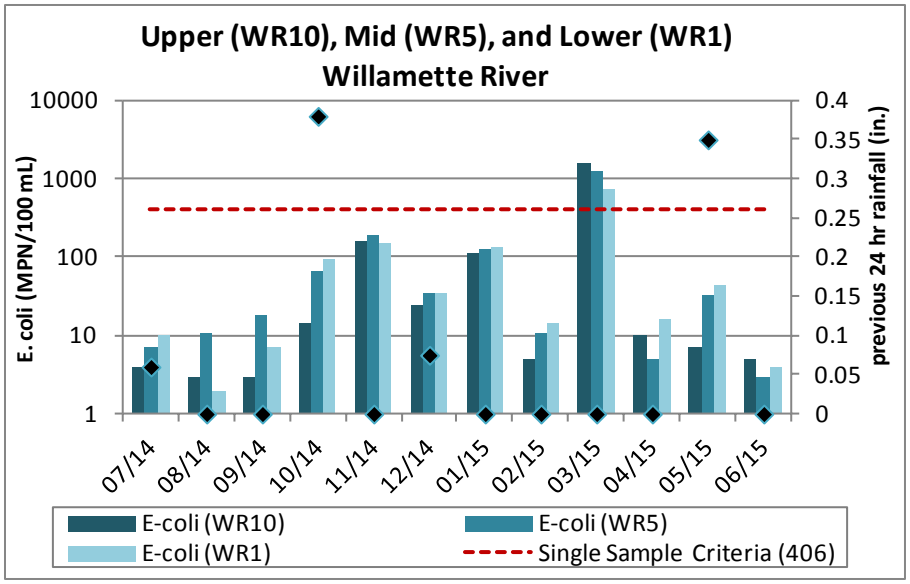
Figure 3

Monthly Instream E. Coli Upstream / Downstream Site Comparison (RY 2014/15)





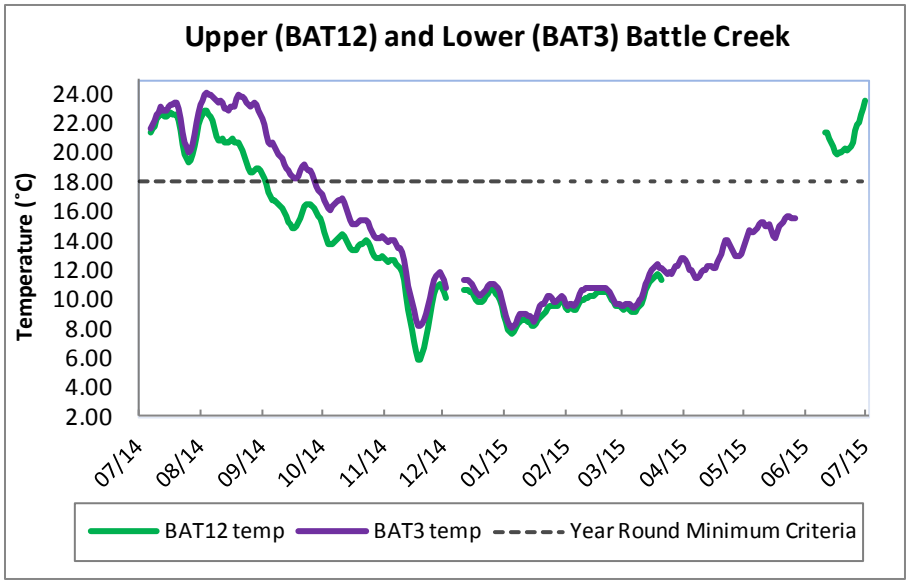


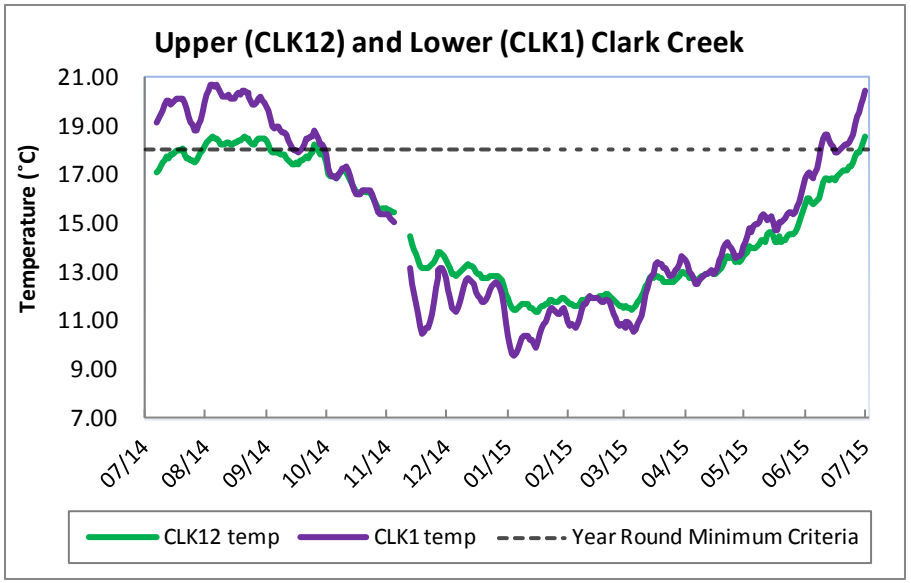


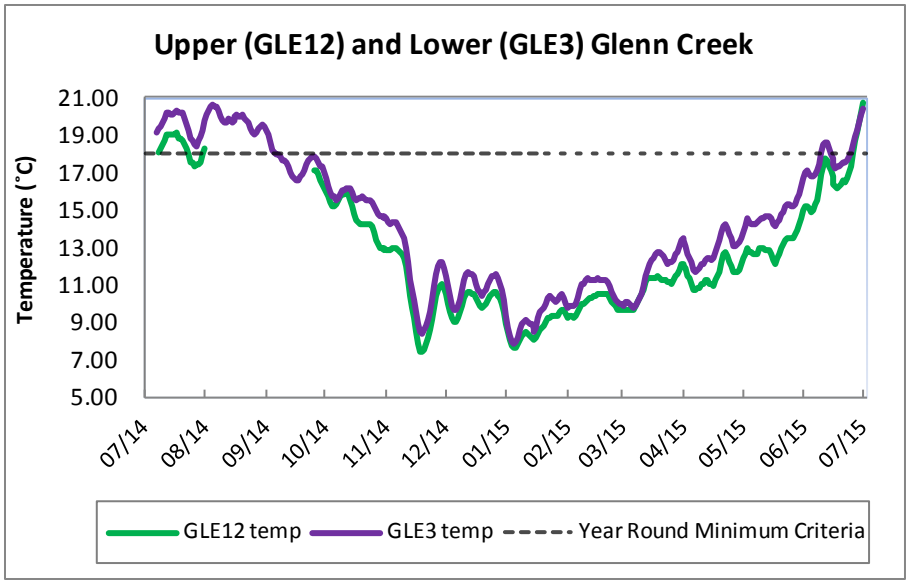
If 24 hour rainfall depth prior to sample collection differed between upstream and downstream sites, the average rainfall of the two sites was used.

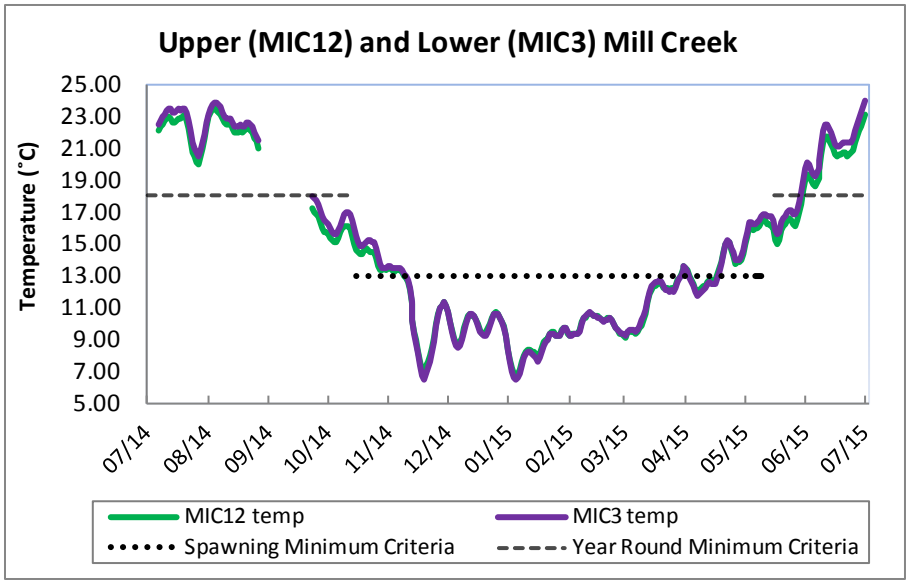
Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum (RY 2014/15)









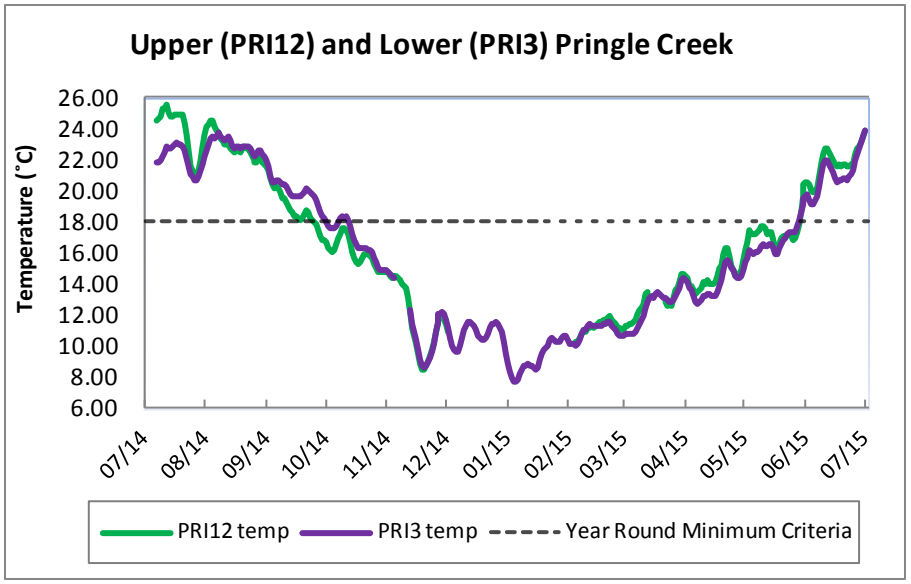
Presented temperature data consists of A grade data with greater than 80% of data points collected per day.

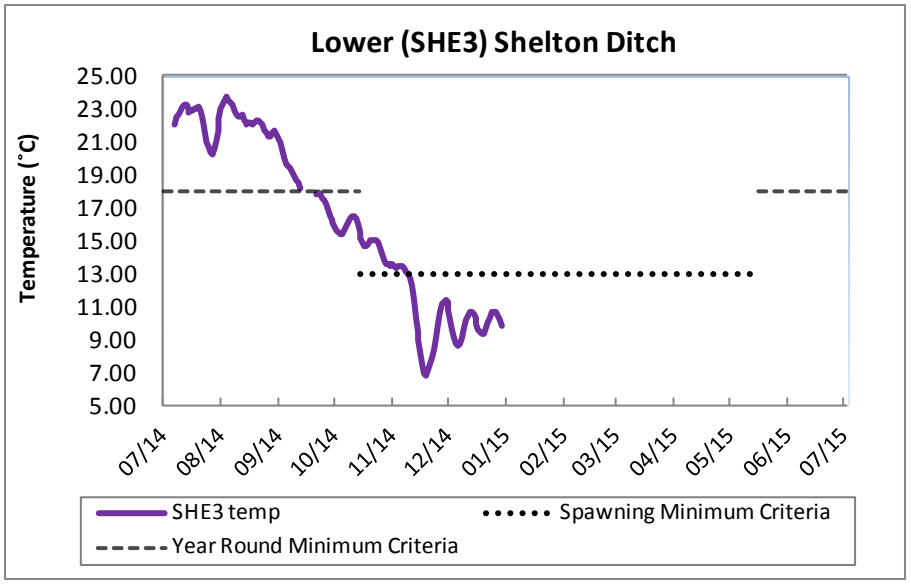
Temperature Criteria as defined in OAR 340-041-0028 and OAR-340-0340, Tables 340A and 340B.

- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13˚C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18˚C.

Figure 4

Continuous Instream Temperature 7-Day Moving Average Maximum (RY 2014/15)





Note: Shelton Ditch water quality datasonde was removed January 2015 due to upcoming bridge removal and will not be replaced until December 2015.

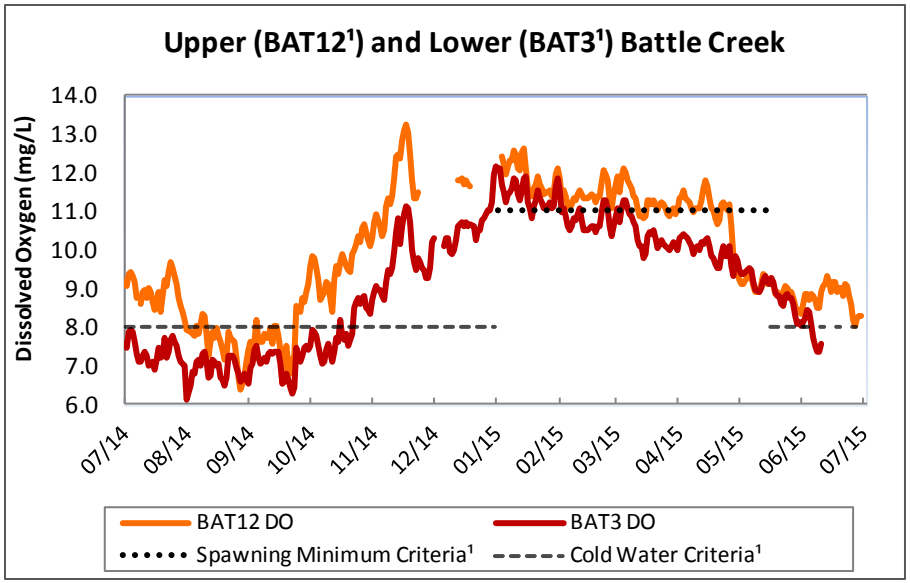
Presented temperature data consists of A grade data with greater than or equal to 80% of data points collected per day.

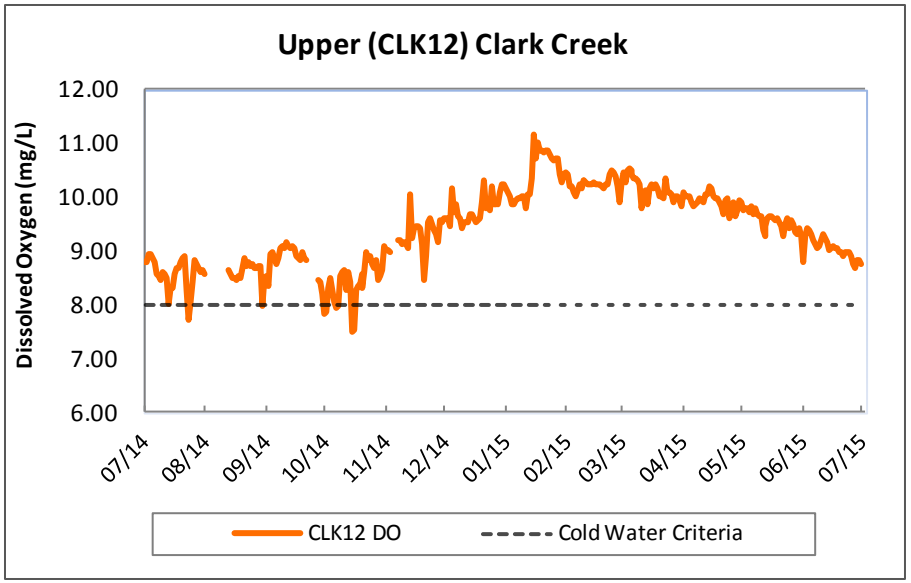
Temperature Criteria as defined in OAR 340-041-0028 and OAR-340-0340, Tables 340A and 340B.

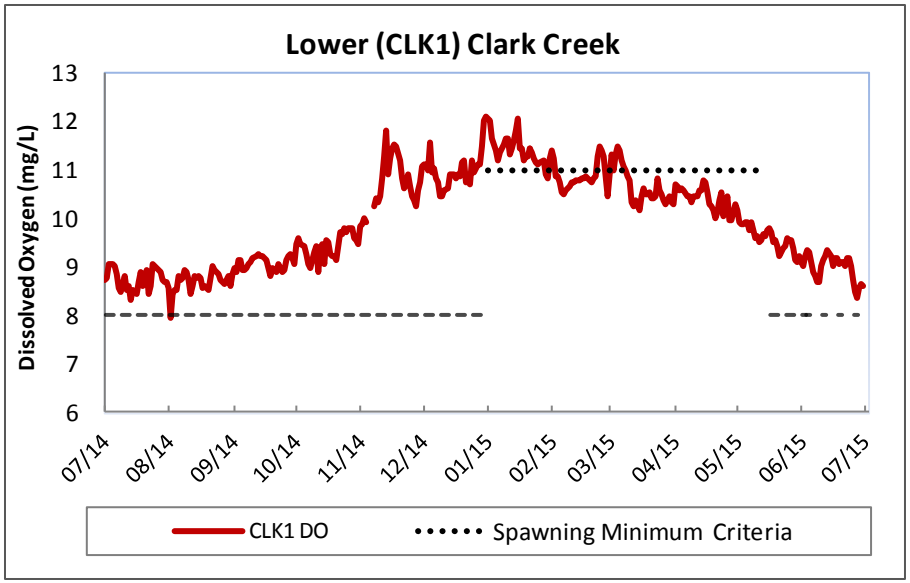
- Spawning Minimum Criteria for applicable streams may not exceed 7-day average maximum of 13˚C.
- Year Round Minimum Criteria may not exceed 7-day average maximum of 18˚C.

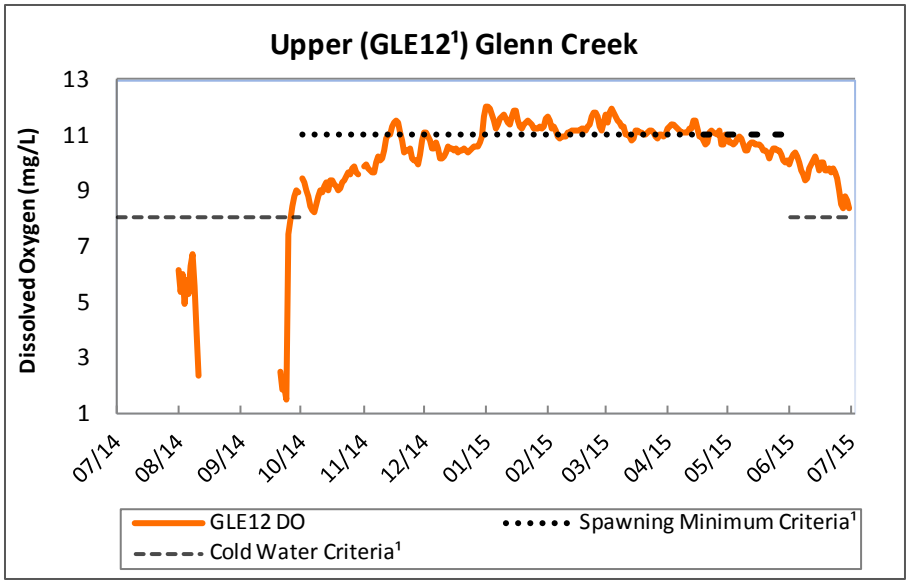
Figure 5

Continuous Instream Dissolved Oxygen Daily Mean (RY 2014/15)









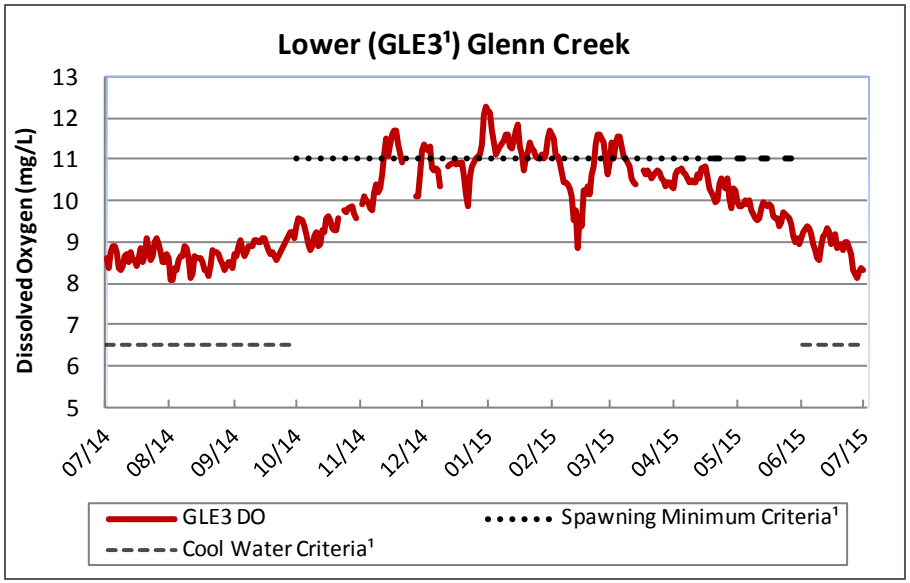
Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day.

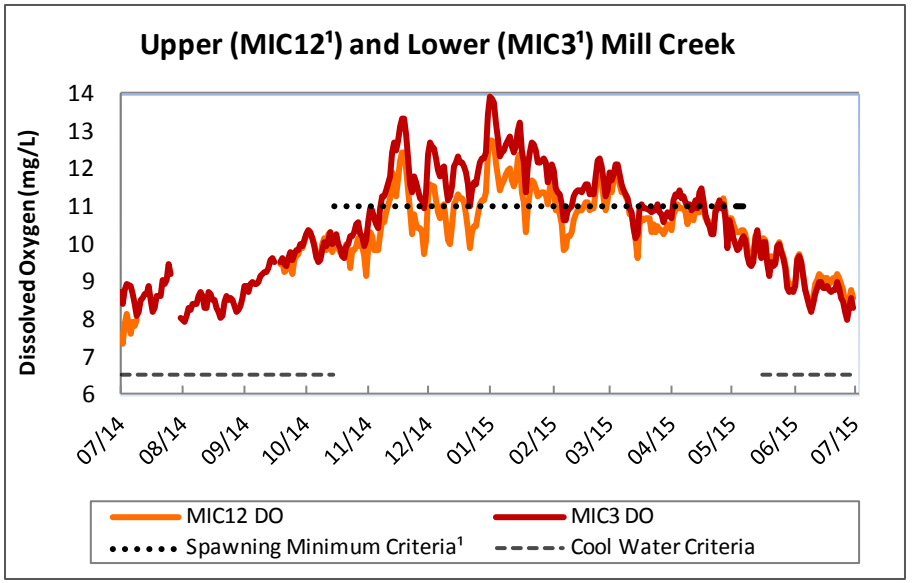
DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B.

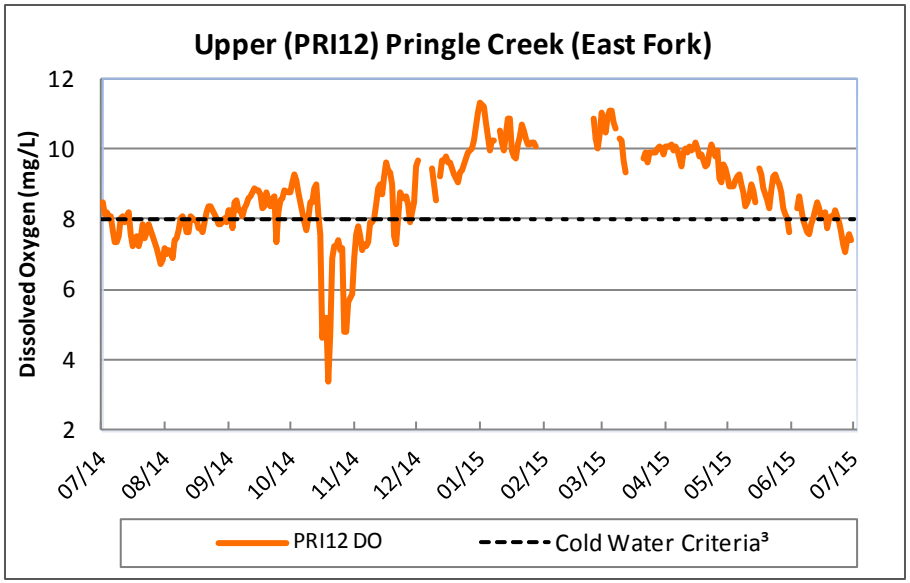
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L .
- Cold Water Criteria for applicable streams may not be less than 8 mg/L.

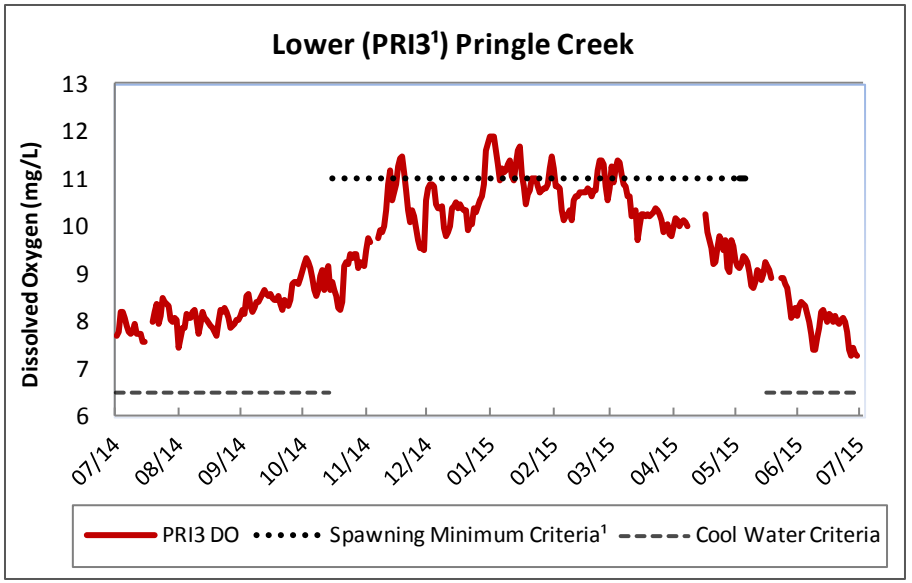
[1] Oregon's 2010 Integrated Report Section 303(d) listed.

Figure 5
Continuous Instream Dissolved Oxygen Daily Mean (RY 2014/15)









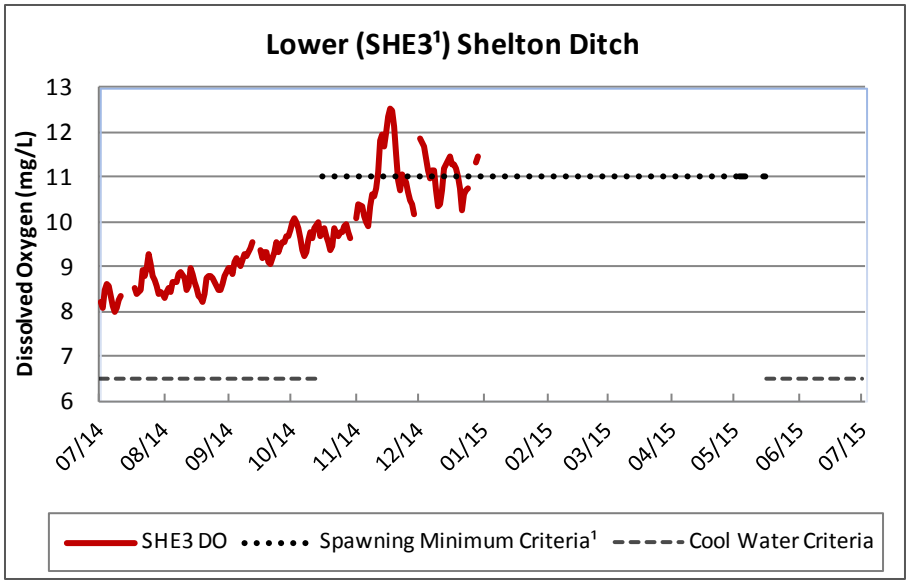
Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day.
DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B.

- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L .
- Cool Water Criteria for applicable streams may not be less than 6.5 mg/L.

[1] Oregon's 2010 Integrated Report Section 303(d) listed.

Figure 5

Continuous Instream Dissolved Oxygen Daily Mean (RY 2014/15)



Note: Water quality datasonde was removed January 2015 due to upcoming bridge removal and will not be replaced until December 2015.

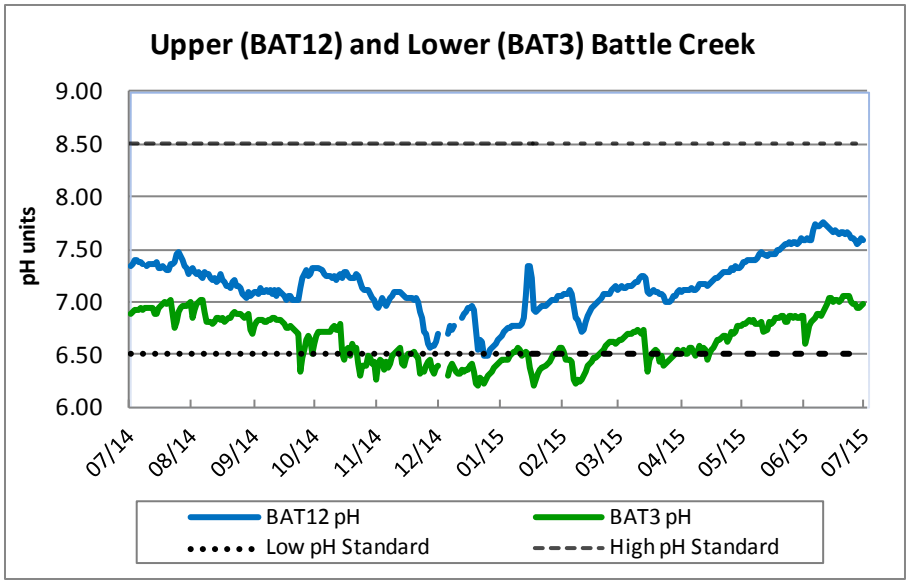
Presented DO data consists of A and B grade data with greater than or equal to 80% of data points collected per day.

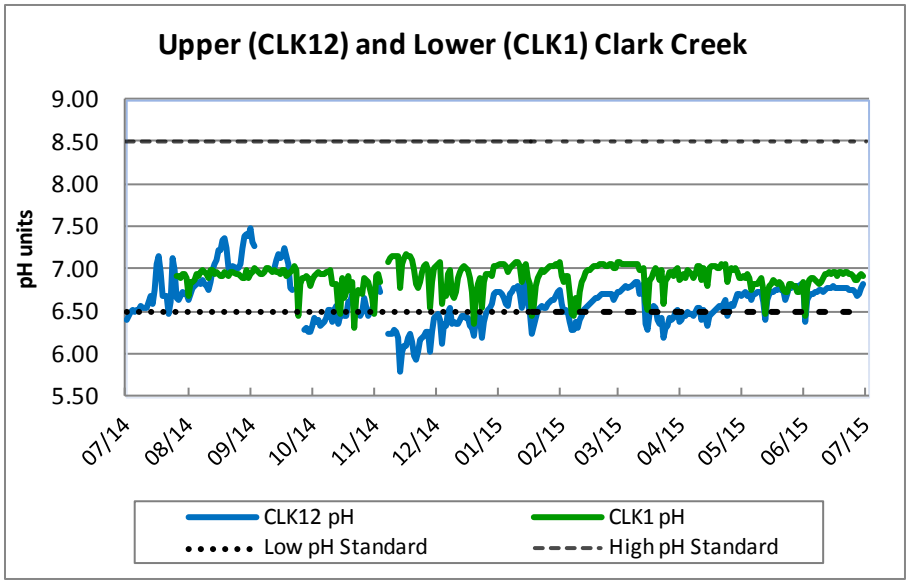
DO Criteria as defined in OAR 340-041-0016 and OAR-340-0340, Tables 340A and 340B.

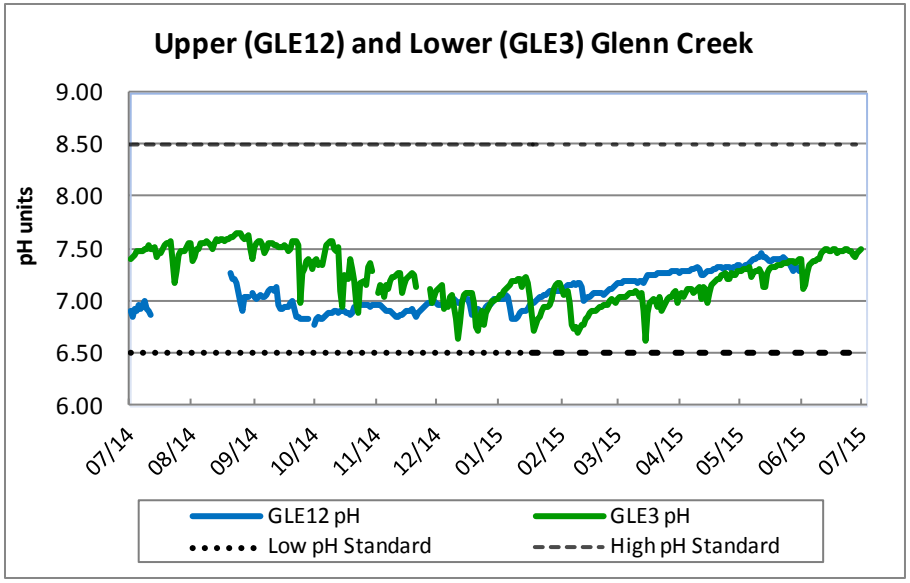
- Spawning Minimum Criteria for applicable streams may not be less than 11 mg/L .
- Cool Water Criteria for applicable streams may not be less than 6.5 mg/L.

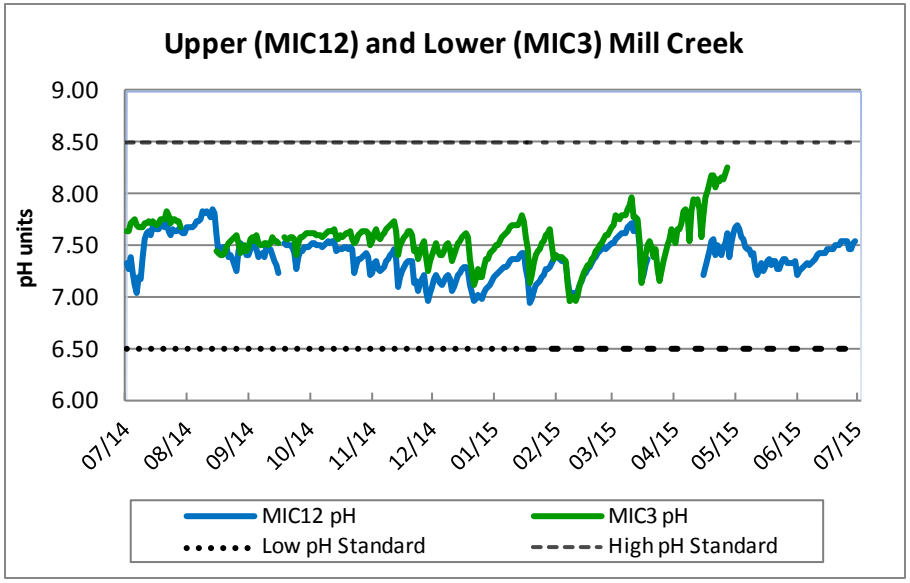
[1] Oregon's 2010Integrated Report Section 303(d) listed.

Figure 6
Continuous Instream pH Daily Mean (RY 2014/15)



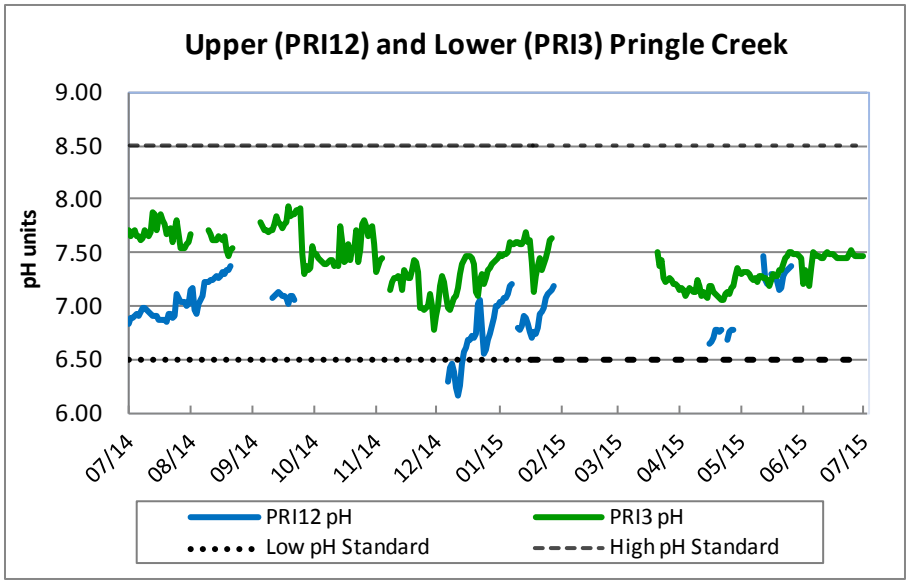


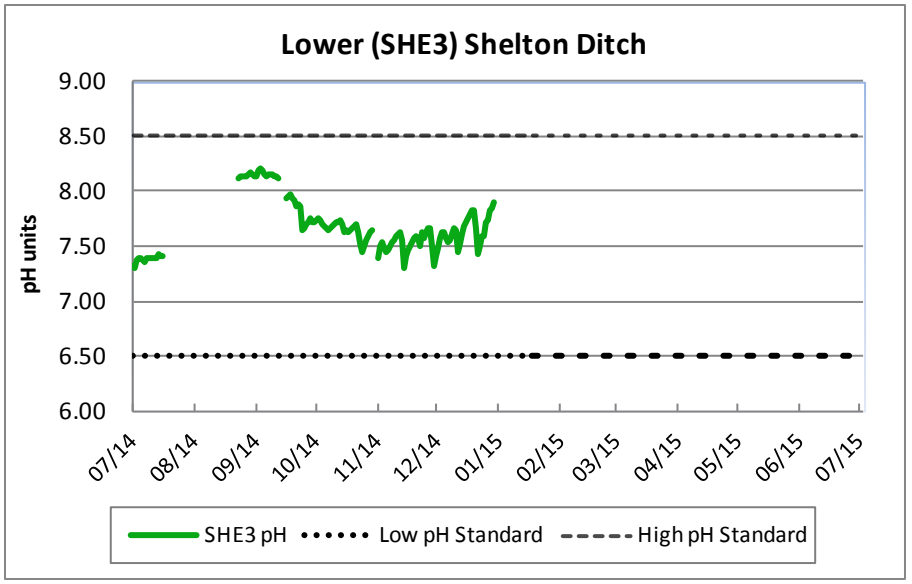




Presented pH data consists of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035, Water Quality Standards for the Willamette Basin, pH may not fall outside the ranges of 6.5 to 8.5.

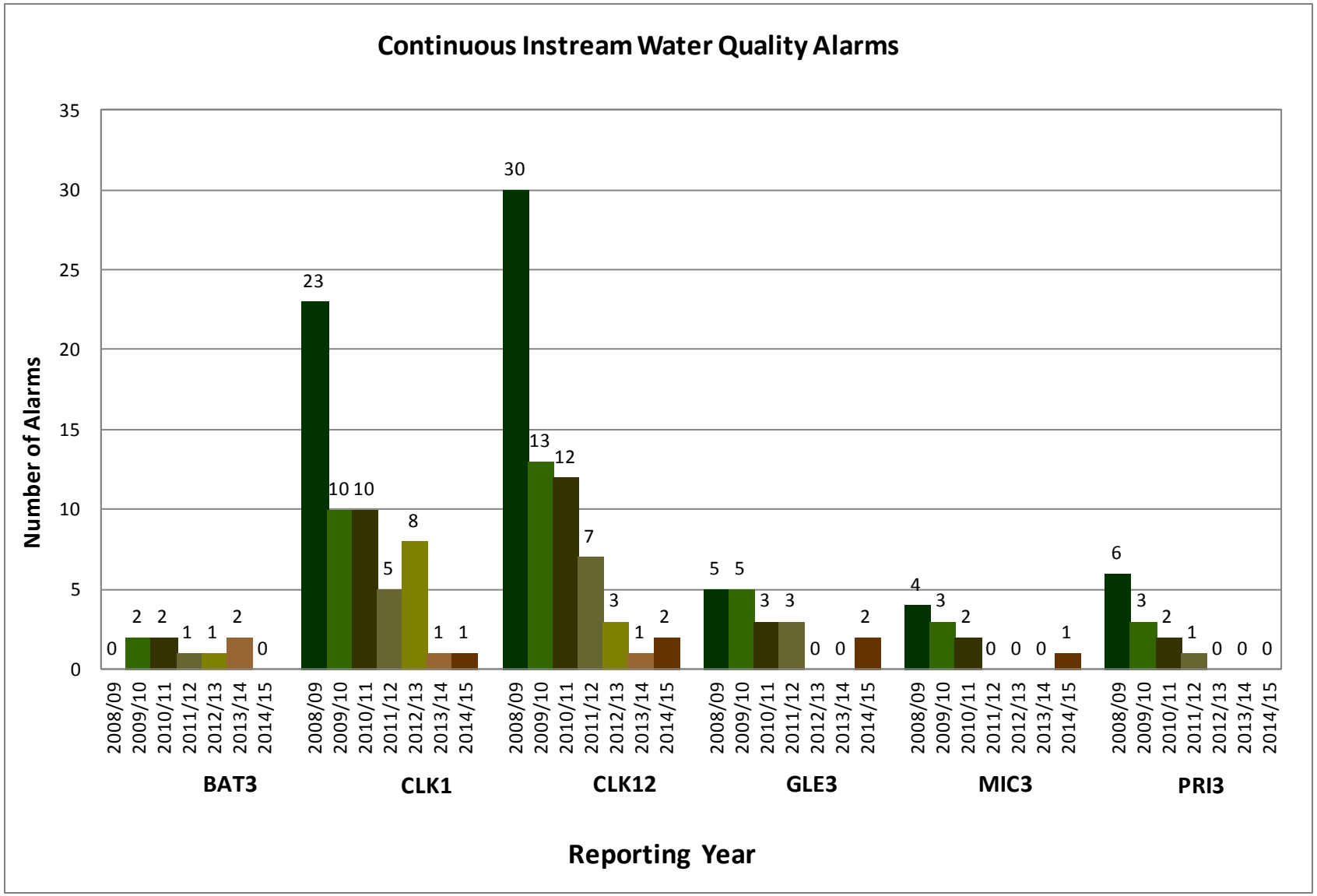
Figure 6
Continuous Instream pH Daily Mean (RY 2014/15)





Note: Shelton Ditch Water quality datasonde was removed January 2015 due to upcoming bridge removal and will not be replaced until December 2015.
Presented pH data consists of A and B grade data with greater than or equal to 80% of data points collected per day.
As defined in OAR 341-041-0035, Water Quality Standards for the Willamette Basin, pH may not fall outside the ranges of 6.5 to 8.5.

Figure 7
Continuous Instream Water Quality Alarms (RY 2008/09 to 2014/15)



Note: The alarm counts have been filtered, based on best professional judgment, to remove alarms resulting from: rain events, non-prohibited activities identified in Schedule A.4.a.xii in the City's NPDES MS4 permit, permitted activities during the in-water work period, and wildlife activity.
The continuous telemetry network was compromised by a radio that was locked in transmitter mode; thus, beginning in April 2014, alarm notification was not received by the City's dispatch center, contributing to a lower number of alarms. This issue was not resolved until August 2014.

ATTACHMENT A. Analytical Report for Pesticide Screening, Pacific Agricultural Laboratory (December 4, 2014).

Pacific Agricultural Laboratory
12505 N.W. Cornell Rd. • Portland, OR 97229-5651 • Ph 503.626.7943 • Fx 503.641.0644

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Analytical Report

Client Sample ID: Electric
Matrix: water

PAL Sample ID: P142477-01
Sample Date: 12/4/14

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
12/08/14	12/12/14	MR Pesticides	Not Detected	See Analyte List	
Surrogate Recovery: 100 %					
Surrogate Recovery Range: 60-140					
(DCBP used as Surrogate)					
Method: EPA 8151A (GC-MS)					
12/08/14	12/12/14	2,4,5-T	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4,5-TP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-D	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-DB	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Acifluorfen	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Bentazon	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Clopyralid	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dicamba	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dichlorprop	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dinoseb	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPA	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Picloram	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Quinclorac	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Triclopyr	Not Detected	0.080 ug/L	
Surrogate Recovery: 86 %					
Surrogate Recovery Range: 18-134					
(DCPAA used as Surrogate)					

Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Analytical Report

Client Sample ID: Hilfiker
Matrix: water

PAL Sample ID: P142477-02
Sample Date: 12/4/14

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
12/08/14	12/12/14	MR Pesticides	Not Detected	See Analyte List	
Surrogate Recovery: 102 %					
Surrogate Recovery Range: 60-140					
(DCBP used as Surrogate)					
Method: EPA 8151A (GC-MS)					
12/08/14	12/12/14	2,4,5-T	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4,5-TP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-D	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-DB	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Acifluorfen	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Bentazon	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Clopyralid	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dicamba	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dichlorprop	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dinoseb	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPA	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Picloram	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Quinclorac	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Triclopyr	Not Detected	0.080 ug/L	
Surrogate Recovery: 95 %					
Surrogate Recovery Range: 18-134					
(DCPAA used as Surrogate)					

Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial
Matrix: water

PAL Sample ID: P142477-03
Sample Date: 12/4/14

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
12/08/14	12/9/14	Propiconazole	0.64 ug/L	0.15 ug/L	
12/08/14	12/12/14	Other Pesticides	Not Detected	See Analyte List	
Surrogate Recovery: 92 %					
Surrogate Recovery Range: 60-140					
(DCBP used as Surrogate)					
Method: EPA 8151A (GC-MS)					
12/08/14	12/12/14	2,4,5-T	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4,5-TP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-D	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-DB	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Acifluorfen	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Bentazon	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Clopyralid	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dicamba	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dichlorprop	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dinoseb	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPA	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Picloram	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Quinclorac	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Triclopyr	Not Detected	0.080 ug/L	
Surrogate Recovery: 99 %					
Surrogate Recovery Range: 18-134					
(DCPAA used as Surrogate)					

Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Analytical Report

Client Sample ID: Salem Industrial Dup
Matrix: water

PAL Sample ID: P142477-04
Sample Date: 12/4/14

Extraction Date	Analysis Date	Analyte	Amount Detected	Limit of Quantitation	Notes
Method: Multiresidue Profile					
12/08/14	12/9/14	Propiconazole	1.7 ug/L	0.15 ug/L	
12/08/14	12/12/14	Other Pesticides	Not Detected	See Analyte List	
Surrogate Recovery: 100 %					
Surrogate Recovery Range: 60-140					
(DCBP used as Surrogate)					
Method: EPA 8151A (GC-MS)					
12/08/14	12/12/14	2,4,5-T	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4,5-TP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-D	Not Detected	0.080 ug/L	
12/08/14	12/12/14	2,4-DB	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Acifluorfen	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Bentazon	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Clopyralid	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dicamba	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dichlorprop	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Dinoseb	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPA	Not Detected	0.080 ug/L	
12/08/14	12/12/14	MCPP	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Picloram	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Quinclorac	Not Detected	0.080 ug/L	
12/08/14	12/12/14	Triclopyr	Not Detected	0.080 ug/L	
Surrogate Recovery: 100 %					
Surrogate Recovery Range: 18-134					
(DCPAA used as Surrogate)					

Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Quality Assurance

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
Method: EPA 8151A (GC-MS)						
12/8/14	12/12/14	4120502-BLK1	2,4,5-T	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	2,4,5-TP	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	2,4-D	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	2,4-DB	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Acifluorfen	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Bentazon	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Clopyralid	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Dicamba	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Dichlorprop	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Dinoseb	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	MCPA	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	MCPP	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Picloram	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Quinclorac	Not Detected	< 0.080 ug/L	
12/8/14	12/12/14	4120502-BLK1	Triclopyr	Not Detected	< 0.080 ug/L	

Method Blank Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
Method: Multiresidue Profile						
12/8/14	12/12/14	4120503-BLK1	MR Pesticides	Not Detected	<LoQ	

Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
12/8/14	12/12/14	4120502-BS1	2,4-D	80	20-124	
12/8/14	12/12/14	4120502-BSD1	2,4-D	95	20-124	
12/8/14	12/12/14	4120502-BS1	Dicamba	94	32-123	
12/8/14	12/12/14	4120502-BSD1	Dicamba	95	32-123	
12/8/14	12/12/14	4120502-BS1	Triclopyr	89	36-114	
12/8/14	12/12/14	4120502-BSD1	Triclopyr	99	36-114	

Blank Spike Data **Matrix:** water

Extraction Date	Analysis Date	Batch QC Sample #	Analyte	% Recovery	Expected % Recovery	Notes
12/8/14	12/9/14	4120503-BS1	Atrazine	99	50-123	
12/8/14	12/9/14	4120503-BSD1	Atrazine	100	50-123	
12/8/14	12/9/14	4120503-BS1	Chlorpyrifos	92	50-138	
12/8/14	12/9/14	4120503-BS1	Chlorpyrifos	96	60-140	
12/8/14	12/9/14	4120503-BSD1	Chlorpyrifos	95	60-140	
12/8/14	12/9/14	4120503-BSD1	Chlorpyrifos	95	50-138	
12/8/14	12/11/14	4120503-BS1	Clothianidin	58	60-140	R2
12/8/14	12/11/14	4120503-BSD1	Clothianidin	60	60-140	
12/8/14	12/9/14	4120503-BS1	Diazinon	107	34-145	
12/8/14	12/9/14	4120503-BSD1	Diazinon	113	34-145	
12/8/14	12/9/14	4120503-BS1	Dieldrin	77	60-140	
12/8/14	12/9/14	4120503-BSD1	Dieldrin	79	60-140	
12/8/14	12/9/14	4120503-BS1	Ethofumesate	87	62-126	
12/8/14	12/9/14	4120503-BSD1	Ethofumesate	87	62-126	
12/8/14	12/11/14	4120503-BS1	Fluometuron	77	60-140	
12/8/14	12/11/14	4120503-BSD1	Fluometuron	82	60-140	
12/8/14	12/9/14	4120503-BS1	Napropamide	85	52-127	
12/8/14	12/9/14	4120503-BSD1	Napropamide	83	52-127	
12/8/14	12/9/14	4120503-BS1	Oxadiazon	103	60-140	
12/8/14	12/9/14	4120503-BSD1	Oxadiazon	104	60-140	
12/8/14	12/9/14	4120503-BS1	Parathion methyl	98	40-120	
12/8/14	12/9/14	4120503-BSD1	Parathion methyl	102	40-120	
12/8/14	12/11/14	4120503-BS1	Thiobencarb	93	60-140	
12/8/14	12/11/14	4120503-BSD1	Thiobencarb	92	60-140	

Rick Jordan, Laboratory Manager

Pacific Agricultural Laboratory
12505 N.W. Cornell Rd. • Portland, OR 97229-5651 • Ph 503.626.7943 • Fx 503.641.0644

City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Project Information

Methodology Employed

EPA 8151A (GC-MS)
Modified EPA 8081B (GC-ECD)
Modified EPA 8141B (GC-FPD)
Modified EPA 8270D (GC-MS SIM)
Modified EPA 8321B (HPLC-MS)

Analyte Information

Method: EPA 8151A (GC-MS)
Chlorinated acids were converted to free acids. Residues were quantitated as free acids.

Project Notes

Notes	Definition
R2	Spike recovery is outside of provisional control limits. Permanent control limits have not been established.

Rick Jordan, Laboratory Manager

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Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Multiresidue Analyte List

Organophosphorous and Organosulfur Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Chlorpyrifos	0.060 ug/L	Aspon	0.30 ug/L
Azinphos-methyl	0.30 ug/L	Carbofenothion	0.30 ug/L
Chlorfenvinphos	0.30 ug/L	Chlorpyrifos-methyl	0.30 ug/L
Coumaphos	0.30 ug/L	Demeton	0.30 ug/L
Diazinon	0.30 ug/L	Dichlorofenthion	0.30 ug/L
Dichlorvos	0.30 ug/L	Dicrotophos	0.30 ug/L
Dimethoate	0.30 ug/L	Disulfoton	0.30 ug/L
EPN	0.30 ug/L	Ethion	0.30 ug/L
Ethoprop	0.30 ug/L	Famphur	0.30 ug/L
Fenamiphos	0.30 ug/L	Fenitrothion	0.30 ug/L
Fensulfothion	0.30 ug/L	Fenthion	0.30 ug/L
Malathion	0.30 ug/L	Merphos	0.30 ug/L
Methidathion	0.30 ug/L	Mevinphos	0.30 ug/L
Monocrotophos	0.30 ug/L	Parathion	0.30 ug/L
Parathion methyl	0.30 ug/L	Phorate	0.30 ug/L
Phosmet	0.30 ug/L	Phosphamidon	0.30 ug/L
Pirimiphos-methyl	0.30 ug/L	Ronnel	0.30 ug/L
Sulprofos	0.30 ug/L	Terbufos	0.30 ug/L
Tetrachlorvinphos	0.30 ug/L	Tokuthion	0.30 ug/L
Trichloronate	0.30 ug/L	Propargite	0.12 ug/L

Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Halogenated Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Acetochlor	0.15 ug/L	Alachlor	0.15 ug/L
Aldrin	0.060 ug/L	Benfluralin	0.060 ug/L
Bifenthrin	0.060 ug/L	a-BHC	0.060 ug/L
b-BHC	0.060 ug/L	d-BHC	0.060 ug/L
g-BHC	0.060 ug/L	Captafol	0.060 ug/L
Captan	0.15 ug/L	Chlordane	0.30 ug/L
Chlorobenzilate	0.15 ug/L	Chloroneb	0.15 ug/L
Chlorothalonil	0.060 ug/L	Cyfluthrin	0.15 ug/L
Cyhalothrin	0.15 ug/L	Cypermethrin	0.15 ug/L
p,p'-DDD	0.060 ug/L	p,p'-DDE	0.060 ug/L
p,p'-DDT	0.060 ug/L	Dacthal	0.060 ug/L
Deltamethrin	0.15 ug/L	Dichlobenil	0.060 ug/L
Dicloran	0.060 ug/L	Dicofol	0.15 ug/L
Dieldrin	0.060 ug/L	Dithiopyr	0.060 ug/L
Endosulfan I	0.060 ug/L	Endosulfan II	0.060 ug/L
Endosulfan sulfate	0.060 ug/L	Endrin	0.060 ug/L
Endrin aldehyde	0.060 ug/L	Endrin ketone	0.060 ug/L
Esfenvalerate	0.060 ug/L	Ethalfluralin	0.060 ug/L
Etridiazole	0.060 ug/L	Fenarimol	0.060 ug/L
Fenvalerate	0.060 ug/L	Flutolanil	0.60 ug/L
Folpet	0.060 ug/L	Heptachlor	0.060 ug/L
Heptachlor epoxide	0.060 ug/L	Hexachlorobenzene	0.060 ug/L
Iprodione	0.060 ug/L	Methoxychlor	0.060 ug/L
Metolachlor	0.15 ug/L	Mirex	0.060 ug/L
Norflurazon	0.060 ug/L	Ovex	0.060 ug/L
Oxadiazon	0.060 ug/L	Oxyfluorfen	0.060 ug/L
PCNB	0.060 ug/L	Permethrin	0.15 ug/L
Prodiamine	0.060 ug/L	Pronamide	0.060 ug/L
Propachlor	0.15 ug/L	Propanil	0.060 ug/L
Propiconazole	0.15 ug/L	Terbacil	0.060 ug/L
Toxaphene	3.0 ug/L	Trifloxystrobin	0.060 ug/L
Triflumizole	0.060 ug/L	Trifluralin	0.060 ug/L
Vinclozalin	0.060 ug/L		

Rick Jordan, Laboratory Manager

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City of Salem
1410 20th St. SE Building 2
Salem, OR 97302

Report Number: P142477
Report Date: December 19, 2014
Client Project ID: [none]

Organonitrogen Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
Ametryn	0.060 ug/L	Amitraz	0.12 ug/L
Atrazine	0.060 ug/L	Azoxystrobin	0.060 ug/L
Bensulide	0.060 ug/L	Boscalid	0.060 ug/L
Bromacil	0.060 ug/L	Bromopropylate	0.12 ug/L
Carfentrazone-ethyl	0.060 ug/L	Clothianidin	0.060 ug/L
Cyanazine	0.12 ug/L	Diclofop-methyl	0.12 ug/L
Dimethenamid	0.060 ug/L	Diphenylamine	0.060 ug/L
Ethofumesate	0.060 ug/L	Fenbuconazole	0.12 ug/L
Fenoxaprop-ethyl	0.12 ug/L	Fipronil	0.12 ug/L
Fluazifop-p-butyl	0.12 ug/L	Fludioxonil	0.12 ug/L
Flumioxazin	0.060 ug/L	Fluometuron	0.060 ug/L
Fluroxypyr-meptyl	0.060 ug/L	Hexazinone	0.060 ug/L
Imidacloprid	0.060 ug/L	Isoxaben	0.060 ug/L
Mefenoxam	0.060 ug/L	Metalaxyl	0.060 ug/L
Metribuzin	0.12 ug/L	Myclobutanil	0.12 ug/L
Napropamide	0.12 ug/L	Pendimethalin	0.060 ug/L
Pirimicarb	0.060 ug/L	Prometon	0.060 ug/L
Prometryn	0.060 ug/L	Propazine	0.060 ug/L
Pyraclostrobin	0.060 ug/L	Pyridaben	0.12 ug/L
Pyrimethanil	0.060 ug/L	Sethoxydim	1.2 ug/L
Simazine	0.060 ug/L	Simetryn	0.060 ug/L
Sulfentrazone	0.060 ug/L	Tebuconazole	0.12 ug/L
Tebuthiuron	0.12 ug/L	Thiabendazole	0.060 ug/L
Triadimefon	0.12 ug/L		

Phenylurea Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
DCPMU	0.060 ug/L	Diuron	0.060 ug/L
Fenuron	0.060 ug/L	Linuron	0.060 ug/L
Monuron	0.060 ug/L	Neburon	0.060 ug/L
Siduron	0.060 ug/L		

Carbamate Pesticides

Analyte	Reporting Limit	Analyte	Reporting Limit
3-Hydroxycarbofuran	0.060 ug/L	Aldicarb	0.060 ug/L
Aldicarb Sulfone	0.060 ug/L	Aldicarb Sulfoxide	0.060 ug/L
Bendiocarb	0.060 ug/L	Carbaryl	0.060 ug/L
Carbofuran	0.060 ug/L	Fenobucarb	0.060 ug/L
Methiocarb	0.060 ug/L	Methomyl	0.060 ug/L
Oxamyl	0.060 ug/L	Propoxur	0.060 ug/L
Thiobencarb	0.060 ug/L		

Rick Jordan, Laboratory Manager

ATTACHMENT B. City of Salem Microbial Source Tracking Using qPCR Pilot Project Plan (March 19, 2015).

City of Salem

Microbial Source Tracking Using qPCR
Pilot Project Plan

03/19/2015

Prepared by:
City Salem Public Works Department
Stormwater Services

March 2015

Table of Contents

Table of Figures

1.0 Purpose

In support of Schedule B of the City of Salem's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit, the City of Salem Stormwater Services Division will be contracting with an outside laboratory, Source Molecular, to perform Microbial Source Tracking (MST) via quantitative Real-Time Polymerase Chain Reaction (qPCR) analysis. This will be done as a pilot project to inform future uses of this technology by the City and to assess the efficacy of qPCR as an analytic tool that the City can use to determine whether or not (and where) controllable anthropogenic sources of fecal bacteria contamination exist within its MS4. The intent of this document is to outline the City's methodology and objectives for this pilot project.

2.0 Background

In accordance with regulatory water quality standards, the City of Salem uses the bacterium, *Escherichia coli* (E. coli) as an indicator of fecal bacteria pollution within its MS4 conveyance system. While E. coli testing is a reliable, low cost method for quantifying fecal bacteria contamination, this analytical test fails to differentiate between sources of fecal contamination (i.e. humans, domestic pets, livestock, birds, and wildlife) in stormwater conveyance systems and urban waterways. This data gap limits the City's ability to easily identify and remediate controllable anthropogenic sources of bacterial pollution.

The City of Salem has been collecting monthly grab samples for E. coli analysis at 21 locations on 11 MS4 receiving steams since 2001. Additionally, the City has performed dry weather outfall sampling (sampling of outfalls after a minimum of a 72 hour antecedent dry period) as part of its Illicit Discharge Detection and Elimination (IDDE) Program since it received its first NPDES MS4 Permit in 1997. The results of these ongoing sampling efforts have identified areas, or "hotspots" within the city where dry weather sample results consistently exceed the Oregon Department of Environmental Quality (ODEQ) acute single sample water quality criterion for E. coli of 406 MPN/100mL. Visual inspection and records review have yet to confirm the source(s) of this observed impairment at a number of these locations. To assist source tracking efforts, the City will test the utility of qPCR MST technology to identify genomic markers within bacteria samples that are specific to various host species; in effect, categorizing the source(s) of bacteria as human, dog, bird, or other. The results of this study will help the City develop more informed hypotheses regarding the source(s) of fecal bacteria within its MS4 during dry weather conditions.

3.0 Project Objectives

A. Use qPCR analysis to determine if, and to what extent, human, dog, and avian fecal bacteria may be contributing to elevated E. coli counts during dry weather conditions in Clark Creek and in two representative outfalls.

B. Compare qPCR analytical results from in-pipe and open channel samples.

C. Evaluate efficacy of sample collection/analysis strategies and identify potential sources of error.

4.0 Study Design

4.1 Sample Locations

For this pilot project, three primary locations will be sampled for E. coli and qPCR analysis:

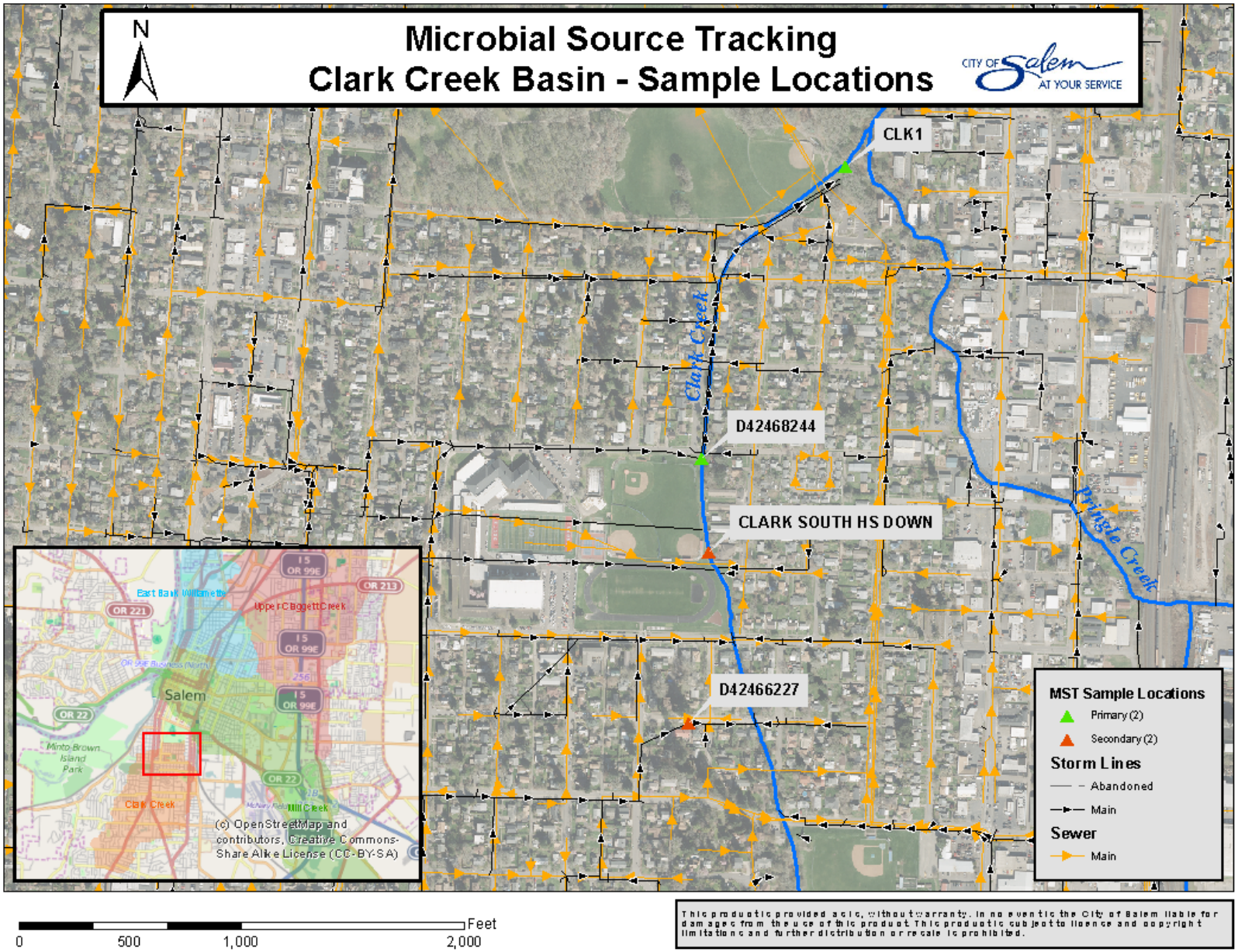
- **CLK1**: In-stream location at the CLK1 monitoring station on Clark Creek;
- **D42468244:** Outfall location in the Clark Creek basin near South Salem High School;
- **D42480222:** Manhole location on Norway St NE in North Salem immediately above the pipe outfall to the Willamette River (the actual outfall is inaccessible during winter flows).

Selection of these locations was based upon site accessibility, support of project objectives, and previously collected E. coli data that demonstrate high bacteria levels during dry weather.

Bacteria levels in flowing surface water can vary significantly. To account for this inherent variability, an alternative location with similar characteristics will be selected for each primary location and sampled during this effort. In the event that E. coli results for a primary sample location indicate low bacteria levels (<406MPN/100mL), the secondary sample location may be substituted for qPCR analysis.

Secondary sample locations include:

- **CLARK SOUTH HS DOWN:** In-stream location near South Salem High School, downstream of sanitary sewer siphon line that crosses underneath the width of Clark Creek;
- **D45476207:** Outfall location in the Mill Creek basin near the intersection of D St NE and Church St NE;
- **D42466227:** Manhole location in the Clark Creek Basin on Electric Ave. SE between Summer St SE and Raynor St SE.


Microbial Source Tracking
Clark Creek Basin - Sample Locations
N
CITY OF Salem AT YOUR SERVICE
CLK1
D42468244
CLARK SOUTH HS DOWN
D42466227
Clark Creek
Pringle Creek
MST Sample Locations
Primary (2)
Secondary (2)
Storm Lines
Abandoned
Main
Sewer
Main
Salem
East Bank Willamette
Upper Claggett Creek
Mill Creek
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)
0
500
1,000
2,000
Feet
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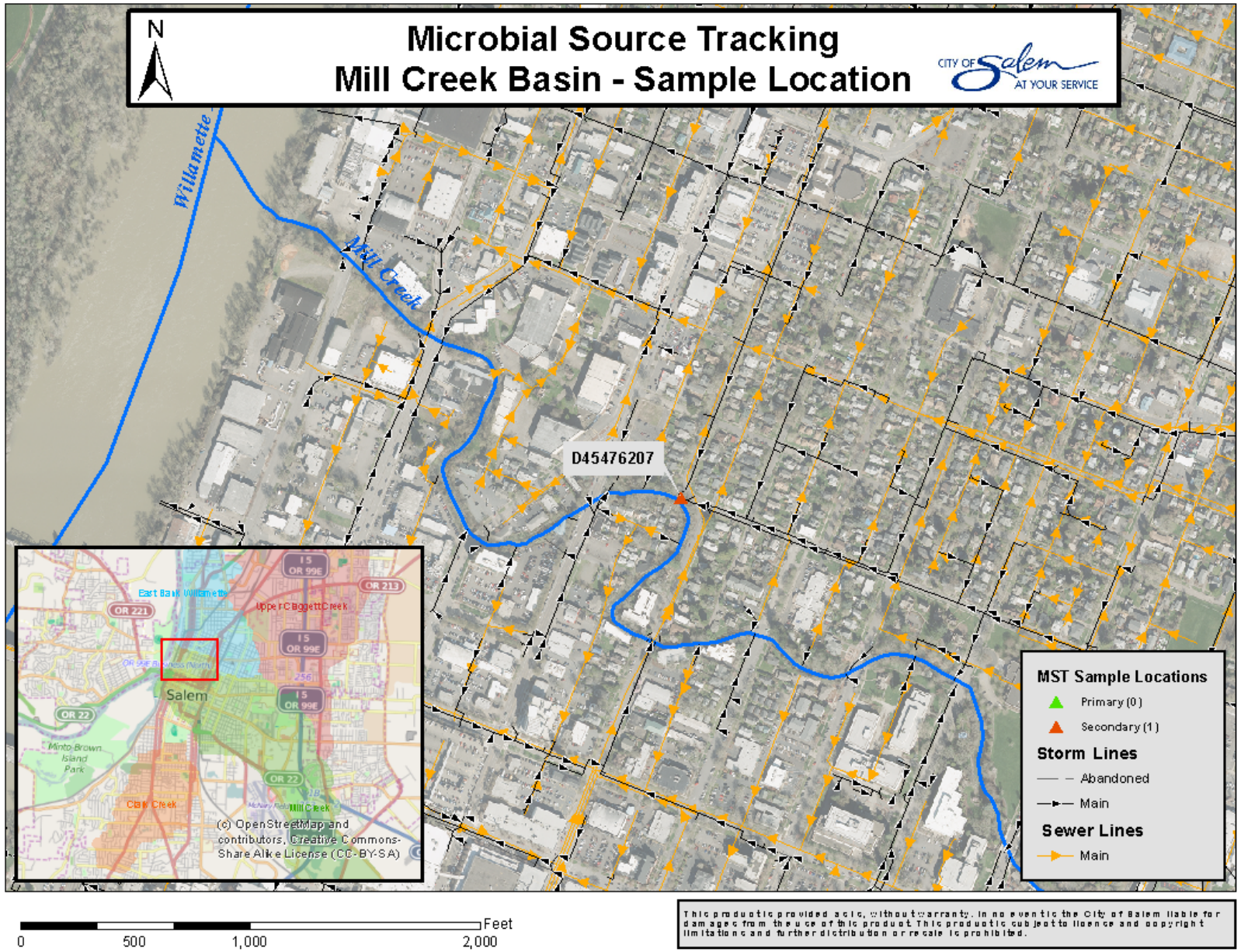
Microbial Source Tracking
Mill Creek Basin - Sample Location
N
CITY OF Salem AT YOUR SERVICE
Willamette
Mill Creek
D45476207
Salem
East Bank Willamette
Upper Claggett Creek
Minto-Brown Island Park
Clark Creek
Mill Creek
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)
MST Sample Locations
Primary (0)
Secondary (1)
Storm Lines
Abandoned
Main
Sewer Lines
Main
0
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1,000
2,000
Feet
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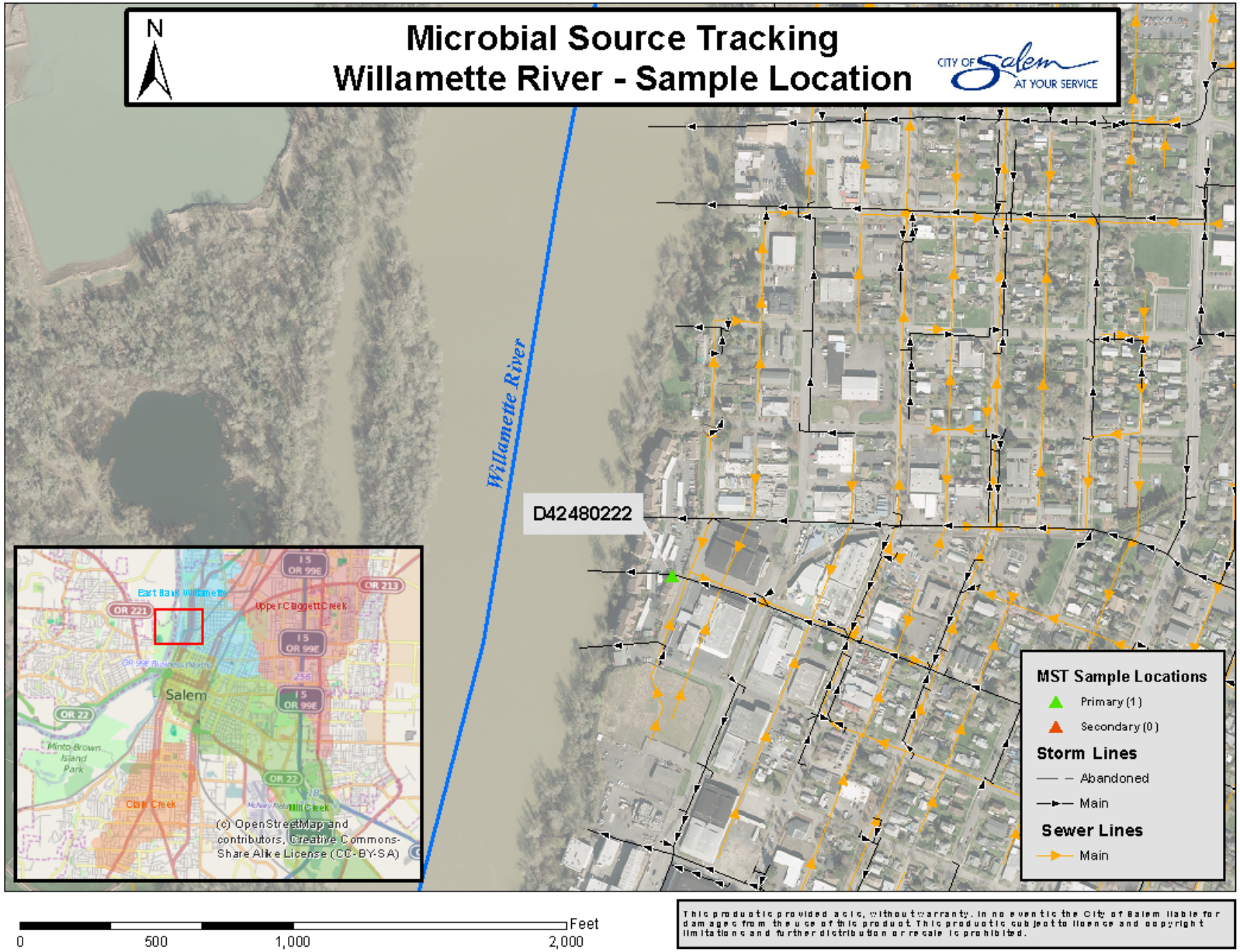
Microbial Source Tracking
Willamette River - Sample Location
N
CITY OF Salem AT YOUR SERVICE
Willamette River
D42480222
MST Sample Locations
Primary (1)
Secondary (0)
Storm Lines
Abandoned
Main
Sewer Lines
Main
Salem
East Bank Willamette
Upper C Baggett Creek
Minto-Brown Island Park
Clark Creek
(c) OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA)
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4.2 Sample Collection Method

Samples will be collected by Stormwater Quality personnel using ODEQ approved field sampling procedures after an antecedent dry period of at least 72 hours. The purpose of sampling during dry weather is to eliminate the influence of stormwater surface runoff on sample results.

In an effort to minimize the influence of heterogeneous in-stream/in-pipe flow and reduce anomalous results, samples will be composited at each location by collecting one 100mL sample in a certified sterile specimen cup every 30 seconds for five minutes. Subsamples will be aggregated into one autoclaved 1000mL polypropylene Nalgene™ bottle and shaken 25 times to ensure homogeneity. Once homogenized, two aliquots will be separated and preserved on ice for transportation to the laboratories; one 500mL aliquot will be separated into a Source Molecular-provided sterile bottle and shipped overnight to Source Molecular's laboratory in Miami, Florida and one 120mL aliquot will be separated into a certified sterile urine specimen cup and transported by hand to the City's laboratory at Willow Lake.

Prior to the infield sampling effort, the 1000mL plastic bottles used for sample aggregation will be autoclaved by the City's Willow Lake laboratory to ensure sterility. Additionally, the Willow Lake laboratory will prepare each bottle with 12 drops of a 10% Sodium thiosulfate pentahydrate ($Na_2S_2O_3$-$5H_2O$) solution in order to neutralize any Chlorine that may be present from municipal drinking water within the streams and pipe system, and prevent inhibition of bacteria in the samples. The Sodium thiosulfate solution will be added to sample bottles prior to being autoclaved in order to ensure sterility.

4.3 Sample Analysis

4.3.1 Willow Lake

Following infield sample collection, six 120mL sample aliquots will be delivered by hand to the City's Willow Lake Laboratory. Once received, laboratory staff will prepare a 1:10 dilution for each sample and perform E. coli analysis using USEPA Method 9223B. After results have been analyzed, the City's Stormwater Quality staff will determine if any substitution of primary samples should be made. Only the three samples with the highest E.coli count will be selected for qPCR analysis at Source Molecular.

4.3.2 Source Molecular

Following infield sample collection, six 500mL sample aliquots will be delivered to Source Molecular's laboratory in Miami, Florida via overnight shipping. Source Molecular will filter these samples through a standard polycarbonate membrane to capture bacteria. Filter membranes will then be frozen and stored at -20°C until notified by Stormwater Quality staff as to which samples will be selected for qPCR analysis based on the results from Willow Lake's E. coli tests.

Once the City's Stormwater Quality staff has selected three samples for MST, Source Molecular will perform qPCR analysis for the following gene biomarkers:

1.0 Human Fecal Bacteria, Bacteroidetes doei. DNA quantification test of the fecal Bacteroidetes Human Gene Biomarker doeri.

2.0 Human Fecal Bacteria, EPA-Patented Target. DNA quantification test of the EPA-Patented fecal Bacteroidetes Human Gene Biomarker.

3.0 Dog Fecal Bacteria, Bacteroidetes specific to dog. DNA quantification test of the fecal Bacteroidetes Dog Gene Biomarker.

4.0 Bird Fecal Bacteria, Helicobacter. DNA quantification test of the Bird Helicobacter Gene Biomarker. Test is shown to detect fecal contamination from the following birds: Gull, Goose, Duck, Chicken, Sandpiper, Coot, Pigeon, Cormorant, Egret, Pelican, Tern, Crow, Swan.

4.3.3 Rationale for Selection of Biomarkers

The four qPCR gene biomarker analyses for this pilot project were selected to build weight of evidence for or against the following hypotheses:

A. The source(s) of bacteria at the selected sample locations is of a controllable anthropogenic source (i.e. human or dog). Transport mechanisms for this may include direct connections from the sanitary sewer to the storm sewer, exfilitration/infiltration from leaking sanitary sewer pipes to leaking storm sewer pipes, or improper disposal of pet/human waste.

B. The source(s) of bacteria at the selected sample locations is due to wildlife such as rodents or raccoons taking residence in storm lines.

C. The source(s) of bacteria at the selected sample locations, particularly in open channels, is due to avian activity within the drainage.

D. The source(s) of bacteria at the selected sample locations, particularly in open channels, is due to wildlife activity such as nutria, opossum, raccoon, beaver, etc.

Analytical test results from Source Molecular will either directly prove or disprove hypotheses A and C for this sample set. However, there are currently no library independent MST analyses available for rodent, raccoon, possum, beaver, and nutria gene biomarkers. Therefore, weight of evidence for hypotheses B and D will depend upon the absence of or a sufficient lack of quantity for human, dog, and avian gene biomarkers to suggest that fecal bacteria is due to these mammals.

5.0 Interpretation of Results

Patterns of bacteria distribution in natural and urban environments are temporally and geographically variable. Due to the high variability of results in fecal indicator bacteria (such as E. coli) data sets, discerning statistically significant trends with acceptable levels of power and confidence are typically not possible without relatively large data sets. Multiple sampling efforts would be necessary in order to

definitively confirm or reject any of the previously stated hypotheses for application beyond the specific conditions these pilot project samples represent. Drawing statistically significant conclusions regarding bacteria sources within Salem's MS4 would require analytical and traditional MST efforts that are beyond the scope of this pilot project. Therefore, sample results from this pilot project will be utilized only in support of the objectives stated in section 3.0.

ATTACHMENT C. Preliminary Interpretation of Microbial Source Tracking Results (March 11, 2015 and June 19, 2015).

Source Molecular
Leader in Microbial Source Tracking

4985 SW 74th Court, Miami, FL 33155 USA
Tel: (1) 786-220-0379, Fax: (1) 786-513-2733, Email: info@sourcemolecular.com

Preliminary Interpretation of Bird Fecal ID™ Quantification Results

Detection and quantification of Bird-associated fecal indicator bacteria by real-time quantitative Polymerase Chain Reaction (qPCR)

Submitter: City of Salem
Date Received: March 11, 2015
Date Reported: March 25, 2015

SM #	Client #	Approximate Contribution of Bird Fecal Pollution in Water Sample	Comment
SM-5C11013	D42466227	**Potential Contributor**	Presence of bird fecal pollution

Source Molecular
Leader in Microbial Source Tracking

4985 SW 74th Court, Miami, FL 33155 USA
Tel: (1) 786-220-0379, Fax: (1) 786-513-2733, Email: info@sourcemolecular.com

Bird Fecal ID™ Quantification

Detection and quantification of Bird-associated fecal indicator bacteria by real-time quantitative Polymerase Chain Reaction (qPCR)

Submitter: City of Salem
Date Received: March 11, 2015
Date Reported: March 25, 2015

SM #	Client #	Analysis Requested	Bird Specific Marker Quantified*	DNA Analytical Results
SM-5C11013	D42466227	Bird Fecal ID	<LOQ**	**Present (Trace)**

*Numbers reported as copy numbers per 100 mL of water
**Below limit of quantification

Laboratory Comments

Submitter: City of Salem

Report Date: March 25, 2015

Trace Results
In sample(s) classified as trace, the bird-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with bird were present in the sample(s) but in low concentrations.

Bird Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the bird-associated fecal genetic in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "negative", “trace”, "minor contributor", "important contributor", or "major contributor" based on the concentration and proportion of the genetic markers found in the water samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer and an optimized buffer. All assays were run in duplicate. Absolute quantification was achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control consisting of bird fecal DNA or plasmid containing the target and a negative control consisting of PCR-grade water, were run alongside the sample(s) to ensure a properly functioning reaction and to reveal any false negatives or false positives. The accumulation of PCR product was detected and graphed in an amplification plot. If the target gene biomarker was absent in the sample, this accumulation was not detected and the sample was considered negative. If accumulation of PCR product was detected, the sample was considered positive.

Theory Explanation of Bird Fecal ID™ Quantification

The genus *Helicobacter* is a group of gram-negative, microaerophilic bacteria that were initially classified under the *Campylobacter* genus prior to 1989. Since then, they have been reclassified into the genus *Helicobacter* after 16S rRNA sequencing differentiated them from other *Campylobacter* species. This group of bacteria typically have a spiral, curved or fusiform morphology with multiple flagella allowing them to rapidly maneuver in the intestinal mucous lining of their hosts. *Helicobacter* species colonize the gastrointestinal tract of mammals and birds and are shed in feces. There are approximately 20 strains of *Helicobacter*[1]. Certain strains, such as *Helicobacter pylori,* are pathogenic to humans causing chronic gastritis, peptic ulcers and stomach cancer.

The Bird Fecal Quantification ID™ service is designed around the principle that certain DNA sequences contained within strains of the *Helicobacter* genus are specific to wild birds. These *Helicobacter* sequences can be used as indicators of bird fecal contamination. Several species have been isolated from specific animal hosts such as *H. fennelliae* from humans, *H. hepaticus* from mice and *H. felis* from cats and dogs.[1] The Bird Fecal Quantification ID™ service targets a bird-associated gene biomarker in *Helicobacter pametensis.*[2] The biomarker is present at different degrees in the feces of various birds including but not limited to gull, goose, chicken, pigeon and duck.

One of the advantages of the Bird Fecal Quantification ID™ service is that the entire population of *Helicobacter* of the selected portion of the water sample is screened. As such, this method avoids the randomness effect of selecting isolates off a petri dish.

Accuracy of the results is possible because the method uses qPCR DNA technology. qPCR simulataneously confirms and quantifies the bird-associated gene biomarker. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genome to be detected. This qPCR technology avoids the cumbersome process of distinguishing DNA bands on a gel electrophoresis apparatus.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve indicates that the bird-associated *Helicobacter* gene biomarker is not present.

References

[1] Goldman, E. and Green, L. H. (2009). *Practical Handbook of Microbiology* (2nd ed) . Boca Raton, FL: CRC Press.

[2] Seymour, C., Lewis, R.G., Kim, M., Gagnon, D.F., Fox, J.G., Dewhirst, F.E., and Paster, B.J. Isolation of *Helicobacter* Strains from Wild Bird and Swine Feces. Appl. Environ. Microbiol. (1994) 60:3, 1025-1028.

Source Molecular
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Preliminary Interpretation of Dog "Quantification" ID™ Results

Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: City of Salem
Date Received: March 11, 2015
Date Reported: March 25, 2015

SM #	Client #	Approximate Contribution of Dog Fecal Pollution in Water Sample	Comment
SM-5C11019	D42466227	**Potential Contributor**	Presence of Dog fecal biomarker

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Dog Bacteroidetes Quantification ID™

Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: City of Salem
Date Received: March 11, 2015
Date Reported: March 25, 2015

SM #	Client #	Analysis Requested	Dog Specific Marker Quantified*	DNA Analytical Results
SM-5C11019	D42466227	Dog Bacteroidetes ID	3.89E+02	**Present**

*Numbers reported as copy numbers per 100 mL of water

Laboratory Comments

Submitter: City of Salem

Report Date: March 25, 2015

Positive Results

In sample(s) classified as positive, the dog-associated fecal gene biomarker(s) was detected in both test replicates suggesting that dog fecal contamination is present in the water sample(s). The biomarker(s) serve as an indicator of the targeted fecal pollution, but the presence of the biomarker does not signify conclusively the presence of that form of fecal pollution. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Dog Fecal Reference Samples

The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the dog-associated fecal genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations

Quantitative results are reported along with interpretations. Interpretations are given as "negative", “trace”, "minor contributor", "important contributor", or "major contributor" based on the concentration and proportion of the genetic markers found in the water samples.

Additional Testing

A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 95°C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate. Absolute quantification was achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control consisting of Dog fecal DNA and a negative control consisting of PCR-grade water, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives. The accumulation of PCR product is detected and graphed in an amplification plot. If the fecal indicator organism is absent in the sample, this accumulation is not detected and the sample is considered negative. If accumulation of PCR product is detected, the sample is considered positive.

Theory Explanation of Dog Bacteroidetes "Quantification" ID™

The phylum *Bacteroidetes* is composed of three large groups of bacteria with the best-known category being *Bacteroidaceae*. This family of gram-negative bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Comprising *Bacteroidaceae* are the genus *Bacteroides* and *Prevotella*. The latter genus was originally classified within the former (i.e. *Bacteroides*), but since the 1990's it has been classified in a separate genus because of new chemical and biochemical findings. *Bacteroides* and *Prevotella* are gram-negative, anaerobic, rod-shaped bacteria that inhabitant of the oral, respiratory, intestinal, and urogenital cavities of humans, animals, and insects. They are sometimes pathogenic.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[1] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Dog Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[2,3,4,5,6] Furthermore, certain categories of *Bacteroidetes* have been shown to be predominately detected in dog. Within these *Bacteroidetes*, certain strains of the *Bacteroides* and *Prevotella* genus have been found in dog.[2,3,5,6] As such, these bacterial strains can be used as indicators of dog fecal contamination.

One of the advantages of the Dog Bacteroidetes ID™ service is that the entire water is sampled and filtered for fecal *Bacteroidetes*. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the dog *Bacteroidetes* gene biomarker is not present.

References

[1] Scott, Troy M., Rose, Joan B., Jenkins, Tracie M., Farrah, Samuel R., Lukasik, Jerzy **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. (2002) 68: 5796-5803.

[2] Bernhard, A.E., and K.G. Field (2000a). **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Applied and Environmental Microbiology, 66: 1,587-1,594.

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[5] Fogarty, Lisa R., Voytek, Mary **A.Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species** Appl. Environ. Microbiol. 2005 71: 5999-6007.

[6] Dick, Linda K., Bernhard, Anne E., Brodeur, Timothy J., Santo Domingo, Jorge W., Simpson, Joyce M., Walters, Sarah P., Field, Katharine G. **Host**

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Preliminary Interpretation of Human Fecal Pollution ID™ Results

Detection and quantification of the fecal Human gene biomarker for Human fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: City of Salem
Date Received: March 11, 2015
Date Reported: March 25, 2015

SM #	Client #	Approximate Contribution of Human Fecal Pollution in Water Sample	Comment
SM-5C11001	D42466227	**Major Contributor**	High levels of 2 human fecal biomarkers

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Human Fecal Pollution ID™ Quantification

Detection and quantification of the fecal Human gene biomarker for Human fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: City of Salem
Date Received: March 11, 2015
Date Reported: March 25, 2015

SM #	Client #	Analysis Requested	Species	Human Specific Marker Quantified*	DNA Analytical Results
SM-5C11001	D42466227	Human Bacteroidetes ID 1	Dorei	2.52E+05	**Present**
SM-5C11007	D42466227	Human Bacteroidetes ID 2	EPA	2.86E+04	**Present**

*Numbers reported as copy numbers per 100 mL of water

Laboratory Comments

Submitter: City of Salem

Report Date: March 25, 2015

Positive Results
In sample(s) classified as positive, the human-associated Bacteroidetes gene biomarker(s) were detected in both test replicates suggesting that human fecal contamination is present in the water sample(s). The biomarker(s) serve as an indicator of the targeted fecal pollution, but the presence of the biomarker does not signify conclusively the presence of that form of fecal pollution. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Human Fecal Reference Samples
The client is encouraged to submit samples from the surrounding wastewater facilities and/or septic systems in order to gain a better understanding of the concentration of the human-associated fecal Bacteroidetes genetic marker as well as the concentration of the general fecal Bacteroidetes genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "negative", “trace”, "minor contributor", "important contributor", or "major contributor" based on the concentration and proportion of the genetic markers found in the water samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **www.sourcemolecular.com/tests**

DNA Analytical Method Explanation

All reagents, chemicals and apparatuses were verified and inspected beforehand to ensure that no false negatives or positives could be generated. In that regard, positive and negative controls were run to attest the integrity of the analysis. All inspections and controls tested negative for possible extraneous contaminates, including PCR inhibitors.

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 50°C for 2 min, 95°C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate. Absolute quantification was achieved by extrapolating genome copy numbers from standard curves generated from serial dilutions of Human specific and generic genomic DNA.

For quality control purposes, a positive control consisting of appropriate genomic DNA and a negative control consisting of PCR-grade water were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Human Bacteroidetes ID™ Species*: B. dorei*

The **Human Bacteroidetes ID™ Species*: B. dorei*** service targets the species *Bacteroides dorei*. *B. dorei* is an anaerobe that is frequently shed from the gastrointestinal tract and isolated from human feces worldwide. It is a newly discovered species that is widely distributed in the USA.[1,2] The human-associated marker DNA sequence is located on the 16S rRNA gene of *B. dorei*.[3] The marker is the microbial source tracking (MST) marker of choice for detecting human fecal pollution due to its exceptional sensitivity and specificity. Internal validations have been conducted on hundreds of sewage, septage, human and animal host fecal samples collected from throughout the U.S and archived in the Source Molecular fecal bank. The marker has also been evaluated in both inland and coastal waters. A recent, comprehensive, multi-laboratory MST method evaluation study, exploring the performance of current MST methods, concluded the *B. dorei* qPCR assay to be the top performing human-associated assay amongst those tested. The success and consistency of this marker in numerous studies around the world[1,3,4] makes the **Human Bacteroidetes ID™ Species*: B. dorei*** service the primary service for identifying human fecal pollution at Source Molecular.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[5] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The Human Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[3,5,6,7,8] Furthermore, certain strains of *Bacteroidetes* have been found to be associated with humans.[3,6] As such, these bacterial strains can be used as indicators of human fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of small copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the unique *B. dorei* DNA sequence. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment desired. If the primers are successful in finding a site on the DNA fragment that is specific to the *B. dorei* DNA sequence, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by the qPCR software. The absence of an amplification curve indicates that the *B. dorei* gene biomarker is not detected in the water sample because it is either not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as
Human Bacteroidetes ID™ Species*: B. stercoris*,
Human Bacteroidetes ID™ Species*: B. fragilis,* and
Human Bacteroidetes ID™ Species*: B. thetaiotaomicron*.

[1]Boehm, A., Fuhrman, J., Mrse, R., Grant, S. **Tiered approach for identification of a human fecal pollution source at a recreational beach: case study at Avalon Bay, Catalina Island, California**. Environ Sci Technol. 2003 37**:** 673–680.
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[4]Ahmed, w., Masters, N., Toze, S. **Consistency in the host specificity and host sensitivity of the Bacteroides HF183 marker for sewage pollution tracking. Lett. Appl. Microbiol. 2012 55: 283-289.**
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[6] Bernhard, A., Field, K. **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Appl. Environ. Microbiol. 2000a 66: 1587-1594.
[7] Fogarty, L., Voytek, M. **A Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species.** Appl. Environ. Microbiol. 2005 71: 5999-6007.
[8] Dick, L., Bernhard, A., Brodeur, T., Santo Domingo, J., *et al*. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic**

Human Bacteroidetes ID™: EPA Developed Assay

The **Human Bacteroidetes ID™: EPA Developed Assay** service targets a functional gene biomarker in *Bacteroidales*-like anaerobic bacteria that is present in high concentrations in the human gut. The U.S Environmental Protection Agency (U.S. EPA) was the first to target the biomarker using quantitative Polymerase Chain Reaction (qPCR) technology in order to detect ground and surface waters impacted by human fecal pollution.[1] Since it's development, the assay has been used succesfully around the U.S to identify fecal pollution originating from human sources, such as sewage and septage wastewaters.

The U.S. EPA Developed assay has been shown to be highly associated with human fecal pollution. It has successfully been validated in multiple nationwide studies using at least 300 individual reference fecal material from 22 different animal species known to commonly contaminate environmental waters.[1,2] A reported 99.2% specificity to human fecal material makes this one of the leading assays to confirm the presence of fecal contamination that is of human origin.[1] The *Bacteroidales*-like bacteria is widely distributed. It was detected in 100% of hundreds of sewage and human reference fecal samples collected from more than 20 human populations, making it highly sensitive. Internal validations have also been conducted on hundreds of wastewater, human and animal host fecal samples archived in the Source Molecular fecal bank.

Fecal anaerobic bacteria are considered for several reasons an interesting alternative to more traditional fecal indicator organisms such as *E. coli* and *Enterococci*.[3] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems.[3] This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The **Human Bacteroidetes ID™: EPA Developed Assay** service is designed around the principle that fecal *Bacteroidales*-like bacteria are found in large quantities in feces of warm-blooded animals.[4,5] Furthermore, certain strains have been shown to be associated with humans.[4,5] As such, these bacterial strains can be used as indicators of human fecal contamination. An advantage of the Human Bacteroidetes ID™ service is that the entire portion of water sampled is filtered to concentrate bacteria. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates. This is an advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the gene biomarker. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment. If the primers are successful in finding a site on the DNA fragment that is specific to the human-associated biomarker, billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by qPCR software. The absence of an amplification curve indicates that the gene biomarker is not detectable in the water sample either because it is not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as
Human Bacteroidetes ID™ Species*: B. dorei*,
Human Bacteroidetes ID™ Species*: B. fragilis,* and
Human Bacteroidetes ID™ Species*: B. stercoris*

[1] Shanks, O., Kelty, C., Sivaganesan, M., Varma, M. and Haugland, R. **Quantitative PCR for Genetic Markers of Human Fecal Pollution**. Appl. Environ. Microbiol. 2009 75: 5507-5513.
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[3] Scott, T., Rose, J., Jenkins, T., Farrah, S. and Lukasik, J. **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. 2002 68: 5796-5803.
[4] Bernhard, A., Field, K. **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Appl. Environ. Microbiol. 2000a 66: 1587-1594.
[5] Bernhard, A., Field, K. **A PCR assay to discriminate human and ruminant feces on the basis of host differences in Bacteroides-Prevotella genes encoding 16S rRNA.** Appl. Environ. Microbiol. 2000b 66: 4571-4574.

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Preliminary Interpretation of Bird Fecal ID™ Quantification Results

Detection and quantification of Bird-associated fecal indicator bacteria by real-time quantitative Polymerase Chain Reaction (qPCR)

Submitter: City of Salem
Date Received: June 19, 2015
Date Reported: July 3, 2015

SM #	Client #	Approximate Contribution of Bird Fecal Pollution in Water Sample	Comment
SM-5F19013	D42466227	Negative	Negative for bird fecal biomarker
SM-5F19016	D42480222	**Potential Contributor**	Presence of bird fecal biomarker

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Bird Fecal ID™ Quantification

Detection and quantification of Bird-associated fecal indicator bacteria by real-time quantitative Polymerase Chain Reaction (qPCR)

Submitter: City of Salem
Date Received: June 19, 2015
Date Reported: July 3, 2015

SM #	Client #	Analysis Requested	Bird Specific Marker Quantified*	DNA Analytical Results
SM-5F19013	D42466227	Bird Fecal ID	ND**	Absent
SM-5F19016	D42480222	Bird Fecal ID	<LOQ***	**Present (Trace)**

*Numbers reported as copy numbers per 100 mL of water
**Non-detect
***Below level of quantification

Laboratory Comments

Submitter: City of Salem

Report Date: July 3, 2015

Negative Results
In sample(s) classified as negative, the bird-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis. It is important to note that a negative result does not mean that the sample does not definitely have bird fecal contamination. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Trace Results
In sample(s) classified as trace, the bird-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with bird were present in the sample(s) but in low concentrations.

Bird Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the bird-associated fecal genetic in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "negative", “trace”, "minor contributor", "important contributor", or "major contributor" based on the concentration and proportion of the genetic markers found in the water samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer and an optimized buffer. All assays were run in duplicate. Absolute quantification was achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control consisting of bird fecal DNA or plasmid containing the target and a negative control consisting of PCR-grade water, were run alongside the sample(s) to ensure a properly functioning reaction and to reveal any false negatives or false positives. The accumulation of PCR product was detected and graphed in an amplification plot. If the target gene biomarker was absent in the sample, this accumulation was not detected and the sample was considered negative. If accumulation of PCR product was detected, the sample was considered positive.

Theory Explanation of Bird Fecal ID™ Quantification

The genus *Helicobacter* is a group of gram-negative, microaerophilic bacteria that were initially classified under the *Campylobacter* genus prior to 1989. Since then, they have been reclassified into the genus *Helicobacter* after 16S rRNA sequencing differentiated them from other *Campylobacter* species. This group of bacteria typically have a spiral, curved or fusiform morphology with multiple flagella allowing them to rapidly maneuver in the intestinal mucous lining of their hosts. *Helicobacter* species colonize the gastrointestinal tract of mammals and birds and are shed in feces. There are approximately 20 strains of *Helicobacter*[1]. Certain strains, such as *Helicobacter pylori,* are pathogenic to humans causing chronic gastritis, peptic ulcers and stomach cancer.

The Bird Fecal Quantification ID™ service is designed around the principle that certain DNA sequences contained within strains of the *Helicobacter* genus are specific to wild birds. These *Helicobacter* sequences can be used as indicators of bird fecal contamination. Several species have been isolated from specific animal hosts such as *H. fennelliae* from humans, *H. hepaticus* from mice and *H. felis* from cats and dogs.[1] The Bird Fecal Quantification ID™ service targets a bird-associated gene biomarker in *Helicobacter pametensis.*[2] The biomarker is present at different degrees in the feces of various birds including but not limited to gull, goose, chicken, pigeon and duck.

One of the advantages of the Bird Fecal Quantification ID™ service is that the entire population of *Helicobacter* of the selected portion of the water sample is screened. As such, this method avoids the randomness effect of selecting isolates off a petri dish.

Accuracy of the results is possible because the method uses qPCR DNA technology. qPCR simulataneously confirms and quantifies the bird-associated gene biomarker. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genome to be detected. This qPCR technology avoids the cumbersome process of distinguishing DNA bands on a gel electrophoresis apparatus.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve indicates that the bird-associated *Helicobacter* gene biomarker is not present.

References

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Source Molecular
Leader in Microbial Source Tracking

4985 SW 74th Court, Miami, FL 33155 USA
Tel: (1) 786-220-0379, Fax: (1) 786-513-2733, Email: info@sourcemolecular.com

Preliminary Interpretation of Dog "Quantification" ID™ Results

Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: City of Salem
Date Received: June 19, 2015
Date Reported: July 3, 2015

SM #	Client #	Approximate Contribution of Dog Fecal Pollution in Water Sample	Comment
SM-5F19009	D42466227	**Major Contributor**	High levels of dog fecal biomarker
SM-5F19012	D42480222	**Potential Contributor**	Presence of dog fecal biomarker

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Dog Bacteroidetes Quantification ID™

Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA

Submitter: City of Salem
Date Received: June 19, 2015
Date Reported: July 3, 2015

SM #	Client #	Analysis Requested	Dog Specific Marker Quantified*	DNA Analytical Results
SM-5F19009	D42466227	Dog Bacteroidetes ID	1.02E+04	**Present**
SM-5F19012	D42480222	Dog Bacteroidetes ID	1.91E+03	**Present**

*Numbers reported as copy numbers per 100 mL of water

Laboratory Comments

Submitter: City of Salem

Report Date: July 3, 2015

Positive Results

In sample(s) classified as positive, the dog-associated fecal gene biomarker(s) was detected in both test replicates suggesting that dog fecal contamination is present in the water sample(s). The biomarker(s) serve as an indicator of the targeted fecal pollution, but the presence of the biomarker does not signify conclusively the presence of that form of fecal pollution. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Dog Fecal Reference Samples

The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the dog-associated fecal genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations

Quantitative results are reported along with interpretations. Interpretations are given as "negative", “trace”, "minor contributor", "important contributor", or "major contributor" based on the concentration and proportion of the genetic markers found in the water samples.

Additional Testing

A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **sourcemolecular.com/tests**

DNA Analytical Method Explanation

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 95°C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate. Absolute quantification was achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control consisting of Dog fecal DNA and a negative control consisting of PCR-grade water, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives. The accumulation of PCR product is detected and graphed in an amplification plot. If the fecal indicator organism is absent in the sample, this accumulation is not detected and the sample is considered negative. If accumulation of PCR product is detected, the sample is considered positive.

Theory Explanation of Dog Bacteroidetes "Quantification" ID™

The phylum *Bacteroidetes* is composed of three large groups of bacteria with the best-known category being *Bacteroidaceae*. This family of gram-negative bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Comprising *Bacteroidaceae* are the genus *Bacteroides* and *Prevotella*. The latter genus was originally classified within the former (i.e. *Bacteroides*), but since the 1990's it has been classified in a separate genus because of new chemical and biochemical findings. *Bacteroides* and *Prevotella* are gram-negative, anaerobic, rod-shaped bacteria that inhabitant of the oral, respiratory, intestinal, and urogenital cavities of humans, animals, and insects. They are sometimes pathogenic.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[1] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Dog Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[2,3,4,5,6] Furthermore, certain categories of *Bacteroidetes* have been shown to be predominately detected in dog. Within these *Bacteroidetes*, certain strains of the *Bacteroides* and *Prevotella* genus have been found in dog.[2,3,5,6] As such, these bacterial strains can be used as indicators of dog fecal contamination.

One of the advantages of the Dog Bacteroidetes ID™ service is that the entire water is sampled and filtered for fecal *Bacteroidetes*. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the dog *Bacteroidetes* gene biomarker is not present.

References

[1] Scott, Troy M., Rose, Joan B., Jenkins, Tracie M., Farrah, Samuel R., Lukasik, Jerzy **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. (2002) 68: 5796-5803.

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[5] Fogarty, Lisa R., Voytek, Mary **A.Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species** Appl. Environ. Microbiol. 2005 71: 5999-6007.

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Source Molecular
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Preliminary Interpretation of Human Fecal Pollution ID™ Results

Detection and quantification of the fecal Human gene biomarker for Human fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: City of Salem
Date Received: June 19, 2015
Date Reported: July 3, 2015

SM #	Client #	Approximate Contribution of Human Fecal Pollution in Water Sample	Comment
SM-5F19001	D42466227	Major Contributor	High levels of 2 human fecal biomarkers
SM-5F19004	D42480222	Major Contributor	High levels of 2 human fecal biomarkers

Source Molecular
Leader in Microbial Source Tracking

4985 SW 74th Court, Miami, FL 33155 USA
Tel: (1) 786-220-0379, Fax: (1) 786-513-2733, Email: info@sourcemolecular.com

Human Fecal Pollution ID™ Quantification

Detection and quantification of the fecal Human gene biomarker for Human fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: City of Salem
Date Received: June 19, 2015
Date Reported: July 3, 2015

SM #	Client #	Analysis Requested	Species	Human Specific Marker Quantified*	DNA Analytical Results
SM-5F19001	D42466227	Human Bacteroidetes ID 1	Dorei	2.97E+05	**Present**
SM-5F19004	D42480222	Human Bacteroidetes ID 1	Dorei	6.91E+05	**Present**
SM-5F19005	D42466227	Human Bacteroidetes ID 2	EPA	1.94E+04	**Present**
SM-5F19008	D42480222	Human Bacteroidetes ID 2	EPA	6.91E+04	**Present**

*Numbers reported as copy numbers per 100 mL of water

Laboratory Comments

Submitter: City of Salem

Report Date: July 3, 2015

Negative Results

In sample(s) classified as negative, the human-associated Bacteroidetes gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis. It is important to note that a negative result does not mean that the sample does not definitely have human fecal contamination. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

In order to strengthen the result, a negative sample should be analyzed further for human fecal contamination with other DNA analytical tests. A list of human fecal ID tests can be found at **www.sourcemolecular.com/human**.

Positive Results

In sample(s) classified as positive, the human-associated Bacteroidetes gene biomarker(s) were detected in both test replicates suggesting that human fecal contamination is present in the water sample(s). The biomarker(s) serve as an indicator of the targeted fecal pollution, but the presence of the biomarker does not signify conclusively the presence of that form of fecal pollution. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Human Fecal Reference Samples

The client is encouraged to submit samples from the surrounding wastewater facilities and/or septic systems in order to gain a better understanding of the concentration of the human-associated fecal Bacteroidetes genetic marker as well as the concentration of the general fecal Bacteroidetes genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations

Quantitative results are reported along with interpretations. Interpretations are given as "negative", “trace”, "minor contributor", "important contributor", or "major contributor" based on the concentration and proportion of the genetic markers found in the water samples.

Additional Testing

A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at **www.sourcemolecular.com/tests**

DNA Analytical Method Explanation

All reagents, chemicals and apparatuses were verified and inspected beforehand to ensure that no false negatives or positives could be generated. In that regard, positive and negative controls were run to attest the integrity of the analysis. All inspections and controls tested negative for possible extraneous contaminates, including PCR inhibitors.

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 50°C for 2 min, 95°C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate. Absolute quantification was achieved by extrapolating genome copy numbers from standard curves generated from serial dilutions of Human specific and generic genomic DNA.

For quality control purposes, a positive control consisting of appropriate genomic DNA and a negative control consisting of PCR-grade water were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.

Human Bacteroidetes ID™ Species*: B. dorei*

The **Human Bacteroidetes ID™ Species*: B. dorei*** service targets the species *Bacteroides dorei*. *B. dorei* is an anaerobe that is frequently shed from the gastrointestinal tract and isolated from human feces worldwide. It is a newly discovered species that is widely distributed in the USA.[1,2] The human-associated marker DNA sequence is located on the 16S rRNA gene of *B. dorei*.[3] The marker is the microbial source tracking (MST) marker of choice for detecting human fecal pollution due to its exceptional sensitivity and specificity. Internal validations have been conducted on hundreds of sewage, septage, human and animal host fecal samples collected from throughout the U.S and archived in the Source Molecular fecal bank. The marker has also been evaluated in both inland and coastal waters. A recent, comprehensive, multi-laboratory MST method evaluation study, exploring the performance of current MST methods, concluded the *B. dorei* qPCR assay to be the top performing human-associated assay amongst those tested. The success and consistency of this marker in numerous studies around the world[1,3,4] makes the **Human Bacteroidetes ID™ Species*: B. dorei*** service the primary service for identifying human fecal pollution at Source Molecular.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.[5] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The Human Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.[3,5,6,7,8] Furthermore, certain strains of *Bacteroidetes* have been found to be associated with humans.[3,6] As such, these bacterial strains can be used as indicators of human fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of small copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the unique *B. dorei* DNA sequence. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment desired. If the primers are successful in finding a site on the DNA fragment that is specific to the *B. dorei* DNA sequence, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by the qPCR software. The absence of an amplification curve indicates that the *B. dorei* gene biomarker is not detected in the water sample because it is either not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as
Human Bacteroidetes ID™ Species*: B. stercoris*,
Human Bacteroidetes ID™ Species*: B. fragilis,* and
Human Bacteroidetes ID™ Species*: B. thetaiotaomicron*.

[1]Boehm, A., Fuhrman, J., Mrse, R., Grant, S. **Tiered approach for identification of a human fecal pollution source at a recreational beach: case study at Avalon Bay, Catalina Island, California**. Environ Sci Technol. 2003 37**:** 673–680.
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[7] Fogarty, L., Voytek, M. **A Comparison of Bacteroides-Prevotella 16S rRNA Genetic Markers for Fecal Samples from Different Animal Species.** Appl. Environ. Microbiol. 2005 71: 5999-6007.
[8] Dick, L., Bernhard, A., Brodeur, T., Santo Domingo, J., *et al*. **Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic**

Human Bacteroidetes ID™: EPA Developed Assay

The **Human Bacteroidetes ID™: EPA Developed Assay** service targets a functional gene biomarker in *Bacteroidales*-like anaerobic bacteria that is present in high concentrations in the human gut. The U.S Environmental Protection Agency (U.S. EPA) was the first to target the biomarker using quantitative Polymerase Chain Reaction (qPCR) technology in order to detect ground and surface waters impacted by human fecal pollution.[1] Since it's development, the assay has been used succesfully around the U.S to identify fecal pollution originating from human sources, such as sewage and septage wastewaters.

The U.S. EPA Developed assay has been shown to be highly associated with human fecal pollution. It has successfully been validated in multiple nationwide studies using at least 300 individual reference fecal material from 22 different animal species known to commonly contaminate environmental waters.[1,2] A reported 99.2% specificity to human fecal material makes this one of the leading assays to confirm the presence of fecal contamination that is of human origin.[1] The *Bacteroidales*-like bacteria is widely distributed. It was detected in 100% of hundreds of sewage and human reference fecal samples collected from more than 20 human populations, making it highly sensitive. Internal validations have also been conducted on hundreds of wastewater, human and animal host fecal samples archived in the Source Molecular fecal bank.

Fecal anaerobic bacteria are considered for several reasons an interesting alternative to more traditional fecal indicator organisms such as *E. coli* and *Enterococci*.[3] Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems.[3] This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The **Human Bacteroidetes ID™: EPA Developed Assay** service is designed around the principle that fecal *Bacteroidales*-like bacteria are found in large quantities in feces of warm-blooded animals.[4,5] Furthermore, certain strains have been shown to be associated with humans.[4,5] As such, these bacterial strains can be used as indicators of human fecal contamination. An advantage of the Human Bacteroidetes ID™ service is that the entire portion of water sampled is filtered to concentrate bacteria. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates. This is an advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the gene biomarker. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment. If the primers are successful in finding a site on the DNA fragment that is specific to the human-associated biomarker, billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by qPCR software. The absence of an amplification curve indicates that the gene biomarker is not detectable in the water sample either because it is not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as
Human Bacteroidetes ID™ Species*: B. dorei*,
Human Bacteroidetes ID™ Species*: B. fragilis,* and
Human Bacteroidetes ID™ Species*: B. stercoris*

[1] Shanks, O., Kelty, C., Sivaganesan, M., Varma, M. and Haugland, R. **Quantitative PCR for Genetic Markers of Human Fecal Pollution**. Appl. Environ. Microbiol. 2009 75: 5507-5513.

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[3] Scott, T., Rose, J., Jenkins, T., Farrah, S. and Lukasik, J. **Microbial Source Tracking: Current Methodology and Future Directions.** Appl. Environ. Microbiol. 2002 68: 5796-5803.

[4] Bernhard, A., Field, K. **Identification of nonpoint sources of fecal pollution in coastal waters by using host-specific 16S ribosomal DNA genetic markers from fecal anaerobes.** Appl. Environ. Microbiol. 2000a 66: 1587-1594.

[5] Bernhard, A., Field, K. **A PCR assay to discriminate human and ruminant feces on the basis of host differences in Bacteroides-Prevotella genes encoding 16S rRNA.** Appl. Environ. Microbiol. 2000b 66: 4571-4574.

ATTACHMENT D. City of Salem Resource Guide: Targeted Grazing with Goats (SRC 400.120(d)(3)).

CITY OF Salem AT YOUR SERVICE

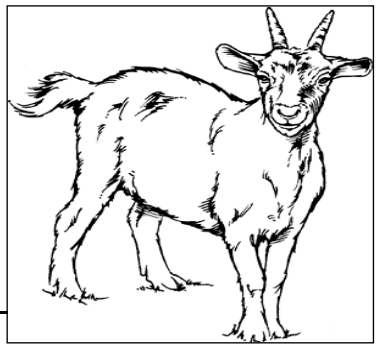
RESOURCE GUIDE

Grazing Goats

Targeted Grazing with Goats

(SRC 400.120(d)(3))

PERMIT APPLICATION CENTER / CITY HALL, 555 LIBERTY STREET SE, ROOM 320, SALEM, OREGON 97301
(503) 588-6213 **www.cityofsalem.net** **@Salem_Planning**



What is Targeted Grazing with Goats?
Targeted grazing with goats is the use of goats for a specific duration and intensity to clear vegetation from land. Targeted grazing is becoming an increasingly popular tool for clearing vegetation because it is an environmentally sensitive alternative to the use of chemical herbicides and mechanical methods of clearing land.

How Do I Get Started?
There are goat herding companies that specialize in renting out herds of goats for targeted grazing. Although not required, it is strongly suggested that you hire one of these experienced goat herders to ensure that the goats are properly monitored and cared for while they are grazing your land.

Is a Permit or License Needed?
No. No permit or license is needed to use goats for targeted grazing in Salem. There are some rules that must be followed, however:

- The keeping of goats permanently on a property is not allowed*
- Goats are allowed to graze for no more than 21 days at a time on a single property that is half an acre or less in area. Properties over half an acre in area may be split into penned areas of at least half an acre in size, and goats are allowed to graze for no more than 21 days at a time in any one penned area.
- Goats may not return to a grazed property or penned area for 30 days.
- No more than 3 grazing treatments at a single property or penned area are allowed in a calendar year.

In What Parts of the City Can I Use Goats for Targeted Grazing?
Goats for targeted grazing are allowed in all areas of the City, so long as the rules listed above are followed.

Can Other Types of Animals be used for Targeted Grazing?
No. Only goats may be used for targeted grazing in Salem.

Should Goats be used on Sites with Protected Vegetation?
Goats will eat both undesirable and desirable vegetation. It is the responsibility of the property owner and goat herder to make sure that goats do not eat protected vegetation. In Salem, all native

* Within the Residential Agriculture (RA) Zone, the keeping of goats permanently by residents of the premises for their own private noncommercial use on a lot 10,000 square feet or greater is allowed.

vegetation is protected within riparian corridors. A riparian corridor is the area on both sides of a waterway, such as a creek or river. The riparian corridor boundary is measured 50 feet horizontally from the top of bank on each side of the waterway. Generally, goat grazing is only appropriate on sites where the entire understory of vegetation is dominated by invasive species.

Can I Use an Electric Fence to Pen Goats in the City?
Yes. Temporary electric fences used to pen grazing goats are allowed within the City. Goat herders often use temporary electric fences to pen goats for targeted grazing. Electric fences must be posted at 15 foot intervals with warning signs notifying persons of a dangerous fence.

Are There Noise Regulations?
Yes. Salem's Noise Ordinance requires that goats not create a noise disturbance for neighboring property owners. Property owners using grazing goats on their land should take care not to allow the goats to make continuous loud noises in close proximity to neighboring homes. Police officers who respond to complaints of loud goats will treat them the same way as barking dogs, and could issue the property owner a citation and fine for keeping continuously loud goats.

To avoid noise disturbances, please remember that goats will generally remain quiet if they are contented. However, goats will vocalize loudly in certain situations, such as:

- When they are hungry or thirsty
- When they are injured or sick
- Females when they are in season or uncastrated males that are frustrated at being unable to access females

How Do I Properly Care for Goats while they are Grazing My Land?
It is strongly suggested that you rent your grazing goats from an experienced goat herder, who will monitor and care for the goats while they are grazing your land. At a minimum, please take care to follow these tips:

- ***Shelter*** - Goats cannot tolerate wet conditions and will always seek out dry shelter during bad weather. Goats should have access to a shelter at all times, regardless of the season. Goat shelters should be cleaned regularly to remove any accumulated waste. Please contact the City's Planning Division (503-588-6213) before establishing any shelter structures on your property, to make sure all applicable accessory structure development standards are met.
- ***Feed*** - Goats cannot just eat the vegetation growing on your property. Instead, goats require a well-rounded diet that typically includes bulk foods such as well-made hay that is free from mold, seasonal green vegetation, and daily mineral supplements. You should seek advice on a suitable diet for your particular goats from an experienced goat owner or a veterinarian.
- ***Water*** - Goats need a constant supply of clean, fresh water. Water containers should be positioned and secured so that goats cannot accidentally urinate or defecate in them or knock them over. Goats can drink up to 6 gallons of water each day.
- ***Fencing*** - Fences should be at least 4 feet in height and should be checked on regularly. Gaps in fences must be small enough so that goats will not get their heads and limbs stuck.
- ***Tethering (tying up on a long leash)*** - Do not tether goats. Tethered goats can become

entangled and injure or strangle themselves on the line. In addition, goats that are tethered cannot escape predatory animals.

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NOTE: This packet is supplemental to the Salem Revised Code (SRC). In the event of a conflict between a statement in this document and the SRC applicable to a particular development, the SRC shall apply. Full version of SRC is available online at http://www.cityofsalem.net/Departments/Legal/Pages/SalemRevisedCodes.asp

ATTACHMENT E. City of Salem Catch Basin Sediment Sampling Plan: Standard Operating Procedures (January 2015).

City of Salem
Catch Basin Sediment Sampling Plan

Standard Operating Procedures

Prepared by:
City Salem Public Works Department
Stormwater Services

January 2015

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List of Tables

1.0 Purpose

As stated in the measureable goals of RC4 Task 11 in the City of Salem Stormwater Management Plan (SWMP) 2010, the City is required to "periodically analyze the material removed from the catch basins". The intent of this document is to describe the City's Standard Operating Procedures (SOP) for the collection and analysis of materials from catch basins. The data will provide a general profile for catch basins based on land-use type and the amount of traffic on each street. This SOP closely follows the City of Portland's July 2003 "Guidance for Sampling of Catch Basin Solids" that was prepared by CH2MHill, as recommended by the DEQ.

2.0 Background

Catch basins are designed to be a first line of pretreatment in the City's storm sewer system, allowing heavier sediment and trash to settle out into the bottom of the catch basin (sump) which is below the outlet. The retention of these solids in the sump varies widely, and depends greatly on the size and weight of the particles, rain intensity and rate of flow, and the cleaning frequency of the sump. There are many different styles of catch basins, as well as different filters and inserts that can be used to trap trash, oil and grease, and other sediments. The City uses four different styles of catch basin, with Type B (standard) catch basin being the most common.

The City of Salem has over 15,000 catch basins spread out across the entire City. Each year the City is required to clean, inspect, and repair as needed 75% of the total number of catch basins. The City has been maintaining catch basins since the 1970's, however the 75% cleaning and inspection requirement went into affect with the City's 2008 SWMP. The catch basins are cleaned using a vactor truck to suck out sediment, and/or by hand using a clamshell shovel.

3.0 Monitoring Objectives

There are four monitoring objectives related to this sampling plan, including:

- Fulfill the 2010 SWMP requirement of "periodically analyze the material removed from the catch basins";
- Characterize common stormwater pollutants based on land use type, age of development, and natural processes and anthropogenic activities in the catchments;
- Help adaptively manage the catch basin cleaning program and help prioritize areas of town that require more frequent catch basin cleaning and/or street sweeping due to types of pollutants present;
- Help to identify types of stormwater treatment facilities or retrofits that target specific pollutants based on land use and age of development.

4.0 Literature Review

In order to determine the best approach and methodologies to use, a thorough literature review was conducted of the following documents:

- 6 (non-consecutive) years worth of street sweeping soil and leachate data that has been collected by City Streets staff and analyzed by Willow Lake laboratory and Specialty Analytical
- "Debris Characterization Study" and associated data provided by City of Gresham
- "SOP: Guidance for Sampling of Catch Basin Solids" prepared for the City of Portland by CH2MHill
- "Evaluation of Analytical Data Characterizing Street Sweepings, Stormwater Sediments and Catch Basin Sediments" prepared by Department of Environmental Protection (Florida)
- "Stormwater Particles Sampling Literature Review" prepared by St. Anthony Falls Laboratory, University of Minnesota (http://www.pca.state.mn.us/index.php/view-document.html?gid=7748)
- "Pollutant Load Removal from Street Sweeping Best Management Practices: Development of Typical Concentration Values for Pollutants of Concern in Contra Costa County, CA" prepared for Contra Costa Clean Water Program by Eisenberg, Olivieri and Associates, Inc.
- "A Simple Field Leach Test to Assess Potential Leaching of Soluble Constituents from Mine Wastes, Soils, and Other Geologic Materials" by the USGS
- EPA SOP #109 "Sampling Equipment Decontamination" (http://www.epa.gov/region6/qa/qadevtools/mod5_sops/misc_field_procudures/deconhazwaste_gui.pdf)

These documents were used to help determine what analyses to use, whether or not a leachate analysis should be done, determine whether or not to analyze different particles sizes separately, how to differentiate sampling areas by land use and how to go about collecting the sediment samples.

5.0 Sampling

5.1 Study Design/Sampling Locations

The study design consists of 9 different sampling locations that were chosen to represent the three major land use types within Salem city limits, and three different levels of traffic within each land use type. Most of the literature reviewed used age of urbanization and land use as variables that could potentially explain a difference in pollutants concentrations. However, Salem is much smaller than other cities that have done studies based on age of urbanization, therefore it was decided to instead use land use and rates of traffic from locations across Salem to be representative.

Special effort will be taken to ensure collection of fine particles (<63µm), because fine-grained sediment have a greater surface area for organic and inorganic contaminants to adsorb, and concentrations tend to be greater on smaller particles (City of Portland SOP, Contra Costa). A duplicate sample will also be taken at one site for a total of 10 samples.

The name of each sampling location, vicinity, land use type, and street type classification are included in Table 1 below, and are identified on Figure 1 (end of document).

Table 1: Sampling Locations

CB Number	Vicinity	Land Use	Street Class
D39-478-560	West Salem	Commercial	< 5000 cars daily
D45-478-673	Downtown Salem	Commercial	5,000 - 15,000 cars daily
D42-456-532	South Salem	Commercial	15,000 – 50,000 cars daily
D48-464-503	Southeast Salem	Industrial	< 5000 cars daily
D48-484-526	North Salem	Industrial	5,000 - 15,000 cars daily
D51-490-502	North Salem/Keizer	Industrial	15,000 – 50,000 cars daily
D60-476-567	Northeast Salem	Residential	< 5000 cars daily
D30-478-580	West Salem	Residential	5,000 - 15,000 cars daily
D36-452-627	South Salem	Residential	15,000 – 50,000 cars daily

Sediment removed from the catch basins will be analyzed for metals, polycyclic aromatic hydrocarbons (PAHs), and total petroleum hydrocarbon (TPH) diesel range organics (DRO), shown in Table 2 below.

Table 2: Pollutant Parameters

Pollutant Parameter	Analytical	Reporting Limit	Laboratory
Moisture Percentage	SM2540G		Willow Lake/CH2MHill
ICP Metals (As, Ba, Cd, Cr, Cu, Pb, Ni, Se, Ag, Zn, Mo)	200.7	0.25 to 1.0 mg/L (depending on % solids)	Willow Lake
Mercury	EPA 245.1	Depending on % solids	Willow Lake
PAH-GC/MS-SIM-Soil	SW8270SIM		CH2MHill
TPH-DRO	NW TPD-Dx		CH2MHill

5.2 Sample Collection Equipment

Samples will be collected in the late spring/summer and after a minimum of 72 hours with less than 0.1 inches of rain, to ensure the catch basin sediment will be moist but not covered with water. Sampling equipment includes the following:

- SOP and list of sampling locations
- stainless steel scoops (10)
- large stainless steel bowls (10)
- nitrile gloves
- metal or wooden rod
- hand operated bilge pump
- field data sheets
- lab supplied bottles/containers

- cooler and ice
- tape measure
- Ziploc bags
- permanent marking pens
- sample labels
- chain of custody seals
- traffic control
- Personal Protective Equipment (PPE)

5.3 Sampling Equipment Decontamination

Due to the nature of the pollutant parameters that each sediment sample will be analyzed for, sampling equipment must be decontaminated before samples can be collected. Ten stainless steel bowls and scoops will be cleaned ahead of time to ensure this process will not need to occur in the field. The decontamination of equipment will be done at Willow Lake laboratory in order to safely use the solvents needed and properly dispose of spent solvents. Decontamination of stainless steel bowls, scoops, and any other item used to collect sample will be done as follows.

1. Non-phosphate detergent wash: All bowls and scoops will be washed with warm water and non-phosphate detergent to remove and oils, dirt, or other residue.
2. Tap water rinse: Thoroughly rinse to remove all detergent residues.
3. Deionized water rinse: Thoroughly rinse with DI water to remove any organics.
4. Ten (10) percent nitric acid rinse: Using a spray bottle, spray all sampling equipment with 10% Nitric acid to remove any metals residues.
5. Deionized water rinse: Thoroughly rinse with DI water to get rid of all nitric acid.
6. Solvent rinse (Hexane): Spray all sampling equipment with pesticide grade Hexane to remove any organics.
7. Air dry: Let the solvent evaporate completely.
8. Deionized water rinse: Once the solvent has evaporated completely, rinse thoroughly with DI water to remove all trace of Hexane.
9. Air dry: Let the cleaned equipment dry thoroughly.
10. Sample packaging: Once all the equipment is thoroughly dry, wrap in aluminum foil and bag each set of equipment separately.

Steps 4 through 10 must be conducted under a laboratory vent hood. The nitric acid rinse water can go down the drain (per Willow Lake laboratory staff), however the Hexane rinse water must be collected, and left in the vent hood to evaporate. All lab protocol for personal protective equipment such as goggles, gloves, and lab coat will be followed.

5.4 Sampling Documentation

Document the following on the field sheet prior to sampling the catch basin sediment:

- Any recent BMP activities such as street sweeping or sediment removal, when it occurred, and how often it normally occurs

- Current weather conditions and any rain that has fallen in the previous 72 hours
- Record the location of the catch basin, and note any potential contamination sources nearby or comments that will be useful to know
- Note the presence of water, and any signs of damage or issues that prevent the catch basin from properly functioning
- Note any odor, sheen, discoloration etc that are evidence of contamination
- Using the metal measuring stick, document the total depth of catch basin and total depth of sediment
- Record observations of color, texture, amount and type of debris
- Take a picture of the catch basin

5.5 Sampling Procedures

1. Follow proper traffic control procedures to secure the area around the catch basin. At a minimum, a workers ahead sign for traffic approaching the catch basin and cones around the work area are required.
2. Carefully remove the lid (grate) of the catch basin, being careful not to drop any extra sediment into the basin. Set lid aside so that it is out of the way.
3. If there is any standing water present, very carefully pump off the surface using a bilge pump, leaving a thin layer of water so as not to disturb the fine sediment layer.
4. Put on a pair of nitrile gloves and remove any large debris such as sticks, leaves, garbage, and gravel/rock from sediment before sampling. Small organic material and other contaminates should be left in sample.
5. To analyze for polycyclic aromatic hydrocarbons (PAHs), the sediment must be disturbed as little as possible. This means that theses samples need to be collected first, and not composited in a stainless steel bowl like the rest of the sample. Remove a decontaminated stainless steel scoop from its bag and gently scoop sediment from the center of the catch basin. Very carefully fill the laboratory provided sample container that is labeled for PAHs and leave minimal headspace. If additional scoops are required to fill the container, very carefully add the additional soil without mixing or compacting the original sample. Quickly cap the sample as soon as you are finished and between scoops to minimize loss of sample via gas off.
6. Using the same decontaminated stainless steel scoop, now collect an equal amount of material (amount depends on how much material is present) from each corner and the center. Each scoop should be a composite of the total depth of accumulated material.
7. Place each of the five scoops of material into the decontaminated stainless steel bowl, and mix thoroughly to composite using the stainless steel scoop.
8. Once the material is thoroughly mixed, collect the necessary amount and place into each laboratory provided sample container.
9. Label each container with the required information and place in cooler with bagged ice to keep at 4° C.
10. Complete the chain of custody and field sheet, and transport to the lab within required the required holding time (to be determined by the lab).

5.6 Quality Assurance / Quality Control

For quality assurance purposes, a duplicate sample will be taken at 10% of the sites, which is 1 site. A equipment blank will also be done to ensure no contamination from the hexane and nitric acid used during the decontamination process. Both samples will be run for all parameters listed in Table 2.

6.0 Adaptive Management

This plan was created prior to the collection of any catch basin sediment samples, therefore if at any point a better method for collecting or analyzing is found, the plan may be reviewed and changed to reflect the new procedures.

7.0 Data Management/Verification

7.1 Data Management

The sampling person is responsible for the completion of the field data sheets. The laboratory manager at Willow Lake Laboratory as well as the outside lab used for sediment analysis will provide a copy of the results. All data will be entered into the Aquarius database by Stormwater Services staff.

7.2 Data Validation and Verification

The Project Manager will do a review of all information on the field sheets. Once the data have been entered into the database, the Project Manager will print a paper copy of the lab data and proofread it against the original lab results to verify no errors in entry. Outliers will be flagged for review, and it is up to the Project Manager to investigate further and determine validity of data.

ATTACHMENT F. Analytical Report for Catch Basin Sediment Sampling, CH2MHill Applied Sciences Laboratory (June 9, 2015).

ANALYTICAL REPORT

For:
Salem, City of - CB Sampling
1758 22nd St SE
Salem, OR 97302-1255

ASL Report #: P2312

Project ID: 921024.OTC
Attn: Anita Panko

Authorized and Released By:

Kathy McKinley

Laboratory Project Manager
Kathy McKinley
(541) 758-0235 ext.23144
June 24, 2015

All analyses performed by CH2M HILL are clearly indicated. Any subcontracted analyses are included as appended reports as received from the subcontracted laboratory. The results included in this report only relate to the samples listed on the following Sample Cross-Reference page. This report shall not be reproduced except in full, without the written approval of the laboratory.

Any unusual difficulties encountered during the analysis of your samples are discussed in the attached case narratives.

Accredited in accordance with NELAP:
Oregon (100022)
Louisiana (05031)

Sample Receipt Comments

We certify that the test results meet all NELAP requirements.

Sample Cross-Reference

ASL Sample ID	Client Sample ID	Date/Time Collected	Date Received
P231201	D30-478-580	06/09/15 09:40	06/10/15
P231202	D39-478-560	06/09/15 10:07	06/10/15
P231203	D45-478-673	06/09/15 10:31	06/10/15
P231204	D48-484-526	06/09/15 10:55	06/10/15
P231205	D51-490-502	06/09/15 11:30	06/10/15
P231206	D60-476-567	06/09/15 12:30	06/10/15
P231207	D36-452-627	06/09/15 13:03	06/10/15
P231208	D42-456-532	06/09/15 13:30	06/10/15
P231209	D48-464-513	06/09/15 13:55	06/10/15
P231210	PAH Eq Blank	06/09/15 10:50	06/10/15
P231211	TPH DrEq Blank	06/09/15 12:30	06/10/15
P231212	D48-484-526 DUP	06/09/15 11:00	06/10/15

CH2MHILL
Applied Sciences Laboratory (ASL)

1100 NE Circle Blvd., Suite 300
Corvallis, OR 97330
Tel 541-768-3120 Fax 541-752-0276

CASE NARRATIVE
GC/MS SEMI-VOLATILES ANALYSIS

Lab Name: CH2M HILL ASL **ASL SDG#:** P2312

Project: Salem, City of **Project #:** 921024.OTC

With the exceptions noted as flags, footnotes, or detailed in the section below; standard operating procedures were followed in the analysis of the samples and no problems were encountered or anomalies observed.

All laboratory quality control samples were within established control limits, with any exceptions noted below, or in the associated QC summary forms.

Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. For diluted samples, the reporting limits are adjusted for the dilution required.

Calculations are performed before rounding to minimize errors in calculated values.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the section below, or in the sample receipt documentation.

Method(s):
SW8270C-SIM: SW3510, SW3550

Surrogate Standard(s):
Surrogate recovery of Terphenyl-d14 in D30-478-580(315%) and D60-476-567(139%) exceeded acceptance criteria of 18-137%.
Surrogate Terphenyl-d14 in D48-484-526 and D48-484-526 DUP was diluted out.

Analytical Exception(s):
Due to heavy matrix interferences observed in soil samples, they were analyzed at no lower than a 10X dilution.

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **PAH Eq Blank**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 10:50
Type: Grab
Matrix: Water

Lab Information

Lab Sample ID: **P231210**

Date Received: 06/10/15
Dilution Factor: 1
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	0.0039	0.0095	0.0039	U	ug/L	SW8270C-SI	06/17/15
2-Methylnaphthalene	91-57-6	0.0023	0.0095	0.0023	U	ug/L	SW8270C-SI	06/17/15
1-Methylnaphthalene	90-12-0	0.0028	0.0095	0.0028	U	ug/L	SW8270C-SI	06/17/15
Acenaphthylene	208-96-8	0.0013	0.0095	0.0013	U	ug/L	SW8270C-SI	06/17/15
Acenaphthene	83-32-9	0.0017	0.0095	0.0017	U	ug/L	SW8270C-SI	06/17/15
Fluorene	86-73-7	0.0013	0.0095	0.0013	U	ug/L	SW8270C-SI	06/17/15
Phenanthrene	85-01-8	0.0015	0.0095	0.0019	J	ug/L	SW8270C-SI	06/17/15
Anthracene	120-12-7	0.0019	0.0095	0.0019	U	ug/L	SW8270C-SI	06/17/15
Fluoranthene	206-44-0	0.0031	0.0095	0.0031	U	ug/L	SW8270C-SI	06/17/15
Pyrene	129-00-0	0.0036	0.0095	0.0036	U	ug/L	SW8270C-SI	06/17/15
Benzo(a)anthracene	56-55-3	0.0018	0.0095	0.0018	U	ug/L	SW8270C-SI	06/17/15
Chrysene	218-01-9	0.0023	0.0095	0.0023	U	ug/L	SW8270C-SI	06/17/15
Benzo(b)fluoroanthene	205-99-2	0.0029	0.0095	0.0029	U	ug/L	SW8270C-SI	06/17/15
Benzo(k)fluoranthene	207-08-9	0.0033	0.0095	0.0033	U	ug/L	SW8270C-SI	06/17/15
Benzo(a)pyrene	50-32-8	0.0024	0.0095	0.0024	U	ug/L	SW8270C-SI	06/17/15
Indeno(1,2,3-c,d)pyrene	193-39-5	0.0018	0.0095	0.0018	U	ug/L	SW8270C-SI	06/17/15
Dibenzo(a,h)anthracene	53-70-3	0.0032	0.0095	0.0032	U	ug/L	SW8270C-SI	06/17/15
Benzo(g,h,i)perylene	191-24-2	0.0023	0.0095	0.0023	U	ug/L	SW8270C-SI	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	90	33-141	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **WB1-0616**

Project Name: Salem, City of
Sample Date: N/A
Sample Time: N/A
Type: QC
Matrix: Water

Lab Information

Lab Sample ID: **WB1-0616**

Date Received: N/A
Dilution Factor: 1
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	0.0041	0.010	0.0041	U	ug/L	SW8270C-SI	06/19/15
2-Methylnaphthalene	91-57-6	0.0025	0.010	0.0025	U	ug/L	SW8270C-SI	06/19/15
1-Methylnaphthalene	90-12-0	0.0030	0.010	0.0030	U	ug/L	SW8270C-SI	06/19/15
Acenaphthylene	208-96-8	0.0014	0.010	0.0014	U	ug/L	SW8270C-SI	06/19/15
Acenaphthene	83-32-9	0.0018	0.010	0.0018	U	ug/L	SW8270C-SI	06/19/15
Fluorene	86-73-7	0.0014	0.010	0.0014	U	ug/L	SW8270C-SI	06/19/15
Phenanthrene	85-01-8	0.0015	0.010	0.0020	J	ug/L	SW8270C-SI	06/19/15
Anthracene	120-12-7	0.0020	0.010	0.0020	U	ug/L	SW8270C-SI	06/19/15
Fluoranthene	206-44-0	0.0033	0.010	0.0033	U	ug/L	SW8270C-SI	06/19/15
Pyrene	129-00-0	0.0038	0.010	0.0038	U	ug/L	SW8270C-SI	06/19/15
Benzo(a)anthracene	56-55-3	0.0019	0.010	0.0019	U	ug/L	SW8270C-SI	06/19/15
Chrysene	218-01-9	0.0024	0.010	0.0024	U	ug/L	SW8270C-SI	06/19/15
Benzo(b)fluoroanthene	205-99-2	0.0031	0.010	0.0031	U	ug/L	SW8270C-SI	06/19/15
Benzo(k)fluoranthene	207-08-9	0.0035	0.010	0.0035	U	ug/L	SW8270C-SI	06/19/15
Benzo(a)pyrene	50-32-8	0.0026	0.010	0.0026	U	ug/L	SW8270C-SI	06/19/15
Indeno(1,2,3-c,d)pyrene	193-39-5	0.0019	0.010	0.0019	U	ug/L	SW8270C-SI	06/19/15
Dibenzo(a,h)anthracene	53-70-3	0.0034	0.010	0.0034	U	ug/L	SW8270C-SI	06/19/15
Benzo(g,h,i)perylene	191-24-2	0.0024	0.010	0.0024	U	ug/L	SW8270C-SI	06/19/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	106	33-141	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D30-478-580

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 09:40
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231201

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	2.51	14.4	39.2		ug/Kg	SW8270C-SI	06/19/15
2-Methylnaphthalene	91-57-6	2.62	14.4	19.6		ug/Kg	SW8270C-SI	06/19/15
1-Methylnaphthalene	90-12-0	2.45	14.4	12.4	J	ug/Kg	SW8270C-SI	06/19/15
Acenaphthylene	208-96-8	2.55	14.4	19.8		ug/Kg	SW8270C-SI	06/19/15
Acenaphthene	83-32-9	2.22	14.4	30.7		ug/Kg	SW8270C-SI	06/19/15
Fluorene	86-73-7	2.53	14.4	34.0		ug/Kg	SW8270C-SI	06/19/15
Phenanthrene	85-01-8	2.69	14.4	243		ug/Kg	SW8270C-SI	06/19/15
Anthracene	120-12-7	3.70	14.4	40.2		ug/Kg	SW8270C-SI	06/19/15
Fluoranthene	206-44-0	2.57	14.4	752		ug/Kg	SW8270C-SI	06/19/15
Pyrene	129-00-0	2.11	14.4	808		ug/Kg	SW8270C-SI	06/19/15
Benzo(a)anthracene	56-55-3	2.16	14.4	272		ug/Kg	SW8270C-SI	06/19/15
Chrysene	218-01-9	4.29	14.4	471		ug/Kg	SW8270C-SI	06/19/15
Benzo(b)fluoroanthene	205-99-2	4.89	14.4	479		ug/Kg	SW8270C-SI	06/19/15
Benzo(k)fluoranthene	207-08-9	6.77	14.4	171		ug/Kg	SW8270C-SI	06/19/15
Benzo(a)pyrene	50-32-8	3.35	14.4	282		ug/Kg	SW8270C-SI	06/19/15
Indeno(1,2,3-c,d)pyrene	193-39-5	5.29	14.4	112		ug/Kg	SW8270C-SI	06/19/15
Dibenzo(a,h)anthracene	53-70-3	4.85	14.4	4.85	U	ug/Kg	SW8270C-SI	06/19/15
Benzo(g,h,i)perylene	191-24-2	5.29	14.4	166		ug/Kg	SW8270C-SI	06/19/15

Surrogate	% Recovery	Control Limits		Qualifier
Terphenyl-d14	315	18-137	1	*

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

1100 NE Circle Blvd., Suite 300
Corvallis, OR 97330
Tel 541-768-3120 Fax 541-752-0276

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D39-478-560

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 10:07
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231202

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	3.21	18.4	14.1	J	ug/Kg	SW8270C-SI	06/19/15
2-Methylnaphthalene	91-57-6	3.34	18.4	67.2		ug/Kg	SW8270C-SI	06/19/15
1-Methylnaphthalene	90-12-0	3.13	18.4	41.0		ug/Kg	SW8270C-SI	06/19/15
Acenaphthylene	208-96-8	3.26	18.4	14.1	J	ug/Kg	SW8270C-SI	06/19/15
Acenaphthene	83-32-9	2.84	18.4	11.2	J	ug/Kg	SW8270C-SI	06/19/15
Fluorene	86-73-7	3.23	18.4	17.0	J	ug/Kg	SW8270C-SI	06/19/15
Phenanthrene	85-01-8	3.43	18.4	28.7		ug/Kg	SW8270C-SI	06/19/15
Anthracene	120-12-7	4.72	18.4	16.8	J	ug/Kg	SW8270C-SI	06/19/15
Fluoranthene	206-44-0	3.28	18.4	44.6		ug/Kg	SW8270C-SI	06/19/15
Pyrene	129-00-0	2.70	18.4	46.9		ug/Kg	SW8270C-SI	06/19/15
Benzo(a)anthracene	56-55-3	2.76	18.4	19.6		ug/Kg	SW8270C-SI	06/19/15
Chrysene	218-01-9	5.48	18.4	24.2		ug/Kg	SW8270C-SI	06/19/15
Benzo(b)fluoroanthene	205-99-2	6.25	18.4	30.0		ug/Kg	SW8270C-SI	06/19/15
Benzo(k)fluoranthene	207-08-9	8.65	18.4	8.65	U	ug/Kg	SW8270C-SI	06/19/15
Benzo(a)pyrene	50-32-8	4.27	18.4	22.1		ug/Kg	SW8270C-SI	06/19/15
Indeno(1,2,3-c,d)pyrene	193-39-5	6.76	18.4	10.5	J	ug/Kg	SW8270C-SI	06/19/15
Dibenzo(a,h)anthracene	53-70-3	6.20	18.4	6.20	U	ug/Kg	SW8270C-SI	06/19/15
Benzo(g,h,i)perylene	191-24-2	6.76	18.4	19.3		ug/Kg	SW8270C-SI	06/19/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	49	18-137	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D45-478-673

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 10:31
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231203

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	3.45	19.8	101		ug/Kg	SW8270C-SI	06/20/15
2-Methylnaphthalene	91-57-6	3.60	19.8	173		ug/Kg	SW8270C-SI	06/20/15
1-Methylnaphthalene	90-12-0	3.37	19.8	106		ug/Kg	SW8270C-SI	06/20/15
Acenaphthylene	208-96-8	3.51	19.8	25.0		ug/Kg	SW8270C-SI	06/20/15
Acenaphthene	83-32-9	3.05	19.8	67.1		ug/Kg	SW8270C-SI	06/20/15
Fluorene	86-73-7	3.47	19.8	131		ug/Kg	SW8270C-SI	06/20/15
Phenanthrene	85-01-8	3.69	19.8	440		ug/Kg	SW8270C-SI	06/20/15
Anthracene	120-12-7	5.08	19.8	112		ug/Kg	SW8270C-SI	06/20/15
Fluoranthene	206-44-0	3.53	19.8	534		ug/Kg	SW8270C-SI	06/20/15
Pyrene	129-00-0	2.90	19.8	607		ug/Kg	SW8270C-SI	06/20/15
Benzo(a)anthracene	56-55-3	2.97	19.8	85.1		ug/Kg	SW8270C-SI	06/20/15
Chrysene	218-01-9	5.90	19.8	159		ug/Kg	SW8270C-SI	06/20/15
Benzo(b)fluoroanthene	205-99-2	6.72	19.8	191		ug/Kg	SW8270C-SI	06/20/15
Benzo(k)fluoranthene	207-08-9	9.31	19.8	9.31	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(a)pyrene	50-32-8	4.60	19.8	129		ug/Kg	SW8270C-SI	06/20/15
Indeno(1,2,3-c,d)pyrene	193-39-5	7.27	19.8	49.1		ug/Kg	SW8270C-SI	06/20/15
Dibenzo(a,h)anthracene	53-70-3	6.67	19.8	6.67	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(g,h,i)perylene	191-24-2	7.27	19.8	119		ug/Kg	SW8270C-SI	06/20/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	127	18-137	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D48-484-526**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 10:55
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231204**

Date Received: 06/10/15
Dilution Factor: 100
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	29.5	169	298		ug/Kg	SW8270C-SI	06/19/15
2-Methylnaphthalene	91-57-6	30.7	169	242		ug/Kg	SW8270C-SI	06/19/15
1-Methylnaphthalene	90-12-0	28.7	169	125	J	ug/Kg	SW8270C-SI	06/19/15
Acenaphthylene	208-96-8	30.0	169	1710		ug/Kg	SW8270C-SI	06/19/15
Acenaphthene	83-32-9	26.0	169	117	J	ug/Kg	SW8270C-SI	06/19/15
Fluorene	86-73-7	29.6	169	231		ug/Kg	SW8270C-SI	06/19/15
Phenanthrene	85-01-8	31.5	169	825		ug/Kg	SW8270C-SI	06/19/15
Anthracene	120-12-7	43.4	169	498		ug/Kg	SW8270C-SI	06/19/15
Fluoranthene	206-44-0	30.1	169	5800		ug/Kg	SW8270C-SI	06/19/15
Pyrene	129-00-0	24.8	169	9880		ug/Kg	SW8270C-SI	06/19/15
Benzo(a)anthracene	56-55-3	25.4	169	2500		ug/Kg	SW8270C-SI	06/19/15
Chrysene	218-01-9	50.3	169	3250		ug/Kg	SW8270C-SI	06/19/15
Benzo(b)fluoroanthene	205-99-2	57.4	169	4470		ug/Kg	SW8270C-SI	06/19/15
Benzo(k)fluoranthene	207-08-9	79.5	169	1740		ug/Kg	SW8270C-SI	06/19/15
Benzo(a)pyrene	50-32-8	39.2	169	4600		ug/Kg	SW8270C-SI	06/19/15
Indeno(1,2,3-c,d)pyrene	193-39-5	62.1	169	3140		ug/Kg	SW8270C-SI	06/19/15
Dibenzo(a,h)anthracene	53-70-3	56.9	169	652		ug/Kg	SW8270C-SI	06/19/15
Benzo(g,h,i)perylene	191-24-2	62.1	169	4200		ug/Kg	SW8270C-SI	06/19/15

Surrogate	% Recovery	Control Limits		Qualifier
Terphenyl-d14	0	18-137	1	*

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D51-490-502**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 11:30
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231205**

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	2.50	14.3	123		ug/Kg	SW8270C-SI	06/20/15
2-Methylnaphthalene	91-57-6	2.61	14.3	36.5		ug/Kg	SW8270C-SI	06/20/15
1-Methylnaphthalene	90-12-0	2.44	14.3	16.5		ug/Kg	SW8270C-SI	06/20/15
Acenaphthylene	208-96-8	2.54	14.3	40.7		ug/Kg	SW8270C-SI	06/20/15
Acenaphthene	83-32-9	2.21	14.3	38.0		ug/Kg	SW8270C-SI	06/20/15
Fluorene	86-73-7	2.52	14.3	38.4		ug/Kg	SW8270C-SI	06/20/15
Phenanthrene	85-01-8	2.68	14.3	238		ug/Kg	SW8270C-SI	06/20/15
Anthracene	120-12-7	3.68	14.3	45.8		ug/Kg	SW8270C-SI	06/20/15
Fluoranthene	206-44-0	2.56	14.3	411		ug/Kg	SW8270C-SI	06/20/15
Pyrene	129-00-0	2.10	14.3	556		ug/Kg	SW8270C-SI	06/20/15
Benzo(a)anthracene	56-55-3	2.15	14.3	131		ug/Kg	SW8270C-SI	06/20/15
Chrysene	218-01-9	4.28	14.3	162		ug/Kg	SW8270C-SI	06/20/15
Benzo(b)fluoroanthene	205-99-2	4.87	14.3	303		ug/Kg	SW8270C-SI	06/20/15
Benzo(k)fluoranthene	207-08-9	6.75	14.3	6.75	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(a)pyrene	50-32-8	3.33	14.3	181		ug/Kg	SW8270C-SI	06/20/15
Indeno(1,2,3-c,d)pyrene	193-39-5	5.27	14.3	89.2		ug/Kg	SW8270C-SI	06/20/15
Dibenzo(a,h)anthracene	53-70-3	4.84	14.3	4.84	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(g,h,i)perylene	191-24-2	5.27	14.3	200		ug/Kg	SW8270C-SI	06/20/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	112	18-137	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D60-476-567

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 12:30
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231206

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	3.40	19.5	15.6	J	ug/Kg	SW8270C-SI	06/20/15
2-Methylnaphthalene	91-57-6	3.54	19.5	8.43	J	ug/Kg	SW8270C-SI	06/20/15
1-Methylnaphthalene	90-12-0	3.32	19.5	6.39	J	ug/Kg	SW8270C-SI	06/20/15
Acenaphthylene	208-96-8	3.46	19.5	3.46	U	ug/Kg	SW8270C-SI	06/20/15
Acenaphthene	83-32-9	3.00	19.5	31.0		ug/Kg	SW8270C-SI	06/20/15
Fluorene	86-73-7	3.42	19.5	33.3		ug/Kg	SW8270C-SI	06/20/15
Phenanthrene	85-01-8	3.63	19.5	336		ug/Kg	SW8270C-SI	06/20/15
Anthracene	120-12-7	5.00	19.5	43.6		ug/Kg	SW8270C-SI	06/20/15
Fluoranthene	206-44-0	3.47	19.5	426		ug/Kg	SW8270C-SI	06/20/15
Pyrene	129-00-0	2.86	19.5	392		ug/Kg	SW8270C-SI	06/20/15
Benzo(a)anthracene	56-55-3	2.93	19.5	118		ug/Kg	SW8270C-SI	06/20/15
Chrysene	218-01-9	5.81	19.5	196		ug/Kg	SW8270C-SI	06/20/15
Benzo(b)fluoroanthene	205-99-2	6.62	19.5	178		ug/Kg	SW8270C-SI	06/20/15
Benzo(k)fluoranthene	207-08-9	9.17	19.5	9.17	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(a)pyrene	50-32-8	4.53	19.5	130		ug/Kg	SW8270C-SI	06/20/15
Indeno(1,2,3-c,d)pyrene	193-39-5	7.16	19.5	45.3		ug/Kg	SW8270C-SI	06/20/15
Dibenzo(a,h)anthracene	53-70-3	6.57	19.5	6.57	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(g,h,i)perylene	191-24-2	7.16	19.5	64.2		ug/Kg	SW8270C-SI	06/20/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	139	18-137	1 *

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D36-452-627

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 13:03
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231207

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	2.54	14.5	6.51	J	ug/Kg	SW8270C-SI	06/20/15
2-Methylnaphthalene	91-57-6	2.64	14.5	4.35	J	ug/Kg	SW8270C-SI	06/20/15
1-Methylnaphthalene	90-12-0	2.47	14.5	2.47	U	ug/Kg	SW8270C-SI	06/20/15
Acenaphthylene	208-96-8	2.58	14.5	2.58	U	ug/Kg	SW8270C-SI	06/20/15
Acenaphthene	83-32-9	2.24	14.5	2.24	U	ug/Kg	SW8270C-SI	06/20/15
Fluorene	86-73-7	2.55	14.5	3.57	J	ug/Kg	SW8270C-SI	06/20/15
Phenanthrene	85-01-8	2.71	14.5	31.9		ug/Kg	SW8270C-SI	06/20/15
Anthracene	120-12-7	3.73	14.5	5.27	J	ug/Kg	SW8270C-SI	06/20/15
Fluoranthene	206-44-0	2.59	14.5	58.2		ug/Kg	SW8270C-SI	06/20/15
Pyrene	129-00-0	2.13	14.5	72.0		ug/Kg	SW8270C-SI	06/20/15
Benzo(a)anthracene	56-55-3	2.18	14.5	12.0	J	ug/Kg	SW8270C-SI	06/20/15
Chrysene	218-01-9	4.33	14.5	33.3		ug/Kg	SW8270C-SI	06/20/15
Benzo(b)fluoroanthene	205-99-2	4.94	14.5	4.94	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(k)fluoranthene	207-08-9	6.84	14.5	6.84	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(a)pyrene	50-32-8	3.38	14.5	3.38	U	ug/Kg	SW8270C-SI	06/20/15
Indeno(1,2,3-c,d)pyrene	193-39-5	5.34	14.5	5.34	U	ug/Kg	SW8270C-SI	06/20/15
Dibenzo(a,h)anthracene	53-70-3	4.90	14.5	4.90	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(g,h,i)perylene	191-24-2	5.34	14.5	5.34	U	ug/Kg	SW8270C-SI	06/20/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	107	18-137	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D42-456-532

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 13:30
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231208

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	2.22	12.7	62.7		ug/Kg	SW8270C-SI	06/20/15
2-Methylnaphthalene	91-57-6	2.31	12.7	21.0		ug/Kg	SW8270C-SI	06/20/15
1-Methylnaphthalene	90-12-0	2.17	12.7	12.7		ug/Kg	SW8270C-SI	06/20/15
Acenaphthylene	208-96-8	2.26	12.7	10.0	J	ug/Kg	SW8270C-SI	06/20/15
Acenaphthene	83-32-9	1.96	12.7	47.2		ug/Kg	SW8270C-SI	06/20/15
Fluorene	86-73-7	2.23	12.7	40.2		ug/Kg	SW8270C-SI	06/20/15
Phenanthrene	85-01-8	2.37	12.7	237		ug/Kg	SW8270C-SI	06/20/15
Anthracene	120-12-7	3.27	12.7	29.0		ug/Kg	SW8270C-SI	06/20/15
Fluoranthene	206-44-0	2.27	12.7	271		ug/Kg	SW8270C-SI	06/20/15
Pyrene	129-00-0	1.87	12.7	324		ug/Kg	SW8270C-SI	06/20/15
Benzo(a)anthracene	56-55-3	1.91	12.7	78.8		ug/Kg	SW8270C-SI	06/20/15
Chrysene	218-01-9	3.79	12.7	94.9		ug/Kg	SW8270C-SI	06/20/15
Benzo(b)fluoroanthene	205-99-2	4.32	12.7	165		ug/Kg	SW8270C-SI	06/20/15
Benzo(k)fluoranthene	207-08-9	5.99	12.7	5.99	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(a)pyrene	50-32-8	2.96	12.7	104		ug/Kg	SW8270C-SI	06/20/15
Indeno(1,2,3-c,d)pyrene	193-39-5	4.68	12.7	52.2		ug/Kg	SW8270C-SI	06/20/15
Dibenzo(a,h)anthracene	53-70-3	4.29	12.7	4.29	U	ug/Kg	SW8270C-SI	06/20/15
Benzo(g,h,i)perylene	191-24-2	4.68	12.7	114		ug/Kg	SW8270C-SI	06/20/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	112	18-137	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D48-464-513

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 13:55
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231209

Date Received: 06/10/15
Dilution Factor: 10
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	2.44	14.0	25.7		ug/Kg	SW8270C-SI	06/17/15
2-Methylnaphthalene	91-57-6	2.54	14.0	13.4	J	ug/Kg	SW8270C-SI	06/17/15
1-Methylnaphthalene	90-12-0	2.38	14.0	8.33	J	ug/Kg	SW8270C-SI	06/17/15
Acenaphthylene	208-96-8	2.48	14.0	8.22	J	ug/Kg	SW8270C-SI	06/17/15
Acenaphthene	83-32-9	2.16	14.0	42.1		ug/Kg	SW8270C-SI	06/17/15
Fluorene	86-73-7	2.46	14.0	34.3		ug/Kg	SW8270C-SI	06/17/15
Phenanthrene	85-01-8	2.61	14.0	122		ug/Kg	SW8270C-SI	06/17/15
Anthracene	120-12-7	3.59	14.0	28.2		ug/Kg	SW8270C-SI	06/17/15
Fluoranthene	206-44-0	2.50	14.0	308		ug/Kg	SW8270C-SI	06/17/15
Pyrene	129-00-0	2.05	14.0	336		ug/Kg	SW8270C-SI	06/17/15
Benzo(a)anthracene	56-55-3	2.10	14.0	133		ug/Kg	SW8270C-SI	06/17/15
Chrysene	218-01-9	4.17	14.0	163		ug/Kg	SW8270C-SI	06/17/15
Benzo(b)fluoroanthene	205-99-2	4.76	14.0	281		ug/Kg	SW8270C-SI	06/17/15
Benzo(k)fluoranthene	207-08-9	6.59	14.0	106		ug/Kg	SW8270C-SI	06/17/15
Benzo(a)pyrene	50-32-8	3.25	14.0	158		ug/Kg	SW8270C-SI	06/17/15
Indeno(1,2,3-c,d)pyrene	193-39-5	5.14	14.0	74.4		ug/Kg	SW8270C-SI	06/17/15
Dibenzo(a,h)anthracene	53-70-3	4.72	14.0	4.72	U	ug/Kg	SW8270C-SI	06/17/15
Benzo(g,h,i)perylene	191-24-2	5.14	14.0	127		ug/Kg	SW8270C-SI	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	129	18-137	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: D48-484-526 DUP

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 11:00
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: P231212

Date Received: 06/10/15
Dilution Factor: 100
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	32.5	186	308		ug/Kg	SW8270C-SI	06/19/15
2-Methylnaphthalene	91-57-6	33.9	186	248		ug/Kg	SW8270C-SI	06/19/15
1-Methylnaphthalene	90-12-0	31.7	186	97.3	J	ug/Kg	SW8270C-SI	06/19/15
Acenaphthylene	208-96-8	33.1	186	2220		ug/Kg	SW8270C-SI	06/19/15
Acenaphthene	83-32-9	28.8	186	37.3	J	ug/Kg	SW8270C-SI	06/19/15
Fluorene	86-73-7	32.7	186	141	J	ug/Kg	SW8270C-SI	06/19/15
Phenanthrene	85-01-8	34.8	186	947		ug/Kg	SW8270C-SI	06/19/15
Anthracene	120-12-7	47.9	186	523		ug/Kg	SW8270C-SI	06/19/15
Fluoranthene	206-44-0	33.2	186	7990		ug/Kg	SW8270C-SI	06/19/15
Pyrene	129-00-0	27.4	186	13300		ug/Kg	SW8270C-SI	06/19/15
Benzo(a)anthracene	56-55-3	28.0	186	3420		ug/Kg	SW8270C-SI	06/19/15
Chrysene	218-01-9	55.6	186	4350		ug/Kg	SW8270C-SI	06/19/15
Benzo(b)fluoroanthene	205-99-2	63.4	186	6710		ug/Kg	SW8270C-SI	06/19/15
Benzo(k)fluoranthene	207-08-9	87.7	186	2460		ug/Kg	SW8270C-SI	06/19/15
Benzo(a)pyrene	50-32-8	43.3	186	6520		ug/Kg	SW8270C-SI	06/19/15
Indeno(1,2,3-c,d)pyrene	193-39-5	68.5	186	3320		ug/Kg	SW8270C-SI	06/19/15
Dibenzo(a,h)anthracene	53-70-3	62.9	186	601		ug/Kg	SW8270C-SI	06/19/15
Benzo(g,h,i)perylene	191-24-2	68.5	186	4250		ug/Kg	SW8270C-SI	06/19/15

Surrogate	% Recovery	Control Limits		Qualifier
Terphenyl-d14	0	18-137	1	*

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: SB1-0615

Project Name: Salem, City of
Sample Date: N/A
Sample Time: N/A
Type: QC
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: SB1-0615

Date Received: N/A
Dilution Factor: 1
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles								
Naphthalene	91-20-3	0.17	1.00	0.17	U	ug/Kg	SW8270C-SI	06/17/15
2-Methylnaphthalene	91-57-6	0.18	1.00	0.18	U	ug/Kg	SW8270C-SI	06/17/15
1-Methylnaphthalene	90-12-0	0.17	1.00	0.17	U	ug/Kg	SW8270C-SI	06/17/15
Acenaphthylene	208-96-8	0.18	1.00	0.18	U	ug/Kg	SW8270C-SI	06/17/15
Acenaphthene	83-32-9	0.15	1.00	0.15	U	ug/Kg	SW8270C-SI	06/17/15
Fluorene	86-73-7	0.18	1.00	0.18	U	ug/Kg	SW8270C-SI	06/17/15
Phenanthrene	85-01-8	0.19	1.00	0.19	U	ug/Kg	SW8270C-SI	06/17/15
Anthracene	120-12-7	0.26	1.00	0.26	U	ug/Kg	SW8270C-SI	06/17/15
Fluoranthene	206-44-0	0.18	1.00	0.18	U	ug/Kg	SW8270C-SI	06/17/15
Pyrene	129-00-0	0.15	1.00	0.15	U	ug/Kg	SW8270C-SI	06/17/15
Benzo(a)anthracene	56-55-3	0.15	1.00	0.15	U	ug/Kg	SW8270C-SI	06/17/15
Chrysene	218-01-9	0.30	1.00	0.30	U	ug/Kg	SW8270C-SI	06/17/15
Benzo(b)fluoroanthene	205-99-2	0.34	1.00	0.34	U	ug/Kg	SW8270C-SI	06/17/15
Benzo(k)fluoranthene	207-08-9	0.47	1.00	0.47	U	ug/Kg	SW8270C-SI	06/17/15
Benzo(a)pyrene	50-32-8	0.23	1.00	0.23	U	ug/Kg	SW8270C-SI	06/17/15
Indeno(1,2,3-c,d)pyrene	193-39-5	0.37	1.00	0.37	U	ug/Kg	SW8270C-SI	06/17/15
Dibenzo(a,h)anthracene	53-70-3	0.34	1.00	0.34	U	ug/Kg	SW8270C-SI	06/17/15
Benzo(g,h,i)perylene	191-24-2	0.37	1.00	0.37	U	ug/Kg	SW8270C-SI	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	91	18-137	

*=See case narrative
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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Project Name: Salem, City of
Type: QC
Matrix: Soil

Lab Information

LCS ID: BS1S0615

Report Revision No.: 0
Dilution Factor: 1

Analyte	CAS#	Spike Amount	Sample Result	Units	%Recovery	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles							
Naphthalene	91-20-3	50.0	37.3	ug/Kg	75	SW8270C-SIM	06/17/15
2-Methylnaphthalene	91-57-6	50.0	36.3	ug/Kg	73	SW8270C-SIM	06/17/15
1-Methylnaphthalene	90-12-0	50.0	36.3	ug/Kg	73	SW8270C-SIM	06/17/15
Acenaphthylene	208-96-8	50.0	39.6	ug/Kg	79	SW8270C-SIM	06/17/15
Acenaphthene	83-32-9	50.0	38.9	ug/Kg	78	SW8270C-SIM	06/17/15
Fluorene	86-73-7	50.0	39.7	ug/Kg	79	SW8270C-SIM	06/17/15
Phenanthrene	85-01-8	50.0	42.2	ug/Kg	84	SW8270C-SIM	06/17/15
Anthracene	120-12-7	50.0	40.5	ug/Kg	81	SW8270C-SIM	06/17/15
Fluoranthene	206-44-0	50.0	46.5	ug/Kg	93	SW8270C-SIM	06/17/15
Pyrene	129-00-0	50.0	45.8	ug/Kg	92	SW8270C-SIM	06/17/15
Benzo(a)anthracene	56-55-3	50.0	41.9	ug/Kg	84	SW8270C-SIM	06/17/15
Chrysene	218-01-9	50.0	45.9	ug/Kg	92	SW8270C-SIM	06/17/15
Benzo(b)fluoroanthene	205-99-2	50.0	48.5	ug/Kg	97	SW8270C-SIM	06/17/15
Benzo(k)fluoranthene	207-08-9	50.0	48.9	ug/Kg	98	SW8270C-SIM	06/17/15
Benzo(a)pyrene	50-32-8	50.0	43.8	ug/Kg	88	SW8270C-SIM	06/17/15
Indeno(1,2,3-c,d)pyrene	193-39-5	50.0	41.5	ug/Kg	83	SW8270C-SIM	06/17/15
Dibenzo(a,h)anthracene	53-70-3	50.0	42.1	ug/Kg	84	SW8270C-SIM	06/17/15
Benzo(g,h,i)perylene	191-24-2	50.0	43.3	ug/Kg	87	SW8270C-SIM	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	98	18-137	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Project Name: Salem, City of
Type: QC
Matrix: Water

Lab Information

LCS ID: BS1W0616

Report Revision No.: 0
Dilution Factor: 1

Analyte	CAS#	Spike Amount	Sample Result	Units	%Recovery	Analysis Method	Date Analyzed
GC/MS Semi-Volatiles							
Naphthalene	91-20-3	0.50	0.36	ug/L	73	SW8270C-SIM	06/17/15
2-Methylnaphthalene	91-57-6	0.50	0.36	ug/L	73	SW8270C-SIM	06/17/15
1-Methylnaphthalene	90-12-0	0.50	0.37	ug/L	73	SW8270C-SIM	06/17/15
Acenaphthylene	208-96-8	0.50	0.39	ug/L	78	SW8270C-SIM	06/17/15
Acenaphthene	83-32-9	0.50	0.38	ug/L	76	SW8270C-SIM	06/17/15
Fluorene	86-73-7	0.50	0.39	ug/L	77	SW8270C-SIM	06/17/15
Phenanthrene	85-01-8	0.50	0.39	ug/L	78	SW8270C-SIM	06/17/15
Anthracene	120-12-7	0.50	0.38	ug/L	77	SW8270C-SIM	06/17/15
Fluoranthene	206-44-0	0.50	0.42	ug/L	84	SW8270C-SIM	06/17/15
Pyrene	129-00-0	0.50	0.42	ug/L	83	SW8270C-SIM	06/17/15
Benzo(a)anthracene	56-55-3	0.50	0.39	ug/L	77	SW8270C-SIM	06/17/15
Chrysene	218-01-9	0.50	0.42	ug/L	84	SW8270C-SIM	06/17/15
Benzo(b)fluoroanthene	205-99-2	0.50	0.42	ug/L	84	SW8270C-SIM	06/17/15
Benzo(k)fluoranthene	207-08-9	0.50	0.45	ug/L	89	SW8270C-SIM	06/17/15
Benzo(a)pyrene	50-32-8	0.50	0.40	ug/L	80	SW8270C-SIM	06/17/15
Indeno(1,2,3-c,d)pyrene	193-39-5	0.50	0.41	ug/L	83	SW8270C-SIM	06/17/15
Dibenzo(a,h)anthracene	53-70-3	0.50	0.43	ug/L	86	SW8270C-SIM	06/17/15
Benzo(g,h,i)perylene	191-24-2	0.50	0.42	ug/L	84	SW8270C-SIM	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier
Terphenyl-d14	95	33-141	

*=See case narrative
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CASE NARRATIVE
GC SEMI-VOLATILES ANALYSIS

Lab Name: CH2M HILL ASL **ASL SDG#:** P2312

Project: Salem, City of **Project #:** 921024.OTC

With the exceptions noted as flags, footnotes, or detailed in the section below; standard operating procedures were followed in the analysis of the samples and no problems were encountered or anomalies observed.

All laboratory quality control samples were within established control limits, with any exceptions noted below, or in the associated QC summary forms.

Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. For diluted samples, the reporting limits are adjusted for the dilution required.

Calculations are performed before rounding to minimize errors in calculated values.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the section below, or in the sample receipt documentation.

Method(s):
NWTPH-DX: SW3510, SW3550

Surrogate Standard(s):
All surrogates were manually integrated per method requirements.
Surrogates in D30-478-580 were diluted out.
Surrogates in D39-478-560 were diluted out.
Surrogates in D45-478-673 were diluted out.
Surrogates in D48-484-526 were diluted out.
Surrogates in D51-490-502 were diluted out.
Surrogates in D60-476-567 were diluted out.
Surrogates in D36-452-627 were diluted out.
Surrogates in D42-456-532 were diluted out.
Surrogates in D48-464-513 were diluted out.
Surrogates in D48-484-526 DUP were diluted out.

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **TPH DrEq Blank**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 12:30
Type: Grab
Matrix: Water

Lab Information

Lab Sample ID: **P231211**

Date Received: 06/10/15
Dilution Factor: 1
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	0.028	0.095	0.028	U	mg/L	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier
o-Terphenyl	102	50-150	
Octacosane	105	50-150	

*=See case narrative
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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **WB3-0616**

Project Name: Salem, City of
Sample Date: N/A
Sample Time: N/A
Type: QC
Matrix: Water

Lab Information

Lab Sample ID: **WB3-0616**

Date Received: N/A
Dilution Factor: 1
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	0.030	0.10	0.030	U	mg/L	NWTPH-DX	06/16/15

Surrogate	% Recovery	Control Limits	Qualifier
o-Terphenyl	92	50-150	
Octacosane	96	50-150	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D30-478-580**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 09:40
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231201**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	72.7	364	477		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D39-478-560**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 10:07
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231202**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	92.7	464	1010		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D45-478-673**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 10:31
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231203**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	98.2	491	750		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D48-484-526**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 10:55
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231204**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	83.6	418	469		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D51-490-502**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 11:30
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231205**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	73.3	367	584		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
U=Not detected at specified detection limit
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J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D60-476-567**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 12:30
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231206**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	95.4	477	418	J	mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
U=Not detected at specified detection limit
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J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D36-452-627**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 13:03
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231207**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	74.6	373	413		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D42-456-532**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 13:30
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231208**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	62.6	313	380		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D48-464-513**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 13:55
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231209**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	69.0	345	242	J	mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
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J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: **D48-484-526 DUP**

Project Name: Salem, City of
Sample Date: 06/09/15
Sample Time: 11:00
Type: Composite
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: **P231212**

Date Received: 06/10/15
Dilution Factor: 50
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	92.5	463	556		mg/Kg	NWTPH-DX	06/17/15

Surrogate	% Recovery	Control Limits	Qualifier	
o-Terphenyl	0	50-150	1	*
Octacosane	0	50-150	2	*

*=See case narrative
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E=Estimated value above calibration range
J=Estimated value below reporting limit

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CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Client Sample ID: SB1-0610
Project Name: Salem, City of
Sample Date: N/A
Sample Time: N/A
Type: QC
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Sample ID: SB1-0610
Date Received: N/A
Dilution Factor: 1
Report Revision No.: 0

Analyte	CAS#	DL	RL	Sample Result	Qualifier	Units	Analysis Method	Date Analyzed
GC Semi-Volatiles								
TPH-Diesel	TPH-Diesel	1.00	5.00	1.00	U	mg/Kg	NWTPH-DX	06/16/15

Surrogate	% Recovery	Control Limits	Qualifier
o-Terphenyl	92	50-150	
Octacosane	95	50-150	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Project Name: Salem, City of
Type: QC
Matrix: Soil

Lab Information

LCS ID: BS1S0610

Report Revision No.: 0
Dilution Factor: 1

Analyte	CAS#	Spike Amount	Sample Result	Units	%Recovery	Analysis Method	Date Analyzed
GC Semi-Volatiles							
TPH-Diesel	TPH-Diesel	100	97.9	mg/Kg	98	NWTPH-DX	06/16/15

Surrogate	% Recovery	Control Limits	Qualifier
o-Terphenyl	99	50-150	
Octacosane	101	50-150	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Project Name: Salem, City of
Type: QC
Matrix: Water

Lab Information

LCS ID: BS3W0616

Report Revision No.: 0
Dilution Factor: 1

Analyte	CAS#	Spike Amount	Sample Result	Units	%Recovery	Analysis Method	Date Analyzed
GC Semi-Volatiles							
TPH-Diesel	TPH-Diesel	1.00	0.71	mg/L	71	NWTPH-DX	06/16/15

Surrogate	% Recovery	Control Limits	Qualifier
o-Terphenyl	95	50-150	
Octacosane	98	50-150	

*=See case narrative
U=Not detected at specified detection limit
E=Estimated value above calibration range
J=Estimated value below reporting limit

1100 NE Circle Blvd., Suite 300
Corvallis, OR 97330
Tel 541-768-3120 Fax 541-752-0276

CH2MHILL
Applied Sciences Laboratory (ASL)

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CASE NARRATIVE
GENERAL CHEMISTRY ANALYSIS

Lab Name: CH2M HILL ASL **ASL SDG#:** P2312

Project: Salem, City of **Project #:** 921024.OTC

With the exceptions noted as flags, footnotes, or detailed in the section below; standard operating procedures were followed in the analysis of the samples and no problems were encountered or anomalies observed.

All laboratory quality control samples were within established control limits, with any exceptions noted below, or in the associated QC summary forms.

Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. For diluted samples, the reporting limits are adjusted for the dilution required.

Calculations are performed before rounding to minimize errors in calculated values.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the section below, or in the sample receipt documentation.

Method(s):
SM2540G

CH2M HILL Applied Sciences Laboratory (ASL)

Client Information

Project Name: Salem, City of

Date Received: 06/10/2015
Type: See C.O.C.
Matrix: Soil
Basis: Dry Weight

Lab Information

Lab Batch ID: P2312

Analysis Method: SM2540G
Units: Percent
Report Revision No.: 0

Client Sample ID	Lab Sample ID	Dilution Factor	DL	Moisture RL	Result	Qualifier	Date Analyzed
General Chemistry							
D30-478-580	P231201	1	N/A	N/A	31.5		06/10/2015
D39-478-560	P231202	1	N/A	N/A	48.3		06/10/2015
D45-478-673	P231203	1	N/A	N/A	50.5		06/10/2015
D48-484-526	P231204	1	N/A	N/A	40.7		06/10/2015
D51-490-502	P231205	1	N/A	N/A	32.6		06/10/2015
D60-476-567	P231206	1	N/A	N/A	49.8		06/10/2015
D36-452-627	P231207	1	N/A	N/A	33.7		06/10/2015
D42-456-532	P231208	1	N/A	N/A	22.9		06/10/2015
D48-464-513	P231209	1	N/A	N/A	29.7		06/10/2015
D48-484-526 DUP	P231213	1	N/A	N/A	47.6		06/10/2015

U=Not detected at specified detection limit
J=Estimated value below reporting limit
E=Estimated value above calibration range
*=See case narrative

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CH2MHILL Applied Sciences Laboratory
CHAIN OF CUSTODY RECORD
AND AGREEMENT TO PERFORM SERVICES

Chain of Custody Record

1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
(541) 768-3120

Client Contact

Project Name: City of Salem CB sampling
Project # or PO #: 427885 (PO#)
Company Name: City of Salem
Address: 1410 28th St SE building 2
City/State/Zip: Salem, OR 97302
Project Manager: Anita Panko
Phone #: 503-589-2188
Report to email: ampanko@cityofsalem.net

Analysis Turnaround Time

TAT is Calander days
TAT if different from below _____
☒ 21 days (STD)
☐ 14 days * ☐ 3 day *
☐ 7 days * ☐ 2 days *
☐ 5 days * ☐ 1 day *
* (Surcharges will apply)

For Lab Use Only:

SDG: P2312
Custody Seals intact? ☑ Yes ☐ No
Hand delivered? ☐ Yes ☑ No
Cooler Temp: 24°C
Therm ID No.: 173 Therm Exp.: 8/15
Packing Material: Circle Below
(Ice) Blue Ice Box Bubble Wrap
Radiological Screen? ☐ Yes ☑ No

	Sample Identification (Limit of 20 characters)	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix (Water, Soil, Air)	Total # of Cont.	Preservation Used	Analysis Requested: moisture by SM2540G	PAH-GC/MS-SIM-Soil SW8270SIM	TPH-DRO (soil) NW TPH-DX	PAH GC/MS SIM-water SW 8270SIM	TPH-DRO (water) NW TPH-DX	Sample Specific Notes:	Lab ID:
1.	D30-478-580	6/9/15	9:40	C	Soil	1		X	X	X				1
2.	D39-478-560		10:07	C	Soil	1		X	X	X				2
3.	D45-478-673		10:31	C	Soil	1		X	X	X				3
4.	D48-484-526		10:55	C	Soil	1		X	X	X				4
5.	D51-490-502		11:30	C	Soil	1		X	X	X				5
6.	D60-476-567		12:30	C	Soil	1		X	X	X				6
7.	D36-452-627		13:03	C	Soil	1		X	X	X				7
8.	D42-456-532		13:30	C	Soil	1		X	X	X				8
9.	D48-464-503		13:55	C	Soil	1		X	X	X				9
10.	PAH Equipment Blank		10:50	G	EB	1					X			10
11.	TPH-Dx Equipment Blank		12:30	G	EB	1						X		11
12.	extra blank		14:00	G	EB	1								~~12~~
13.	D48-484-526 DUP		11:00	C	Soil	1		X	X	X				13/12

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are samples hazardous? ☐ Yes ☒ No
If yes, select hazard(s): ☐ Listed ☐ Ignitable ☐ Corrosive ☐ Reactive ☐ Toxic
If YES or NO is not checked above, samples will be assumed hazardous and hazardous disposal fees will be applied.

Sample Disposal (A fee may be added if samples are retained longer than 30 day per client request, samples are returned to client, or classified as hazardous.)
☐ Return to Client ☒ Disposal by Lab ☐ Archive for _____ months

Sampled By: Anita Panko Date/Time: 6/9/2015 9:40-14:50
Relinquished by: [signature] Date/Time: 6/9/15 14:50
Received by: Date/Time:
Relinquished by: Date/Time:
Received in Laboratory by: [signature] Date/Time: 6/10/15 1015
Shipped Via: ☐ UPS ☐ Fed-Ex ☐ USPS ☐ Other Tracking #:

Special Instructions/QC Requirements

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

SDG ID: P2312 Date Received: 6/10/15

Client/Project: City of Salem Received By: KF

Were custody seals intact and on the outside of the cooler?		☑ Yes	☐ No	☐ N/A
Shipping Record:	☐ Hand Delivered	☑ On File	☐ COC	
Radiological Screening for DoD		☐ Yes	☐ No	☑ N/A
Packing Material:	☐ Hand Delivered	☑ Ice	☐ Blue Ice	☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp. 8/15	2.4 °C	☑ Yes	☐ No	☐ N/A
Was a Chain of Custody (CoC) Provided?		☑ Yes	☐ No	☐ N/A
Was the CoC correctly filled out (If No, document below)		☑ Yes	☐ No	☐ N/A
Did sample labels agree with COC? (If No, document below)		☑ Yes	☐ No	☐ N/A
Did the CoC list a correct bottle count and the preservative types (No=Correct on CoC)		☑ Yes	☐ No	☐ N/A
Were the sample containers in good condition (broken or leaking)?		☑ Yes	☐ No	☐ N/A
Was enough sample volume provided for analysis? (If No, document below)		☑ Yes	☐ No	☐ N/A
Containers supplied by ASL?		☑ Yes	☐ No	☐ N/A
Any sample with < 1/2 holding time remaining? If so contact LPM		☐ Yes	☑ No	☐ N/A
Samples have multi-phase? If yes, document on SRER		☐ Yes	☑ No	☐ N/A
All water VOCs free of air bubbles? No, document on SRER		☐ Yes	☐ No	☑ N/A
pH of all samples met criteria on receipt? If "No", preserve and document below.		☐ Yes	☐ No	☑ N/A
Dissolved/Soluble metals filtered in the field?		☐ Yes	☐ No	☑ N/A
Dissolved/Soluble metals have sediment in bottom of container? If so document below.		☐ Yes	☐ No	☑ N/A

Preservation Adjustment

Sample ID	Reagent	Reagent Lot Number	Volume Added	Initials/Time	24 hour pH check Initials/Time

Did pH of all metals samples preserved upon receipt meet criteria 24 hours after preservation? ☐ Yes ☐ No

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

APPENDIX C. STORMWATER OUTREACH ACTIVITIES FY 2014-15

2014	JUL	AUG	SEP	OCT	NOV	DEC	2015	JAN	FEB	MAR	APR	MAY	JUNE
SAT	CC: Summer in Salem Photo Contest (G)		CC: FOT crew lead training (TP) & SOLVE riverside clean up (TH)	CC: Crew lead training (TP), Make a Difference Day (TH), Cascade Gateway Planting (TP), & Storm Drain Cleaning and Fall Leaf Haul (ID)	1CC: Storm Drain Cleaning and Fall Leaf Haul (ID)	CC: Storm Drain Cleaning and Fall Leaf Haul (ID), Rverside clean up report (T)	SAT	CC: Mutt Mitt Volunteer thanks (E)	CC: Photo contest (G), Green Awards G)	CC: No Ivy Coaltion (P); Poison Prevention (HHW)	CC: Earth 411 (2x) G, No Ivy @ Waldo Park P, SOLVE event (TH)		
SUN	SW: Vol. for storm drain marking (ID)	SW: Photo contest (G)	SW: Call Dispatch (ID)		2	SW: Electronic Recycling (HM)	SUN	SW: Resolution (G)	1	1			
MON	R. Fourth of July debris (TH)		1 Back to school Satety (O)	SW: Leaf Debris (ID)	3 R. FLH Volunteers (TH)	1 R. Fall Leaf Haul (TH)	MON		2 R. I LOVE SALEM (G)				1 R. Public Works Day (G)
TUE	1		2		4	2	TUE		3 Ed. Clean H20 Chal. (50) G 2/2				2
WED	2		3	1	5	3	WED		4	4	1		3
THUR	3		4	2	6	4 Ed. Community forestry presentation for Envirothon (13) G	THUR	1	5	5	2		4
FRI	4	1	5	3	7	5	FRI	2	6	6	3 E. OGS SUMMIT	1	5
SAT	5	2 O. Family Fest (1200) G	6	4 O. HOWLAPALOOZA (700) E. (20 CCC)	8	6 E. Fall Leaf Haul (210 yds^3; 40 vol) ID	SAT	3	7	7	E. NESCA /Lansing Plantings	2	6
MON	7 R. Oil Disposal (HM)	4 R. Car Wash (G)	8 SOLVE Clean Up (TH) &NIC	6 R *River starts Here (G)	10 R. *America Recy. (TH)	8 R. * E. Preparedness (O)	MON	5 R. Resolution (G)	9 R. Know Rain (G)	9 R. POLICE PSA (O)	6 R. * E411 (G)	4 R*Grasscycling (N)	8 R. *Storm Marking (ID)
TUE	8	5	9 Ed. Salmon Watch (28) G.	7	11 Ed. Clean water challenge (40) G 11/10	9 Ed. Erosion (52) TY + Clean H20 Chal. (22) G	TUE	6	10	10	7	5	9
WED	9	6	10	8 R * SW Review (G)	12	10	WED	7	11	11	8 O. E 411 on KMUZ	6	10
THUR	10	7	11	9	13	11	THUR	8	12	12	9	7	11 E. PW DAY (800) G
FRI	11 Ed. Geren Island (20) G	8	12 Ed. Critters pres. (28) G.	10	14	12	FRI	9 Ed. Enviroscape (45) G	13	13	10	8 Ed. ENVIROTHON (160) G	12
SAT	12 O. Saturday Market (50) G	9 O. Saturday Market (20) G	13	11 E. NIC at Orchard Heights Park (P)	15 E. Cascade gateway planting TP	13	SAT	10	14	14	11 E. Earth 411 (800 - 1000) G	9 O. Saturday Market (50) G	13
MON	14 R.Clean Streams (G)	11 R. Storm Drain Vol. (TH)	15 CCC (E)	13 R * SW Review (G)	17 R.Adopt A Drain (TH)	15 R. Know Rain (G)	MON	12 R. E. coli (E)	16 R.Woodmansee (TP)	16 R. *Poison Prev. (P)	13 R. Waldo Face Lift (P)	11 R. * CAS (O)	15 R. * Car wash (HM)
TUE	15	12	16	14	(TH)	16	TUE	13	17	17 Ed. Creek Critters (23) G	14 O.Fam. Nature N. (50) G	12	16
WED	16	13	17	15	19	17	WED	14	18	18	15	13	17
THUR	17	14	18	16 Ed. Critters in Creek @Bush (26) G	20 Ed. Clean water challenge (28) G	18	THUR	15	19	19 O. E 411 on KBZY + From River to Tap (21)	16	14	18
FRI	18	15	19 Ed. Macro/OH Park (28) G.	17	21	19 Ed. Sally Salmon (46) G	FRI	16	20	20	17	15	19
SAT	19	16	20 O. E. Salem Day of Play (100) (G)	18	22	20	SAT	17	21	21 Ed. From River to Tap at Geren Island (11) G	18	16	20
MON	21 R. E. coli (E)	18 R. Walk N Wag (E)	22 R. Friends of Trees Crew Lead Training (TP)	20 R. Make a Difference (G)	24 R. *Thankful for water resources(G)	22 R. * Recycling (HM)	MON	19 R. No Ivy (P)	23 R. *Green Awards (G)	23 R. No Ivy Coaltion (P)	20 R. Earth Day activities (G)	18 R. *Invasive Weed Awareness (P) +	22 R. CAS (O)
TUE	22	19	23	21	25	23	TUE	20	(G)	24. O. Earth 411 (90) G	21	19 Ed. Water Cycle (53) G	23
WED	23	20	24 Ed: Salmon Watch (25) G	22	26	24	WED	21	25	25	22 E.WALDO IVY PULL (P)	20	24
THUR	24	21	25 Ed. Salmon Watch (25) G	23	27	25	THUR	22	26	26 Ed. Water Cons. (27) G	23	21 Ed. Geren Island (52) G	25
FRI	25	22	26 Ed. Salmon Watch (30) G	24 Ed. Watersheds (25) G	28	26	FRI	23	27	27	24	22 Ed. Pledge Pres. (6) G	26
SAT	26	23 O. Walk N Wag (300) E. (17 new members)	27	25 E. FOT Crew Leader Training (TP) & NIC event (P)	29	27	SAT	24 E. No Ivy @ Brush college Park (P)	28 E. Woodmansee Park Planting (TP) / NIC (P)	28 E. No Ivy @Woodmansee (P)	25 E. NIC at Wallace Marine Park (P)	23E. NIC at Woodmansee Park (P)	27
MON	28 R. Family Fest (G)	25 R.Photo Contest (G)	29 R. Howlapalooza (E)	27 R. Know Rain (G)		29 R. * PW with you	MON	26 R. SW Wise (TY)		30 R. *FOT planting (TP)	27 R.* E. Preparedness (O)	25 R. Rx Take Back (HHW)	
TUE	29	26	30 Ed. Salmon Watch (26) G	28 Ed. Clean H20 Chal.(24) G 10/28		(O)	TUE	27 E. EROSION SUMMIT (TY)			28	26	
WED	30	27		29		31	WED	28			29	27	
THUR	31	28 O. Great Outdoors (12) G		30 R. *Halloween Safety (O)			THUR	29			30	28 Ed. WQ Studies (42) G	
FRI		29		31 Ed. OGS Coord. training (23) G 10/30			FRI	30				29 Ed. Stormwater Relay (30) G + Macros (48) G	
SAT		30					SAT	31				30 O. D. Park Open (25) E	

Legend:

CC: Community Connection Newsletter	
SW: Salem Weekly (Monthly Ad)	
Facebook Post (not on calendar)	
R: Radio Stations (Monday - Friday)	
R* Includes Spanish Radio	
Ed: Education Presentation	
O: Outreach Event	
E: City-sponsored Event	

#
18 articles/ads
6 ads
169 posts
52 weeks aired
15 weeks aired
47 presentations
12 events attended
16 sponsored

Pollutant Category symbols

Turbidity (TY)	Nutrients (N)
Trash/Solid Waste (T)	Industrial SW (IND)
Heavy M / Toxins (HM)	Illicit Discharge (ID)
General (G)	
E coli (E)	
Other (O)	
Temperature (TP)	
Mercury (M)	
Household Haz Waste (HHW)	
Pesticides/herbicides (P)	
Dissoved Oxygen (DO)