City of Auburn

Comprehensive Storm Drainage Plan

Report // Appendices

December 2015

Brown AND Caldwell

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Prepared for the

Community Development and Public Works Department

City of Auburn, Washington

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List of Abbreviations

§	section
ACC	Auburn City Code
BAB	Build America Bonds
BMP	best management practice
CCTV	closed-circuit television
CEMP	City's Emergency Management Plan
CERB	Community Economic Revitalization Board
cfs	cubic foot/feet per second
CIP	Capital Improvement Program
CMMS	computerized maintenance management system
Comp Plan	Comprehensive Plan for the City of Auburn (Land Use Plan)
CWA	Clean Water Act
DEM	Digital Elevation Model
Drainage Plan	Comprehensive Storm Drainage Plan
Ecology	Washington State Department of Ecology
Engineering	Engineering Services (division within Community Development and Public Works)
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	equivalent service unit
EWE	Energy and Water Efficiency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FTE	full-time equivalent
GASB	Governmental Accounting Standards Board
GIS	geographic information system
GMA	Growth Management Act
GO	general obligation
HDPE	high-density polyethylene
H&H	hydrologic and hydraulic
HPA	Hydraulic Project Approval
IDDE	illicit discharge detection and elimination
KCFCD	King County Flood Control Zone District
LFC	local facilities charge
LID	low-impact development
LOS	level of service
LOMR	Letter of Map Revision
MACP	Manhole Assessment and Certification Program
MEP	maximum extent practicable
M&O	maintenance and operations
MS4	municipal separate storm sewer system
NASSCO	National Association of Sewer Service Companies
NAVD88	North American Vertical Datum 1988
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPDES Permit	Western Washington Phase II Municipal Stormwater Permit
NRCS	Natural Resources Conservation Service
NSF	non-single-family
PACP	Pipeline Assessment and Certification Program
PWB	Public Works Board
RCW	Revised Code of Washington
ROW	right-of-way
R&R	repair and replacement
RSI	required supplementary information
SCADA	supervisory control and data acquisition
SDC	system development charge
SEPA	State Environmental Policy Act
SFAP	Stormwater Financial Assistance Program
SFHA	Special Flood Hazard Area
SR	State Route

SRS	software requirement specification
SWIF	System Wide Improvement Framework
SWMM	Surface Water Management Manual
SWMP	Stormwater Management Program
TMDL	total maximum daily load
ULID	utility local improvement district
USACE	U.S. Army Corps of Engineers
VRFA	Valley Regional Fire Authority
WAC	Washington Administrative Code
WRCC	Western Regional Climate Center
WSDOT	Washington State Department of Transportation

Executive Summary

This Comprehensive Storm Drainage Plan (Drainage Plan) for the City of Auburn (City) updates the previous plan, which was completed in 2009. The update was done to address new regulatory requirements, refine and document maintenance and operations (M&O) practices and assess staffing needs, update the list of projects for the Capital Improvement Program (CIP), and develop a current financial plan. This new Drainage Plan is intended to guide future activities and improvements for the storm drainage system based on an asset management approach.

This Drainage Plan was developed through the following steps:

- Review relevant information regarding the Storm Drainage Utility organizational structure, funding mechanisms, and regulatory drivers (Chapter 2).
- Review and update the level-of-service (LOS) goals in light of current Storm Drainage Utility responsibilities and new regulatory requirements (Chapter 3). LOS goals are policy- and community-based objectives for capital facility infrastructure development, operation, maintenance, and other Storm Drainage Utility activities.
- Characterize the current and expected future conditions of the natural and constructed drainage systems (Chapter 4) and identified drainage problems. The constructed drainage system requires a detailed system inventory for use in analyses and asset management.
- Evaluate the Storm Drainage Utility to identify potential gaps between the LOS goals and current or expected future service levels (Chapter 5). Evaluations included hydraulic analyses of the drainage system, asset life-cycle analyses, environmental investigations, and review of M&O activities (Chapter 6).
- Evaluate alternatives to reduce or eliminate identified gaps in service (Chapter 7) and select the measures to be included in the Drainage Plan based on detailed hydraulic modeling, estimated costs, and other factors.
- Establish the implementation plan, which is the future work plan for the Storm Drainage Utility (Chapter 8). Capital improvement projects from Chapter 7 were prioritized and placed into 6-year and 20-year CIP time frames. Non-capital works recommendations such as flow monitoring, regulatory compliance, future staffing needs improvements, additional asset management best practices, and additional programs and analysis are also included in the implementation plan.
- Prepare a financial plan (Chapter 9) to support the costs associated with proposed improvements.

This Drainage Plan contains implementation for future actions and decisions. These time frames could change depending on factors such as scheduling of project work, funding, and future opportunities to coordinate with non-Storm Drainage Utility projects such as road improvements. Therefore, the time frames are intended as guidance only and do not represent actual commitments by the City.

The following sections summarize the development of the Drainage Plan and outline the recommendations contained in the implementation plan and a summary of the financial plan.

ES-1 LOS Goals

LOS goals provide a framework for the Storm Drainage Utility to assess its staffing levels, prioritize its resources, justify its rate structure, and document its successes. It is important that LOS goals include clear criteria for evaluating Storm Drainage Utility performance.. LOS goals and associated City policies are summarized in Table ES-1.

Table ES-1. Level-of-Service Goals		
Item	**Policy description**	**2015 Drainage Plan LOS goal**
Policy category: business practices		
1	The City desires to employ recognized best business practices that result in the efficient and cost-effective operation of the utility.	The City shall identify the key business functions within the utility (e.g., billing, permitting, asset management, and planning) and develop supporting best business practices for each. The utility will conduct a performance audit every 6 years in conjunction with its capital projects planning cycle to evaluate how well best business practices are being implemented and how effective they are.
2	The City shall seek to employ the best practices for asset management by systematically basing choices on an understanding of asset performance, risks, and costs in the long term.	The City shall begin implementing the following best practices for all stormwater facilities during the next planning period and report progress annually: • Have knowledge about assets and costs (i.e., detailed inventories and condition assessments) • Maintain desired levels of service confirmed by customers • Take a life-cycle approach to asset management planning Implement the planned solutions to provide reliable, cost-effective service
Policy category: protection of public safety and property		
3	The City shall seek to manage stormwater runoff within the public right-of-way (ROW) to allow access to and functionality of critical services such as hospitals, fire and police stations, Emergency Operations Center, maintenance and operations, and City Hall. 7.	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of surface water flooding that disrupts the function of critical facilities (i.e., with floodwaters reaching the building structure, damaging the structure, and permitting no ingress/egress) will be no greater than 1% (i.e., an average recurrence interval of 100 years).
4	The City shall seek to manage stormwater runoff within the public ROW to preserve mobility on major transportation routes (i.e., arterial roads) and residential roads.	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates city roadways to an impassable level will be no greater than 4% (i.e., an average recurrence interval of 25 years).
5	The City shall seek to manage stormwater runoff from the public ROW to protect real property structures (e.g., residences and businesses).	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding (surface water from ROW runoff entering premises and damaging building structures) will be no greater than 2 percent (i.e., an average recurrence interval of 50 years).
6	The City shall seek to prevent erosion and landslides related to construction, operation, and maintenance of the publicly owned drainage system.	Public drainage infrastructure will be constructed, operated, and maintained so that there is no resulting erosion or landslides.
7	The City shall seek to maintain storm drainage infrastructure to ensure proper function of drainage facilities. The City shall seek to seasonally maintain storm drain inlets, conveyance, and outfalls to preserve design conveyance capacity.	The City will continue to refine its maintenance practices and reallocate staff as needed to address seasonal concerns, with an emphasis on maintaining facilities that have a high “consequence of failure.” An example would be focusing extra M&O staff on catch basin inlet cleaning during autumn when leaves are falling. All activities will be documented within the City’s Cartegraph computerized maintenance management system (CMMS).
Policy category: reliability of the storm drainage infrastructure		
8	The City shall seek to maintain an asset criticality database to be used in prioritizing asset maintenance and R&R.	The existing criticality database (developed for the 2008 Drainage Plan) will be refined to include more asset information, such as pipe material, diameter, age, consequence of failure, etc. The criticality database will be validated using the results of previous and ongoing M&O inspections. Activities will be documented within the City’s Cartegraph CMMS.
9	The City shall seek to perform condition assessments of critical assets.	The City will develop and implement a condition assessment schedule for all critical assets as identified through criticality analyses of stormwater infrastructure assets. Criticality is based on the risk and consequences of failure. Criticality data will be stored in a criticality database, and all condition assessment activities will be documented in the City’s Cartegraph CMMS.

Table ES-1. Level-of-Service Goals		
Item	Policy description	2015 Drainage Plan LOS goal
10	The City shall seek to repair or replace system assets before they exceed their economic lives.	The number of high-criticality pipe segments beyond their economic lives will be determined. After the criticality database inventory is complete, the City's goal will be to limit the number of pipe segments beyond their economic lives, including setting specific numeric goals for replacement of those segments.
11	The City shall seek to conduct maintenance activities in accordance with a schedule developed to comply with Ecology requirements and asset criticality.	No deferred maintenance on all critical or Ecology-required assets. The City will prioritize its inspection activities based on the combined "risk of failure" and "consequence of failure" computed by the criticality database and meet current NPDES inspection schedule (e.g., inspecting catch basins). The experience of M&O staff should be incorporated into the criticality database (see item 8 above). All inspection activities will be documented in the CMMS.
12	The City shall seek to maintain storm drainage infrastructure to ensure proper function of drainage facilities in accordance with Ecology requirements..	The City will develop a ditch maintenance program. The City will secure proper permits as well as coordinate with other agencies for work in the associated ROW. The ditch maintenance program will consist of inspecting and maintaining all ditches within the permit cycle and then on an as-needed basis.
13	The City shall seek to manage stormwater runoff from the public ROW with City-owned facilities located in the public ROW or on City-owned property. The City shall maintain or seek access to City-owned facilities for necessary maintenance and operation.	The City's Storm Drainage Utility will be responsible for maintenance and operation of the City's drainage system. The City shall seek to have access to all City-owned drainage infrastructure. The City shall seek to obtain easements or relocate infrastructure as necessary to maintain access.
Policy category: protection of the environment		
14	The City shall seek to comply with all federal and state regulations applied to stormwater management activities.	Meet all requirements of the Western Washington Phase II Municipal Stormwater Permit with no enforcement actions of the CWA for violations as a result of City stormwater operations.
15	The City shall seek to provide pump redundancy and backup power generators or dual power feeds at City-owned and -operated drainage pump stations.	All pump stations will be designed with two or more pumps to ensure proper function during maintenance. Backup and/or dual-feed power supplies will be installed as needed.
16	The City shall seek to comply with all federal, state, and local regulations in operation and maintenance of the City's storm drainage infrastructure.	Meet all specific targets. Examples include complying with NPDES Phase II inspection cycle, performing all necessary ESA consultations, etc.
17	The City shall protect and preserve existing native vegetation and drainage courses while maintaining their conveyance capacity.	The City will maintain existing habitat along drainage ways so there is no net loss of native vegetation (in terms of area) or natural drainage systems (in terms of stream length) . This does not apply to constructed or maintained facilities.
18	The City shall seek to comply with all federal, state, and local regulations to reduce runoff volumes and pollutant loads associated with new development and redevelopment.	The City will comply with the elements of the Western Washington Phase II Municipal Stormwater Permit and will adopt or implement the Ecology manual or equivalent for new development and redevelopment.
19	The City shall place emphasis on onsite approaches such as LID as the first consideration for runoff and pollutant load reduction for new development and redevelopment.	The City will identify feasibility criteria and provide guidance for the implementation of LID drainage management measures for new development and redevelopment (including City-owned properties).
20	The City shall seek to evaluate Storm Drainage Utility activities to emphasize sustainability.	City staff will identify specific areas to measure sustainability by examining how Storm Drainage Utility operations affect energy resources, natural resources, and the community. City staff will benchmark practices and log changes over the next planning period.
21	The City shall continue to participate in regional storm drainage, water resources, and water quality planning efforts.	The City will continue to actively participate in developing and implementing regional water quality planning and flood hazard reduction efforts within the Green River, Mill Creek, and White River drainage basins. The City will participate in the state's water quality monitoring program.

Table ES-1. Level-of-Service Goals		
Item	Policy description	2015 Drainage Plan LOS goal
22	The City shall comply with all federal, state, and local regulations in the inspection of the City's publicly owned storm drainage infrastructure and privately owned LID facilities.	For all new LID systems constructed after 2016, the City will develop authority and an inspection frequency for stormwater facilities developed in compliance with the NPDES Phase II Stormwater Permit. The City will develop an inspection assessment database to monitor and schedule facility maintenance for all publicly owned storm drainage infrastructure and privately owned LID facilities. This database will provide maintenance information for the criticality database in the City's Cartegraph CMMS.
Policy category: Storm Drainage Utility financial performance		
23	The City shall continue to fund and provide storm drainage services through the existing Storm Drainage Utility.	The City's Storm Drainage Utility should be responsible for implementation, maintenance, and operation of the City's drainage system, with a goal of 100% of the cost of drainage service delivery recovered via Storm Drainage Utility fees. Seek opportunities to provide public drainage benefits through grant funding and/or development partnerships where applicable.
24	The City shall assess appropriate rates and SDCs to fund the ongoing maintenance, operation, and capital expenditures of the utility, in accordance with the Drainage Plan.	Periodic cost-of-service studies shall be completed to reassess the monthly service fees and SDCs. Updates to coincide with all 6-year CIP updates.
25	The City shall seek to track the cost of claims as a metric.	City staff will summarize the annual costs of claims for the recent past to establish a baseline measurement of existing practices. If the current costs are deemed excessive, City staff will evaluate methods to reduce the risk of claims and measure its progress at reducing the overall cost of claims.
26	The City shall seek to track elements of capital improvement project implementation: (1) individual schedule, (2) project budget accuracy, and (3) overall performance in implementing CIP..	City staff will summarize current methods for capital improvement project implementation to create a baseline (e.g., schedule and costs) against which future improvements can be evaluated.
Policy category: customer satisfaction		
27	The City shall seek to evaluate and strive to maintain customer satisfaction with Storm Drainage Utility service delivery.	To effectively measure the public perception of utility performance, City staff will conduct the following: (1) summarize annual customer complaint reports, (2) communicate proactively with community and stakeholders regarding drainage infrastructure improvements, and (3) comply with Western Washington Phase II Municipal Stormwater Permit requirements for public education and outreach.
28	The City shall seek to build, operate, and maintain storm drainage infrastructure within an overarching goal of protecting employee safety.	City staff will track health and safety incidents to create a baseline against which to evaluate future improvements.

ES-2 Evaluation of the Storm Drainage Utility

A series of analyses were conducted to evaluate the Storm Drainage Utility and identify gaps between existing service levels and the desired LOS goals. The following evaluations were completed as:

- **Hydraulic:** Hydraulic evaluations consisted of using hydraulic models covering locations of existing problems to evaluate problems and develop capital improvement projects. Existing hydraulic models were updated based on recent geographic information system (GIS) data, design drawings, and record drawings. Some model updates also included calibration to flow monitoring data that were collected in 2010 and 2011. For problem areas that had not been previously modeled, new models were developed to estimate flow for capital improvement project sizing.

- **Asset management:** Asset life-cycle evaluations require detailed system information. System data (e.g., pipe material, pipe age, and proximity to critical facilities), which are stored in the City's Cartegraph CMMS, are used for such an analysis. This Drainage Plan includes a recommendation for implementing the economic life model using the data in Cartegraph.
- **Environmental:** Environmental evaluations centered on regulatory compliance for the 2013–18 National Pollutant Discharge Elimination System (NPDES) Western Washington Phase II Municipal Stormwater Permit (NPDES Permit). The permit was compared to the previous permit to identify additional requirements that could affect City regulations, facilities, and activities. The results were used to identify gaps and develop potential actions to comply with the NPDES Permit conditions over the permit period. The results of that effort, including as they affect Storm Drainage Utility staffing needs, are summarized in this Drainage Plan. The Compliance Work Plan, which outlines and guides compliance activities over the current permit term, was also updated based on the results of the analysis and is provided as an appendix to this Drainage Plan.
- **Maintenance and operations:** Existing M&O activities were evaluated to establish a baseline understanding of the preventive and responsive maintenance procedures currently performed by City Storm Drainage Utility M&O staff. The results were compared to LOS goals in order to estimate Storm Drainage Utility staffing, data collection, computerized record-keeping, and other Storm Drainage Utility needs. This plan identifies recommendations for improving existing services or work productivity and for regulatory compliance.

ES-3 Implementation Plan

The implementation plan is intended to serve as the work plan for the Storm Drainage Utility. The implementation plan consists of 6-year and 20-year CIPs, recommendations including monitoring and data collection, activities for NPDES compliance, and recommendations for using asset management strategies to improve utility M&O with an outlook on long-term sustainability.

ES-3.1 6-Year and 20-Year CIP

The 6-year CIP focuses mainly on existing flooding problems where recent storm events have revealed deficiencies in the drainage system. The capital improvement projects are designed to mitigate flooding in these areas and are expected to provide immediate benefits. The 6-year CIP also contains ongoing programmatic efforts, such as the Storm Drainage Utility's participation in the Street Utility Improvements program.

As current problems are addressed in the near term, the focus of the CIP begins to shift toward a more proactive program, where repair and replacement (R&R) of storm drainage assets can be prioritized according to the optimal timing for interventions. Ultimately, this process will allow the City to meet customer service levels, effectively manage risks, and minimize the City's costs of ownership. The 20-year CIP includes R&R. Table ES-2 lists the 12 capital improvement projects included in this Drainage Plan and lays out annual expenditures for the 6-year and 20-year CIP time frames.

Table ES-2. Project Cost Summary for 6- and 20-Year CIP

Project number	Project name	Priority	Repair/ Replacement	Upgrade/ Expansion	6-year CIP						2022–35	Total project costs, $[a]
					2016	2017	2018	2019	2020	2021		
1	West Main Street Pump Station Upgrade	1		100%	2,968,000							2,968,000
2	37th and I Streets NW Storm Improvements	1		100%	291,000							291,000
3	Hillside Drainage Assessment	1	100%		139,000	150,000						289,000
4A	30th Street NE Area Flooding, Phase 2	2		100%		896,000						896,000
4B	30th Street NE Area Flooding, Phase 3	3		100%				2,124,000				2,124,000
5A	West Hills Drainage Improvements at S 330th St. and 46th Pl. S	2		100%	317,000							317,000
5B	West Hills Drainage Improvements near S 314th St. and 54th Ave. S	3		100%			408,000		304,000			712,000
6	North Airport Area Improvements	2		100%	218,000							218,000
7	D St. SE Storm Improvements	2		100%			1,827,000					1,827,000
8	23rd St. SE Drainage Improvements	3		100%			316,500			316,500		633,000
9	Comprehensive Storm Drainage Plan update	1	35%	65%					300,000			300,000
10	Vegetative Waste Sorting Facility	1	100%			750,000	75,000					825,000
11	Storm Drainage Infrastructure Repair & Replacement Program	1	100%		100,000	1,000,000	100,000	1,000,000	100,000	1,000,000	7,700,000	11,000,000
12	Street Utility Improvements	1	100%		100,000	100,000	100,000	100,000	100,000	100,000	1,400,000	2,000,000
Total CIP cost for priority 1 projects					*3,598,000*	*2,000,000*	*275,000*	*1,100,000*	*500,000*	*1,100,000*	*9,100,000*	*17,673,000*
Total CIP cost for priority 2 projects					*535,000*	*896,000*	*1,827,000*	*0*	*0*	*0*	*0*	*3,258,000*
Total CIP cost for priority 3 projects					*0*	*0*	*724,500*	*2,124,000*	*304,0000*	*316,500*	*0*	*3,469,000*
Total CIP cost					$4,133,000	$2,896,000	$2,826,500	$3,224,000	$804,000	$1,416,500	$9,100,000	$24,400,000

a. Project costs are in 2014 dollars.

ES-3.2 Monitoring

Precipitation, stormwater flow, and water level data are needed to simulate rainfall-runoff processes with hydrologic and hydraulic (H&H) models. Precipitation is the source of stormwater runoff, and precipitation intensity and duration data are needed to drive H&H models. The City currently collects rainfall data with a rain gauge at City Hall. Stormwater flow data, such as flow rates, runoff volumes, and flooding elevations, are needed to calibrate models to assess the current capacity of the storm drainage system and develop potential capital improvement projects. Water level data can be useful for evaluating the performance of stormwater ponds and assessing the risk of overtopping. Water level monitoring in creeks to which the City's system discharges can be helpful to evaluate water level changes due to restoration and culvert replacement activities, and their impacts on the storm drainage system.

The City should continue to collect these types of data and store them in a consistent and organized manner. Table ES-3 summarizes specific recommendations for additional flow monitoring data collection for two potential problem areas. Table ES-4 summarizes specific recommendations for ongoing water level data collection at existing creek and pond locations, as well as additional pond locations.

Table ES-3. Proposed Flow Monitoring Sites

Site number[a]	Location	Purpose	Measurement	Start year	Approx. duration[b]
Potential problem area: Riverwalk Drive and Howard Road (increasing the tributary area to 17th and 21st street ponds)					
P1012-C690_C689	Intersection of Auburn Way S and Riverwalk Dr. SE	Quantify flow from upstream areas tributary to flow control device in CB1012-C688	Depth and velocity	2016	1 to 2 wet seasons
CB1012-C688	Intersection of Auburn Way S and Riverwalk Dr. SE	Estimate flows to high flow ditch on Riverwalk Dr. SE	Depth	2016	1 to 2 wet seasons
C1111-C1469_C1470	Intersection of Howard Rd. and Riverwalk Dr. SE	Quantify flows to support modeling flows that may be connected to the City's system at CB1011-C1474	Depth and velocity	2016	1 to 2 wet seasons
P1011-C1452_C1453	Howard Rd. between 21st St. SE and Riverwalk Dr. SE	Quantify flows to support modeling flows that may be connected to the City's system at CB1011-C1474	Depth and velocity	2016	1 to 2 wet seasons
P1011-C1086_C1137	Howard Rd. between 21st St. SE and Riverwalk Dr. SE	Quantify flows to support modeling flows that may be connected to the City's system at CB1011-C1474	Depth and velocity	2016	1 to 2 wet seasons
P1010-C3_C29	Howard Rd. near Auburn Way S	Provide data for H&H model calibration (subbasin C)	Depth and velocity	2016	1 to 2 wet seasons
P1010-B220_B221	21st and K Streets SE	Provide data for H&H model calibration (subbasin C) post-CIP (AWS Phase 2)[c]	Depth and velocity	2016	1 to 2 wet seasons
Potential problem area: 2nd and G streets SE					
P909-C122_C121	Auburn Way S, near 9th St. SE	Quantify flows upstream of flow split (at MH 909-C12) between subbasins B and C, and provide data for H&H model calibration	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons
P809-C113_C112	F St. SE, north of SR 18	Quantify flows upstream of sewer crossing, and provide data for H&H model calibration	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons
P810-C701_809-C18	G St. SE and E Main St.	Provide data for H&H model calibration (subbasin C)	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons

Table ES-3. Proposed Flow Monitoring Sites

Site number[a]	Location	Purpose	Measurement	Start year	Approx. duration[b]
P810-C698_C16	M St. SE, south of E Main St.	Provide data for H&H model calibration since M St. Grade Separation and Well 1 Transmission Projects implementation	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons
P810-C15_C241	E Main St. and N St. SE	Estimate backwater effects on drainage system	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons

a. *P = pipe, C = culvert, CB = catch basin, MH = manhole.*

b. *Data to support CIP need at least one wet season of good data—approximately October through April; if sufficiently large storms occur during the first season, then year 2 data may not be necessary. Monitoring period and duration within a potential problem area should be the same.*

c. *Relieve Auburn Way S Flooding; Phase 2 (AWS Phase 2) is planned for construction in 2015.*

d. *Detailed survey of the flow split at MH 909-C12 should be completed prior to flow monitoring, to understand system hydraulics at this location.*

Table ES-4. Proposed Water Level Monitoring Sites

Site number	Location	Purpose	Start year	Approx. duration
WL-Mill-01	Mill Creek at 37th St. NW	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Mill-02	Mill Creek at 29th St. NW	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Mill-03	Mill Creek at 15th St. NW	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Mill-04	Mill Creek at West Main St.	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Pond-17thSt	17th and A streets SE	Monitor pond performance (water levels and infiltration rates)	Ongoing since 2010	Indefinite[b]
WL-Pond-21stSt	21st and D streets SE	Monitor pond performance (water levels and infiltration rates)	Ongoing since 2011	Indefinite[b]
WL-Pond-RiverN	Riverwalk Dr. SE and U St. SE	Monitor pond performance (water levels and infiltration rates) and evaluate capacity in support of analysis for potential problem area at Riverwalk and Howard Road	2015	Indefinite[b]
WL-Pond-LakeS1	Lakeland South Pond 1	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]
WL-Pond-LakeS2	Lakeland South Pond 2	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]
WL-Pond-LakeEP	Lakeland East Pond	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]
WL-Pond-Mill	Mill Pond (Oravetz Rd. SE)	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]

a. *Based on need to examine backwater effects on system; if new capital improvements are identified for Mill Creek, additional years may be needed.*

b. *To be continually reevaluated; if data indicate that stormwater pond is performing adequately or has low risk of failure, then monitoring could cease.*

ES-3.3 Programmatic Measures for NPDES Compliance

As part of NPDES, the City of Auburn is covered by the NPDES Permit, which regulates stormwater discharges from the City's municipal separate storm sewer system (MS4). The City is actively engaged in stormwater management activities to comply with the Permit, including the following:

- Stormwater management plan administration
- Public education and outreach
- Public involvement and participation
- Illicit discharge detection and elimination (IDDE)
- Control of runoff from new development, redevelopment, and construction sites
- Municipal operations and maintenance
- Monitoring and assessment

The compliance schedule for key NPDES Permit requirements is included in Figure ES-1. The City of Auburn 2015 Stormwater Management Program Plan (City of Auburn, March 2015) provides additional details regarding the City's NPDES compliance activities.

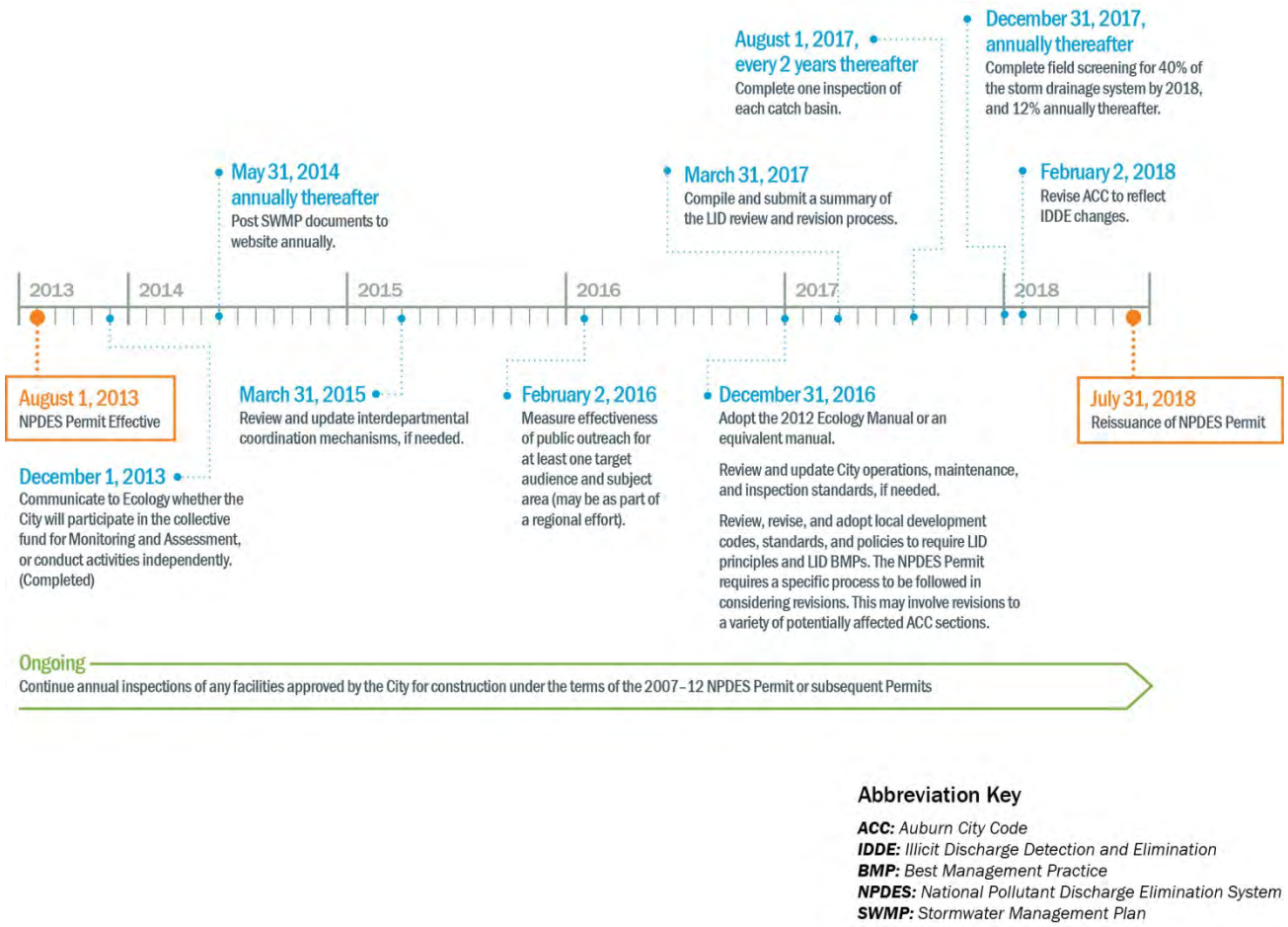


Figure ES-1. NPDES Compliance Schedule

ES-3.4 Future Staffing and Equipment Needs

Current Engineering Services (Engineering) and M&O staff and equipment were reviewed in light of anticipated NPDES Permit requirements as well as existing and future M&O responsibilities. Based on this evaluation, the following additional staff and equipment are recommended:

- 1.15 full-time equivalent (FTE) Engineering Services
- 3.3 FTE Storm Drainage Utility M&O Services
- 1.2 FTE Vegetation Maintenance Division Services
- Closed-circuit television (CCTV) inspection equipment for pipe inspection
- Excavator for drainage ditch and stormwater pond maintenance and restoration
- Excavator mower attachment for pond vegetation maintenance

ES-3.5 Assessment Management

Additional recommendations were made for activities to support asset management and ongoing M&O:

- **Continue system inventory:** The City should continue its comprehensive system inventory and the inventory should be continually updated to reflect additional data collected during maintenance activities (i.e., condition assessment and frequency of maintenance activities) and drainage system changes through capital improvement projects.
- **Implement economic life model using Cartegraph data:** The City should implement the economic life model for the pipes in its stormwater collection system using Cartegraph CMMS as a primary data source. Improvements to the model should also be implemented including incorporating City data on costs and failure rates, as well as adding catch basins and manholes to the model.
- **Optimize M&O program:** The City should continue to use the economic life model to optimize M&O activities. Model results can be used to prioritize M&O activities and R&R for the assets for which the City is carrying most of its risk. The City should continue the implementation of the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) and Manhole Assessment and Certification Program (MACP) certified inspection programs to allow integration of inspection and condition assessment results with Cartegraph. The City should also provide staff training to ensure assessment consistency.

ES-3.6 Recommendations for Additional Activities

Additional recommendations were made for activities that will support the Storm Drainage Utility in meeting its LOS:

- **Develop easement review and acquisition program:** Parts of the City's drainage network, particularly in areas annexed from King County, are located outside of the right-of-way (ROW) and cross private property without easements. The City should develop a process to ensure that it can meet the LOS goal related to having access to City-owned facilities for M&O activities.
- **Conduct risk assessment/asset vulnerability analysis:** The City should conduct a vulnerability analysis on the entire stormwater drainage system to examine the potential for natural disasters such as flood, erosion, earthquake, or volcanic activity to cause system failures. Of particular concern are critical facilities such as pump stations, hospitals, fire stations, M&O, City Hall, and City Hall Annex. The probabilities of failure associated with natural hazards should be weighed with the consequences of failure to determine if action is necessary and to identify appropriate mitigation measures.

- **Incorporate sustainability:** The City should take steps toward incorporating sustainability into Storm Drainage Utility activities. Recommended actions include developing specific and measurable sustainability goals for the Storm Drainage Utility and establishing standards that incorporate sustainability into project and activities.

A timeline (Figure ES-2) was developed to illustrate how each of the recommended activities in the implementation plan fit together within the 6-year and 20-year time frames.

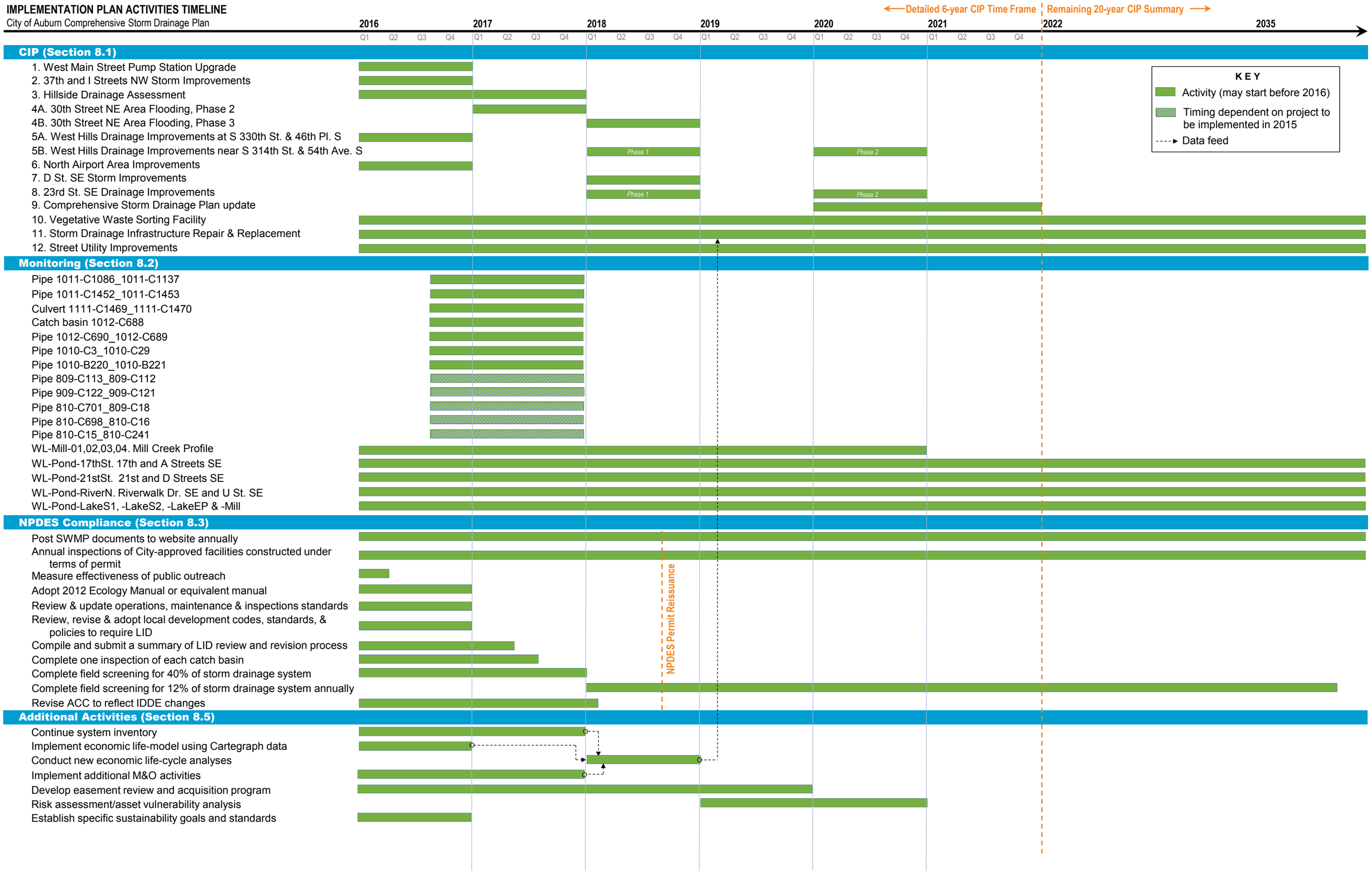
ES-4 Financial Plan

A financial plan was developed to identify the total cost of providing storm drainage service and to provide a financial program that allows the Storm Drainage Utility to remain financially viable during execution of the CIP. The viability analysis considered the historical financial condition of the Storm Drainage Utility, sufficiency of utility revenues to meet current and future financial and policy obligations, and financial impact of executing the CIP. The plan also provides a review of the Storm Drainage Utility's rate structure with respect to rate adequacy and customer affordability.

The financial analysis indicated that the adopted rates should be sufficient to meet the predicted Storm Drainage Utility financial obligations through 2018 with minimal bonds. An average rate increase of 2.6 percent is required to meet Storm Drainage Utility financial obligations for 2019 through 2021. The evaluation also found that the projected rates would remain well within the defined threshold of affordability

IMPLEMENTATION PLAN ACTIVITIES TIMELINE

City of Auburn Comprehensive Storm Drainage Plan



Chapter 1

Introduction

This Comprehensive Storm Drainage Plan (Drainage Plan) for the City of Auburn, Washington, updates the previous plan that was completed in December 2009 and amended in 2011. An update to the 2009 Drainage Plan is necessary for several reasons:

- The Washington State Growth Management Act (GMA) requires planning documents to be reassessed and updated periodically.
- New and updated regulatory and permitting requirements, such as those associated with the National Pollutant Discharge Elimination System (NPDES), need to be addressed.
- Continued growth and development, especially in areas annexed from King County, requires new and revised evaluations of the storm drainage system to maintain an understanding of existing and potential problems throughout the utility service area.
- The system inventory has been updated and is needed to account for utility assets and to improve the accuracy of the analyses used to develop capital improvement projects.
- The Capital Improvement Program (CIP) proposed in the 2009 Drainage Plan needs to be reevaluated to account for completed projects, changes in system conditions, and new development, as well as to incorporate new financial information.
- Additional capital improvement projects need to be developed for problems identified since the 2009 Drainage Plan.

This comprehensive plan contains time frames that are the intended framework for future funding decisions and within which future actions and decisions are intended to occur. However, these time frames are estimates, and depending on factors involved in the processing of applications and project work, and availability of funding, the timing may change from the included time frames. The framework does not represent actual commitments by the City of Auburn, which may depend on funding resources available.

1.1 Purpose and Objectives

The purpose of this Drainage Plan is to guide the City's Storm Drainage Utility with respect to future activities and improvements. The Drainage Plan's objectives are to:

- Evaluate environmental, social, and regulatory drivers to update the level-of-service (LOS) goals for capital facility infrastructure development, operation, maintenance, and other key elements of utility management
- Incorporate updates to the stormwater drainage system inventory into the hydraulic models used for analyzing the system
- Perform hydraulic modeling analysis to evaluate system capacity focusing on known problems and areas where data are available for model development and calibration
- Identify monitoring needs for evaluating the performance of system assets, as well as for calibrating hydraulic models in future modeling efforts
- Develop a CIP that meets required customer service levels, effectively managing risks, and minimizing the City's costs of drainage asset ownership

- Document maintenance and operations (M&O) activities and develop recommendations for improving the M&O program
- Prioritize capital improvement projects to accommodate both 6- and 20-year funding frameworks
- Incorporate information and activities from concurrent NPDES compliance planning
- Identify additional staffing needed based on NPDES requirements and future M&O activities
- Develop programmatic recommendations to address utility needs

1.2 Approach and Document Organization

Asset management principles were used throughout the development of this Drainage Plan. An asset management approach is designed to deliver defined service levels at an acceptable risk with the lowest life-cycle cost. Given this approach, identified problems were analyzed with respect to LOS goals, and recommendations were developed for achieving those goals.

This Drainage Plan is organized in a way that focuses on the actions the utility will take while implementing the plan. In most cases, supporting documentation and background information is included in appendices rather than chapters of the Drainage Plan. The Drainage Plan is organized into the following chapters:

Chapter 1 **Introduction:** describes the reasons for developing an updated Drainage Plan, and also states the purpose and objectives of the Drainage Plan

Chapter 2 **Background:** provides background information regarding the Storm Drainage Utility and regulatory drivers for developing LOS goals

Chapter 3 **Utility Policies and Level-of-Service Goals:** specifies the LOS goals used to develop capital improvements and future M&O activities

Chapter 4 **Drainage System:** describes the existing conditions of the City's drainage system

Chapter 5 **Evaluation of the Storm Drainage Utility:** describes methodologies used to evaluate existing problems and develop capital improvement projects

Chapter 6 **Maintenance and Operations:** documents existing Storm Drainage Utility M&O activities

Chapter 7 **Capital Improvements:** describes recommended capital improvement projects including cost estimates and conceptual figures

Chapter 8 **Implementation Plan:** prioritizes capital improvement projects and lays out a future work plan

Chapter 9 **Finance:** identifies the total cost of providing stormwater drainage services and provides a program for the utility to remain viable during execution of the CIP

Chapter 10 **Limitations**

Chapter 11 **References**

Chapter 2

Background

This chapter provides a brief description of the Storm Drainage Utility; organizational structure; and funding mechanisms; as well as an overview of the federal, state, and local regulations that can affect stormwater management in the city.

2.1 Storm Drainage Utility

Recurring local flooding, continued development, and degradation of water resources led the City of Auburn to form a public utility in 1986 to provide ongoing management of a storm drainage system[1]. Chapter 35.67 of the Revised Code of Washington (RCW) provides for the creation and funding of a public sewerage system and associated drainage systems. Establishment of a Storm Drainage Utility is found in Chapter 13.48 of the Auburn City Code (ACC). The general purpose of the Storm Drainage Utility is to avoid public nuisances and promote public health, safety, and welfare by reducing the likelihood of:

- Inundation of public and private property by stormwater
- Uncontrolled volume increase, rate, or contaminated load of runoff
- Degradation of existing water resources such as creeks, streams, rivers, ponds, lakes, groundwater, and other water bodies
- Degradation of water used for contact recreation, aquatic habitat, and aesthetic quality
- Jeopardy to the community's compliance with federal flood insurance programs

The City's current storm drainage system consists of 210 miles of pipe, 40 miles of ditches, more than 11,000 catch basins and manholes, 293 storage and water quality facilities, and 7 stormwater pump stations designed to convey rainwater from various collection points for eventual discharge to nearby receiving waters. A detailed description of the drainage system is provided in Chapter 4.

Sections 2.1.1 and 2.1.2 below describe the organizational structure of the Storm Drainage Utility and funding mechanisms, respectively.

2.1.1 Organizational Structure

The City's Storm Drainage Utility is organized under the larger umbrella of the Community Development and Public Works Department. This department covers six basic areas of responsibility:

- Water Utility Program
- Sanitary Sewer Utility Program
- Storm Drainage Utility Program
- Transportation Program
- Maintenance and Operations Program
- Community Development Services

[1] A public utility for stormwater management was established by City of Auburn Ordinance 4193 on December 15, 1986.

Under these programs the Community Development and Public Works Department carries out long-term planning, budget management, interaction, and regulation of development; management of capital improvements; and maintenance and operation for the associated City facilities. Given these program responsibilities, the Community Development and Public Works Department is divided into three divisions: Engineering Services, Maintenance and Operation (M&O) Services, and Community Development Services (see Figure 2-1). Planning and construction of storm drainage facilities is provided by Engineering Services. Maintenance of storm drainage facilities is provided by a dedicated stormwater division within M&O.

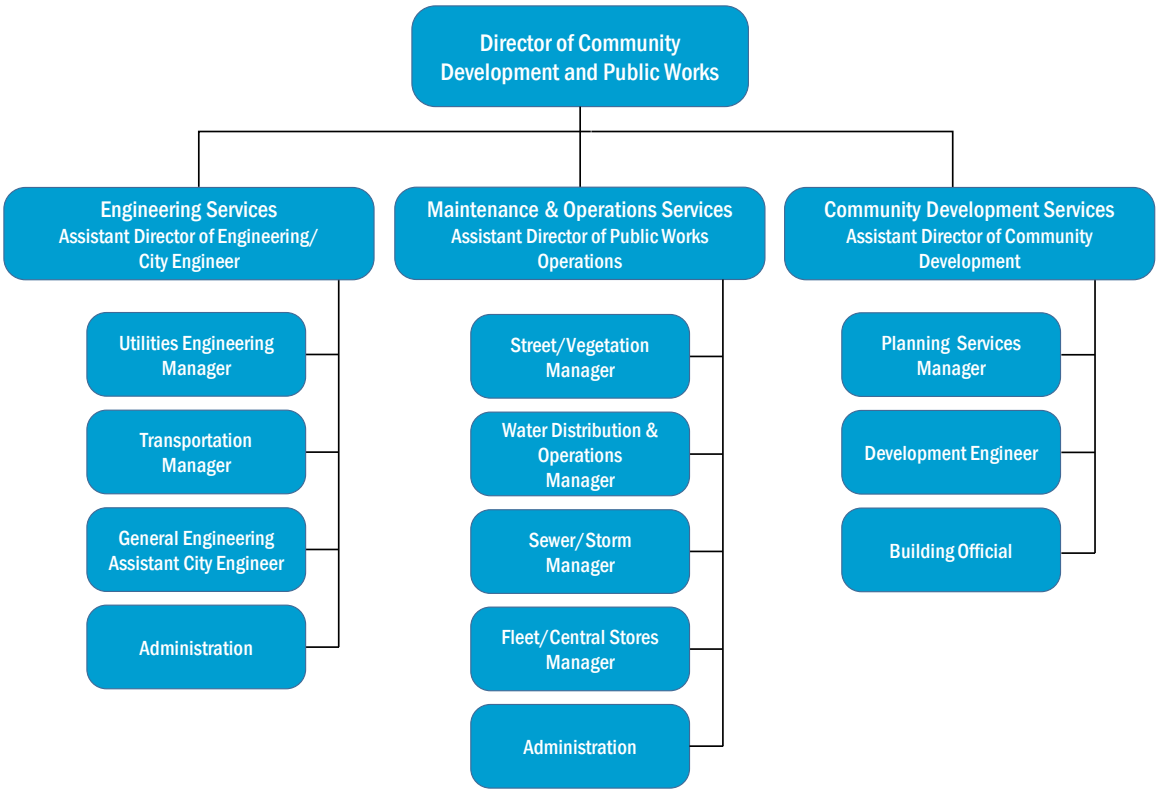


Figure 2-1. Community Development and Public Works Department Staff Organizational Chart

2.1.2 Funding Mechanisms

The following section provides adapted text from ACC, Title 13: Water, Sewers and Public Utilities, Chapter 13.48, Storm Drainage Utility, §13.48.060, Authority to establish rates. Per the ACC, the City has established rate classifications, service charges, and various fees and charges to pay for the following costs:

- The development, adoption, and implementation of a comprehensive Storm Drainage Utility master plan
- The debt service and related financing expenses of the construction and reconstruction of storm drainage and water quality facilities required for the management of stormwater and surface waters that benefit the service area but do not presently exist

- The operation, repair, maintenance, improvement, replacement, and reconstruction of storm drainage facilities that benefit the present service area (e.g., capital improvement projects to increase system capacity in accordance with LOS goals)
- The purchase of a fee or lesser interest, including easements, in land that may be necessary for the storm drainage system in the service area including, but not limited to, land necessary for the installation and construction of storm drainage facilities and all other facilities that are reasonably required for proper and adequate management of stormwater for the benefit of the service area
- The costs of monitoring, inspection, enforcement, and administration of the utility including, but not limited to, water quality surveillance, private system maintenance inspection, construction inspection, and other activities that are reasonably required for the proper and adequate implementation of the City's stormwater and surface water policies

2.1.2.1 Rates

The currently established rates for the storm drainage service are provided in Table 2-1 below, which lists rates for 2015 and 2016. Base rates are the monthly charge for service from the Storm Drainage Utility to recover costs incurred by the utility such as administrative, billing, and collection. Equivalent service units (ESU) are used as a means for estimating the development or impervious surfaces estimated to contribute an amount of runoff to the City's storm drainage system, which is approximately equal to that which is created by the average single-family residential parcel. "Impervious," as defined by the City (see ACC Chapter 13.41), is a hard surface area that prevents the entry of water into the soil mantle. Common impervious surfaces include, but are not limited to, rooftops, walkways, patios, concrete, or asphalt paving. Open, uncovered, retention/detention facilities shall not be considered as impervious surfaces for the purpose of ESU calculations. One ESU is equal to 2,600 square feet of impervious surface area or any portion thereof. Table 2-1 provides the current monthly charges, base rates, and ESU monthly rates for classifications used by the utility.

Table 2-1. 2015 and 2016 Utility Rates for Storm Drainage Service

Single-family parcel types	Effective as of January 1, 2015		Effective as of January 1, 2016	
	Monthly charge		Monthly charge	
Single-family residential parcels[a]	$19.25		$19.73	
Two-family residential parcels[b]	19.25		19.73	
Non-single-family parcels	**Base rate per month, $**	**ESUs per month**	**Base rate per month, $**	**ESUs per month**
Non-single-family (NSF)[c]	$11.97	$15.32	$12.27	$15.71
NSF with detention[d]	11.97	12.31	12.27	12.62
NSF with retention[e]	11.97	7.61	12.27	7.80
NSF with water quality treatment[f]	11.97	9.21	12.27	9.44
NSF with detention and water quality treatment	11.97	6.95	12.27	7.13
NSF with retention and water quality treatment	11.97	4.35	12.27	4.46

a. *Any parcel of land having on it a single detached dwelling unit that is designed for occupancy by one family or a similar group of people.*

b. *A building designed exclusively for occupancy by two families living independently of each other, and containing two dwelling units.*

c. *Any parcel of developed land other than single-family or two-family (duplex) residential.*

d. *Detention is the temporary storage of stormwater and surface water runoff with provisions for the controlled offsite surface release of the stored water.*

e. *Retention means the storage of stormwater and surface water runoff with no provisions for offsite surface release of the stored water other than by evaporation and infiltration.*

f. *Water quality treatment means an engineered and approved facility to remove contaminants in the existing flow regime of stormwater generated from a developed parcel pursuant to applicable design standards in place at the time of approval.*

Storm Drainage Utility rates are billed on a monthly basis. Storm drainage charges start from the day a water meter servicing the property is installed by the City. In cases where the property does not receive water service from the City, storm drainage charges start from the day that the storm drainage permit is finalized by the City. Payments received for utility bills are applied to expenses in the following order of priority: late charges, additional fees, stormwater, garbage, sewer, and water. Payment for stormwater drainage service charges is due and payable to the Finance Department office 15 days after the billing date appearing on the bill. Utility charges are constituted as a lien, and thus can be applied to a lien upon the property from which such charges are due, superior to all other liens and encumbrances whatsoever, except for general taxes and local special assessments.

2.1.2.2 Fees

The City has permit fees and connection fees. Permit fees are applied to cover the planning, checking, inspection, record drawings, and processing of permit information for new connections to the public storm drainage system. A repair permit fee is applied to cover inspection and processing of permit information for repairs conducted to private storm drainage systems.

Connection fees are charges in lieu of assessments. Such fees can be applied to properties that have not previously paid for storm drainage systems abutting their property, but intend to connect to it. The City determines the charge in lieu of assessment amount based on the property's proportional share of the calculated cost for the storm drainage system. Properties connected to storm drainage systems constructed prior to 1987 are not required to pay a charge in lieu of assessment, unless required to do so under an existing agreement. The City rarely charges connection fees for stormwater, but rather a system development charge (SDC) at the time a new customer joins into the system (see the following section).

2.1.2.3 System Development Charge

A utility SDC is a charge imposed on new customers, or existing customers revising use of their property, in recognition of the previous investment of the City and its customers in the utility systems. The purpose of an SDC is to recover a fair share of the costs of providing existing utility system infrastructure to serve new customers or revised uses of existing customers and provide for future improvements to serve new customers. As with Storm Drainage Utility rates, SDCs are based on the relative amount of impervious surface added to the system. In 2014, SDCs were estimated to be $1,162 per ESU (see Section 2.1.2.1 for a definition of ESU).

2.2 Development Code and Design Standards Updates

In compliance with the requirements of the 2007–12 NPDES Permit (as discussed in Section 2.3.2), the City conducted substantive updates to its development regulations and design standards contained within the ACC, including the City's Zoning Code, Subdivision Code, and Engineering Design Standards. The City also revised related stormwater standards, policies, and practices, and adopted a stormwater manual as required by the Permit. Specifically, the City adopted the Auburn Surface Water Management Manual (SWMM), which is a modified version of the City of Tacoma's 2008 Surface Water Management Manual (approved by the Washington State Department of Ecology [Ecology] as an equivalent manual).

In August 2012, Ecology issued an updated NPDES Permit to comply with requirements of the federal Clean Water Act (CWA). The new NPDES Permit became effective on August 1, 2013, and is effective through July 31, 2018. In January 2015, a modified version of the NPDES Permit was issued to incorporate outcomes from the permit appeals process, which were not significant for the City. To comply with updated requirements of the reissued NPDES Permit, the City will be required to pursue further updates to the ACC and stormwater standards.

Updates to City codes, standards, and policies are anticipated to:

- Incorporate low-impact development (LID) principles, making LID the preferred way of managing stormwater runoff from future development and redevelopment
- Reflect updated stormwater facility requirements for new development and redevelopment
- Accommodate new and more frequent inspections of permanent stormwater infrastructure, including public and private stormwater facilities
- Incorporate required changes to other City stormwater program elements, including illicit discharge detection and elimination (IDDE), public outreach and education, and monitoring

Development regulations related to stormwater and drainage design standards will also be reviewed for potential revision consistent with current policies and LOS goals.

See the following section for an overview of the City Stormwater Management Program (SWMP) and Chapter 8 for specific steps needed to maintain compliance with updated NPDES Permit requirements.

2.3 Regulatory Considerations

Numerous federal, state, and local regulations can affect stormwater management in the city. Table 2-2 summarizes a number of the applicable regulations.

Table 2-2. Federal, State, and City Regulations and Programs Relevant to the Auburn Storm Drainage Utility

Title	Regulation or program	Application to the City
Federal		
Clean Water Act (CWA): §402 NPDES Permit	Regulation	The NPDES Permit includes a number of requirements that affect stormwater management in the city. See Section 2.3.2 below.
CWA: §303(d) total maximum daily load (TMDL) listing	Regulation	TMDLs could lead to more stringent stormwater quality controls in future NPDES Permits.
CWA: §404 permit requirements	Regulation	Some stormwater capital improvement projects can affect wetlands or other "waters of the U.S." §404 permitting and mitigation can increase capital improvement project costs and schedules.
Endangered Species Act (ESA)	Regulation	Stormwater capital improvement projects that involve federal permitting or funding could require consultation with federal agencies under §7 of the ESA. ESA consultation could increase project timelines and costs.
National Flood Insurance Program	Program	The Drainage Plan could affect the City's rating under the Community Rating System, which affects flood insurance rates.
Governmental Accounting Standards Board (GASB) Statement 34	Program	Requires accurate inventory of City's stormwater infrastructure. See Section 2.3.3 below.
State		
State Environmental Policy Act (SEPA)	Regulation	Each capital improvement project would require SEPA review prior to implementation, unless that project qualifies as exempt.
Water quality standards	Regulation	The NPDES Permit does not authorize discharges that would violate State water quality standards. The State may establish TMDLs for water bodies that violate the standards. As noted above, the TMDLs can become NPDES Permit requirements.
§401 water quality certification	Regulation	Individual projects that require §404 or other federal permits would also require a 401 certification from Ecology. A 401 certification could include site-specific mitigation measures, which could affect capital improvement project design and cost estimates.
Puget Sound Water Quality Management Plan	Program	Drainage Plan recommendations should be consistent with the *Puget Sound Water Quality Management Plan*.

Table 2-2. Federal, State, and City Regulations and Programs Relevant to the Auburn Storm Drainage Utility		
Title	**Regulation or program**	**Application to the City**
Puget Sound Partnership	Program	In 2007, the Washington State Legislature created a State agency for the purpose of developing and overseeing the implementation of a 2014/2015 "Action Agenda" to clean up, restore, and protect Puget Sound by 2020. The Partnership's "Action Agenda" identified three priorities, one of which is to prevent pollution from urban stormwater runoff.
GMA and *City Comprehensive Plan*	Regulation	This Drainage Plan is required by the GMA. GMA is discussed in Section 2.3.1 below.
State Hydraulic Code	Regulation	Capital improvement projects that involve work in waters of the state would require a Hydraulic Project Approval (HPA) permit. HPA permitting and mitigation measures could affect capital improvement project costs.
Archaeological and cultural coordination	Regulation	If any capital improvement projects are planned for areas with known or suspected archaeological sites, the City will need to coordinate with the Department of Archaeology and Historic Preservation, local Indian tribes, and King County Historic Preservation.
City		
Environmental review	Regulation	Each capital improvement project would be subject to environmental review prior to permitting and construction as prescribed in ACC 16.06. This chapter of the ACC was adopted under the authority of SEPA.
Critical areas ordinance	Regulation	The Drainage Plan should avoid capital improvement projects in critical areas (e.g., wetlands, groundwater protection zones, or wildlife habitat). If a capital improvement project must be sited in a critical area, the cost estimate should include costs for mitigation and permitting as prescribed in ACC 16.10.
Development regulations	Regulation	The City's development regulations must be consistent with NPDES Permit requirements.
Shoreline Master Program	Regulation	Future projects should be located and designed to be consistent with the City shoreline regulations (ACC 16.08). Projects within designated shorelines could require permits and mitigation, which could affect project costs and schedules.

Most of the regulations listed in Table 2-2 primarily affect the implementation of specific measures recommended in the Drainage Plan. For example, capital improvement projects that could affect wetlands would need to comply with City critical areas regulations and possibly federal CWA Section 404 regulations. However, three of the regulations listed in Table 2-2—the GMA, Ecology's Phase II NPDES Stormwater Permit, and federal GASB Statement 34—directly affect the LOS for this Drainage Plan. These regulations are discussed in greater detail in Sections 2.3.1 through 2.3.3 below.

2.3.1 Growth Management Act

The Washington State Legislature enacted the GMA in 1990 in response to rapid population growth and concerns with suburban sprawl, environmental protection, quality of life, and related issues. The GMA is codified primarily in RCW Chapter 36.70A.

The GMA provides a framework for regional coordination, and counties planning under the GMA are required to adopt countywide planning policies to guide plan adoption within the county and to establish urban growth areas. Local comprehensive plans must include the following elements: land use, housing, capital facilities, utilities, transportation, economic development, parks and recreation, and, for counties, a rural element. This Drainage Plan serves as the capital facilities element for City-owned storm drainage assets.

RCW 36.70A.070 requires capital facilities elements to include:

- An inventory of existing capital facilities owned by public entities, showing the locations and capacities of the capital facilities.

- A forecast of the future needs for such capital facilities.
- The proposed locations and capacities of expanded or new capital facilities.
- At least a 6-year plan that will finance such capital facilities within projected funding capacities and clearly identifies sources of public money for such purposes.
- A requirement to reassess the land use element if probable funding falls short of meeting existing needs and to ensure that the land use element, capital facilities plan element, and financing plan within the capital facilities plan element are coordinated and consistent. Parks and recreation facilities shall be included in the capital facilities plan element.

To facilitate meeting the above requirements, Washington Administrative Code (WAC) Section 365-196-415 recommends:

- An inventory of existing capital facilities showing locations and capacities, including the extent to which existing facilities have available capacity for future growth. The inventory should be periodically reviewed and updated.
- A forecast of capital facilities (including general location and capacity) needed during the planning period, based on the LOS or planning assumptions selected and consistent with the growth, densities, and distribution of growth anticipated in the land use element.
- The creation of at least a 6-year capital facilities plan for financing capital facilities needed within that time frame. Projected funding capacities based on revenues available under existing laws and ordinances, are to be evaluated, followed by the identification of sources of public or private funds for which there is reasonable assurance of availability. The 6-year plan should be updated at least biennially so that financial planning remains sufficiently ahead of the present for concurrency to be evaluated.
- A provision should be made to reassess the land use element and other elements of the plan if the probable funding for capital facilities is insufficient to meet development needs. If the reassessment identifies a lack of public facilities, a variety of strategies may be implemented including reducing LOS and increasing revenue.

2.3.2 Phase II Municipal Stormwater Permit

The NPDES permit program is a requirement of the federal CWA, which is intended to protect and restore waters for “fishable, swimmable” uses. The federal Environmental Protection Agency (EPA) has delegated permit authority to state environmental agencies, and these agencies can set permit conditions in accordance with and in addition to the minimum federal requirements. In Washington, Ecology is the NPDES-delegated Permit authority.

Phase I of the stormwater NPDES regulation applies to cities and counties that operate municipal separate storm sewer systems (MS4s) and had populations of 100,000 people or more according to the 1990 census. Phase II of the stormwater NPDES regulation applies to municipalities that operate MS4s and have populations of fewer than 100,000 people. Auburn is a Phase II permittee.

Ecology issued the initial Western Washington Phase II Municipal Stormwater Permit (NPDES Permit) in February 2007, a subsequent updated NPDES Permit in August 2012, and a further modified version in January 2015 (Appendix A). The Permit requires the City to submit a SWMP Plan by March 31 of each year, in which the City identifies activities to be completed in compliance with the Permit requirements. The Permit also requires submittal of an annual report that looks back on SWMP activities for the prior year.

Implementation of updated NPDES Permit conditions is staggered throughout the 5-year Permit term from August 1, 2013, through July 31, 2018. The NPDES Permit will again be revised and reissued at the

end of this period. The NPDES Permit and associated requirements are described in detail in the City's current SWMP Plan available on the City's website.

The NPDES Permit allows municipalities to discharge stormwater runoff from their municipal drainage systems into the state's water bodies (e.g., streams, rivers, lakes, and wetlands) as long as municipalities implement programs to protect water quality by reducing the discharge of "nonpoint source" pollutants to the "maximum extent practicable" (MEP) through application of Permit-specified "best management practices" (BMPs). The stormwater management activities specified in the NPDES Permit are collectively referred to as the SWMP and grouped under the following program components:

- SWMP administration
- Public education and outreach
- Public involvement and participation
- IDDE
- Control of runoff from new development, redevelopment, and construction sites
- Municipal operations and maintenance
- Monitoring and assessment

The NPDES Permit also requires compliance with established total maximum daily loads (TMDLs)[2]. The current NPDES Permit requires the City to monitor discharges to the White River, in association with the Puyallup River watershed fecal coliform TMDL. Ecology has identified several other water bodies in the vicinity of Auburn that do not appear to meet the water quality standards, and additional TMDL requirements are possible in future Permits.

2.3.3 Governmental Accounting Standards Board

Financial reporting by public utilities must adhere to requirements set by the GASB, the agency responsible for developing standards of state and local governmental accounting and financial reporting. Most prominent is GASB Statement 34, "Basic Financial Statements—and Management's Discussion and Analysis—for State and Local Governments," which was issued in June 1999. The main objective of Statement 34's requirements is to have financial reports that are more comprehensive and are easier to understand by the public. Statement 34 consists of several components, which can be seen in full in paragraphs 3–166 of the GASB publications. In summary, Statement 34 requires that the basic financial statements and required supplementary information (RSI) for general purpose governments should consist of the following:

- **Management's discussion and analysis.** In sum, this requirement states that prior to the basic financial statements, a discussion providing an analytical overview of the government's financial activities is necessary.
- **Basic financial statements,** which should include:
  - Government-wide financial statements that include information on *net assets* (e.g., storm drainage infrastructure) and *a statement of activities.*

[2] A TMDL is a calculated maximum pollutant loading a water body can receive while still meeting water quality standards. Once a TMDL is established, the State determines how much each source must reduce its discharges of the pollutant in order to bring the water body back into compliance with the water quality standards. The federal CWA requires that TMDLs be established for all water bodies that do not meet water quality standards, and that TMDL requirements be included in the NPDES permits for dischargers into the affected water bodies.

  - Fund financial statements that focus on information about the government's major governmental and enterprise funds (e.g., the City's Storm Drainage Utility), including its blended component units.
  - Notes to the financial statements that will enable users to understand the basic financial statements.
- **Required supplementary information.** Budgetary comparison schedules should be presented as RSI along with other types of data as required by previous GASB pronouncements.

Consequently, the City needs an accurate inventory of its stormwater infrastructure in order to comply with the GASB 34 requirements.

Chapter 3

Utility Policies and Level-of-Service Goals

This chapter describes a set of guiding policies for the City's Storm Drainage Utility and LOS goals for complying with these policies. Level of service is generally defined as a community's specific goals or objectives for capital facility infrastructure development, operation, maintenance, and other key elements of utility management. These goals provide a framework for the utility to assess its staffing levels, prioritize its resources, justify its rate structure, and document its successes. LOS goals should relate directly to Utility policies and include clear criteria to use in evaluating how well LOS goals are being met.

The City has developed policies and LOS goals for the following elements of Storm Drainage Utility operation:

- Business practices
- Protection of public safety and property
- Reliability of the storm drainage infrastructure
- Protection of the environment
- Financial performance of the utility
- Customer satisfaction

The remainder of this Chapter introduces the concept of LOS goals in storm drainage utilities and presents the Storm Drainage Utility policies and specific LOS goals for the City.

3.1 Level-of-Service Goals within Storm Drainage Utilities

LOS goals defined by a storm drainage utility can relate to quality, quantity, reliability, responsiveness, safety, environmental acceptability, and cost of delivering service. To serve as effective management tools, LOS goals should be measurable. For example, a measurable "public health and safety" LOS goal for drainage would be to ensure that flooding beyond a certain depth does not recur on critical traffic routes more often than a target frequency (e.g., flooding that affects private property limited to an average of once per 50 years). An example of an "environmental protection" LOS goal would be compliance with all required elements of the City's Phase II NPDES Stormwater Permit. In the latter example, the NPDES Permit has embedded specific metrics for evaluating compliance (e.g., implementation of 95 percent of Permit-required stormwater facility inspections). In this instance, the NPDES Permit is mandating that the City implement measurable LOS criteria.

By documenting LOS, a storm drainage utility provides a transparent set of metrics to elected officials and the community, and can begin to communicate with stakeholders about rate implications associated with increasing or decreasing service. Higher LOS standards result in greater costs to taxpayers, ratepayers, and new development; lower LOS standards may result in lower rates but unacceptable public safety, environmental stewardship, or regulatory compliance. LOS goals may be flexible; communities should be willing to periodically revisit LOS goals to make sure that they are still appropriate.

3.2 Storm Drainage Utility Policies and Levels of Service

The Storm Drainage Utility policies and LOS goals are provided in Table 3-1 and are organized by category.

Table 3-1. Storm Drainage Utility Policies and LOS Goals

Item	Policy description	2015 Drainage Plan LOS goal
Policy category: business practices		
1	The City desires to employ recognized best business practices that result in the efficient and cost-effective operation of the utility.	The City shall identify the key business functions within the utility (e.g., billing, permitting, asset management, and planning) and develop supporting best business practices for each. The utility will conduct a performance audit every 6 years in conjunction with its capital projects planning cycle to evaluate how well best business practices are being implemented and how effective they are.
2	The City shall seek to employ the best practices for asset management by systematically basing choices on an understanding of asset performance, risks, and costs in the long term.	The City shall begin implementing the following best practices for all stormwater facilities during the next planning period and report progress annually: • Have knowledge about assets and costs (i.e., detailed inventories and condition assessments) • Maintain desired levels of service confirmed by customers • Take a life-cycle approach to asset management planning Implement the planned solutions to provide reliable, cost-effective service
Policy category: protection of public safety and property		
3	The City shall seek to manage stormwater runoff within the public right-of-way (ROW) to allow access to and functionality of critical services such as hospitals, fire and police stations, Emergency Operations Center, maintenance and operations, and City Hall.	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of surface water flooding that disrupts the function of critical facilities (i.e., with floodwaters reaching the building structure, damaging the structure, and permitting no ingress/egress) will be no greater than 1% (i.e., an average recurrence interval of 100 years).
4	The City shall seek to manage stormwater runoff within the public ROW to preserve mobility on major transportation routes (i.e., arterial roads) and residential roads.	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates city roadways to an impassable level will be no greater than 4% (i.e., an average recurrence interval of 25 years).
5	The City shall seek to manage stormwater runoff from the public ROW to protect real property structures (e.g., residences and businesses).	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding (surface water from ROW runoff entering premises and damaging building structures) will be no greater than 2 percent (i.e., an average recurrence interval of 50 years).
6	The City shall seek to prevent erosion and landslides related to construction, operation, and maintenance of the publicly owned drainage system.	Public drainage infrastructure will be constructed, operated, and maintained so that there is no resulting erosion or landslides.
7	The City shall seek to maintain storm drainage infrastructure to ensure proper function of drainage facilities. The City shall seek to seasonally maintain storm drain inlets, conveyance, and outfalls to preserve design conveyance capacity.	The City will continue to refine its maintenance practices and reallocate staff as needed to address seasonal concerns, with an emphasis on maintaining facilities that have a high "consequence of failure." An example would be focusing extra M&O staff on catch basin inlet cleaning during autumn when leaves are falling. All activities will be documented within the City's Cartegraph computerized maintenance management system (CMMS).
Policy category: reliability of the storm drainage infrastructure		
8	The City shall seek to maintain an asset criticality database to be used in prioritizing asset maintenance and R&R.	The existing criticality database (developed for the 2008 Drainage Plan) will be refined to include more asset information, such as pipe material, diameter, age, consequence of failure, etc. The criticality database will be validated using the results of previous and ongoing M&O inspections. Activities will be documented within the City's Cartegraph CMMS.

Table 3-1. Storm Drainage Utility Policies and LOS Goals		
Item	Policy description	2015 Drainage Plan LOS goal
9	The City shall seek to perform condition assessments of critical assets.	The City will develop and implement a condition assessment schedule for all critical assets as identified through criticality analyses of stormwater infrastructure assets. Criticality is based on the risk and consequences of failure. Criticality data will be stored in a criticality database, and all condition assessment activities will be documented in the City's Cartegraph CMMS.
10	The City shall seek to repair or replace system assets before they exceed their economic lives.	The number of high-criticality pipe segments beyond their economic lives will be determined. After the criticality database inventory is complete, the City's goal will be to limit the number of pipe segments beyond their economic lives, including setting specific numeric goals for replacement of those segments.
11	The City shall seek to conduct maintenance activities in accordance with a schedule developed to comply with Ecology requirements and asset criticality.	No deferred maintenance on all critical or Ecology-required assets. The City will prioritize its inspection activities based on the combined "risk of failure" and "consequence of failure" computed by the criticality database and meet current NPDES inspection schedule (e.g., inspecting catch basins). The experience of M&O staff should be incorporated into the criticality database (see item 8above). All inspection activities will be documented in the CMMS.
12	The City shall seek to maintain storm drainage infrastructure to ensure proper function of drainage facilities in accordance with Ecology requirements.	The City will develop a ditch maintenance program. The City will secure proper permits as well as coordinate with other agencies for work in the associated ROW. The ditch maintenance program will consist of inspecting and maintaining all ditches within the permit cycle and then on an as-needed basis.
13	The City shall seek to manage stormwater runoff from the public ROW with City-owned facilities located in the public ROW or on City-owned property. The City shall maintain or seek access to City-owned facilities for necessary maintenance and operation.	The City's Storm Drainage Utility will be responsible for maintenance and operation of the City's drainage system. The City shall seek to have access to all City-owned drainage infrastructure. The City shall seek to obtain easements or relocate infrastructure as necessary to maintain access.
Policy category: protection of the environment		
14	The City shall seek to comply with all federal and state regulations applied to stormwater management activities.	Meet all requirements of the Western Washington Phase II Municipal Stormwater Permit with no enforcement actions of the CWA for violations as a result of City stormwater operations.
15	The City shall seek to provide pump redundancy and backup power generators or dual power feeds at City-owned and -operated drainage pump stations.	All pump stations will be designed with two or more pumps to ensure proper function during maintenance. Backup and/or dual-feed power supplies will be installed as needed.
16	The City shall seek to comply with all federal, state, and local regulations in operation and maintenance of the City's storm drainage infrastructure.	Meet all specific targets. Examples include complying with NPDES Phase II inspection cycle, performing all necessary ESA consultations, etc.
17	The City shall protect and preserve existing native vegetation and drainage courses while maintaining their conveyance capacity.	The City will maintain existing habitat along drainage ways so there is no net loss of native vegetation (in terms of area) or natural drainage systems (in terms of stream length). This does not apply to constructed or maintained facilities.
18	The City shall seek to comply with all federal, state, and local regulations to reduce runoff volumes and pollutant loads associated with new development and redevelopment.	The City will comply with the elements of the Western Washington Phase II Municipal Stormwater Permit and will adopt or implement the Ecology manual or equivalent for new development and redevelopment.
19	The City shall place emphasis on onsite approaches such as LID as the first consideration for runoff and pollutant load reduction for new development and redevelopment.	The City will identify feasibility criteria and provide guidance for the implementation of LID drainage management measures for new development and redevelopment (including City-owned properties).
20	The City shall seek to evaluate Storm Drainage Utility activities to emphasize sustainability.	City staff will identify specific areas to measure sustainability by examining how Storm Drainage Utility operations affect energy resources, natural resources, and the community. City staff will benchmark practices and log changes over the next planning period.

Table 3-1. Storm Drainage Utility Policies and LOS Goals		
Item	Policy description	2015 Drainage Plan LOS goal
21	The City shall continue to participate in regional storm drainage, water resources, and water quality planning efforts.	The City will continue to actively participate in developing and implementing regional water quality planning and flood hazard reduction efforts within the Green River, Mill Creek, and White River drainage basins. The City will participate in the state's water quality monitoring program.
22	The City shall comply with all federal, state, and local regulations in the inspection of the City's publicly owned storm drainage infrastructure and privately owned LID facilities.	For all new LID systems constructed after 2016, the City will develop authority and an inspection frequency for stormwater facilities developed in compliance with the NPDES Phase II Stormwater Permit. The City will develop an inspection assessment database to monitor and schedule facility maintenance for all publicly owned storm drainage infrastructure and privately owned LID facilities. This database will provide maintenance information for the criticality database in the City's Cartegraph CMMS.
Policy category: Storm Drainage Utility financial performance		
23	The City shall continue to fund and provide storm drainage services through the existing Storm Drainage Utility..	The City's Storm Drainage Utility should be responsible for implementation, maintenance, and operation of the City's drainage system, with a goal of 100% of the cost of drainage service delivery recovered via Storm Drainage Utility fees. Seek opportunities to provide public drainage benefits through grant funding and/or development partnerships where applicable.
24	The City shall assess appropriate rates and SDCs to fund the ongoing maintenance, operation, and capital expenditures of the utility, in accordance with the Drainage Plan.	Periodic cost-of-service studies shall be completed to reassess the monthly service fees and SDCs. Updates to coincide with all 6-year CIP updates.
25	The City shall seek to track the cost of claims as a metric.	City staff will summarize the annual costs of claims for the recent past to establish a baseline measurement of existing practices. If the current costs are deemed excessive, City staff will evaluate methods to reduce the risk of claims and measure its progress at reducing the overall cost of claims.
26	The City shall seek to track elements of capital improvement project implementation: (1) individual schedule, (2) project budget accuracy, and (3) overall performance in implementing CIP.	City staff will summarize current methods for capital improvement project implementation to create a baseline (e.g., schedule and costs) against which future improvements can be evaluated.
Policy category: customer satisfaction		
27	The City shall seek to evaluate and strive to maintain customer satisfaction with Storm Drainage Utility service delivery.	To effectively measure the public perception of utility performance, City staff will conduct the following: (1) summarize annual customer complaint reports, (2) communicate proactively with community and stakeholders regarding drainage infrastructure improvements, and (3) comply with Western Washington Phase II Municipal Stormwater Permit requirements for public education and outreach.
28	The City shall seek to build, operate, and maintain storm drainage infrastructure within an overarching goal of protecting employee safety.	City staff will track health and safety incidents to create a baseline against which to evaluate future improvements.

Chapter 4

Drainage System

Chapter 3 lays out clear LOS goals for the Storm Drainage Utility. The next step toward developing a future work plan is to collect and organize information describing the current conditions of the storm drainage system. This information provides the basis for investigations (Chapter 5) designed to evaluate the Storm Drainage Utility performance relative to the LOS goals. This chapter provides an overview of the City's drainage system including both natural (Section 4.1) and constructed (Section 4.2) drainage elements.

Figures presented in this chapter consist of several maps of the Storm Drainage Utility service, drainage, and surrounding areas. These figures are presented at the end of the chapter.

4.1 Natural Drainage

The City of Auburn encompasses approximately 30 square miles; the central portion of the city lies along the bottom of a valley, while the outer edges of the city extend into the surrounding hills (see Figure 4-1). In general, stormwater runoff from the city flows to one of three major receiving waters: Green River, White River, and Mill Creek. Other notable water features in the Auburn area include the following:

- Big Soos Creek, which drains southeast into the Green River
- Soosette Creek (also known as Little Soos Creek), which drains south into Big Soos Creek
- Mullen Slough, which drains along the northwest side of Mill Creek toward the Green River
- Bowman Creek, which drains north into the White River
- Olson Creek, which drains west into the Green River
- Lake Tapps, which is located just south of the city
- White Lake, which is located southeast of R Street SE and State Route (SR) 18
- Coal Creek Springs, which drains north to the White River

The city contains nearly 30 miles of rivers and streams and more than 1,000 acres of floodplain area associated with these water features. There are over 1,500 acres of wetlands, including forested/shrub and freshwater emergent wetlands.

The following sections provide additional information on each of the three major receiving waters.

4.1.1 Green River

The Green River flows over 93 miles beginning on the west slope of the Cascade Mountains and ending in the Duwamish Waterway, meandering through the northeast portion of Auburn along the east valley wall. Throughout the last century, the Green River was altered for the purpose of flood control, including the construction of levees and bank revetments, and the diversion of the White River in the early 1900s. In 1962, the Howard A. Hanson Dam was built on the Green River to control flooding in the valley.

From 1960 to 2007, the City of Auburn participated in Green River flood management activities as part of the Green River Flood Control District. In 2007, the Green River Flood Control District was phased out as flood control and management efforts for the Green River are now included in the King County Flood Control District (KCFCD), which was established in 2007. These efforts are reflected in the 2006 King County Flood Hazard Management Plan. The KCFCD goals and objectives include maintaining and

repairing levees and revetments and acquiring at-risk floodplain properties. Auburn elected officials and staff serve on advisory committees for the KCFCD such as the Green River System Wide Improvement Framework (Green River SWIF). The goal of the Green River SWIF is to recommend and prioritize a set of capital projects and programs for flood protection for the Lower Green River.

4.1.2 White River

The White River originates on the slopes of Mount Rainier and flows generally northward and westward into the Puget Sound lowlands. Near Auburn, the White River flows north and then west through the southern portions of the city before it curves southward toward the Puyallup River. The White River is a very dynamic, sediment-laden river, which has led to changing channel morphology.

Prior to 1900, the White River flowed into the Green-Duwamish River; however, floodwaters from the White River drained to both the Green-Duwamish River and the Puyallup River. A flood in 1906 caused the White River to shift and flow into the old Stuck River channel, which leads to the Puyallup River. In 1907, a diversion wall located within Game Farm Park was constructed to permanently direct the White River flow into the Puyallup River (USACE, October 2009).

The shifting of floodwaters from the White River caused inter-jurisdictional conflicts between King and Pierce counties. After attempts by the two counties to control flooding along the White River met with limited success, the U.S. Army Corps of Engineers (USACE) was engaged for help. In 1948, the USACE finished construction of the Mud Mountain Dam to control floods on the White River.

At the time Mud Mountain Dam was finished, White River channel capacity in the area of Auburn was estimated to be 20,000 cfs. Since then, vegetation encroachment and sediment accumulation have reduced channel capacity (USACE, October 2009). Reduced channel capacity causes higher river levels during large storm events, which can impact the City's gravity drainage outfalls along the White River.

4.1.3 Mill Creek

Mill Creek flows out of the hills on the west side of the valley near SR 18, and then turns northward along the western portion of the city, running adjacent to SR 167. It crosses under SR 167 several times as it flows through the valley floor. Approximately 1 mile north of the city boundary, Mill Creek discharges into the Green River.

Historically, Mill Creek served as vital habitat for migrating salmon and provided ideal conditions for rearing and storm refuge. However, increasing development has altered the natural flow pattern of Mill Creek, including the installation of diversions and culverts, channel straightening, degradation of water quality, and aggradation from increased stormwater inflows with high sediment loads. In many areas the stream is straight and shallow, and exhibits a lack of quality riparian habitat for Endangered Species Act (ESA)-listed species such as Chinook salmon and bull trout (USACE, April 2009). Aggradation along Mill Creek has also contributed to flooding and drainage problems in the city. The City's drainage outfalls to Mill Creek can become submerged, thereby reducing the hydraulic capacity of the system.

The USACE and the City have initiated a restoration project, called the Mill Creek 5K Reach Restoration Project, for the reach of Mill Creek on the west side of SR 167 extending from Main Street to north of the 15th Street NW culvert. The project includes constructing a new creek channel and replacing the culvert at 15th Street NW. In addition to improving fish passage and flow conveyance through the culvert, the project will reduce flood elevations along Mill Creek.

4.1.4 Drainage Areas

The city's drainage can be described by dividing the city into six general sub-areas[3] and their discharge location (Figure 4-2):

- **Lea Hill** lies northeast of the Green River. Most of the Lea Hill area drains west into the Green River. However, the eastern edge drains south and east out of the city into Soosette Creek and Big Soos Creek.
- **West Hill** lies west of Mill Creek. The West Hill area drains into several small tributaries to Mill Creek. The northern portion of West Hill drains to the northeast into steep ravines that discharge to Mullen Slough and other wetland areas on the valley floor.
- The **Southern** portion of the city drains to the White River. The area west of Bowman Creek consists largely of the Lakeland Hills developments, which drain to the White River to the west and north, Bowman Creek to the east, and a small portion that drains south toward Lake Tapps. The area east of Bowman Creek consists of rural residential development; this area drains to Bowman Creek on the southwest and the White River on the northeast side.
- The **Southeast** portion of the city lies along a narrow plateau between the Green and White rivers. Runoff from this area drains to the Green River along the north side and the White River along the south side.
- The **North Central** portion of the city lies along the valley floor and is located north of 27th Street SE. This is part of the central and most developed area of the city. The topography in this area is so flat that roadways and storm drainage infrastructure largely determine the receiving water to which runoff is diverted. Runoff from this area is generally split between Mill Creek and the Green River.
- The **South Central** portion of the city also lies along the valley floor and is located south of 27th Street SE. This area is also part of the most developed area of the city. The topography in this area is so flat that roadways and storm drainage infrastructure largely determine the receiving water to which runoff is directed. This area, plus the Boeing property drains to the White River.

The above-described areas can be divided into smaller drainage subbasins. For the 2002 Comprehensive Drainage Plan (Tetra Tech, 2002) subbasins were delineated such that the entire Storm Drainage Utility was covered, resulting in a total of 61 drainage subbasins covering approximately 34 square miles. Each subbasin is identified by a series of one, two, or three letters (Figure 4-2).

4.1.5 Climate and Precipitation

Auburn's climate is typical of that in the Puget Sound lowlands of Western Washington, where the summers are cool and comparatively dry, while the winters are mild, wet, and cloudy (Western Regional Climate Center [WRCC], 2014a). Mean annual precipitation in the Puget Sound lowlands varies from 32 inches (north Seattle) to approximately 47 inches (near Centralia, Washington).

The precipitation gauge at Auburn City Hall has been recording data since 1995. The mean annual precipitation recorded at that gauge (with missing data filled in from the nearby King County Lakeland Hills gauge) from 1995 to 2014 was approximately 38 inches. This is very similar to the mean annual precipitation recorded at the two nearest long-term gauges:

[3] For the purposes of this Drainage Plan, sub-areas are generally defined areas within the city that do not have clearly defined boundaries such as those of a basin or subbasin, which can be delineated based on topographic information. Sub-areas are defined for the purpose of general discussion and are not used for specific evaluations or analyses.

- Seattle-Tacoma Airport, which is part of the National Oceanic and Atmospheric Administration (NOAA) Cooperative Network (Station 457473), has a mean annual precipitation of approximately 38 inches based on 74 years of recorded data (WRCC, 2014b). The Seattle-Tacoma Airport gauge is located approximately 8 miles northwest of Auburn.
- Kent, Washington (NOAA Co-op Station 454169) has a mean annual precipitation of approximately 39 inches based on 57 years of recorded data (WRCC, 2014c). The Kent gauge is located approximately 7 miles north of Auburn.

Precipitation-frequency data for Washington are compiled in Volume 9 of NOAA Atlas 2 (Miller, Frederick and Tracey, 1973); precipitation-frequency estimates for Auburn, Washington, are listed in Table 4-1.

Table 4-1. Precipitation Frequency Data for Auburn, Washington, from NOAA Atlas 2

Frequency, duration	Precipitation (inches)
2-year, 6-hour	0.95
2-year, 24-hour	1.75
100-year, 6-hour	1.90
100-year, 24-hour	3.80

4.1.6 Geology and Groundwater

Topography and geology in the Auburn region has been influenced largely by millions of years of advancing and retreating glaciers, most recently with the Vashon glaciation occurring approximately 12,000–18,000 years ago (Booth, 1991). Following the retreat of the glacier, interglacial processes such as landslides, mudflows, erosion, and alluvial deposition have continued to shape the region. In general, the upland hills around the city's periphery comprise glacial and interglacial deposits, while the valley is filled with more recent deposits overlying glacial and older interglacial deposits.

Major geologic units of the White and Green River Valley include undifferentiated glacial and interglacial deposits, Vashon recessional deltaic deposits, undifferentiated alluvium, Osceola mudflow, and White River alluvium. The undifferentiated glacial and interglacial deposits form the lowest layer in the valley consist of materials deposited during the glacial periods. As the glacier retreated, meltwater flowed into a water-filled embayment then occupying the present White and Green River Valley area. This meltwater deposited sand and gravel known as the Vashon recessional deltaic deposits. After the end of the glacial period, the Green River deposited undifferentiated alluvium in the valley as a result of erosion of upland glacial deposits. Approximately 5,700 years ago, a massive volcanic mudflow from Mount Rainier, known as the Osceola mudflow, flowed down into the valley (Troost and Booth, 2008). White River alluvium is the geologic unit nearest the surface and consists of alluvial deposits from the White and Green rivers. Bedrock is found approximately 1,280 feet beneath the valley floor. Surficial geologic mapping of the Auburn region is shown in Figure 4-3.

In general, groundwater flow systems in the Auburn area are characterized by upland recharge flowing toward the valley. The two major aquifers in the White and Green River Valley are the modern alluvium aquifer and a deep deltaic valley aquifer; the latter is used for Auburn's water supply. The modern alluvium aquifer is the shallowest aquifer in the Auburn-Kent Valley, often lying 10 to 15 feet below the ground surface. Groundwater in the deep deltaic valley generally flows in a pattern parallel to the direction of the Green River in the north and the White River in the south.

4.1.7 Soils and Runoff Potential

Surface soils are classified by the Natural Resources Conservation Service (NRCS) into four hydrologic soil groups based on the soil's runoff potential: A, B, C, and D. Group A soils generally have the lowest runoff potential while Group D soils have the highest. Hydrologic soil groups are defined by NRCS (1986) as follows:

- Group A is sand, loamy sand, or sandy loam types of soils. It has low runoff potential and high infiltration rates, even when thoroughly wetted. It consists chiefly of deep, well to excessively drained sands or gravels and has a high rate of water transmission.
- Group B is silt loam or loam. It has a moderate infiltration rate when thoroughly wetted and consists chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.
- Group C is sandy clay loam. It has low infiltration rates when thoroughly wetted and consists chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure.
- Group D is clay loam, silty clay loam, sandy clay, silty clay, or clay. It has very low infiltration rates when thoroughly wetted and consists chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.

For Auburn and the surrounding areas, the valley floor is mostly Group D soils, which typically have very low infiltration rates and high runoff potential. The West Hill, Lea Hill, and Lakeland Hills areas are predominantly Group C soils, which have low infiltration rates and moderate to high runoff potential. The Southeast area, Bowman Creek area, and valley area located generally between SR 18 and the White River have Group A soils, which are characterized by high infiltration rates and low runoff potential. See the NRCS maps (http://www.nrcs.usda.gov/) for mapped soils within the city.

4.1.8 Land Use and Development

Land use and the intensity of development have considerable effects on the quality and quantity of stormwater runoff flowing into the drainage system and ultimately discharging to receiving waters. As the population of the city increases, new areas of the city are developed or existing areas are redeveloped at a higher density. These changes can result in increased stormwater runoff and greater water quality impacts to water bodies. However, development regulations and drainage design standards imposed by the City are intended to mitigate these impacts. The following sections describe expected growth and how development regulations and design standards are being updated to reduce impacts to stormwater runoff.

4.1.8.1 Recent Growth

Auburn's population has steadily increased since the 1950s. Auburn's population increased by an average of 8 percent per year from 1960 to 1980, then slowed to approximately 1.7 percent per year from 1980 to 1994. Auburn's population growth rate began to increase in 1998, as the City began annexing new areas, which precipitated several large housing developments. The Washington State Office of Financial Management indicates that Auburn's population in 2014 was approximately 74,600 (approximately 65,300 in King County and 9,300 in Pierce County).

4.1.8.2 Future Growth

The City's goals, objectives, and policies for growth and development are described in detail in the 2015 Comp Plan. These goals, objectives, and policies are applied to different areas of the city through land use designations (see Figure 4-4). The City also has developed special land use plans for certain areas of

the city where specific land use goals have been identified. An important example is the city's downtown area; one of the goals described in the Comp Plan is to encourage development and redevelopment in the downtown area to serve as an urban center for the community.

4.1.8.3 Development Regulations and Drainage Design Standards

The City implements state and federal stormwater regulations through the stormwater code, the Auburn SWMM, and related stormwater management programs and policies. City stormwater regulations contain specific requirements for managing stormwater quality and quantity in areas subject to new development and redevelopment. For example, the SWMM provides guidance for implementing LID measures that are designed both to improve water quality and to control peak flows and durations of runoff. The City is in the process of updating its local development regulations and drainage standards in accordance with updated NPDES Permit requirements.

City stormwater regulations and development standards are intended to avoid substantial increases in stormwater discharges to the existing drainage system through the implementation of onsite stormwater controls. Ideally, this would keep stormwater conveyance demands at or near existing levels.

4.1.9 Flood Hazard Mapping

The City of Auburn is a participant in the National Flood Insurance Program (NFIP) administered through the Federal Emergency Management Agency (FEMA) to enable property owners to purchase insurance protection from the government against losses from flooding. Participation in the NFIP is based on an agreement between the City and the federal government, stating that if the City adopts and enforces a floodplain management ordinance to reduce future flood risks to new construction in areas designated as Special Flood Hazard Areas (SFHA), the federal government will make flood insurance available within the community as a financial protection against flood losses. The SFHAs and other risk premium zones applicable to each participating community are depicted on Flood Insurance Rate Maps (FIRMs).

FEMA established flood hazard zones from a Flood Insurance Study (FIS) for King County conducted in 2013, which examined flooding along several major rivers. Although the primary purpose of the FIS was to establish flood insurance rates, the flood mapping resulting from these studies is also used for floodplain management and flood hazard mitigation planning. Updates to the flood hazard zones are continually being made at local levels (King County and Pierce County) and represented in Preliminary FIRMs or Letters of Map Revision (LOMR). Preliminary FIRMs for all of King County were reissued on February 1, 2013. The most recent flood hazard mapping for Pierce County is presented in the County's "Rivers Flood Hazard Management Plan" adopted in 2013 and also in LOMR files located on the FEMA Map Service Center Web page (Pierce County, 2013). Table 4-2 lists the Flood Insurance Rate Maps developed for areas within the City of Auburn.

Table 4-2. FEMA Flood Insurance Rate Maps Applicable to Auburn

53033C1232K	53033C1253K	53033C1264K	5301380213C
53033C1235K	53033C1254K	53033C1266K	5301380375C
53033C1242K	53033C1261K	53033C1267K	5301380220C
53033C1251K	53033C1262K	53033C1268K	5301380351C
53033C1252K	53033C1263K	53033C1269K	

4.2 Stormwater Drainage Infrastructure

As part of the development of the 2009 Drainage Plan, the City embarked on a substantial effort to update its inventory of drainage system infrastructure owned or operated by the Storm Drainage Utility. Since that plan, the City has continued to update its inventory through dedicated field staff conducting surveys. This effort will continue until field surveys have been completed citywide. A comprehensive system inventory will provide the City with a database of infrastructure assets, which will achieve the following objectives:

- Help to meet regulatory requirements
- Provide input for hydraulic models to analyze system conveyance capacity
- Serve as a basis for an asset criticality database used to prioritize repair and replacement (R&R) activities
- Support the City's M&O activities through the computerized maintenance management system (CMMS)

Table 4-3 provides a summary of stormwater infrastructure inventory.

Table 4-3. Stormwater Drainage Infrastructure Summary

Infrastructure element	GIS data type	GIS feature class name	Quantity[a]	Unit
Pipes, all sizes	Polyline	Storm pipes	1,108,000	Linear feet
Pipes, all sizes (excluding force mains)	Polyline	Storm pipes	11,500	Count
6–10 in. diameter	Polyline	Storm pipes	2,300	Count
			162,300	Linear feet
12–15 in. diameter	Polyline	Storm pipes	6,400	Count
			547,500	Linear feet
16–18 in. diameter	Polyline	Storm pipes	1,100	Count
			129,300	Linear feet
21–24 in. diameter	Polyline	Storm pipes	700	Count
			96,900	Linear feet
27–36 in. diameter	Polyline	Storm pipes	400	Count
			69,500	Linear feet
42–48 in. diameter	Polyline	Storm pipes	100	Count
			32,700	Linear feet
54–72 in. diameter	Polyline	Storm pipes	10	Count
			1,600	Linear feet
Force mains	Polyline	Storm pipes	23	Count
			2,500	Linear feet
Open channels	Polyline	Storm channels	217,100	Linear feet
Culverts	Polyline	Storm culverts	38,400	Linear feet
Manholes	Point	Storm manholes	2,330	Count
Catch basins	Point	Storm catch basins	8,880	Count
Weirs	Point	Storm auxiliary equipment	1	Count

Table 4-3. Stormwater Drainage Infrastructure Summary				
Infrastructure element	GIS data type	GIS feature class name	Quantity[a]	Unit
Orifices	Point	Storm manholes or storm catch basin data, where attribute flow control = yes	203	Count
Outfalls (to water courses, ditches, etc.)	Point	Storm outfalls	127	Count
Detention ponds	Point	Detention sites	139	Count
Infiltration ponds	Point	Detention sites	12	Count
Vaults	Point	Vault	17	Count
Pump stations	Point	Storm pumps	7	Count

a. Quantities are based on current inventory and have not yet been finalized.

Most of the storm drainage infrastructure is located in the city's core, between Mill Creek and the Green River, where development densities are highest. Figure 4-5 shows an overview of the city's stormwater drainage infrastructure.

4.3 Critical Facilities

Section 3.2.2 describes policies and LOS goals for managing the City's critical facilities and critical stormwater assets. Two groups of policies and LOS goals in particular focus on criticality. The first applies to critical facilities, stating that the City will manage stormwater runoff within the public ROW in the vicinity of critical facilities to allow access and ensure function of these facilities at all times, especially during large storm events (LOS Goal 3). Eleven critical facilities have been identified and included in Table 4-4.

The second group of policies relates to the management of the City's critical stormwater assets (LOS Goals 8–11). The City is modifying its inspection and maintenance practices to prioritize active management of facilities with the highest combined risk and consequence of failure (i.e., a criticality-based maintenance program). Factors that impact criticality include the age of the asset, repair history of the asset, condition of the asset, and financial consequences of a failure. The consequences of a system failure impacting a hospital or school are considered more serious than one affecting a residence or unoccupied property, and are thus assigned as critical assets. The City has identified 11 city facilities (Table 4-4) and seven stormwater pump stations (Table 4-5) as critical assets. The list of critical stormwater assets may expand as the City refines its criticality database by adding information (e.g., inspection and repair logs, asset age; see LOS Goal 8). The locations of these critical facilities are shown in Figure 4-6.

Table 4-4. Critical City Facilities	
Facility	Address
City Hall	25 W Main Street
City Hall Annex	1 E Main Street
Justice Center	340 E Main Street
Maintenance and Operation Facility	1305 C Street SW
Regional Hospital	201 N Division Street
Senior Center	808 9th Street SE

Table 4-4. Critical City Facilities	
Facility	Address
Valley Regional Fire Authority (VRFA) Station 31	1101 D Street NE
VRFA Station 32	1951 R Street SE
VRFA Station 33	500 182nd Avenue E
VRFA Station 34	31290 124th Avenue SE
VRFA Station 35	2905 C Street SW

Table 4-5. Critical Stormwater Facilities		
Storm drainage facility	Year constructed	Address
A Street Pump Station	1973	404 A Street SE
Auburn Way S Pump Station	1994	405 Auburn Way S
Brannan Park Pump Station	2001	1302 30th Street NE
Emerald Park Pump Station	1999	499 42nd Street NE
M Street Pump Station	2014	410 M Street SE
West Main Street Pump Station	2008	1410 W Main Street
White River Pump Station	2012	4640 A Street SE

4.4 Water Quality

This section describes the existing water quality and regulatory conditions that affect surface water quality in Auburn and describes upcoming processes that are required to maintain compliance with the City's NPDES Permit.

4.4.1 Existing Conditions

According to water resource inventories by Ecology, the main water bodies within the City's administrative boundaries include the Green River, Mill Creek, White Lake, White River, and Bowman Creek. The City's NPDES Permit requires that these water bodies meet water quality standards and criteria. Municipal storm sewers that discharge runoff from urban areas to surface waters are not authorized to violate state water quality standards.

Appendix 2 of the NPDES Permit (Appendix A of this plan) describes water bodies that have been assessed as impaired and have additional requirements based on established TMDLs. A fecal coliform TMDL for the Puyallup River watershed is included in the current NPDES Permit. As part of the TMDL, the City is required to conduct wet weather sampling of discharges to the White River at Auburn Riverside High School. Details of the required activities are included in Appendix 2 to the NPDES Permit.

The Green River has a TMDL for temperature that was approved by EPA in 2011. The TMDL report indicated that implementation will depend on the support and participation of Auburn; however, the water quality improvement plan has not been developed yet and the TMDL is not in Appendix 2 of the NPDES Permit (Ecology, 2011).

The Green River is also being evaluated for a potential TMDL for dissolved oxygen, and Ecology is currently evaluating Mill Creek, White River and Little Soosette Creek within the city. Mill Creek is being

examined for potential TMDLs for temperature, fecal coliform, dissolved oxygen, and copper, and the lower White River currently is under evaluation for TMDLs for pH and temperature. Soos Creek watershed, which is partially in the city and includes the tributary Little Soosette Creek, has TMDLs under development for aquatic habitat, dissolved oxygen, temperature, and fecal coliform. One or more new TMDLs could be included in a future NPDES Permit.

4.4.2 Regulatory Compliance

The City has a well-developed MS4 M&O program that employs and provides training on numerous processes and procedures to minimize water quality impacts from municipal operations. The City also actively implements stormwater management BMPs in its municipal activities. BMPs include activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices that prevent or reduce the release of pollutants and other adverse impacts to waters of Washington State.

The current NPDES Permit includes provisions for monitoring and assessment of water quality. Permittees have the option of paying annual fees to participate in statewide monitoring programs, or developing individual monitoring programs to meet the requirement. The City notified Ecology in 2013 that it intends to participate in the statewide monitoring programs. Fees totaling $47,710 are due annually, beginning in August 2014.

The City is in full compliance with its NPDES Permit, with programs, codes, processes, and procedures that meet all of the NPDES Permit requirements currently in effect. The City's SWMP Plan contains a summary of the NPDES Permit requirements and descriptions of the City's current and planned activities for NPDES Permit compliance.

However, the City will need to make several changes to comply with updated requirements of the NPDES Permit that phase in during the permit term. The City is conducting a process to identify and implement needed updates to codes, standards, and programs by the relevant due dates. As part of the process, the City developed a Compliance Work Plan to outline and guide compliance activities over the current permit term. A copy of the Compliance Work Plan is included as Appendix B.

A schedule of relevant due dates to comply with updated NPDES Permit requirements is provided in Section 8.3.

4.5 Existing Drainage Problems

Members of the City staff working within the Storm Drainage Utility are experienced and familiar with the condition of the drainage system. Existing drainage problems have been observed by the staff and are known to cause frequent flooding of roadways. The most apparent problems were identified for analysis (see Hydraulic Evaluation, Section 5.1). Additionally, a severe storm event occurring in November 2007 caused substantial flooding in several locations that were identified during the development of the 2009 Drainage Plan. Many high-priority capital improvement projects were implemented to address these problems. Capital improvement projects, which were developed for some lower-priority locations, have yet to be implemented. For this planning effort, unimplemented capital improvement projects were revised based on current conditions and available information. Existing drainage problems are described in Table 4-6 and locations are mapped in Figure 4-7. Capital improvement projects developed to address these problems are described in Chapter 7.

Table 4-6. Existing Drainage Problems

No.	Priority	Location	Description	Approximate frequency or last noted occurrence
P1	1	West Main Street dead end near SR 167	The dead-end portion of Old West Main Street near SR 167 has a history of observed flooding. The City installed a temporary pump station to dewater the gravity pipe, flowing on the south side of Old West Main Street, in the effort to protect local businesses from flooding. Since its installation in 2008, the pump station has eliminated flooding at the observed location. The pump station, however, does not meet the City's LOS guidelines regarding pump redundancy, and may be insufficient to convey the 25-year flow rate. The City's gravity pipe on the north side of Old West Main Street experiences flooding, at one catch basin, approximately once per year. Portions of this gravity pipe are full and water has been observed at catch basin rims during summer months. The pump station and gravity pipe discharge to a Washington State Department of Transportation (WSDOT) ditch along the east side of SR 167. WSDOT has recently cleaned this ditch segment, and the impacts of this maintenance work are still being determined.	Catch basin flooding once per year and system surcharging
P2	1	37th and I Streets NW	Recurring flooding in the vicinity of 37th Street NW and I Street NW causes several nuisance problems including slow or impeded traffic on 37th Street NW, driveway damage and/or impeded access to the nearby power substation, and impeded pedestrian and bicycle access to the Interurban Trail south of 37th Street NW (east of the substation).	A couple times a year, after heavy rain prolonged wet periods following storm events
P3	1	Hillsides throughout the city	The existing drainage system includes pipes that discharge over hillsides. While a preliminary inventory and mapping of locations has been completed, field-locating and detailed inspection is warranted to define deficiencies.	Periodic
P4A	2	East of I Street NE between 32nd Street NE and 35th Street NE	The residential development east of I Street NE between 32nd Street NE and 35th Street NE discharges flows into a City-owned infiltration area. The infiltration area commonly experiences prolonged periods of standing water due to high groundwater from extended high flows in the Green River, which is adjacent to the infiltration area. The drainage system on I Street NE currently lacks infrastructure to collect and convey stormwater away from the infiltration area as well as residential roadways and parking areas. Ponding occurs within the parking of the developments and presents a nuisance and potential hazard to local residents.	Once every few years
P4B	3	C Street NE between 30th Street NE and 37th Street NE	The December 3, 2007, storm (approximately a 50-year storm) produced extensive flooding along C Street NE northward toward 37th Street NE, which required sandbagging to protect local businesses. Deposition of sediment within Mill Creek has raised the water levels within the creek and diminished the capacity of the gravity system in C Street NE and downstream in 37th Street NE. In addition to the influence of Mill Creek, modeling efforts demonstrate that the system's capacity is limited by low pipe gradient and shallow inverts and that flooding would continue even with sediment removal within Mill Creek.	December 2007
P5	1	West Hills	Flooding has been reported along the S 330th Street roadway. Surface water from the ROW is conveyed through a ditch and set of pipes located on private properties. The portion on private property had previously been conveyed in a ditch. In an attempt to reclaim the front yard, a previous property owner filled the ditch with two parallel pipes. A City-owned pipe daylights to the backyard of a residential parcel and discharges runoff onto the northern adjacent property located on S 312th Street.	Once in last 5 years

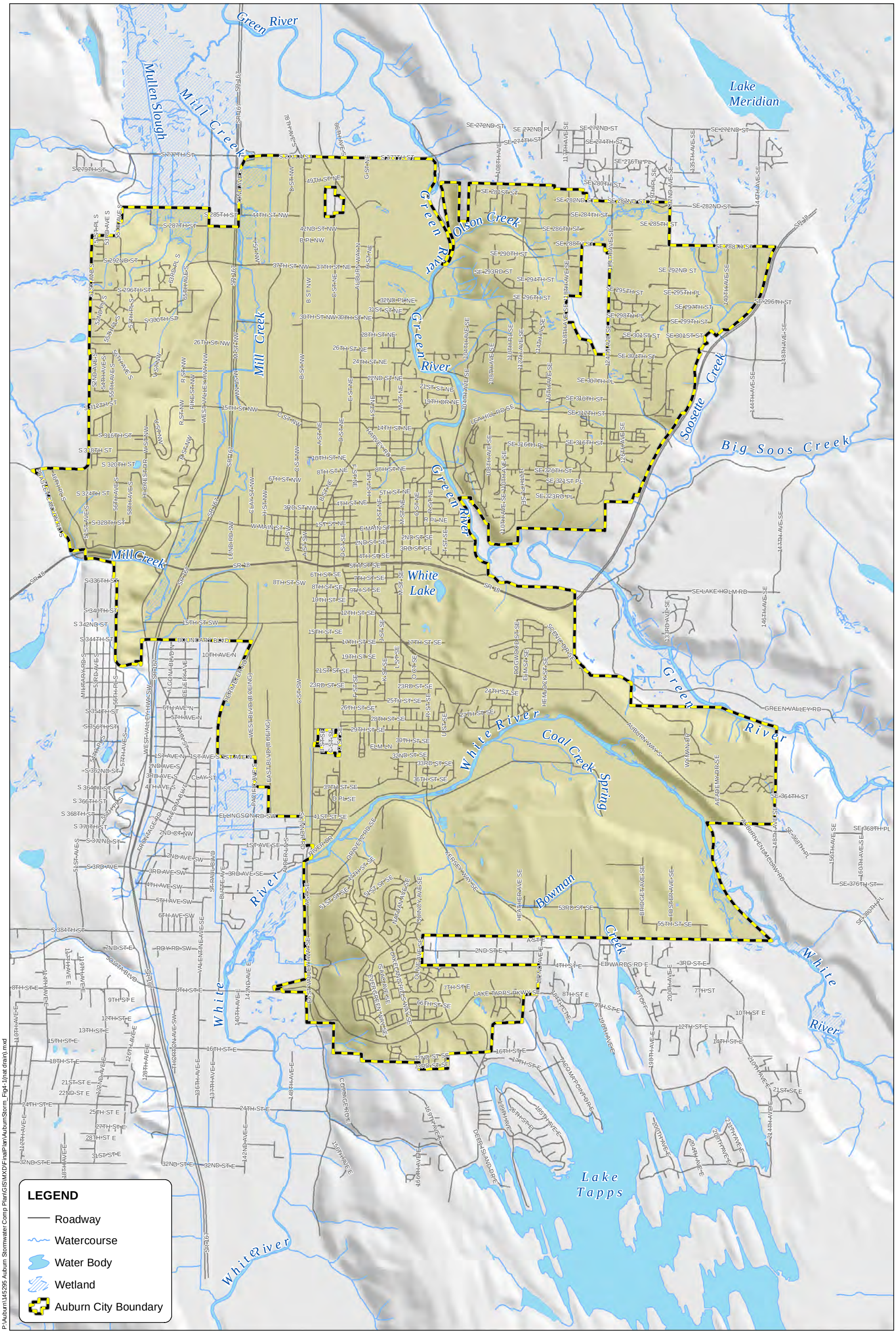
Table 4-6. Existing Drainage Problems

No.	Priority	Location	Description	Approximate frequency or last noted occurrence
P6	2	North Airport area	The inlet and outlet of Airport Pond I do not allow the pond to operate as designed; the pond fills from its outlet when the storm line in 30th Street NE surcharges. In the north hangar area immediately east of Airport Pond I, surcharging flows from the storm line in 30th Street NE backwater to the airport's 30-inch-diameter storm drain and causes flooding to the north and west of the most northerly hangar.	December 2007
P7	2	D Street SE at 25th Street	The western dead-end portion of 25th Street SE has a history of observed flooding. An existing dry well has inadequate infiltration. The dry well floods after heavy rain, several times a year. Floodwater fills the adjacent section of 25th Street SE to the curb. Numerous dry wells also do not meet discharge standards.	Floods after heavy prolonged rain
P8	3	23rd Street SE	A new 12-inch-diameter stormwater gravity drain was installed along K Street SE, south of 23rd Street SE, in 2014 to address localized flooding. This piping increased the tributary area to the 8-inch-diameter gravity drain along 23rd Street SE. Modeling results indicate that the existing 8-inch-diameter gravity drain along 23rd Street SE does not meet the LOS.	None reported; potential flooding simulated through modeling

In addition to the problem locations listed in Table 4-6, the City identified two potential problem areas described below.

Riverwalk Drive SE and Howard Road. Roadside ditches along the north and east side of Howard Road, between Riverwalk Drive SE and R Street SE overtop and flood portions of Howard Road and the mobile home park along the south side of the road. The Muckleshoot Indian Tribe has development plans for the property between Howard Road and Auburn Way S. As part of the development, storm drainage infiltration areas will be expanded northward of the existing facilities in the vicinity of the City's water treatment facility. Proposed facilities will include an overflow to the City's storm drainage system, which flows to the 21st Street Pond. The proposed modifications may address the observed flooding.

2nd and G Streets SE. The 2009 Drainage Plan described a problem at this location as roadway flooding during large rain events due to manhole surcharging in the intersection. The manhole is located in a local low point, and water encroaches on private property. In addition, a King County regional sewer line crosses the storm drainage line at this manhole reducing conveyance capacity at this location. A project to address this problem was included in the 2009 Drainage Plan, but has not been implemented. Flooding has not been reported at this location since the development of the 2009 Drainage Plan. With the implementation of the project Auburn Way S Flooding, Phase 1 in 2012 and planned construction of Auburn Way S Flooding, Phase 2 in 2015/2016, the tributary area to this reported problem location will be reduced. The lack of recent reported flooding and the reduced tributary area may indicate a project is not warranted for this location.



COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

0 4,000 8,000 Feet
1 inch = 4,000 feet

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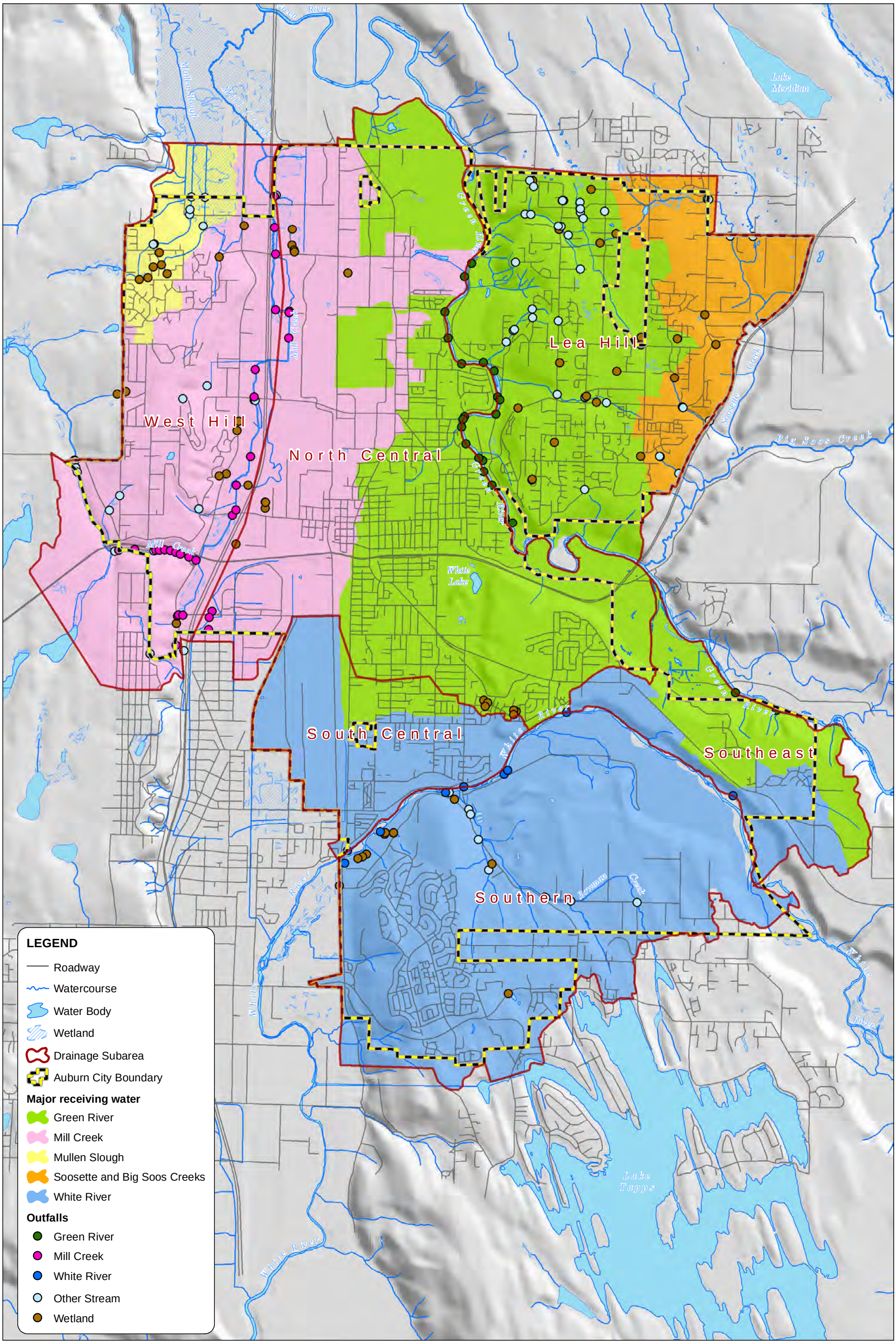
CITY OF AUBURN WASHINGTON

Figure 4-1
Natural Drainage Features
of the City of Auburn



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COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

0 4,000 8,000 Feet
1 inch = 4,000 feet

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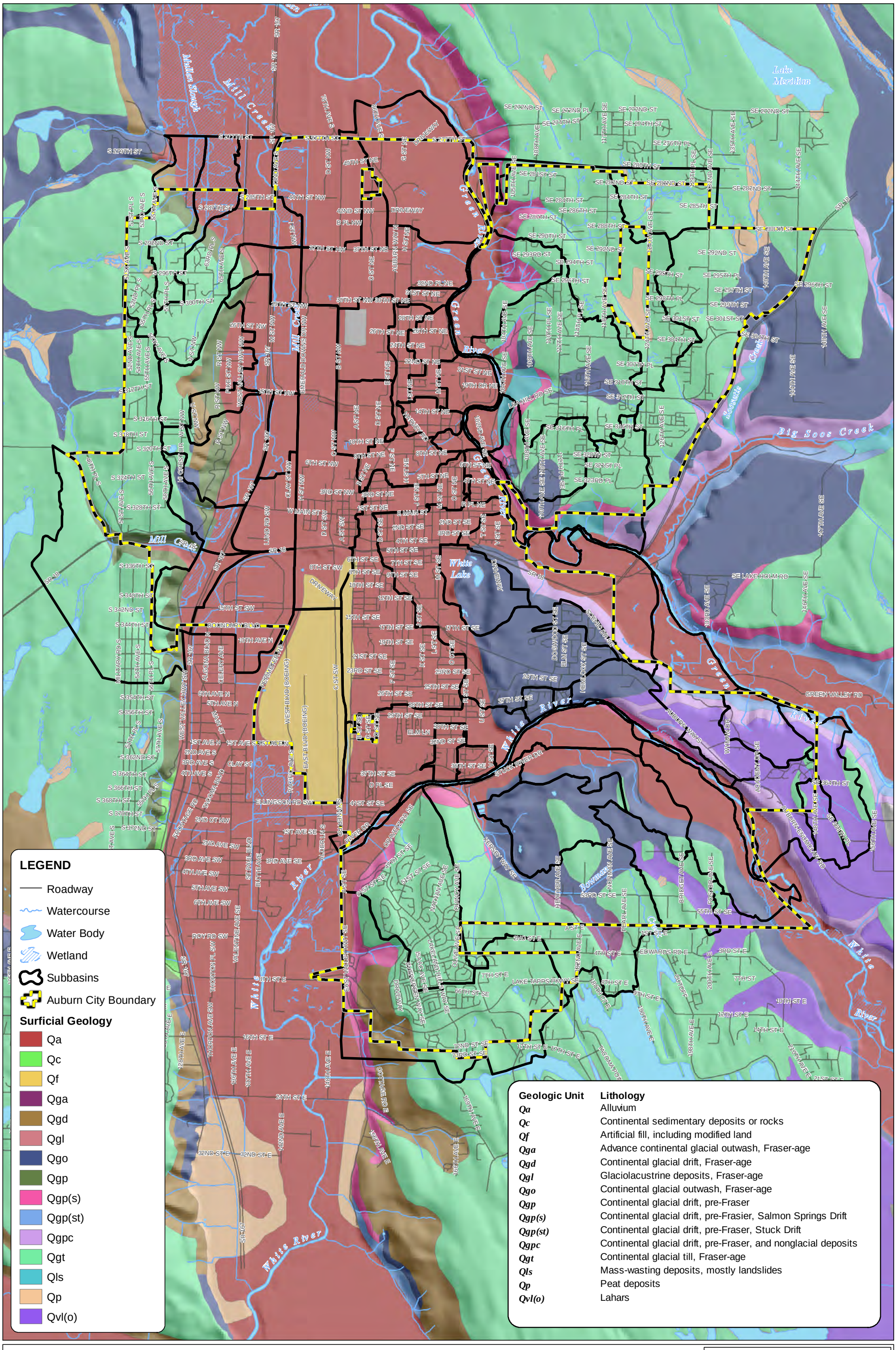
CITY OF AUBURN WASHINGTON

Figure 4-2
Drainage Subareas for
the City of Auburn
Storm Drainage Utility



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COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

0 4,000 8,000 Feet
1 inch = 4,000 feet

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CITY OF AUBURN WASHINGTON

Figure 4-3
Surface Geology in the Vicinity of the City of Auburn

LEGEND

- Roadway
- Watercourse
- Hydrography
- Subbasins
- Auburn City Boundary

Existing Land Use

- Rural
- Single-Family Residential
- Moderate Density Residential
- High Density Residential
- Office Residential
- Neighborhood Commercial
- Light Commercial
- Heavy Commercial
- Downtown
- Light Industrial
- Heavy Industrial
- Public and Quasi-Public
- Open Space
- Special Plan Area - Adopted
- Special Plan Area - Proposed

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COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

0 4,000 8,000 Feet

1 inch = 4,000 feet

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CITY OF AUBURN WASHINGTON

Figure 4-4
Land Use Designations
for the City of Auburn

Emerald Park PS
Brannan Park PS
West Main PS
A Street PS
Auburn Way South PS
White River PS
M Street PS
PS
Green River
Mill Creek
Mullen Slough
Lake Meridian
Soosette Creek
Big Soos Creek
White Lake
White River
Bowman Creek
Lake Tapps

LEGEND

- Pump Station
- Infiltration Pond or Swale
- Detention Pond
- Stormwater Vault or Tank
- Storm Pipe
- Open Channel (Ditch)
- Roadway
- Watercourse
- Water Body
- Wetland
- Auburn City Boundary

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COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

0 4,000 8,000 Feet
1 inch = 4,000 feet

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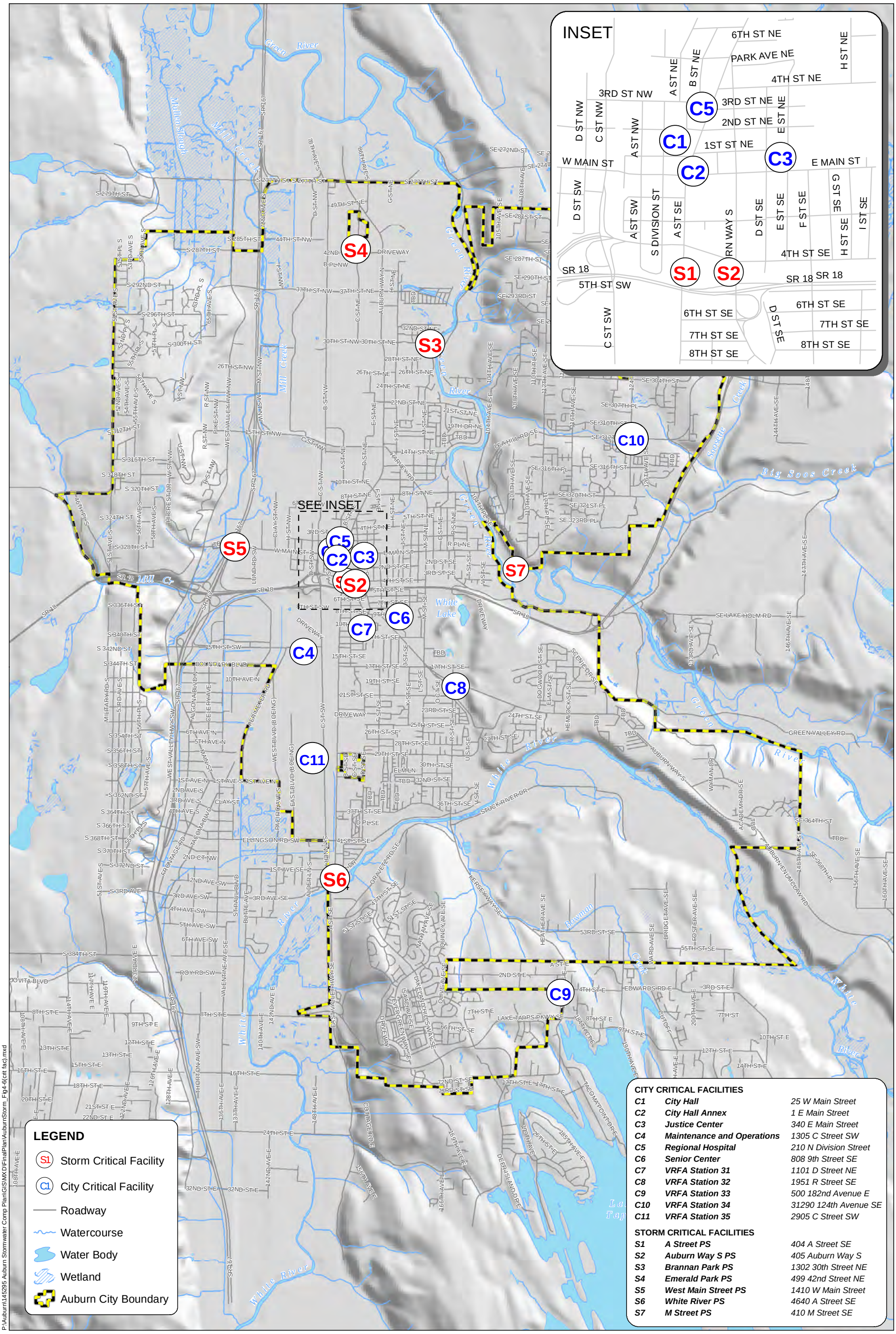
CITY OF AUBURN WASHINGTON

Figure 4-5
Drainage Infrastructure for
the City of Auburn
Storm Drainage Utility



CITY CRITICAL FACILITIES

C1	City Hall	25 W Main Street
C2	City Hall Annex	1 E Main Street
C3	Justice Center	340 E Main Street
C4	Maintenance and Operations	1305 C Street SW
C5	Regional Hospital	210 N Division Street
C6	Senior Center	808 9th Street SE
C7	VRFA Station 31	1101 D Street NE
C8	VRFA Station 32	1951 R Street SE
C9	VRFA Station 33	500 182nd Avenue E
C10	VRFA Station 34	31290 124th Avenue SE
C11	VRFA Station 35	2905 C Street SW

STORM CRITICAL FACILITIES

S1	A Street PS	404 A Street SE
S2	Auburn Way S PS	405 Auburn Way S
S3	Brannan Park PS	1302 30th Street NE
S4	Emerald Park PS	499 42nd Street NE
S5	West Main Street PS	1410 W Main Street
S6	White River PS	4640 A Street SE
S7	M Street PS	410 M Street SE

LEGEND

- S1 Storm Critical Facility
- C1 City Critical Facility
- Roadway
- Watercourse
- Water Body
- Wetland
- Auburn City Boundary

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COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

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1 inch = 4,000 feet

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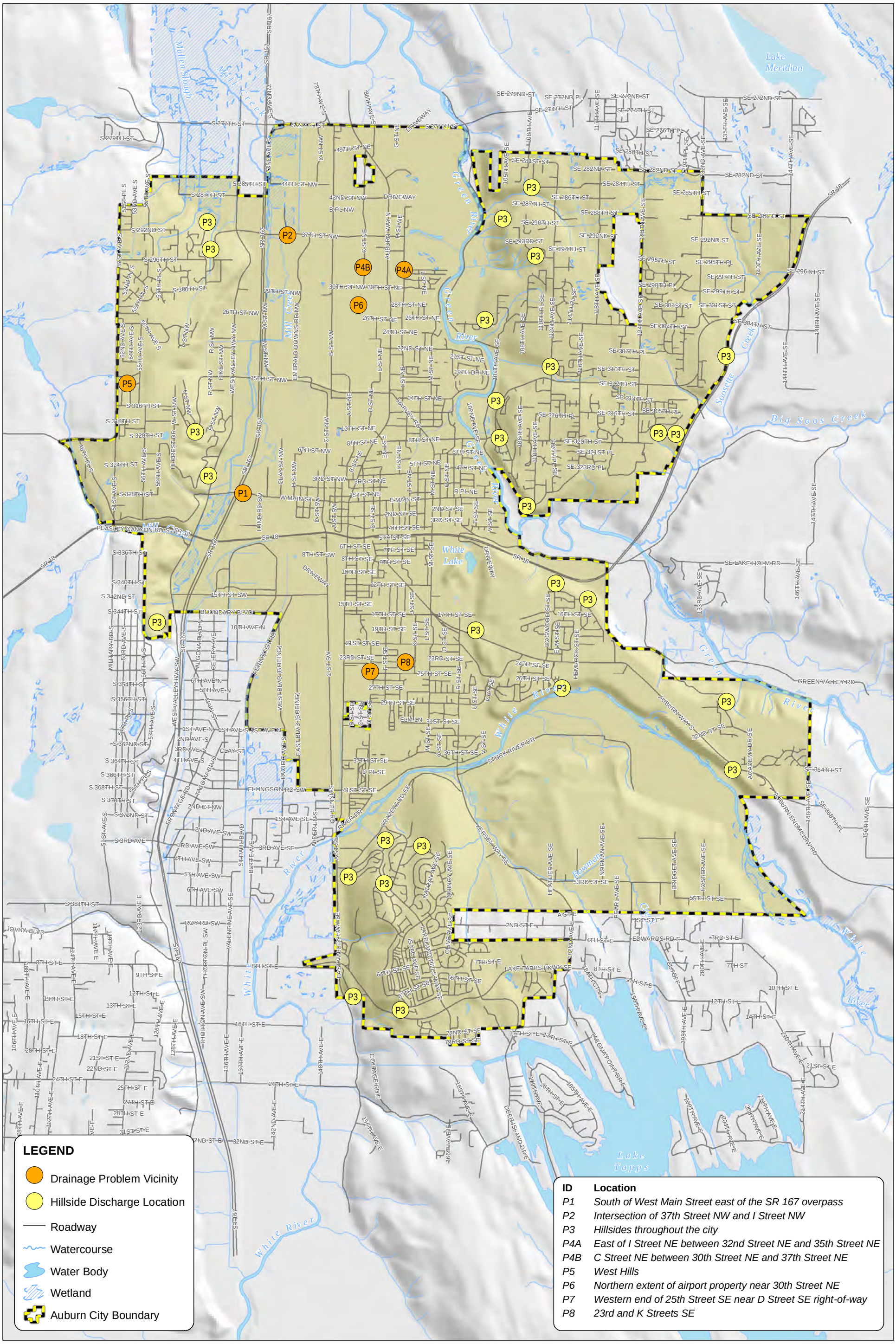
CITY OF AUBURN WASHINGTON

Figure 4-6
City and Storm Drainage
Critical Facilities for
the City of Auburn



COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

0 4,000 8,000 Feet
1 inch = 4,000 feet

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CITY OF AUBURN WASHINGTON

Figure 4-7
Drainage Problem Locations for the Storm Drainage Utility

Chapter 5

Evaluation of the Storm Drainage Utility

This chapter presents analyses conducted to evaluate the Storm Drainage Utility and identify gaps between existing service levels and the desired LOS described in Section 3.2.2. The following types of evaluations were completed to identify Storm Drainage Utility future activities to address the range of LOS goals:

- **Hydraulic:** gather system data, update or develop computer models, assess hydraulic performance, and develop capital improvement projects with respect to LOS and associated system design criteria
- **Asset management:** develop system requirements specification for integrating the City's pipe criticality database, which is the basis of the City's pipe repair and replacement asset management model, into the City's Cartegraph CMMS
- **Environmental:** determine differences between the 2013–18 permit and previous NPDES Permit, and evaluate how the differences could affect City regulations, facilities, and activities; conduct an NPDES program gap analysis; update the existing Compliance Work Plan; and estimate the time and costs for NPDES Permit compliance
- **Maintenance and operations:** assess process performance, equipment, and personnel with respect to LOS for M&O

These evaluations were conducted to develop capital improvements for the 6- and 20-year horizons, as well as identify future M&O needs. The following sections summarize the hydraulic, asset management, and environmental evaluations. The M&O evaluations are described in Chapter 6.

5.1 Hydraulic Evaluation

As described in Chapter 4, the City of Auburn owns and operates a large system of stormwater drainage infrastructure to collect and convey stormwater runoff to nearby receiving waters. For the 2009 Plan, models were developed to assess the system on a per basin or problem area scale in MIKE URBAN[4] software. Subsequent to the 2009 Drainage Plan, the City converted the existing hydraulic models to the PCSWMM[5] software platform and updated the models with new survey data, and construction and record drawings. Additionally, some models were updated by calibrating to flow monitoring data collected in 2010 and 2011.

[4] MIKE URBAN is a GIS-integrated, modular software program developed by the Danish Hydraulic Institute for modeling water distribution and collection systems. The stormwater module is internally powered by the SWMM5 engine, which is public domain software distributed by EPA. Information about MIKE URBAN software can be found at http://www.dhigroup.com/Software/Urban/MIKEURBAN.aspx.

[5] PCSWMM is a GIS-based hydraulic and hydrologic modeling platform developed by Computational Hydraulics International (CHI). The software fully supports the EPA SWMM5 hydrology and hydraulics engine, thus providing comparable computation between EPA SWMM and PCSWMM models. Information about PCSWMM software can be found at http://www.chiwater.com/Software/PCSWMM/index.asp.

Hydraulic modeling efforts for the 2015 Drainage Plan focused on updating those models covering locations of existing problems as described in Chapter 4. The model updates were based on recent GIS data, design drawings, and record drawings. Some model updates also included calibration to flow monitoring data collected in 2010 and 2011. For problem areas that had not been previously modeled, new PCSWMM models were developed or WWHM[6] was used to estimate flow for capital improvement project sizing.

The following sections describe the steps used to update existing models or develop new models.

5.1.1 Updating Existing Models

The hydraulic components of existing models were updated with recent GIS data. The following model data were verified against the GIS data:

- pipe size
- pipe invert elevations
- pipe material (for estimating pipe roughness)
- node rim elevation
- system connectivity

Where the GIS data did not accurately describe the existing system, technical reports, record drawings, or construction drawings were used to update the model. Where data were available, models were given more detail with respect to pump and storage facility information.

For model hydrology, subcatchment delineations within problem areas were reviewed and revised based on recent GIS data, topographic data, and 2012 aerial photography. Total impervious area was estimated with the City's impervious area coverage. Subcatchment slope was estimated as the average slope based on a digital elevation model. Where available, flow monitoring data were used to calibrate modeled flow by adjusting effective impervious area and soil conductivity parameters.

5.1.2 Creating New Models

The following is a general description of steps followed to develop new PCSWMM models:

1. Infrastructure data from existing GIS databases were used to build drainage networks in problem areas. Drainage network models consist of catch basins, manholes, pipes, junctions, ditches, control structures, vaults, storage ponds, pump stations, and outfalls. GIS data were validated and augmented as necessary based on record drawings and City-conducted field investigations.
2. The drainage network was developed to a level of detail that is sufficient for analyzing conveyance on a subbasin-wide or problem-specific scale. In general, pipes 1 foot in diameter or greater were included; smaller-diameter pipes and pipes that were part of private systems were generally not included in the model unless they provided an important link within the system.
3. Subbasin areas were divided into smaller drainage area delineations called subcatchments, which in the model are linked into the drainage network at specific nodes. Hydrologic parameters such as area, slope, and percent impervious area are developed for each subcatchment. Subcatchment slope was estimated as the average slope based on a digital elevation model (DEM). Total impervious area was estimated with the City's impervious area coverage.

[6] WWHM is a western Washington-specific hydrology model developed for the Washington State Department of Ecology. The software is based on HSPF continuous-simulation hydrology methodologies and uses regional HSPF parameters and long-term recorded precipitation data. Information about WWHM software can be found at http://www.ecy.wa.gov/Programs/wq/stormwater/wwhmtraining/index.html.

4. Models were calibrated using either pump runtime data or flow monitoring data where available.
5. Long-term simulations were performed to determine the 2 percent and 4 percent exceedance storms (one in 50-year and one in 25-year flows, respectively). These storms were used as design storms to identify ways to alleviate existing drainage problems through capital improvements, which meet the LOS (see Chapter 7 for a description of proposed capital improvements).

The following is a general description of steps followed to develop new WWHM models:

1. Subcatchments within subbasins were delineated with existing GIS information including 2012 aerial photography, roadway extents, contours, and drainage network (catch basins, manholes, pipes, ditches, infalls, and outfalls).
2. Existing GIS information was used to determine hydrologic parameters, per subcatchment, used by WWHM such as hydrologic soil type, slope, and impervious area. Since subbasins were relatively small, slope was estimated from City 2-foot contour data, instead of the coarser DEM. Total impervious area was estimated with the City's impervious area coverage. 2012 Aerial photography was used to estimate vegetation.
3. WWHM model results provide annual peak flows, and determines the 2 percent and 4 percent exceedance storms (one in 50-year and one in 25-year flows, respectively). These flows were used as design storms to identify ways to alleviate existing drainage problems through capital improvements, which meet the LOS (see Chapter 7 for a description of proposed capital improvements).

Appendix C provides a detailed description of the hydrologic and hydraulic (H&H) modeling methodologies.

5.2 Asset Management Evaluation

All utilities manage their assets in one way or another through maintenance practices, capital improvement projects, and R&R activities. However, for most storm drainage utilities, the means of deciding where and how to direct limited resources has often been done in a reactive, ad hoc approach based on incomplete or incorrect information. In contrast, asset management is a systematic approach to maintaining assets in good working order to minimize future costs of maintaining and replacing them, especially to avoid costly deferred maintenance. The best practices for asset management involve systematically basing choices on an understanding of asset condition and performance, risks, and costs in the long term. Asset best practices include:

- having knowledge about assets and costs (i.e., detailed inventories)
- maintaining desired LOSs
- taking a life-cycle approach to asset management planning
- implementing the planned solutions to provide reliable, cost-effective service
- establishing funding levels and rates to support ongoing infrastructure rehabilitation or replacement projects

The first step to effectively managing storm drainage assets is to establish LOS goals for the City's Storm Drainage Utility as described in Chapter 3 of this Drainage Plan. The second step is preparing a comprehensive inventory of the assets. The next steps include performing asset assessments and economic analyses to estimate life-cycle costs and the risk associated with each of the City's storm drainage assets.

Asset management evaluations completed for the 2009 Drainage Plan focused on pipes and pump stations. A pipe criticality database and an economic life model were developed. The pipe criticality database contained data (i.e. pipe diameter, age, length, material, depth of bury, condition) describing

the current conditions of the pipe network. The data in the database were the basis for the economic life model. The economic life model was used to evaluate the life-cycle costs and risk for the City's drainage pipe assets. The model estimated a risk cost associated with each asset by multiplying a probability of failure in a given year by the cost (including capital, social, and environmental costs) of that asset failing. Then the risk cost associated with each asset was compared to the life-cycle cost of owning the asset to estimate the timing for repair or replacement.

The results of the economic model are only as good as the input data describing the pipes. For the 2009 planning effort, the pipe inventory was incomplete and pipe data for many pipes were missing. Since then, the City has systematically been inventorying the system, and collecting necessary pipe data which are stored in GIS for future link to Cartegraph. A quarter of the system, however, is still missing pipe material and/or installation date data, which are needed for the economic life model (Figure 5-1). The City are in the process of collecting these data.

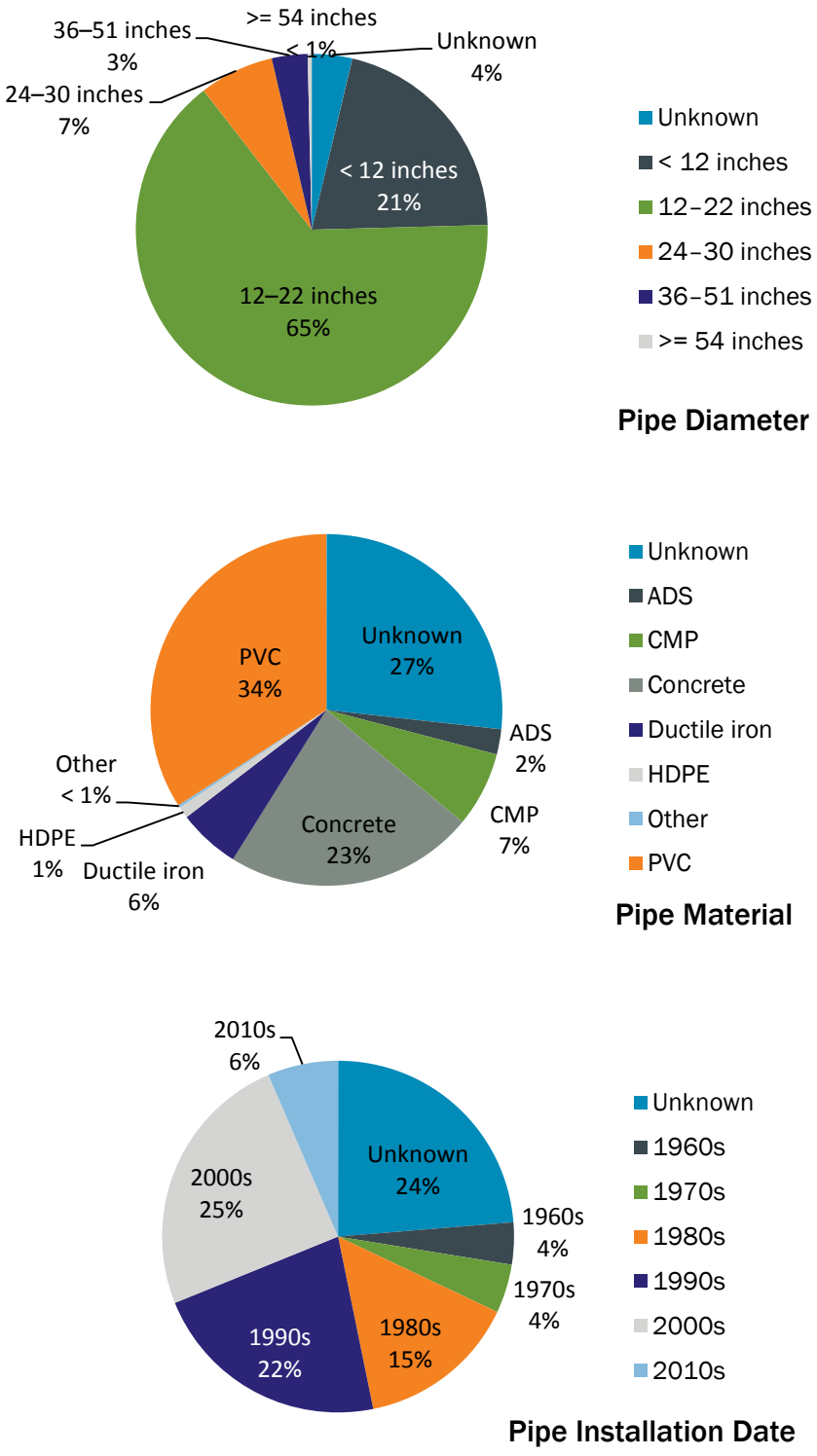


Figure 5-1. Drainage Pipe Summary

Evaluations completed for this Drainage Plan consisted of developing a system requirements specification for implementing the economic life model using the data in the City's asset management system, Cartegraph (Brown and Caldwell, 2014). Once the pipe inventory is complete, and the economic life model is implemented, the model can be rerun and used to inform future R&R priorities. Currently, the economic life model includes only collection system piping, and there is an opportunity to expand the model to include the catch basins and manholes, as described in Chapter 8.

5.3 Environmental Investigation

The federal Clean Water Act requires municipalities to help maintain fishable/swimmable waters through the NPDES Permit Program (see Section 2.3.2 and Appendix A), which requires municipalities to reduce the discharge of pollutants from their stormwater systems to the MEP by implementing municipal stormwater management programs. The City has an established municipal SWMP that complies with all Permit requirements currently in effect. Updates to the City's codes, programs, and standards are being developed to comply with the requirements of the updated 2013 NPDES Permit.

The City's SWMP Plan identifies activities that will be implemented by the City to comply with NDPES Permit requirements. The SWMP Plan is updated annually to reflect new requirements that phase in during each year, including one-time and new ongoing activities. An updated SWMP Plan is submitted to Ecology in March of each year. The City's current SWMP Plan is accessible on the City website.

To plan for upcoming requirements of the new NPDES permit, the City formed a project team consisting of staff from the City Attorney's office, the City Community Development and Public Works, and Brown and Caldwell.

The project team reviewed Auburn's City-wide stormwater management programs, codes, standards, processes, and documentation protocols in order to identify potential actions to comply with the NPDES Permit conditions over the 5-year Permit period. From these documents, the project team created a database cataloging responsible City departments/entities, reference documents, and potential requirements for each updated section of the Permit. Interviews were then conducted with appropriate staff (e.g., stormwater M&O staff) to discuss the potential implications of Permit changes for existing City codes, programs, and standards. The information on existing City practices and programs was then compared to the updated Permit requirements to identify potential compliance needs. Some policy issues and potential compliance strategies were also identified. The results of this analysis were used as the foundation for development of a 5-year Compliance Work Plan (see Appendix B). Recommended future activities from the Compliance Work plan are summarized in Chapter 8.

Chapter 6

Maintenance and Operations

An evaluation of existing Storm Drainage Utility M&O activities was conducted in support of this Drainage Plan. This chapter documents existing Storm Drainage Utility M&O activities with the primary purpose of establishing a baseline understanding of the proactive and responsive maintenance procedures performed by City Storm Drainage Utility M&O staff. This baseline understanding is used herein to evaluate utility staffing, data collection and computerized record-keeping needs, and other utility needs necessary to continue to meet LOS goals.

The information provided in this chapter is a summary of information collected during City Storm Drainage Utility staff interviews, review of computerized records, and existing utility forms/checklists.

6.1 Utility Responsibility and Authority

This section provides an overview of the Storm Drainage Utility organization and basic information related to utility staffing, training, and education.

6.1.1 Organizational Structure

The City Storm Drainage Utility is operated as a utility enterprise under the direction of the Director of Community Development and Public Works. The Department of Community Development and Public Works is responsible for planning, design, construction, operation, maintenance, quality control, and management of the storm drainage system. The City has a mayor-council form of government; therefore, the Director of Community Development and Public Works reports to the Mayor, with input from Council through Council study sessions and meetings. The Mayor and the City Council provide oversight for the implementation of policies, planning, and management for the Storm Drainage Utility.

Engineering Services (Engineering) within Community Development and Public Works is the lead group for comprehensive storm drainage system planning; development of a CIP; and the design, construction, and inspection of projects related to the storm drainage system. The Assistant Director of Engineering/City Engineer oversees Engineering and reports directly to the Community Development and Public Works Director.

Maintenance and Operations Services is the group responsible for the day-to-day maintenance and operation of the storm drainage system. The Sewer/Storm Drainage Operations Manager reports to the Assistant Director of Public Works Operations, and oversees nine storm drainage employees including a field supervisor. Vegetation Maintenance Division is responsible for mowing, tree trimming and weed control of city properties and facilities.

The overall Community Development and Public Works Department organizational structure is shown in Figure 2-1.

6.1.2 Staffing Level

The Storm Drainage Utility currently includes eight full-time M&O field staff, two seasonal staff, plus a field supervisor and an M&O manager, who perform administrative duties. This chapter does not include an evaluation of utility management, including regulatory compliance, planning, and coordination with other City departments. Position titles and the primary functions of the M&O staff working within the Storm Drainage Utility are shown in Table 6-1.

Table 6-1. Storm Drainage Utility M&O Personnel	
Position	**Primary function(s)**
Sewer/Storm Manager	Management of sewer and storm M&O staff
Storm field supervisor	Supervision of field staff
Maintenance worker II	Seven full-time staff dedicated to field inspection and maintenance
Maintenance worker I	One full-time staff dedicated to field inspection and maintenance
Seasonal employee	Two seasonal staff, for four months of the year, for field inspection and maintenance

In addition to the M&O field staff identified in Table 6-1, full-time and seasonal staff support the following Storm Drainage functions:

- Management and administration: A full-time manager performs administrative duties for both the Sewer and Storm Divisions. Management and administrative tasks include general oversight of the Sewer and Storm Drainage utilities M&O staff, regulatory compliance, planning, and coordination with other City departments. Field work is supervised by a full-time field supervisor.
- Vegetation maintenance: The Vegetation Maintenance Division consists of six full-time and three seasonal staff. These staff primarily (approximately 90 percent of total staff effort) support the Storm Drainage Utility M&O field staff with pond vegetative control, weed control and herbicide spraying, right-of-way and ditch mowing, tree trimming and removal, and leaf removal.
- Contracted services: The Storm Drainage Utility utilizes other City departments or external contractors for some services, as discussed in Section 6.3.

M&O activities routinely performed by Storm Drainage Utility staff are discussed in Section 6.2. Additional M&O activities, performed by other City divisions or contracted services on behalf of the Storm Utility are discussed in Section 6.3. The staffing plan presented in Section 6.6 considers M&O activities performed by Storm Drainage Utility and Vegetation Maintenance staff.

6.1.3 Level of Service

The Storm Drainage Utility operates in accordance with the LOS criteria outlined in Chapter 3, and internally adopted goals integral to meeting those levels. These goals are generally based on the current staffing level and tasks deemed most critical to the City and its residents. However, the existing staffing requirements discussed in Section 6.6 herein include near-term goals, which may not be met by existing staff.

6.1.4 Training and Education

The City recognizes the value of having a knowledgeable and well-trained staff operating the storm drainage system, and encourages employees to obtain the highest level of training available. At this time, the State of Washington does not require certification for stormwater maintenance operators but the City would support any effort to establish certification for these positions. Seminars, conferences, and college coursework have become tools to advance knowledge for maintenance staff.

Many M&O staff are specialized in specific job functions, which can promote expertise through specialization but also has the potential to limit the ability of the utility to absorb absences due to vacation, sickness, retirement, resignation, and termination. To mitigate this limitation, the City has broadened the scope of the Storm Drainage Utility's education system by initiating a cross-training program.

6.2 Routine Operations Provided by the Storm Drainage Utility

This section discusses routine operations provided by the Storm Drainage Utility M&O staff shown in Table 6-1. Each sub-section provides a brief description of the M&O activity, City goals with respect to proactive maintenance, and the estimated Storm Drainage Utility staff effort to achieve the proactive maintenance goal.

6.2.1 Catch Basin and Manhole Inspection, Cleaning, and Repair

The storm drainage system includes approximately 8,880 catch basins and 2,330 manholes. Catch basin and manhole maintenance includes initial inspection and potential follow-up cleaning and/or repair. Inspection is performed by two person using utility mapping to locate the targeted facilities. M&O staff use an inspection checklist to identify which facilities require further cleaning or repair. The checklist includes items such as observation of trash, debris, sediment, or vegetation blocking or within the catch basin/manhole; structural damage; evidence of contamination or pollution; and the integrity of catch basin grates, manhole covers, and ladders. Follow-up cleaning and maintenance work orders are generated based upon the results of initial inspection and typically include a two-person crew. Based upon recent maintenance history, it is assumed that approximately one in five catch basin/manhole inspections leads to further cleaning. The City assumes that a total of 250 catch basins and manholes per year require some level of maintenance/repair.

Catch basin inspection is required as part of the City's NPDES Phase II Municipal Stormwater Permit, recently updated in August 2013. Beginning in 2015, the City is required to inspect and maintain all catch basin facilities every 2 years. To achieve this permit requirement, the City goal is to inspect 60 catch basins per day. Manhole inspection frequency is not mandated by the permit, but the City's goal is to complete inspection of all City manholes on a 4-year rotating schedule.

In the future, the City intends to demonstrate (through maintenance records) that catch basins do not require inspection every 2 years. The City will use Cartegraph software (see Section 6.5) to record and track results of catch basin inspection, cleaning, and maintenance efforts.

6.2.2 Stormwater Pipeline Cleaning and CCTV

The storm drainage system includes approximately 210 miles of collection system piping. Cleaning and inspection of the storm drainage system is performed using City-owned vactor/jet truck and closed-circuit television (CCTV) equipment. Cleaning and CCTV inspection are typically performed in tandem from structure to structure (i.e., catch basin or manhole) by a two-person crew for each task.

Jetting of stormwater pipelines and subsequent vactor truck suction is the principal means of removing debris or obstructions from the storm drainage system. A hose with a special end fitting is inserted into a pipe and high-pressure water (up to 2,500 pounds per square inch) is sent through the hose. The high-pressure water exits the small hole at the tip of the nozzle, breaking down and/or scouring obstructions. Debris is then removed via suction by the vactor truck equipment at each manhole.

Following cleaning, CCTV inspection is performed to identify structural defects and potential pipeline leaks. "Lamping" inspections, where the camera is inserted into the manhole or catch basin but not advanced through the pipe system, are typically performed as a first step of the CCTV process. Although the visual range is limited, lamping can identify structures and piping in very good condition. In these cases, no additional CCTV inspection is completed. Lamping is generally limited to areas of newer pipe or low-priority facilities.

Routine CCTV inspection of the storm drainage system is an essential component of the M&O program as it can identify trouble spots before larger failures occur and can provide the City with accurate information about the condition of the storm drainage system. Since the end of 2007, inspection reports

and digital video captured by the CCTV crews have been stored within the City's computer network (flexidata software). While the ability to edit information in flexidata is limited to licensed machines, the flexidata reader is available for all City staff. Currently, the City does not have the ability to transfer the data stored in flexidata, specifically a summary of pipe condition, to the more comprehensive data stored within Cartegraph, the utility CMMS software. A primary goal of the utility in the near future is to use the results of CCTV inspection to populate pipe conditions fields within Cartegraph in order to provide a more accurate planning tool based upon the known condition of storm drainage system assets.

The City's goal is to clean and inspect all stormwater collection pipes within the system on a 15-year cycle. On average, a two-person crew can clean approximately 1,500 feet of pipe per day and inspect approximately 500 feet of pipe per day.

6.2.3 Stormwater Outfall Inspection, Cleaning, and Maintenance

The storm drainage system includes 65 outfalls, or discharges from localized collection systems to the Green River, White River or Mill Creek. Outfall maintenance includes initial inspection and potential follow-up corrective actions. Outfall inspections are performed to identify excessive vegetative growth that could obstruct flow, outfall erosion protection, structural damage to the pipe itself, and abnormal discharge from the pipe that might be indicative of contamination (i.e., color/sheen or odor). Follow-up cleaning and maintenance work orders are generated based upon the results of initial inspection. The City goal is to inspect each outfall seasonally (four times per year) and to perform maintenance at least annually, or at a greater frequency depending upon inspection results. On average, inspection and maintenance activities require 0.75 hour and 1.0 hour, respectively, for a two-person crew.

6.2.4 Drainage Ditch Maintenance and Restoration

The storm drainage system includes approximately 40 miles of drainage ditches. Drainage ditch maintenance is required to preserve the original line and grade, hydraulic capacity, and purpose of the ditch. Routine maintenance activities include re-grading and removal of sediment; nuisance vegetation; and isolated obstructions such as trash, trees, and accumulated debris. Because vegetation is important for erosion control, the City strives to minimize the removal of beneficial vegetation.

Drainage ditch maintenance efforts are time-consuming for the Storm Drainage Utility. Up to six M&O staff are required for a single ditch maintenance crew to operate the City-owned excavator, control traffic (as necessary), and manually re-grade or remove obstructions. The City assigns a six-person ditch maintenance crew approximately 15 days per year (3 days per week for 1, out of 4, month in the summer). On average, these crews can complete 200 feet of ditch maintenance per day. The City's goal is to maintain all ditches within the system on a 20-year cycle.

6.2.5 Stormwater Pond and Swale Inspection, Maintenance, and Restoration

Inspection of the approximately 168 City stormwater ponds and 75 swales is performed by a two-person crew using an inspection checklist to identify conditions that require correction. The checklist includes items such as observation of trash, debris, sediment, and animal or insect infestation that could impact pond function or future maintenance; structural damage or erosion; evidence of contamination or pollution; and the integrity/function of emergency overflow spillways. On average, inspection activities require 1.0 hour for a two-person crew per location. Follow-up maintenance and restoration is scheduled during the summer months. The City assigns a six-person stormwater pond/swale crew approximately 45 days per year (3 days per week for 3, out of 4, months in the summer).

The City goal is to inspect each pond/swale twice per year. Maintenance and restoration are performed as necessary. After major storms (greater than 10-year events), it is recommended that some stormwater ponds be inspected briefly to verify proper function and identify damage, if any. It is

recommended that the City develop a list of ponds that should be inspected following these major storms. Some larger City ponds have been maintained by King County staff, as discussed in Section 6.3.

6.2.6 Culvert Inspection and Cleaning

Culvert maintenance includes inspection and cleaning of the approximately 800 culverts within the storm drainage system. Culverts are typically inspected by a two-person crew, with corrective actions and cleaning performed during the inspection when possible. On average, inspection and cleaning activities require 0.75 hour for a two-person crew. Culvert inspection focuses on the assessment of free flow within the culvert and identifying any structural defects. Any debris that cannot be removed during the initial inspection or any noted structural concerns result in a work order for corrective action. The City goal is to inspect (and clean as necessary) each culvert twice per year.

6.2.7 General Facility Maintenance and Other Field Tasks

Storm Drainage Utility M&O staff perform a number of duties that do not readily fall into the categories previously listed, and often support other City departments. Examples of these additional storm drainage tasks include:

- General facility maintenance: Maintenance may include detention vault cleaning and sediment removal, weir cleaning, filter inspection and cleaning, and maintenance of oil/water separators.
- Engineering support: Storm Drainage Utility M&O staff often provide facility inspection services for Engineering projects and support Engineering through visual observation in the field. M&O staff also make small repairs such as replacing catch basins or failed culverts, or minor drainage pipe replacement. See Section 6.7 for recommendations related to documenting M&O repair projects.

It is difficult to quantify in terms of full-time equivalent (FTE) the general inspection and field tasks performed by Storm Drainage Utility staff. Many of the activities occur outside of a regular maintenance schedule. FTE assumptions are summarized in Section 6.6.

6.3 Routine Operations Provided to the Storm Drainage Utility

This section discusses routine operations performed by other City staff or by contracted services in support of the Storm Drainage Utility. Each sub-section provides a brief description of the M&O activity. FTE efforts for these activities are funded by the Storm Drainage Utility. Because Vegetation Maintenance staff primarily support the Storm Drainage Utility (approximately 90 percent of total staff effort), these staff are included in the existing staffing requirements discussed in Section 6.6.

6.3.1 Vegetation Maintenance

Vegetation maintenance is performed by Vegetation Maintenance Division full-time and seasonal staff that support City Storm Drainage Utility M&O staff. Vegetation maintenance includes mowing, herbicide application, seeding and re-planting, and removal of nuisance vegetation or vegetation that impairs the function of storm drainage facilities. In the fall, vegetation maintenance also includes removal of leaves that can accumulate and block flow to catch basins.

Full-time Storm Drainage Utility staff may also perform limited vegetation maintenance as part of the routine operations discussed in Section 6.2.

6.3.2 Stormwater Pump Station Maintenance

Maintenance of the seven pump stations within the City storm drainage system is performed by Sewer Utility staff since they have pump specialists whom perform all pump station maintenance. Sewer Utility staff perform scheduled weekly and monthly maintenance inspections as described in the City of Auburn *Sewer Comprehensive Plan Update* and summarized below:

Weekly pump station maintenance activities include the following tasks:

- Perform a general visual inspection of grounds and pump station structure or vault
- Check equipment for abnormal vibrations
- Check lubrication of all pumping equipment
- Check and clean, as needed, seal filters
- Check ultrasonic level sensor
- Check pump run times
- Bleed lines of moisture
- Inspect control valves
- Check wet well for debris
- Manually run pump and observe wet well level

Monthly pump station maintenance activities include the following tasks:

- Inspect and test engine-generators
- Inspect pump station mechanical bypass pumping
- Flush sump pit and manually run sump pump
- Clean pump station interior and, at a minimum, wipe down control panels and pumps, and wash down/disinfect floor
- Inspect fall restraint system
- Spot-check control system and telemetry alarms

6.3.3 Stormwater Pond Maintenance by King County

The City has contracted with King County to provide stormwater pond maintenance of two to five larger stormwater ponds per year because the County can more efficiently provide this service using County-owned equipment and property for disposal of sediment materials. The City seeks to phase out the use of County resources by adding personnel and procuring additional equipment. Maintenance activities and frequency of maintenance as discussed in Section 6.2.5 applies to those facilities maintained by King County.

6.3.4 Stormfilter Maintenance

Stormfilters are designed to remove sediment, metals, and other stormwater pollutants from wet weather runoff via filter cartridges. The City currently has eleven stormfilter cartridge facility locations. The stormfilter vaults are inspected by city staff quarterly to identify conditions that require additional, unscheduled maintenance. Such conditions could include excess sediment accumulation, damaged piping, or vault and access cover damage. The stormfilters and vaults are maintained (cartridges replaced) annually by a private contractor.

6.4 Non-Routine and Emergency Operations

The intent of the routine inspection and maintenance activities discussed in Sections 6.2 and 6.3 is to minimize, through proactive management of the stormwater facilities, the potential for conditions that could lead to emergencies. This section discusses unscheduled activities performed by Storm Drainage Utility M&O staff, and describes a response plan for emergency conditions.

6.4.1 Customer Service Requests

Customer service requests, typically related to a local drainage complaint, trigger creation of a work order to inspect the affected area or stormwater facility and identify potential solutions. In some cases, relatively simple solutions, such as removal of blockages, can alleviate the issue. However, other cases require coordination with Engineering or other City departments. On average, City Storm Drainage Utility staff respond to approximately three customer service/complaint-related work orders per week. The effort required to resolve these complaints varies considerably.

Good record-keeping can help in complaint resolution by ensuring that all relevant data are gathered and by serving as a reminder to resolve the complaint and notify the complainant. When a complaint is received, the following information should be recorded to the extent possible:

- Name and contact information of the person making the complaint
- Brief description of the nature of the complaint
- Time and date the complaint was received
- Storm drainage staff assigned to respond

Following initial response, the complaint record should be updated to include the results of inspections and corrective actions taken, if any. If the complaint cannot be resolved internally within the Storm Drainage Utility, the complaint record should be forwarded to Engineering for further investigation. Notification of any system investigation and/or action should be provided to the customer making the complaint.

6.4.2 Emergency Response Program

The Storm Drainage Utility, in conjunction with the other utilities divisions, has prepared a Public Works Emergency Response Manual as a guide on how to handle emergency situations. While the manual is by no means all-inclusive for every type of disaster, it is a valuable tool for dealing with many of the emergency situations that municipalities face. Copies of the Emergency Response Manual are available at the M&O Building, at City Hall Annex with the City Engineer, and with the Valley Regional Fire Authority (VRFA) Station.

The Emergency Response Manual is one element of the City's overall Emergency Operations Plan. The primary objectives of the Emergency Operations Plan are to ensure public safety, restore essential services as quickly as possible, and provide assistance to other areas as required. There is also a master response program for the entire City as documented in the City's Emergency Management Plan (CEMP). The material in the CEMP provides guidance for mitigation, preparedness, responsibilities, recovery operations, training, and community education activities. Copies of the Emergency Operations Plan are located in each City department, the M&O Building, and with the VRFA.

The utility has implemented a standby program whereby one on-call employee is designated to be the first to receive after-hours emergency calls. Most storm drainage system problems that occur outside of normal working hours are reported through the City's 911 emergency response system or a non-emergency response number. An emergency call-out list is provided to the emergency operator in order to contact utility staff in case of an emergency. The primary responder to those after-hours calls is the on-call employee. Storm Drainage Utility M&O staff have been trained to respond to system emergencies. The contacted staff assesses the situation, contacts additional staff as necessary, and then responds in accordance with established emergency response procedures.

6.5 Data Collection and Record-Keeping

Data collection and record-keeping functions for the Storm Drainage Utility are performed using Cartegraph, a Web-based commercial software package provided by Cartegraph Inc. Cartegraph

integrates GIS data with utility M&O records, providing managers with overview information about system and operational performance and field crews with information related to the condition and failure history of specific stormwater facilities. The City currently uses Cartegraph to plan field staff activities (work orders), record results of both routine and non-routine maintenance, and compare actual maintenance efforts to City goals. The City recently upgraded its Cartegraph system and plans to transition toward the use of Cartegraph as an asset management tool, through which the City would optimize staffing and capital resource planning.

In recent years, the City has made considerable progress in adding asset information to Cartegraph, specifically GIS data, physical information related to size and material, and installation date. However, to fully utilize the asset management function of Cartegraph, additional information related to risk, asset criticality, and condition is also necessary. To assist the City's transition to an asset management program, the attributes listed below should be used within Cartegraph to define each of the City stormwater assets (catch basin, pipe segment, stormwater pond, etc.).

Asset-Specific Attributes. The following asset-specific attributes are related to the asset and remain relatively unchanged over time:

- **Asset ID:** The unique asset number that is used by all business systems to identify an asset.
- **Location:** Where the asset is located (GIS).
- **In-service date:** The date the asset was placed into service.
- **Replacement cost:** The cost to replace the asset and the year that the cost data were calculated.
- **Useful life:** The average life expectancy of the asset.
- **Asset criticality:** A value assigned to each asset that indicates how essential it is to maintaining a defined LOS. Typically it is defined as a combined score based on the consequence of failure and the likelihood of failure.
  - **Consequence of failure**: The social and economic cost if the asset fails
  - **Likelihood of failure (condition):** The estimated time until the asset fails, usually based on condition
- **Asset class:** A group of assets that share the same characteristics (e.g., ponds, pipe segments). Asset class is used to estimate replacement costs and useful life of groups of assets.
- **Nameplate information and asset specifications:** Important information that is used to uniquely describe an asset such as the manufacturer name, type of asset, serial number, size, material, etc. This information is used for asset identification, replacement, and repair.

Maintenance and Operation Attributes. The following M&O attributes are captured as part of the operations, maintenance, and repair history associated with each asset:

- **Asset ID:** The unique asset number that is used by all business systems to identify an asset. Work orders should be associated with one or more assets.
- **Issue, cause, action**: These codes are used to classify historical M&O activities associated with corrective actions or unplanned maintenance.
  - **Issue:** What is the problem observed in the field?
  - **Cause:** What is the underlying cause of the problem?
  - **Action:** What was done to address the cause?
- **Target hours and actual hours:** Recording the estimated hours and actual hours to complete a work order can help in determining efficiency, planning workloads, and assessing repair costs.
- **Target start/stop date and actual dates:** Recording the estimated and actual start and stop dates for a work order can help in determining efficiency, planning workloads, and assessing repair costs.

- **Work order costs:** Work order costs include labor, parts, materials, and equipment, and should be accurately recorded for each work order.
- **Work order type:** Work order types are used to group and compare different types of work activities. Typical work order types include:
  - **Capital improvement:** Work associated with a capital improvement project
  - **Corrective maintenance:** Work associated with an unplanned repair
  - **Preventive maintenance:** Work associated with a planned preventive maintenance activity
  - **Predictive maintenance:** Work associated with predictive measures (usually for critical assets)
- **Warranty information:** Helps to determine assets that are under warranty and the warranty maintenance requirements.

6.6 M&O Staffing Requirements

This section outlines existing and future staffing requirements for M&O staff.

6.6.1 Existing Staffing Requirements

Existing staffing requirements for M&O activities discussed in this chapter were compiled and evaluated to determine the M&O staffing level needed to efficiently operate, maintain, repair, and collect and report the information necessary to properly operate the storm drainage system. Table 6-2 and Table 6-3 evaluate Storm Drainage Utility and Vegetation Maintenance Division staff, respectively. Each table evaluates the estimated time to conduct storm drainage system M&O tasks in the manner currently performed. Calculated days for each M&O activity are for a single person performed over an 8-hour "day." Therefore, an activity that is performed quarterly and that requires 4 hours and two M&O staff to complete would result in an annual requirement of 4 days.

Table 6-2. Existing Storm Drainage System Maintenance and Staffing Requirements

Work activity	FTE days required annually	Assumptions/City goal
Catch basin and manhole inspection, cleaning, and repair		
Catch basin inspection	148	Inspect once every 2 years, total of 8,880 catch basins. Perform 60 inspections per day with one-person crew.
Manhole inspection	13	Inspect once every 4 years, total of 2,330 manholes. Perform 45 inspections per day with one-person crew.
Catch basin cleaning	222	One cleaning is required for every five inspections. Two-person crew, 1 hour each.
Manhole cleaning	29	One cleaning is required for every five inspections. Two-person crew, 1 hour each.
Catch basin/manhole repair	63	250 repairs (25 percent of all inspected) per year. Two-person crew, 1 hour each.
Stormwater pipeline cleaning and CCTV		
Pipeline cleaning	99	City goal is 74,000 ft per year (entire system in 15 years). Two-person crew can clean 1,500 ft of pipe per day.
CCTV	220	City goal is 55,000 ft per year (entire system in 20 years). Two-person crew can CCTV 500 ft of pipe per day.
Stormwater outfall inspection, cleaning, and maintenance		
Inspection	49	City goal is four times per year (65 total outfalls). Two-person crew, 0.75 hour each.
Maintenance	16	City goal is one time per year (65 total outfalls). Two-person crew, 1 hour each.

Table 6-2. Existing Storm Drainage System Maintenance and Staffing Requirements		
Work activity	FTE days required annually	Assumptions/City goal
Drainage ditch, stormwater pond, and swale inspection, maintenance, and restoration		
Drainage ditch maintenance and restoration	90	Six-person crew for 15 days (approximately 3 days per week for a month in the summer).
Stormwater pond and swale inspection	91	City goal is twice per year for each of 243 ponds/swales. Two-person crew, 0.75 hour each.
Stormwater pond and swale maintenance and restoration	270	Six-person crew for 45 days (approximately 3 days per week for 3 months in the summer).
Culvert inspection and cleaning		
Culvert inspection and cleaning	300	City goal of twice per year for each of 800 culverts. Two-person crew, 0.75 hour each.
Other stormwater M&O activities		
General facility maintenance and other field tasks	26	One day per week. Two-person crew, 2 hours each.
Customer service requests/complaints	39	Three requests per week.[a] Two-person crew, 1 hour each.
Data entry	130	20 hours per week total (8 people at 0.5 hour per day).
Subtotal	**1,804**	
Total	**1,985**	**Assumes 10% unquantified work**
Total number of working days available per FTE	221	365 minus weekends (104), holidays (12), vacation (15), sick (12), and training (1).
Number of FTEs required	9.0	1,985 days required divided by 221 days per FTE year.
Current funded FTEs	8.7	8 FTE and 2 seasonal staff

Note: FTE days are defined as 8 hours.

a. Many customer service requests are related to maintenance needs for privately owned drainage systems.

Table 6-3. Existing Vegetation Maintenance and Staffing Requirements		
Work activity	FTE days required annually	Assumptions/City goal
Pond Vegetation Management		
Mowing	744	6-person crew, 40 hours per week for 6 months
Weeding/Spraying	248	4-person crew, 20 hours per week for 6 months
Weed Control/Herbicide Spraying		
Weed Control/Herbicide Spraying	37.2	2-person crew, 3 days per week (4.8 hrs per day) for 6 months
ROW and Ditch Mowing		
Staff 1	115.5	40 hours per week for 8 months
Staff 2	46.2	2 days per week for 8 months
Tree Trimming and Removal		
Tree Trimming and Removal	248	4-person crew, 40 hours per week for 3 months
Leaf Removal		
Leaf Removal	186	3-person crew, 40 hours per week for 3 months
Subtotal	**1,625**	
Total	**1,706**	**Assumes 5% unquantified work**
Total number of working days available per FTE	221	365 minus weekends (104), holidays (12), vacation (15), sick (12), and training (1).
Number of FTEs required	7.7	1,706 days required divided by 221 days per FTE year.
Current funded FTEs	6.5	6 FTE and 3 seasonal staff x 90% availability for Storm Drainage Utility M&O

Note: FTE days are defined as 8 hours.

Table 6-2 shows that the Storm Drainage Utility, including two seasonal staff, is slightly under- staffed with respect to meeting current City proactive goals for M&O activities, with the exception of drainage ditch maintenance and restoration. Based upon discussions with City staff, they are unable to meet the goal of performing ditch maintenance of all ditches within the system on a 20-year cycle with the available M&O staff. In addition, the City would like to maintain all their stormwater ponds and no longer rely on King County's assistance with the larger ponds. Additional staffing needs required to more consistently meet the current LOS goals, additional pond maintenance responsibilities, future regulatory requirements, and anticipated system growth are discussed in Section 6.6.2. Table 6-3 shows that 1.2 additional FTE is required to meet current vegetation maintenance needs of the Storm Drainage Utility.

6.6.2 Future Staffing Requirements and Equipment Needs

The M&O activities discussed in Section 6.2 and summarized in Table 6-2 are current efforts and do not include additional activities that will be required as part of the revised NPDES Phase II Municipal Stormwater Permit. Furthermore, additional staffing is required to more consistently meet LOS goals with respect to stormwater pond and drainage ditch maintenance. Future staffing requirements are summarized in the sections below and Table 6-4.

6.6.2.1 Drainage Ditch and Stormwater Pond Maintenance and Restoration

The City intends to increase overall Storm Drainage Utility staffing in order to dedicate more staff to drainage ditch maintenance and restoration during the summer months (see Table 6-4). In order to meet the City's goal to maintain all ditches within the system on a 20-year cycle, existing ditch maintenance frequency will be increased by approximately 36 days (with a six-person crew), or 1 FTE per year.

As identified in Section 6.3.3, the City desires to phase out current King County maintenance of City storm ponds. It is estimated that existing pond maintenance frequency will be increased by approximately 55 days (with a six-person crew), or 1.5 FTE per year, to replace current King County maintenance activities. A new excavator will also be necessary and is estimated to cost $180,000.

6.6.2.2 Other Stormwater M&O Activities

The City intends to hire one full-time staff member for Cartegraph maintenance tracking and reporting functions. This staff member would support the City Storm Drainage, Sewer, and Water utilities and would be a liaison with the City Information Services (IS) division.

Many of the new requirements of the NPDES Permit emphasize implementation of LID practices, such as minimizing impervious surfaces, native vegetation loss, and stormwater runoff. A majority of new development and redevelopment projects will be required to construct new types of onsite LID facilities, which will need to be inspected and maintained to ensure proper function moving forward.

An estimate of FTE effort for LID facility inspection and maintenance based upon review of the new NPDES Permit requirements was prepared separately from the Storm Drainage Utility planning process. Through that effort it was estimated that 0.5 FTE of Storm Drainage Utility M&O staff will be required for LID inspection and maintenance activities. Additional inspectors from Engineering would also be dedicated to LID facilities and other requirements of the NPDES Permit.

6.6.2.3 Stormwater Pond Vegetation Maintenance

As new stormwater ponds are constructed, vegetation maintenance including mowing and weeding will be necessary. Not all facilities can be maintained with equipment and some require additional maintenance time because work has to be completed by hand. The additional effort required each year is driven by the number of ponds constructed. As this is a small incremental increase that would not impact the staffing requirements for this planning period, it is not shown in Table 6-4.Increases in efforts for pond vegetation maintenance, however, should be considered in future planning efforts. For existing

pond maintenance, an excavator mower attachment is needed for vegetation maintenance and is estimated to cost $30,000.

Table 6-4. Future Storm Drainage System Maintenance and Staffing Requirements

Work activity	FTE days required annually	Assumptions/City goal
Drainage ditch and stormwater pond maintenance and restoration		
Drainage ditch maintenance and restoration	216	Six-person crew for 36 days during the summer months.
Stormwater pond restoration	330	Six-person crew for 55 days during the summer months.
Other stormwater M&O activities		
Cartegraph tracking and reporting	111	Approximately 0.5 FTE (1 FTE shared with Sewer and Water utilities).
LID inspection and maintenance	104	One day per week. Two-person crew.
Total	761	
Total number of working days available per FTE	221	365 minus weekends (104), holidays (12), vacation (15), sick (12), and training (1).
Number of FTEs required	3.4	761 days required divided by 221 days per FTE year.

6.6.2.4 Equipment Needs

New and updated Storm Drainage Utility and Vegetation Maintenance equipment needs identified via consultation with City staff include CCTV inspection equipment for pipe inspection, an excavator for drainage ditch and stormwater pond maintenance and restoration, and an excavator mower attachment for pond vegetation maintenance. The Storm Drainage Utility utilizes the Sewer Utility's reallocated CCTV inspection equipment and truck. New equipment would allow for increased efficiency and inspection frequency. CCTV inspection is essential component of the M&O program as it can identify trouble spots before larger failures occur and can provide planning information based on the condition of the storm drainage system. A new excavator is needed to meet the City's goal for ditch maintenance and the City's plan to maintain all City ponds. A new excavator mower attachment is needed to maintain vegetation in storm drainage facilities.

New equipment would increase M&O and Vegetation Maintenance field staff efficiency and may reduce the need for additional staff. Estimated costs, based on recent vendor quotes, for the equipment are summarized below.

- CCTV inspection equipment: $250,000
- Excavator: $180,000
- Excavator mower attachment: $30,000

6.7 Potential Improvement Opportunities and Capital Needs

The Storm Drainage Utility has a positive track record for M&O, as evidenced by the limited need for non-routine maintenance and few customer service complaints about the city's drainage system. Routine facility cleaning, regular inspections, experienced staff, and a well-planned storm drainage system contribute to that success. However, as shown in Table 6-3, 1.2 FTE within the Vegetation Maintenance Division are necessary to adequately support storm drainage utility functions. Furthermore, the need to comply with the new NPDES Permit and the growing backlog for drainage ditch and stormwater pond/swale maintenance should be addressed by the City by adding to the current Storm Drainage

Utility M&O staff. An additional 3.4 FTE (Table 6-4) are required to achieve current City proactive M&O goals plus future NPDES permit LID requirements.

Based upon discussions with City staff and analysis of M&O activities discussed in this chapter, the following improvement opportunities are available to the Storm Drainage Utility. These opportunities are based on improving existing services, regulatory compliance, and improving work productivity:

- Obtain or upgrade the following utility equipment to improve M&O and Vegetation Maintenance efficiency:
  - CCTV inspection equipment for pipe inspection
  - Excavator for drainage ditch and stormwater pond maintenance and restoration
  - Excavator mower attachment for pond vegetation maintenance
- Continue to integrate asset management with existing utility management software (Cartegraph and GIS).
  - Continue to add GIS attributes to known Storm Drainage Utility assets.
  - Perform and document condition assessments. Use defined criteria (such as leaks/cracks observed, cleanliness, and other specific measures) and provide staff training to ensure assessment consistency. Use National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP) certified inspection programs to allow integration of inspection results with Cartegraph.
  - Over time, use results of condition assessments to move toward risk-based maintenance to best utilize staff resources. For example, consistently high assessment scores would result in a lower risk or need for maintenance, allowing M&O staff to be diverted to more essential activities.
  - Over time, demonstrate (through maintenance records) that a subset of city catch basins do not require inspection, cleaning, and maintenance every 2 years per the new NPDES Permit.
- All M&O repair projects (see Section 6.2.7) should be constructed to established City engineering standards. It is recommended that the City develop a more formal procedure for tracking M&O repair projects to ensure that as-built and GIS records are updated when repairs are completed.

Chapter 7

Capital Improvements

This chapter describes recommended capital improvement projects for the City of Auburn Storm Drainage Utility. Capital improvement projects described in this chapter are compiled into a 6-year CIP that addresses the most crucial drainage problems and a 20-year CIP that addresses longer-term capital planning goals (see Chapter 8). This comprehensive plan contains time frames that are the intended framework for future funding decisions and within which future actions and decisions are intended to occur. However, these time frames are estimates, and depending on factors involved in the processing of applications and project work, and availability of funding, the timing may change. The framework does not represent actual commitments by the City of Auburn, which may depend on available funding resources.

In general, capital improvement projects are modifications to stormwater drainage infrastructure designed to improve the condition and function of the drainage system so that it can meet the LOS goals established for the City's Storm Drainage Utility (see Chapter 3). Example goals include limiting flooding across roadway segments to an average of once per 25 years and limiting the number of pipes that have exceeded their economic lives (prior to repair or replacement). All projects were developed and sized to be consistent with these LOS goals.

The capital improvement projects presented in this chapter were identified and developed through focused investigations and by working collaboratively with City staff. This focused and collaborative approach was based on the practical consideration that the City can implement only two to four capital improvement projects per year given existing revenue streams and staff availability. The intent is to produce an economical CIP that addresses the most salient issues in the near term, while still planning for the long-term ability of the Storm Drainage Utility to meet LOS goals. The following basic steps are used to develop capital improvement projects:

- The project team worked closely with City staff to identify and characterize existing problems based on direct staff observations from recent storm events. Such observations are a valuable supplement to modeling analyses and, in this case, were used in conjunction with modeling activities to assist with model development.
- Modeling was completed for the historical event that most closely produced a once per 25 year flow rate (the specific event varied by basin). Results from historical events were used to assess the extent and severity of the drainage problem. Results from the design event were used to size infrastructure improvements to mitigate drainage problems.
- Hydraulic modeling was completed using PCSWMM, a software package that uses GIS technology to import and export data, allowing a seamless transition between the system inventories and modeling input files. For smaller basins for which a PCSWMM model did not exist or was not created, Manning's n equations were used to determine pipe sizing.
- Recommendations were developed for flow and water level monitoring in the vicinity for some of the proposed projects or other locations where future modeling may be warranted.
- Members of the City's staff have a thorough understanding of the storm drainage system and firsthand experience with existing drainage problems. The project team worked with City staff to identify the most viable mitigation alternative.
- Once the projects were defined, the project team developed concept-level cost estimates.

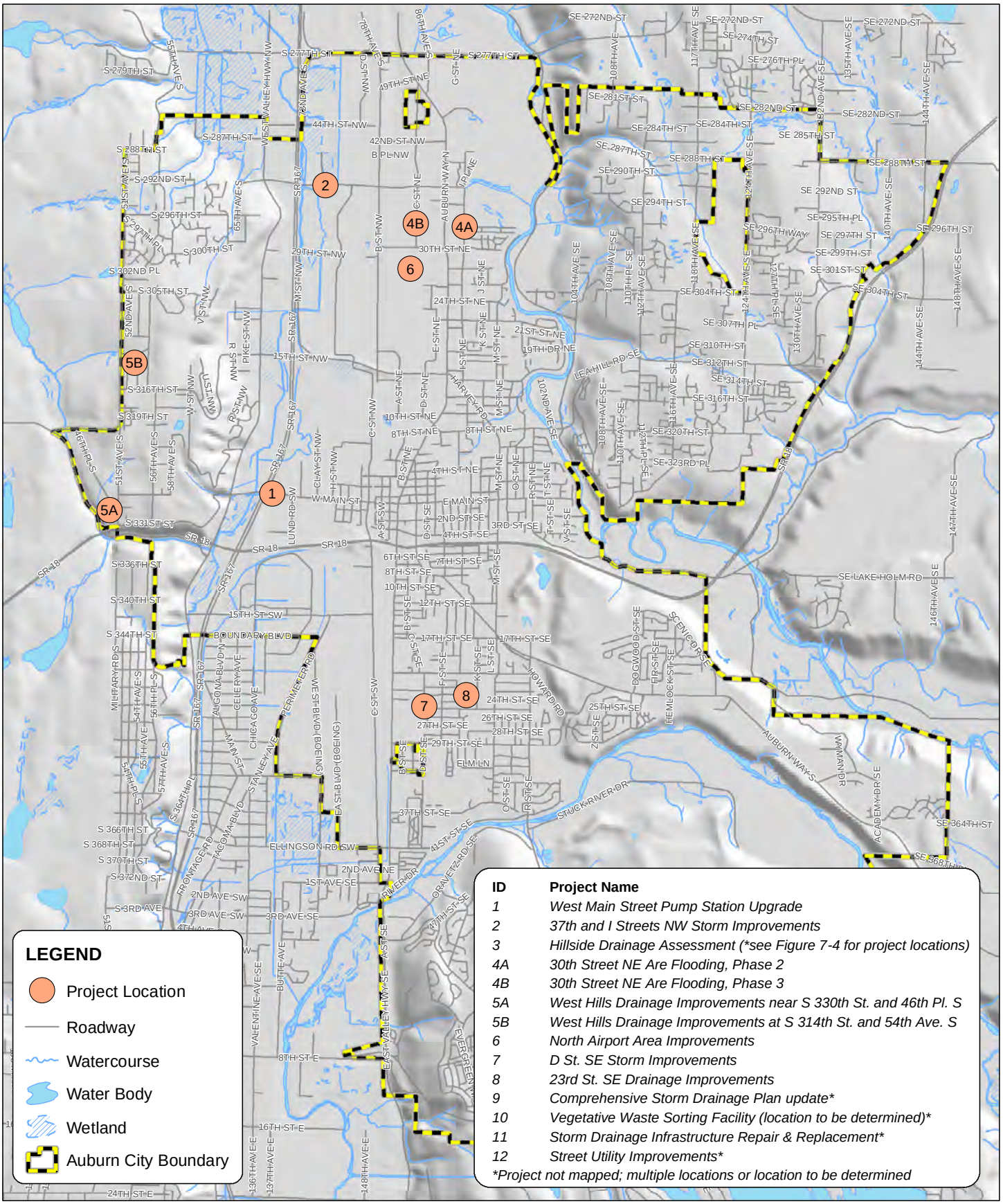
An overview of project locations is shown in Figure 7-1. Section 7.1 describes a tiered method for establishing project priorities. Section 7.2 presents detailed descriptions of new proposed projects. Section 7.3 describes programmatic drainage projects. Section 7.4 examines the need for repair and replacement of existing pipes.

7.1 Project Prioritization

Storm Drainage Utility staff prioritized capital improvement projects by grouping them into one of three tiers. Projects in the top tier, or highest priority, are classified as tier 1; projects with medium priority are classified as tier 2; and projects with lowest priority relative to the other projects are considered tier 3. Prioritization was based on a qualitative evaluation of the following issues:

- The magnitude of the LOS gap that would be addressed by a CIP project. For example, a project that rectifies an annual flooding problem would rank higher than a project in a different area that eliminates less frequent flooding.
- The reduction in risk and reduction in consequences associated with a CIP project. For example, the consequence of flooding that occurs near critical facilities (e.g., hospital or fire station) or along major arterial streets may be larger than flooding along residential streets. A CIP project that addresses a larger consequence would rank higher.
- The opportunity for coordination with ongoing City of Auburn street improvements, or other utility or transportation projects. Coordinated projects that reduce the overall cost of a CIP project would rank higher.
- The capital funding capacity of the Storm Drainage Utility. The overall list of project priorities attempts to balance the need for action with the funding and implementation capacity of the Storm Drainage Utility.
- Other considerations included the potential to improve water quality, reductions in maintenance, and increased reliability of the system.

Priorities for each project are included in each project description in the following sections. Project priority and budgetary constraints were considered together in developing the year-by-year schedules for project implementation in the 6- and 20-year CIPs (see Chapter 8).



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1 inch = 5,000 feet

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Figure 7-1
Project Locations
Stormwater Drainage Utility
Capital Improvements Program

7.2 Proposed Drainage Projects

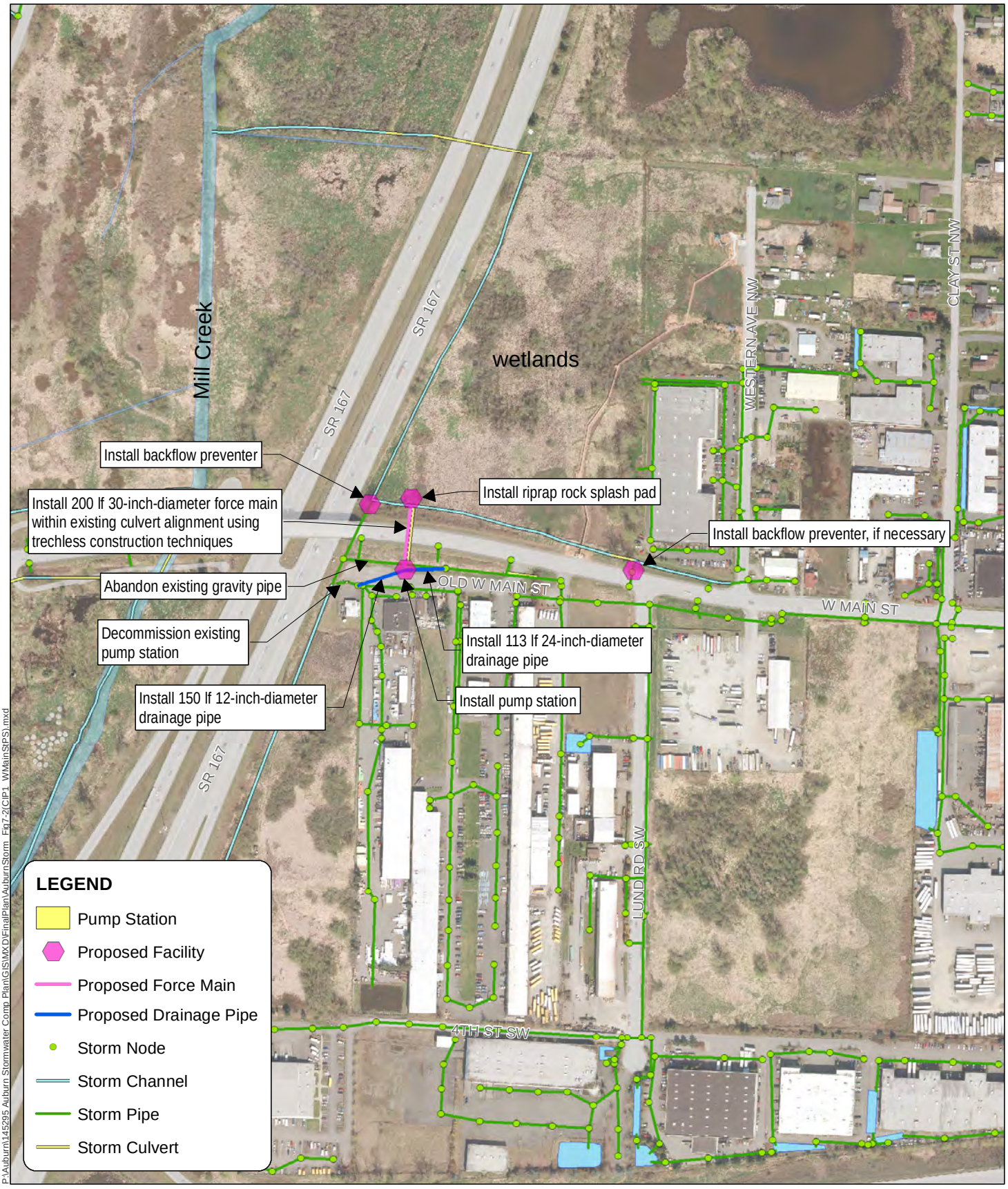
Capital improvement projects described in this section were developed as part of this Drainage Plan and are described in sufficient detail to allow the City to proceed with budgeting and design. Project descriptions are organized into summaries containing the following information:

- **Project number:** CIP numbers were generally assigned by priority.
- **Project name:** A short, descriptive name was assigned to each project.
- **Location:** A simple description of the project location, such as the cross streets, is provided.
- **Priority and schedule:** Project priorities and years of implementation are provided to present complete project summaries; however, prioritization and scheduling is discussed in more detail in Chapter 8.
- **Problem summary:** A brief description of the observed problem is presented along with a summary of the analysis conducted to characterize the problem and evaluate alternatives for mitigation. A more complete discussion of the hydraulic analyses performed to evaluate system conveyance capacities is summarized in Section 5.1 and described in detail in Appendix C.
- **Description:** A description of the proposed project is provided, including major project elements and sizes.
- **LOS goal(s) addressed:** The LOS goal(s) addressed by the project is provided.
- **Recommended predesign refinement:** In some cases, pre-project data collection and monitoring is proposed.
- **Recommended post-construction monitoring:** In some cases, post-project monitoring is proposed.
- **Planning-level cost estimate**: A list of estimated costs is provided including construction costs, engineering and administrative costs, taxes, and contingency costs. The estimate was developed based on the conceptual design, preliminary quantity take-offs, and estimated unit costs. Estimated unit costs were based on the City of Seattle Unit Cost Report (SPU, 2012), WSDOT Unit Bid Tab for the Northwest region (2012–2014), King County's Tabula conveyance system cost estimating software, vendor quotes, and escalated project costs from recent projects with similar components.
- **Project map:** A figure showing the conceptual design and location of project elements is provided.

Proposed project summaries and maps are presented on the following pages.

Project number	1
Project name	West Main Street Pump Station Upgrade
Location	South of West Main Street east of the SR 167 overpass
Priority	1
Schedule	Begin construction 2016
Problem summary	The dead-end portion of Old West Main Street near SR 167 has a history of observed flooding. The City installed a pump station to dewater the gravity pipe, flowing on the south side of Old West Main Street, in an effort to protect local businesses from flooding. Since its installation in 2008, the pump station has eliminated flooding at the observed location. The pump station, however, does not meet the City's LOS guidelines regarding pump redundancy, and modeling indicates that the pump station does not have capacity to convey the 25-year flow rate. The City's gravity pipe on the north side of Old West Main Street experiences flooding, at one inlet, approximately once per year. Portions of this gravity pipe are now inundated because of high water elevations associated with the water surface elevation in Mill Creek, which is downstream. The pump station and gravity pipe discharge to a WSDOT ditch along the east side of SR 167. The ditch flows north to a WSDOT 24-inch-diameter culvert under West Main Street. Approximately 1,150 feet north of West Main Street, the WSDOT ditch discharges to Mill Creek via a 24-inch-diameter culvert under SR 167. During a field visit on April 30, 2014, approximately 5 feet of standing water was observed in the WSDOT system as well as in portions of the City's gravity system. Sediment and vegetation accumulation in the WSDOT downstream conveyance (north of West Main Street) prevent the City's system from draining. Also, when Mill Creek's water surface elevation is high, it backflows into the WSDOT ditch and inundates the adjacent wetland area north of West Main Street. WSDOT has recently completed cleaning of the ditch segment. The impact of this maintenance work on water elevations in the WSDOT system and in the City's gravity system should be evaluated to determine the timing for construction. Modeling results show that some sections of the gravity portion of the system are capacity-limited (for the 25-year flow rate), primarily along West Main Street near Clay Street.
Description	This project consists of building a new pump station sized to convey the peak 25-year flow rate with multiple pumps to meet the pump redundancy LOS (Figure 7-2). The new pump station would convey all flows from the gravity pipe on the north and south sides of Old West Main Street. The pump station wet well should be low enough to adequately drain the lowest catch basin in the basin. The force main from the new pump station would be routed to the City ditch on the north side of West Main Street. The 30-inch-diameter force main will be constructed within or near the alignment of the existing culvert with trenchless construction technologies (e.g. pipe-bursting). The force main will discharge to a riprap rock splash pad constructed in the ditch at the current culvert discharge location. A backflow preventer should be installed on the 24-inch-diameter WSDOT culvert under West Main Street to prevent backflow from the north side of the overpass to the south. A backflow preventer may need to be installed at the 12-inch-diameter culvert crossing at West Main Street, near Lund Road SW, to prevent flow from the north side of West Main Street to the south side. Post-project monitoring should be conducted to confirm that the pump station discharges are not causing backups in the City's ditch, warranting a backflow preventer at this location. Model calibration was limited to pump station supervisory control and data acquisition (SCADA) data from October 2013 through April 2014. Although the existing pump station tributary area is approximately 15% of the total basin area, the observed flow characteristics from the pump station were used to characterize flow from the entire basin. Because of the limited calibration data, the proposed pump station should include SCADA/telemetry capabilities to provide additional flow information, and allow for additional capacity, if necessary. Key components include: • Pump station (estimated capacity 25 cubic feet per second [cfs] with multiple pumps) with wet well and SCADA/telemetry • Gravity system conveyance to new pump station: – 150 feet of 12-inch-diameter pipe – 113 feet of 24-inch-diameter pipe • 200 feet of 30-inch-diameter force main installed with trenchless construction technologies • Riprap rock splash pad at existing culvert outfall in ditch

Project number	1	
	• Backflow preventers to prevent stormwater recirculation to WSDOT ditch or the City's system (if necessary)	
Recommended predesign requirement	• Evaluate the impact of the WSDOT maintenance work on water elevations in the WSDOT system and the City's gravity system, to determine construction timing and future needs for ditch cleaning. • Coordinate with WSDOT on installation of the backflow preventer on the WSDOT culvert.	
Recommended post-construction monitoring	Conduct periodic site inspections during storm events to confirm that the pump station discharges are not causing backups in the City's ditch to the 12-inch-diameter culvert crossing West Main Street near Lund Road SW. If backups do occur, a backflow preventer on the north end of the 12-inch-diameter culvert may be warranted.	
LOS goal(s) addressed	• Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates the city roadways to an impassable level no more than once every 25 years. (LOS Goal 4) • Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding (surface water from ROW runoff entering premises and damaging building structures) will occur no more than once every 50 years. (LOS Goal 5) • Pump stations will be designed with two or more pumps to ensure proper function during maintenance. Backup and/or dual-feed power supplies will be installed as needed. (LOS Goal 15)	
Cost estimate	Stormwater pump station with SCADA/telemetry: 25 cfs pump station located in Old West Main Street	$750,000
	Gravity piping: 150 feet of 12-inch-diameter pipe and 113 feet of 24-inch-diameter pipe from existing manholes to new pump station	$85,000
	Force main: construct 200 feet of 30-inch-diameter force main below underpass (from south to north side through existing culvert) using trenchless technology, abandon 18-inch-diameter culvert, and install riprap rock splash pad at existing culvert outfall in ditch outfall	$257,000
	Ancillary improvements: decommission existing pump station; install backflow preventer on WSDOT culvert	$40,000
	Wetland permitting and mitigation (20% of construction subtotal)	$227,000
	Subtotal line-item costs	*$1,359,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs).	$245,000
	Construction contingency (30% of all above construction costs)	$481,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$198,000
	Subtotal construction costs	*$2,283,000*
	Administration, engineering design, and permitting (30% of construction costs)	$685,000
	CIP 1 project cost	**$2,968,000**



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1 inch = 400 feet

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Figure 7-2
Project 1: West Main Street
Pump Station Upgrade

Project number	2
Project name	37th and I Streets NW Storm Improvements
Location	Intersection of 37th Street NW and I Street NW; Interurban Trail approximately 300 feet east
Priority	1
Schedule	Begin construction 2016
Problem summary	Recurring flooding in the vicinity of 37th Street NW and I Street NW causes several nuisance problems including slow or impeded traffic on 37th Street NW, driveway damage and/or impeded access to the nearby power substation, and impeded pedestrian and bicycle access on the Interurban Trail south of 37th Street NW (east of the substation). Flooding problems occur relatively frequently and can result from large storm events as well as prolonged wet periods following storm events. Observations and anecdotal information suggest that floodwaters originate from Mill Creek and/or drainage system backups caused by high water levels in Mill Creek, particularly at the north side of 29th Street NW. Although high water levels in Mill Creek at 37th Street could also be a source of flooding and/or reduce the conveyance capacity of the drainage ditch along 37th Street, it has been observed that there is typically a positive flow gradient leading from the flooded areas back toward Mill Creek. There appear to be at least two flow paths between overflows at 29th Street NW and flooding at 37th Street NW: 1. Backflow along 29th Street NW is diverted into a remnant channel of Mill Creek that flows north toward the power substation. The remnant channel appears to be blocked by the substation and does not have a clear path back to the main channel. It appears that, when discharges in the remnant channel are high, at least a portion of the flow goes northeast and becomes impounded on the east side of the power substation driveway. 2. Backflow along 29th Street NW can extend as far as the Interurban Trail crossing, causing backflow through the culverts into the area between the trail embankment and the railroad embankment. Water can then flow north along the embankments until it ponds on the south side of 37th Street NW. When the ponding gets high enough, water floods over the Interurban Trail and into the impounded water on the east side of the power substation driveway. In 2013, a small berm was constructed between the trail embankment and the railroad embankment to try to prevent water from flowing north; however, it is not known whether this modification sufficiently addressed the problem. The impounded water on the east side of the power substation driveway can lead to flooding when water surface elevations rise to roughly 51 feet elevation (NAVD88). Specifically, the substation driveway is overtopped and areas of 37th Street NW are flooded because of backflow through an existing storm drain catch basin, and perhaps also because of direct flow over the sidewalk and curb. City maintenance crews completed a small works project in 2012 to try to mitigate the flooding. Two 8-inch-diameter ductile iron culverts were installed under the power substation driveway near 37th Street NW at a higher invert elevation than the existing 12-inch-diameter culvert. The intention was to provide additional conveyance capacity to drain the water that ponds on the east side of the driveway back to Mill Creek. However, reports from the City suggest that this modification has not been sufficient to eliminate the flooding problems.
Description	This project will increase the conveyance capacity of the drainage along 37th Street NW by replacing the existing culverts under the power substation driveway and installing a new culvert under the Interurban Trail (Figure 7-3). A drainage ditch should be constructed to convey water from the Interurban Trail culvert to the existing ditch along the south side of 37th Street NW. The trapezoidal ditch should have a bottom width of 4 feet, 3:1 side slopes, and a depth of 2 feet. In addition, the existing ditch along 37th Street NW should be cleaned out (remove sediment, vegetation, obstructions, and accumulated debris) to maximize conveyance capacity and minimize the tail water effects on culvert outlets. The magnitude and frequency of flows emanating from Mill Creek backflows are difficult to quantify without a hydraulic study of the Mill Creek main channel, as well as a detailed survey of the drainage flow paths leading to the flooded areas at 37th Street NW. Therefore, the proposed new culverts were not sized to pass a specific design discharge. Alternatively, a hydraulic analysis of the ditch and culvert system was performed to examine the potential for reducing water surface elevations by installing larger culverts. The project includes two new 3-foot (span) by 2-foot (rise) reinforced concrete box culverts: the first would be installed under the power substation driveway at an invert elevation of approximately 46.5 feet (NAVD88), and a second would be installed under the Interurban Trail embedded by approximately 1 foot because of likely cover limitations. Installation of these culverts would reduce upstream water surface elevations by roughly 2 feet during high flow conditions that currently result in flooding at approximately 51

Project number	2	
	feet NAVD88. The proposed culverts are the smallest standard box culvert. If additional data are collected (see predesign recommended predesign refinements), culvert sizes could be refined, and a larger size could be installed if warranted.	
Recommended predesign refinements	• Perform additional site reconnaissance and survey, including a stream walk during high flow conditions (to estimate high water elevations) and confirm flow paths assumptions • Conduct a detailed topographic survey of the drainage system including the ditch, road and trail crossings, and nearby flooded areas; in addition, conduct a ground survey of key structures such as culvert invert elevations and dimensions • Conduct a revised hydraulic analysis of the drainage system using new survey data, high water mark estimates, and confirmed flow paths; refine culvert sizing given needed conveyance capacity, spatial constraints, and project costs	
LOS goal(s) addressed	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates the city roadways to an impassable level no more than once every 25 years. (LOS Goal 4)	
Cost estimate	Interurban Trail culvert: construct 60 feet of 3-by-2-foot precast concrete box culvert including inlet and outlet headwalls and riprap rock splash pad at outlet	$40,000
	Power substation driveway culvert: construct 60 feet of 3-by-2-foot precast concrete box culvert including inlet and outlet headwalls and riprap rock splash pad at outlet, and drainage bypass	$50,000
	Ancillary improvements: construct 50-foot-long ditch to connect Interurban Trail culvert to roadside ditch; clean 1,000-foot-long existing ditches along south side of 37th Street NW	$33,000
	Wetland permitting and mitigation	$22,000
	Subtotal line-item costs	*$145,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs)	$26,000
	Construction contingency (20% of all above construction costs)	$34,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$19,000
	Subtotal construction costs	*$224,000*
	Administration, engineering design, and permitting (30% of construction costs)	$67,000
	CIP 2 project cost	**$291,000**

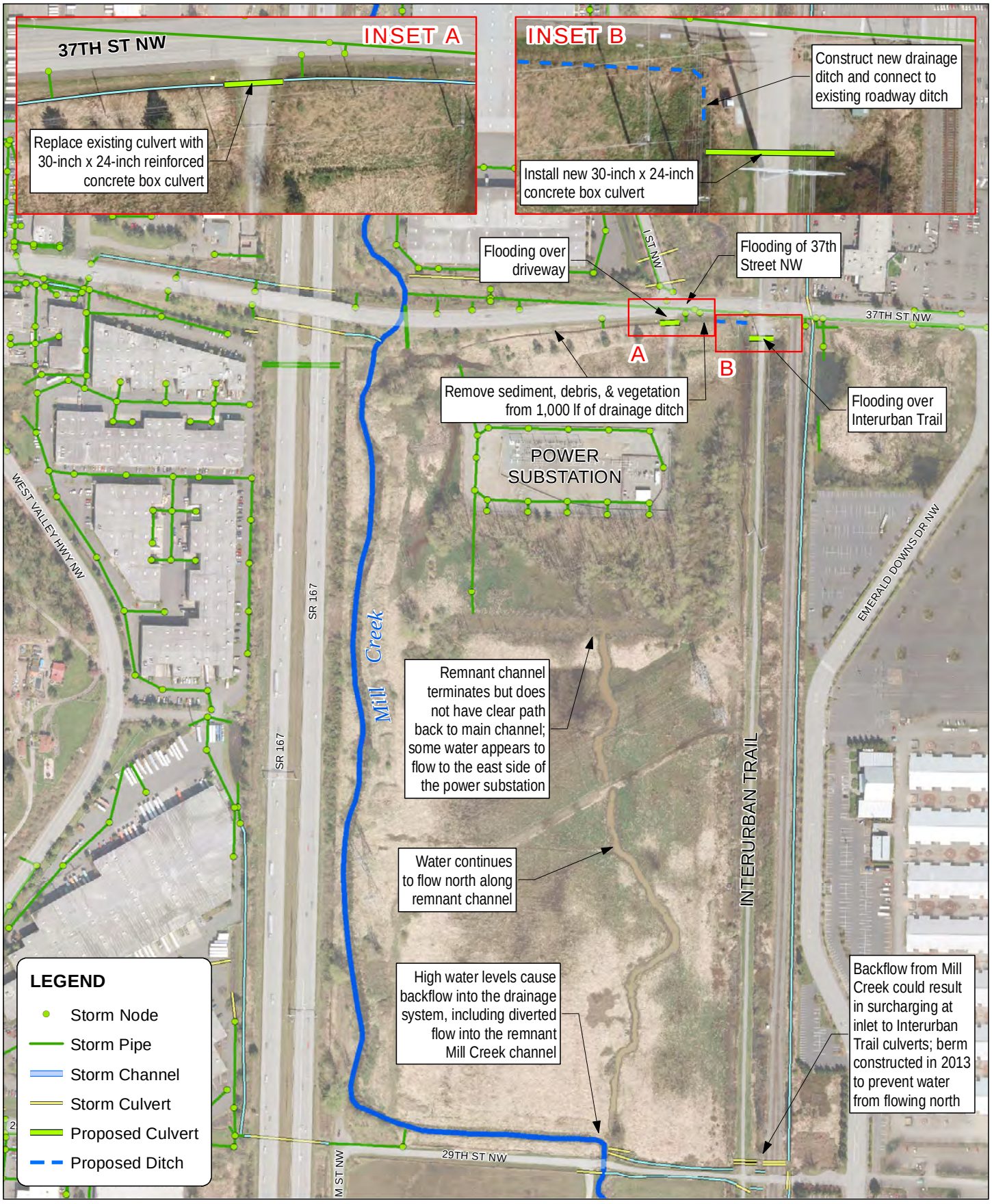

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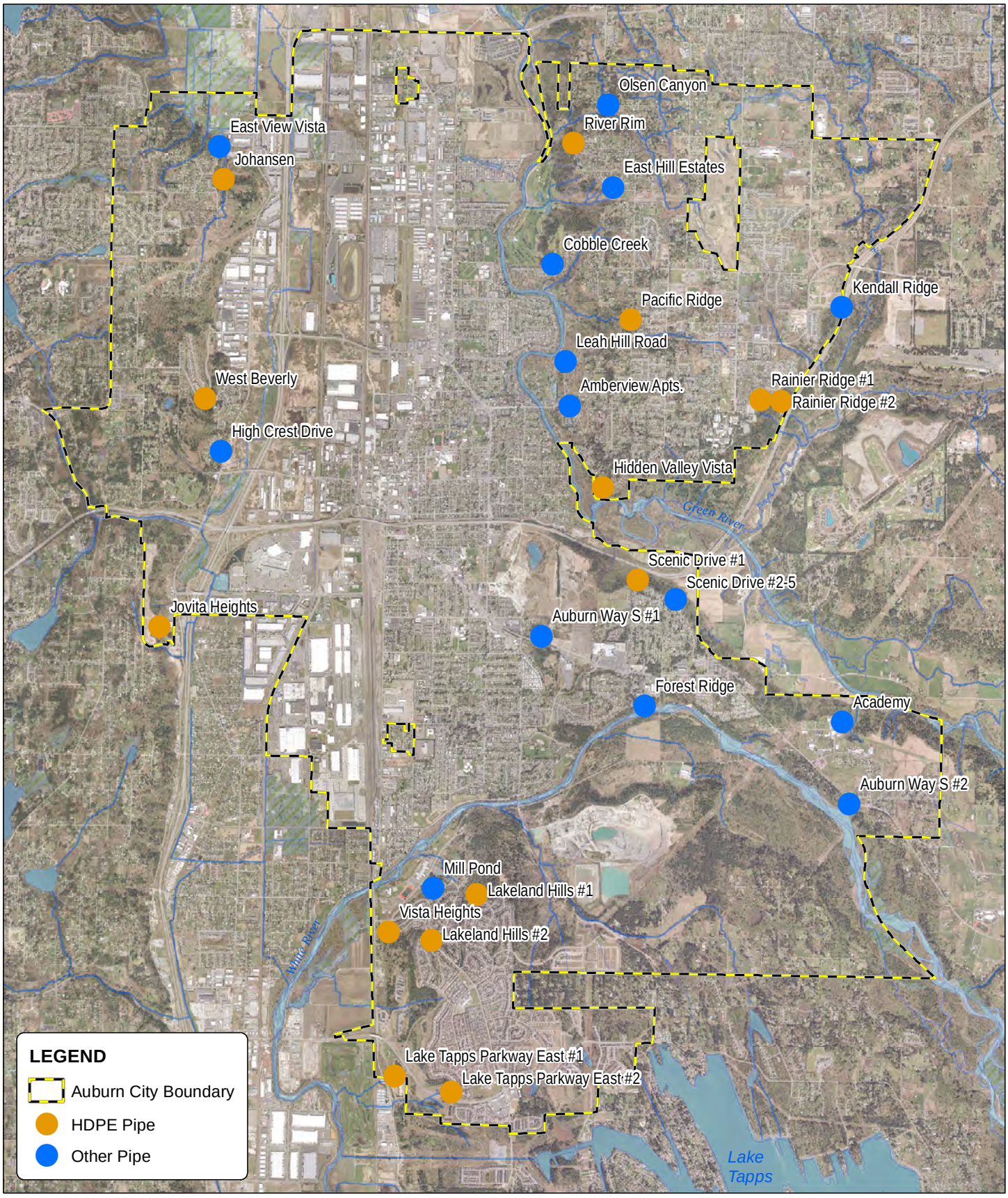
Figure 7-3
Project 2: 37th and I Streets NW
Storm Improvements

Project number	3 (Phases 1 and 2 described jointly)	
Project name	Hillside Drainage Assessment	
Location	Hillsides throughout the city	
Priority	1	
Schedule	Begin assessment 2016 (Phase 1) and 2017 (Phase 2)	
Problem summary	The existing drainage system includes pipes that discharge over hillsides. While a preliminary inventory and mapping of locations has been completed, field-locating and detailed inspection is warranted to define deficiencies.	
Description	This project would entail compiling and reviewing existing documentation (GIS, record drawings, Cartegraph) on piped stormwater discharges to hillsides throughout the city (Figure 7-4). Some pipes may be located on private property or may be accessed only through private property. The project would include reviewing property legal descriptions to determine where easements may be lacking and working with property owners to obtain temporary access for the CIP work. Field visits would be conducted for all identified pipes. Field crews would locate, perform a detailed inspection, and define outfall deficiencies (e.g., poor access, damaged pipe, insufficient slope protection at the outfall, structural support of pipe). Special equipment (e.g., pipe video cameras) may be necessary based on site conditions (e.g., heavy vegetation, steep slope). Last, the field visit and the necessary actions would be documented. Necessary actions could include: • Obtaining permanent easements for ongoing inspection and maintenance • Constructing an access road or trail • Pipe replacement or repair • Repair or replacement of slope protection • Engineering services for pipe or slope protection replacement This project would be completed in a phased approach. Phase I would consist of completing the assessment for all non-high-density polyethylene (HDPE) pipes, as there is less information about these pipes and they tend to be older. Phase 2 would consist of completing the assessment for all HDPE pipes. HPDE pipes tend to be newer, have more information, and are easier to locate as many are aboveground installations. The cost estimate includes a placeholder for implementing drainage assessment recommendations. Actual implementation costs will be estimated after the assessment is complete.	
LOS goal(s) addressed	Public drainage infrastructure will be constructed, operated, and maintained so that there is no resulting erosion or landslides. (LOS Goal 6)	
Recommended predesign refinements	This project is for an assessment that will help define the predesign requirements.	
Cost estimate	Collect and review available documentation on pipes (28 locations)	$10,000
	Coordinate access with private landowners (18 locations)	$4,000
	Conduct field visit and assess the pipe(s) and outfall, Phase 1: Non-HDPE Pipes	
	Medium vegetation on a medium slope (12 locations)	$21,000
	Medium to dense vegetation on a steep slope (2 locations)	$5,000
	Conduct field visit and assess the pipe(s) and outfall, Phase 2: HPDE Pipes	
	Medium to dense vegetation on a mild slope (4 locations)	$7,000
	Medium to dense vegetation on a medium slope (8 locations)	$14,000
	Medium vegetation on a steep slope (2 locations)	$6,000
	Document results of assessment	$14,000
	Implement drainage assessment recommendations	$88,000
	Subtotal line-item costs	*$169,000*
	Construction contingency (20% of all above construction costs)	$34,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$19,000
	Subtotal construction costs	*$222,000*

Project number	3 (Phases 1 and 2 described jointly)	
	Administration, engineering design, and permitting (30% of construction costs)	$67,000
	CIP 3 project cost	**$289,000**



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1 inch = 5,000 feet

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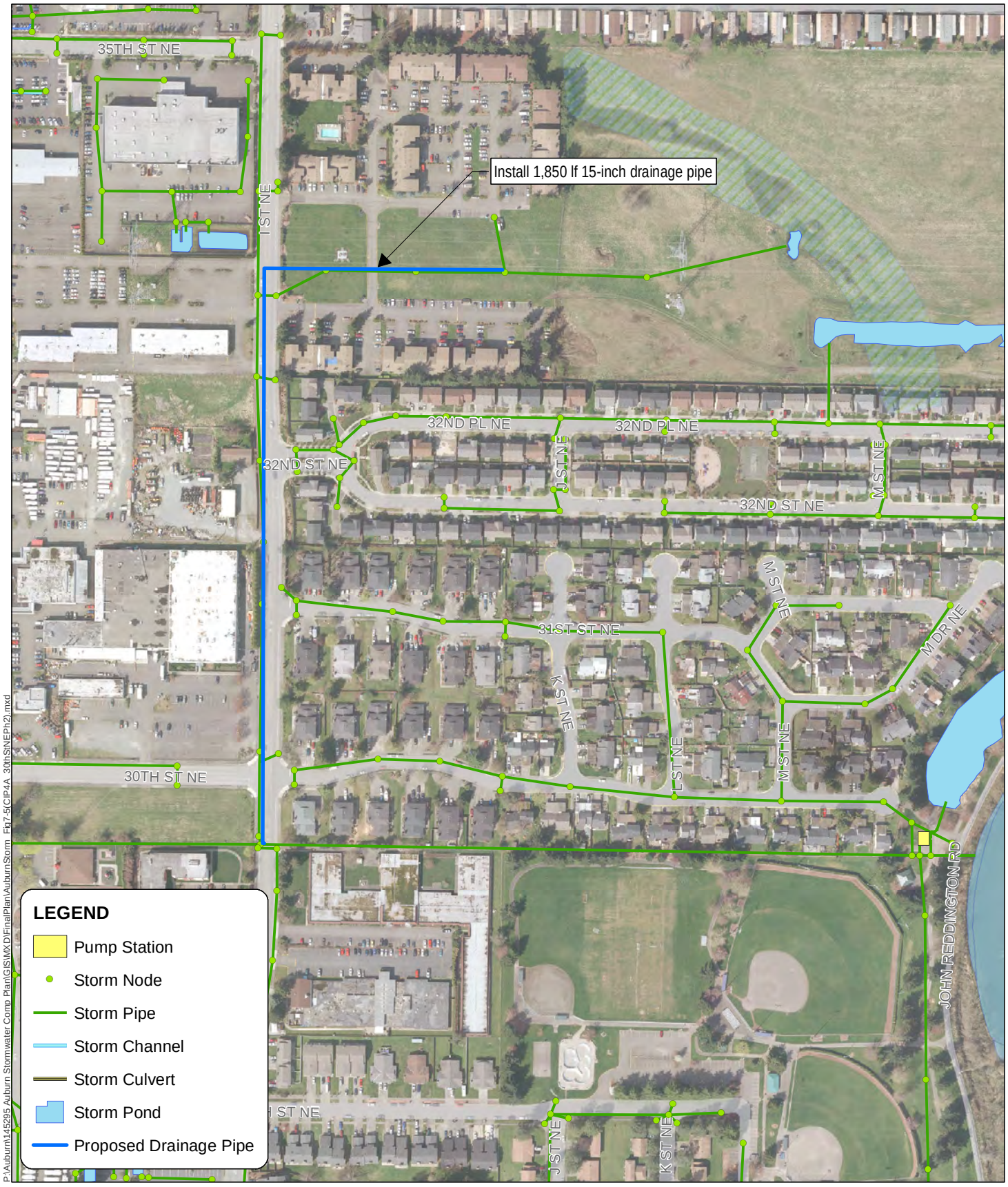
Figure 7-4
Project 3: Hillside
Drainage Assessment

Project number	4A and 4B (described jointly)
Project name	30th Street NE Area Flooding, Phases 2 and 3
Location	East of I Street NE between 32nd Street NE and 35th Street NE, and at C Street NE between 30th Street NE and 37th Street NE
Priority	2 (4A) and 3 (4B)
Schedule	Phase construction with Project 4A (Phase 2) in 2017 and Project 4B (Phase 3) in 2019
Problem summary	The north-central area of Auburn has a history of surface flooding with street flooding occurring once every few years. The residential development east of I Street NE between 32nd Street NE and 35th Street NE discharges flows into a City-owned infiltration area. The infiltration area commonly experiences prolonged periods of standing water due to high groundwater from extended high flows in the Green River, which is adjacent to the infiltration area. The drainage system on I Street NE currently lacks infrastructure to collect and convey stormwater away from the infiltration area, as well as residential roadways and parking area. Ponding occurs within the parking areas of the developments and presents a nuisance and potential hazard to local residents. The December 3, 2007, storm (approximately a 50-year storm) produced extensive flooding along C Street NE northward toward 37th Street NE, which required sandbagging to protect local businesses. Deposition of sediment within Mill Creek has raised the water levels within the creek and diminished the capacity of the gravity system in C Street NE and downstream in 37th Street NE. In addition to the influence of Mill Creek, modeling efforts demonstrate that the system's capacity is limited by low pipe gradient and shallow inverts and that flooding would continue even with sediment removal within Mill Creek. Although the two problems are not hydraulically connected, the proposed projects are described jointly as they will connect the problem areas to the 30th Street NE system.
Description	These projects are Phases 2 and 3 of a three-phased capital improvement project (Relieve 30th Street NE Area Flooding) from the 2009 Comprehensive Stormwater Drainage Plan. The goal of the 2011 capital improvement project was to increase the capacity of the 30th Street NE system to reduce flooding along 30th Street NE and to provide capacity to connect other flooding drainage systems (C Street NE and I Street NE). The implementation of this capital improvement project is occurring in phases, as funding, staff availability, and priorities allow. The first phase (30th Street NE Area Flooding, Phase 1) is scheduled for construction in 2015/2016. The subsequent phases, referred to as Projects 4A and 4B in this Drainage Plan, are scheduled for construction in 2017 and 2019, respectively. **Project 4A** would address the flooding adjacent to I Street NE (Figure 7-5). This project would locate a storm drain line to capture stormwater from the two residential developments currently discharging stormwater to the City's infiltration area. In addition, this project would construct a new storm drain within I Street NE southward to connect into the 42-inch-diameter storm drain (which will be constructed as part of the 30th Street NE Area Flooding project, Phase I, from the 2009 Plan) near the intersection at I Street NE and 30th Street NE. The 42-inch-diameter line will have sufficient available capacity to convey the I Street NE flows. Key components of Project 4A include: • 1,850 feet of 15-inch-diameter gravity storm drain • Catch basin and incidental grading to collect stormwater at the upstream end of the system **Project 4B** would address flooding along C Street NE (Figure 7-6). Currently stormwater flows along C Street NE are conveyed north to the 37th Street NE storm conveyance line and discharge to Mill Creek. This project would reduce flooding in C Street NE by increasing capacity in the line by lowering inverts and upsizing the pipe diameter of a portion of the system, and by redirecting the high wet weather flows southward to the 42-inch-diameter storm drain (to be completed in 2016) in 30th Street NE. Flows are redirected with a diversion to a new pump station and force main connection to 30th Street NE. Key components of Project 4B include: • Backflow preventer to isolate the C Street NE system from Mill Creek backwater • Diversion structure in C Street NE for pump station • Pump station (estimated capacity of 5 to 7 cfs) • 850 feet of 24-inch-diameter drainage pipe (replace existing pipe with larger and steeper pipe) • 1,730 feet of 15-inch-diameter force main Upon completion, City staff should consider lowering the level settings for Brannan Park pumps 4 and 5, because the hydraulic improvements associated with this project will allow more stormwater to reach the pump station.
LOS goal(s) addressed	• Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates the city roadways to an impassable level no more than once every 25

Project number	4A and 4B (described jointly)	
	years. (LOS Goal 4) • Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding (surface water from ROW runoff entering premises and damaging building structures) will occur no more than once every 50 years. (LOS Goal 5)	
Project 4B recommended predesign refinements	Pump station design capacity and control strategy should consider the potential impacts to the downstream conveyance systems along 30th Street NE and the airport. Pump station real time control at the airport stormwater ponds could be included, where the pond outflow is restricted when the pump station is operating.	
Cost estimate Project 4A	Gravity storm drain: install 1,850 feet of 15-inch-diameter pipe (along I Street NE to 30th Street NE storm drain)	$481,000
	Subtotal line-item costs	*$481,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs)	$87,000
	Construction contingency (20% of all above construction costs)	$114,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$65,000
	Subtotal construction costs	*$747,000*
	Administration, engineering design, and permitting (20% of construction costs)	$145,000
	CIP 4A (Phase 2) project cost	**$896,000**
Cost estimate Project 4B	Flow diversion structure	$4,000
	Install backflow preventer for 24-inch-diameter pipe	$10,000
	Gravity line: replace 850 feet of pipe with 24-inch-diameter pipe at steeper grade	$289,000
	Stormwater pump station: 5 to 7 cfs pump station located C Street NE to the south of 37th Street NE	$300,000
	Force main: install 1,730 feet of 15-inch-diameter pipe (connect to 30th Street NE storm drain)	$450,000
	Subtotal line-item costs	*$1,053,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs)	$190,000
	Construction contingency (20% of all above construction costs)	$249,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$142,000
	Subtotal construction costs	*$1,634,000*
	Administration, engineering design, and permitting (30% of construction costs)	$490,000
	CIP 4B (Phase 3) project cost	**$2,124,000**
	Total CIP 4A and 4B project cost	**$3,020,000**



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COMPREHENSIVE STORM DRAINAGE PLAN
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0 150 300 600 Feet

1 inch = 300 feet

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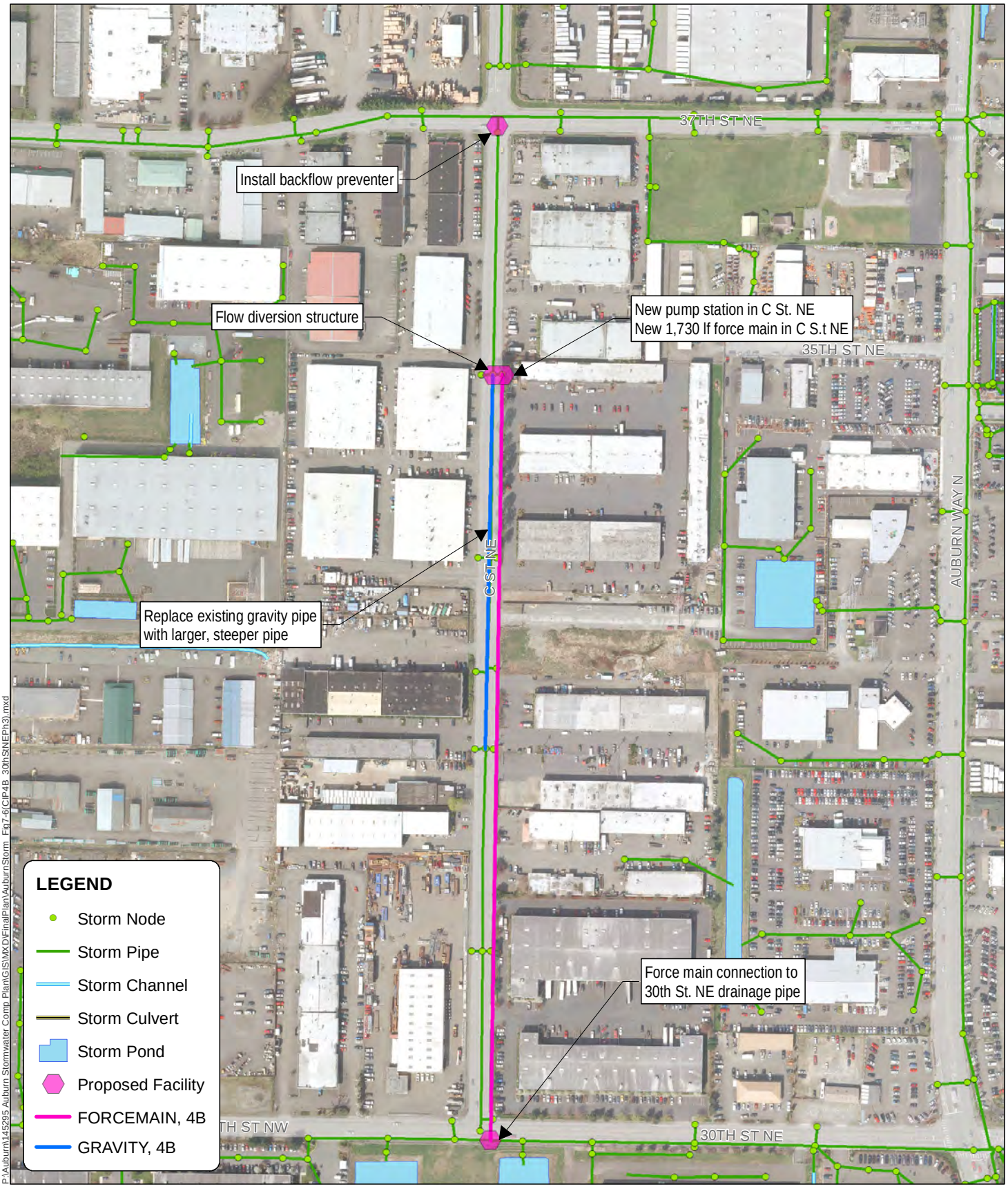
Figure 7-5
Project 4A: 30th Street NE
Area Flooding, Phase 2



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0 150 300 600 Feet

1 inch = 300 feet

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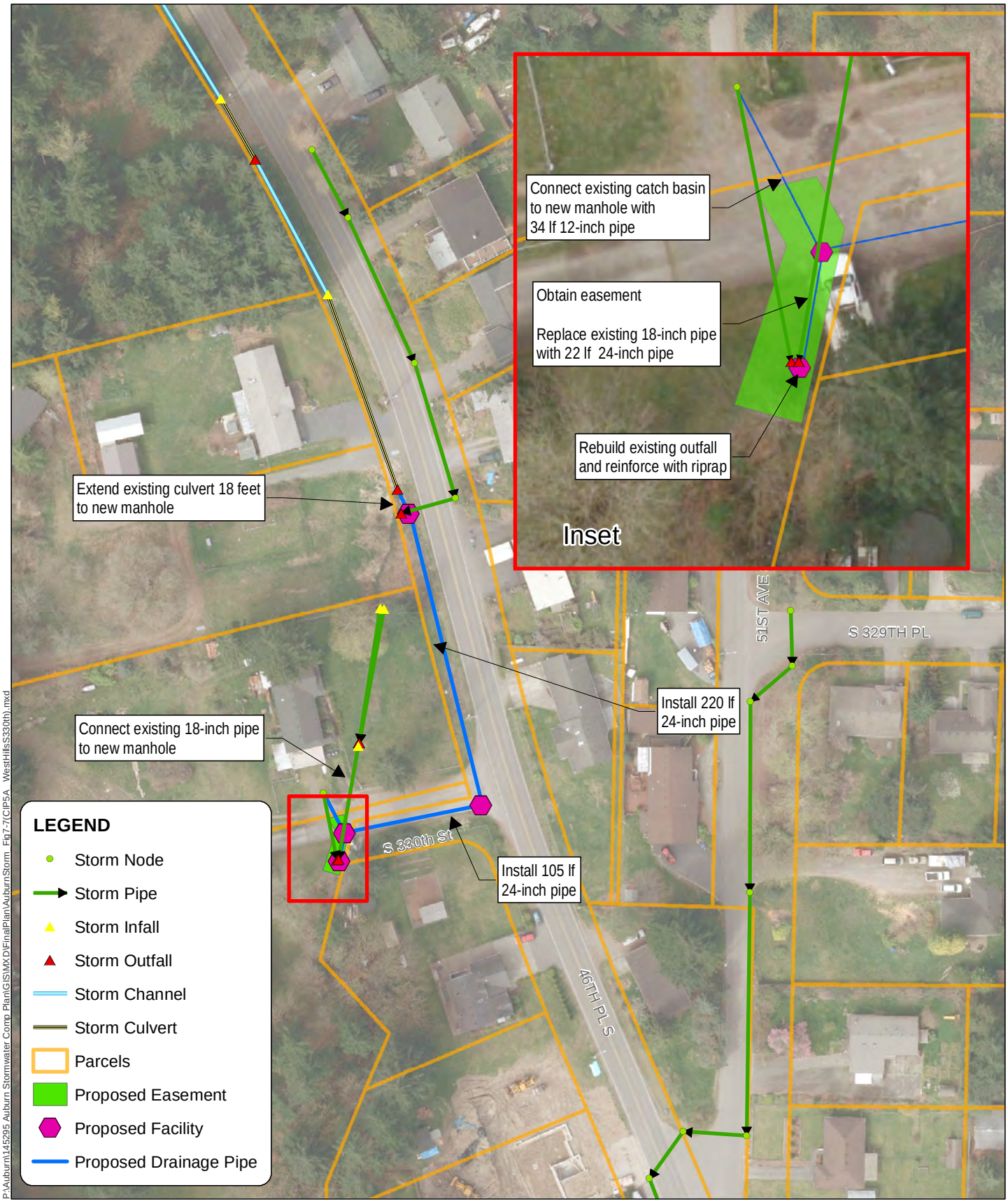
Figure 7-6
Project 4B: 30th Street NE
Area Flooding, Phase 3

Project number	5A	
Project name	West Hills Drainage Improvements at S 330th St. and 46th Pl. S	
Location	Southwest corner of S 330th Street and 46th Place S	
Priority	2	
Schedule	Begin construction 2016	
Problem summary	Flooding has been reported along the S 330th Street roadway. Surface water from upstream of the flooding location including the City's ROW is conveyed through a ditch and pipes, located on private property adjacent to the problem area. The pipes located on private property had previously been conveyed in a ditch. In an attempt to reclaim the front yard, a previous property owner filled the ditch with two parallel pipes. The existing system discharges to a ravine outfall south of S 330th Street. Flows from the ravine eventually discharge to Mill Creek.	
Description	This project would re-route flows upstream of the private property including those flows from the City ROW into a new piped system. The proposed 24-inch-diameter pipe would be aligned in the 46th Place S and S 330th Street ROWs. The project includes three connection structures: a tie-in to the existing system at the upstream end, a manhole where the pipe alignment turns onto S 330th Street, and a manhole where the pipe alignment turns toward the outfall. This manhole also connects the adjacent private system to the new pipe system. The project results in a single 24-inch-diameter pipe discharging to the existing outfall. The east side of the existing outfall is a brick retaining wall and will be rebuilt as part of this project. The outfall will also be reinforced with riprap.	
LOS goal(s) addressed	Maintain or seek access to City-owned facilities for necessary maintenance and operation. (LOS Goal 13)	
Recommended predesign refinements	Flows to the project area were estimated using WWHM12, assuming existing conditions for the current subbasin contributing area. Prior to detailed design, the basin contributing area should be refined by accounting for any changes due to new or re-development. Obtain easement from one property owner.	
Cost estimate	Extend existing (12-inch-diameter) culvert 18 feet to new tie-in connection	$4,000
	Gravity storm drain: install 220 feet of 24-inch-diameter pipe in ROW under power line	$70,000
	Gravity storm drain: install 105 feet of 24-inch-diameter pipe in ROW	$34,000
	Gravity storm drain: install 22 feet of 24-inch-diameter pipe in easement	$8,000
	Gravity storm drain: install 34 feet of 12-inch-diameter pipe in easement from existing catch basin to new manhole	$7,000
	Install three connecting structures	$10,000
	Rebuild outfall and reinforce discharge area	$5,000
	Obtain easement	$20,000
	Subtotal line-item costs	*$158,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs)	$28,000
	Construction contingency (20% of all above construction costs)	$37,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$21,000
	Subtotal construction costs	*$244,000*
	Administration, engineering design, and permitting (30% of construction costs)	$73,000
	CIP 5A project cost	**$317,000**



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0 50 100 200 Feet

1 inch = 100 feet

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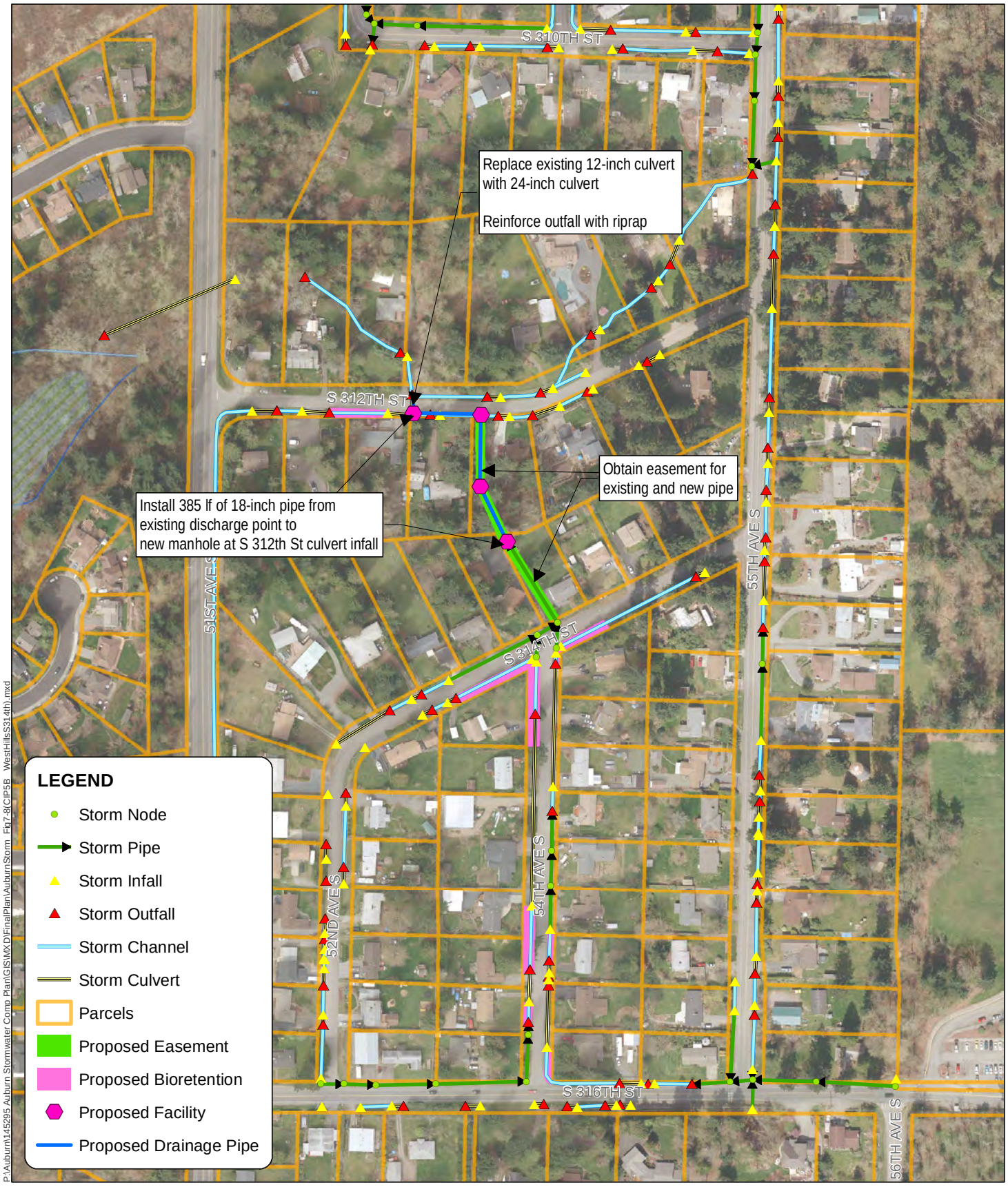
Figure 7-7
Project 5A:
West Hills Drainage Improvements
S 330th St. and 46th Pl. S

Project number	5B (Phases 1 and 2 described jointly)	
Project name	West Hills Drainage Improvements near S 314th St. and 54th Ave. S	
Location	S 314th Street and 54th Avenue S	
Priority	2	
Schedule	Begin construction 2018	
Problem summary	A City-owned pipe daylights to the back yard of a residential parcel on S 314th St and discharges runoff onto the northern adjacent property. Although the northern property reports water under the home, there is no record of nuisance ponding or flooding. The discharging pipe is the outfall for a 25-acre subbasin roughly spanning S 316th and 314th streets and 52nd and 55th avenues S. The residential area surrounding the 25-acre subbasin (to the west and north) is served by a grass ditch and culvert system that conveys flows to a culvert crossing at S 312th Street. The discharge continues through a series of open channels and culverts and eventually drains to Mill Creek.	
Description	Phase 1: The project's first phase is to implement LID BMPs in the ROW to provide infiltration and reduce flows into the existing and proposed piped system (Figure 7-8. The ROW areas in this neighborhood are good candidates for roadside bioretention cells over gravel trench based on gentle consistent slope of the existing grass-lined ditches, existing infall and outfall infrastructure, and lack of street/shoulder parking. The gravel trench provides storage and detention time for infiltration in areas of low infiltration rates. Phase 2: Given that LID BMPs do not significantly reduce high flows, the project also includes installing 385 feet of 18-inch-diameter pipe through easements and ROW to connect the existing discharge point to the downstream system on S 312th Street (Figure 7-8). Pipe conveyance was selected over a ditch to minimize the risk of flooding impacts to private premises and to ensure future conveyance maintenance. The pipe alignment includes upgrading the ditch and culvert system on S 312th Street to a piped system. The existing 12-inch-diameter culvert crossing S 312th Street will be increased to a 24-inch-diameter culvert. The culvert discharges to an open channel that traverses three private properties. The culvert outfall will be reinforced with riprap.	
LOS goal(s) addressed	• Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding (surface water from ROW runoff entering premises and damaging building structures) will occur no more than once every 50 years. (LOS Goal 5) • Maintain or seek access to City-owned facilities for necessary maintenance and operation. (LOS Goal 13)	
Recommended predesign refinements	Confirm infiltrative capacity of proposed bioretention sites with infiltration tests. Soils in the area are listed as NRCS hydrologic soil group "C," which has a low infiltration rate (0.15 to 0.05 inch per hour), but there may be localized areas with higher infiltration rates. Confirm that grades and existing culvert and pipe inlets are sufficient for LID BMP drainage design. Confirm the open channel downstream of S 312th Street culvert crossing has the capacity for the 100-year flow (based on City open-channel design standards). The King County culvert crossing 51st Avenue S is the next culvert downstream of the project area. The infall to this culvert is partially blocked by a living tree root wad. With more surface flow directed to this infall, the root wad should be removed. This effort will need to be coordinated with King County. Obtain easements from two property owners.	
Cost estimate Phase 1	Install 7 gravel trench draining bioretention cells with infall and outfall connection to the existing drainage system	$210,000
	Subtotal line-item costs	*$210,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs)	$38,000
	Construction contingency (20% of all above construction costs)	$50,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$28,000
	Subtotal construction costs	*$326,000*
	Administration, engineering design, and permitting (25% of construction costs)	$82,000
	CIP 5B (Phase 1) project cost	**$408,000**

Project number	5B (Phases 1 and 2 described jointly)	
Cost estimate Phase 2	Gravity storm drain: install 385 feet of 18-inch-diameter pipe	$100,000
	Upsize existing 12-inch-diameter culvert to 24-inch-diameter (36 feet) and reinforce culvert outlet with riprap	$15,000
	Install five connecting structures	$16,000
	Easement acquisition	$20,000
	Subtotal line-item costs	*$151,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs)	$27,000
	Construction contingency (20% of all above construction costs)	$36,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$20,000
	Subtotal construction costs	*$234,000*
	Administration, engineering design, and permitting (30% of construction costs)	$70,000
	CIP 5B (Phase 2) project cost	**$304,000**
	Total CIP 5B project cost	**$712,000**



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0 125 250 500 Feet

1 inch = 250 feet

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Figure 7-8
Project 5B:
West Hill Drainage Improvements
S 314th St. and 54th Ave. S

Project number	6	
Project name	North Airport Area Improvements	
Location	Northern extent of airport property near 30th Street NE	
Priority	2	
Schedule	Begin construction 2016	
Problem summary	**Pond I:** The current configurations of the inlet and outlet of airport Pond I do not allow the pond to operate as designed. The inlet is intended to receive primary flows from the airport drainage system, but instead is configured to take only high flows. The pond does not fill from its inlet because the inlet elevation is higher than designed. The inlet is made further ineffective by an inverse grade or high point along its alignment. Rather than accepting primary or low flows through its inlet and releasing detained water through a flow control riser to the storm system in 30th Street NE, the pond fills from its outlet because of a disconnected riser when the storm line in 30th Street NE surcharges. This surcharging usually occurs prior to the high flows entering the pond. **North Hangar Area:** In the north hangar area immediately east of Pond I, surcharging flows from the storm line in 30th Street NE backwater to the airport's 30-inch-diameter storm drain and causes flooding to the north and west of the most northerly hangar. Historically, the flooding extends to part of the taxiway and into the hangar. The grate inlets in 30th Street NE are higher than the ground elevation of the northern airport area, which allows the airport area to flood before street flooding occurs in 30th Street NE. In addition, given that onsite runoff is not being diverted to or retained by Pond I, onsite flows contribute to the north hangar area surcharging.	
Description:	**Pond I:** This project would provide Pond I with more detention volume and allow the pond inlet and outlet to operate as intended, collecting and detaining surface water generated on airport property with high flows discharging to the 30th Street NE system. The project would excavate portions of the pond to provide more storage capacity, replace the existing inlet pipe at a lower invert and consistent positive slope to capture the primary flow, reconnect the flow control structure to the outlet, and install a backflow preventer at the outlet. **North Hangar Area:** The project for the north hangar area consists of installing a backflow preventer at the connection to the 30th Street NE system. Pond I upgrades need to be completed first because the north hangar area is at a lower elevation and receives flow from both the airport drainage and the 30th Street NE system. Because portions of the airport area have lower elevations than the adjacent 30th Street NE system, the north hangar area may experience some localized flooding, even with the Pond I upgrades and installation of backflow preventers, because the 30th Street NE is higher. This project would be constructed as shown in Figure 7-9.	
LOS goal(s) addressed	• Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates the city roadways to an impassable level no more than once every 25 years. (LOS Goal 4) • Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding (surface water from ROW runoff entering premises and damaging building structures) will occur no more than once every 50 years. (LOS Goal 5)	
Recommended predesign refinements	None	
Cost estimate	**Pond I:** Excavate portions of the pond	$46,000
	Replace and lower pond inlet pipe	$25,000
	Upgrade diversion manhole	$4,000
	Replace flow control manhole at pond outlet	$4,000
	Install backflow preventer	$7,000
	North Hangar Area: Install backflow preventer for 30-inch-diameter pipe	$14,000
	Subtotal line-item costs	*$100,000*

Project number	6	
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs).....	$18,000
	Construction contingency (30% of all above construction costs).....	$35,000
	Washington State and King County sales taxes (9.5% of all above construction costs)	$15,000
	Subtotal construction costs	*$168,000*
	Administration, engineering design, and permitting (30% of construction costs)	$50,000
	CIP 6 project cost	$218,000

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0 150 300 600 Feet

1 inch = 300 feet

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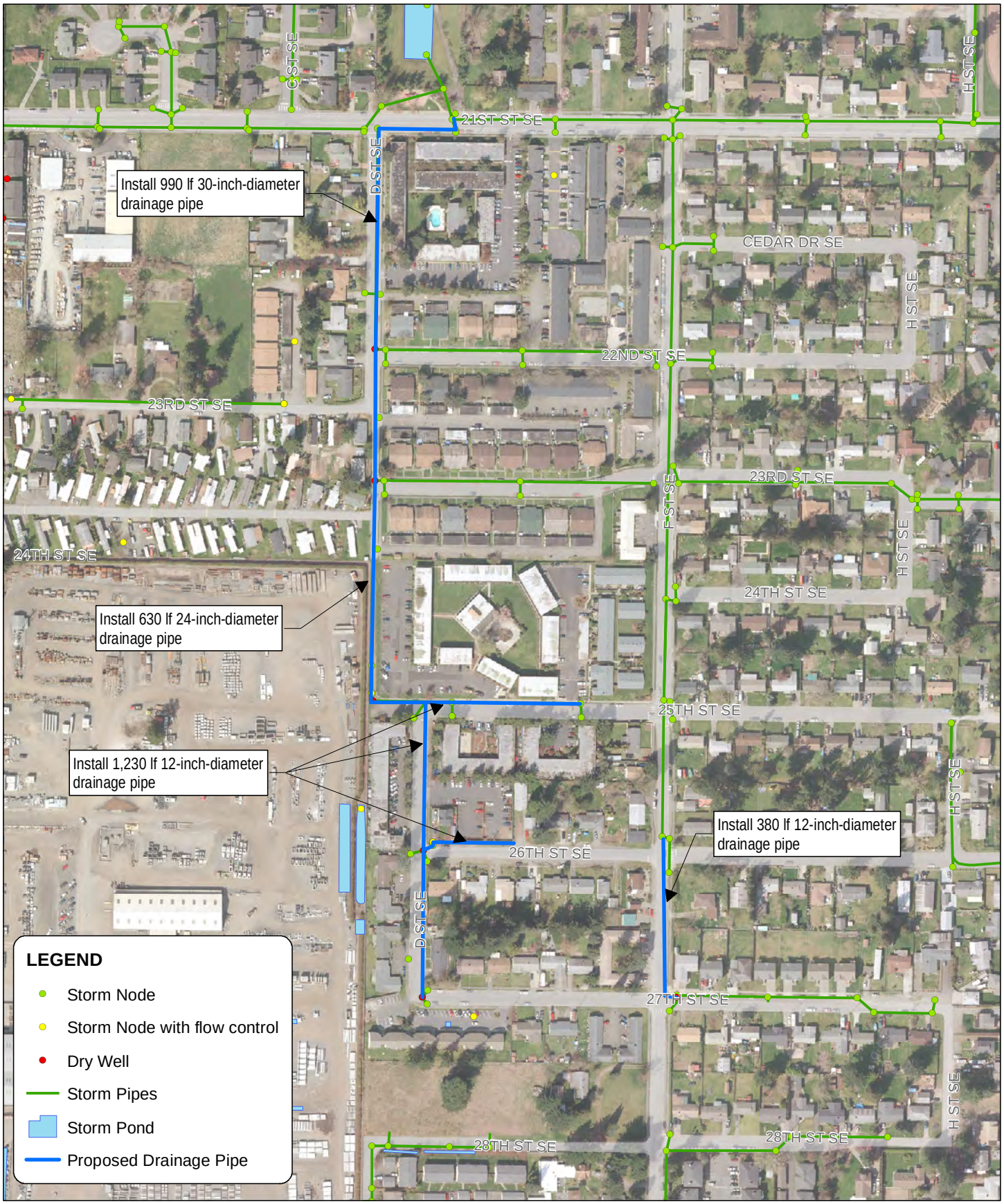
Figure 7-9
Project 6: North Airport Area Improvements

Project number	7	
Project name	D St. SE Storm Improvements	
Location	Western end of 25th Street SE near D Street SE right-of-way	
Priority	2	
Schedule	Begin construction 2018	
Problem summary	The western dead-end portion of 25th Street SE has a history of observed flooding. An existing dry well has inadequate infiltration. The dry well floods after heavy rain, several times a year. Floodwater fills the adjacent section of 25th Street SE to the curb. There are also numerous dry wells not meeting discharge standards in this area.	
Description	This project consists of installing a new gravity drain to convey the peak 25-year flow rate from the flooding location to the 21st Street stormwater pond (Figure 7-10). New piping consists of a 24-inch-diameter gravity drain from the existing dry well location (at the intersection of D Street SE ROW and 25th Street SE) north along D Street SE to the intersection of 23rd Street SE. New 30-inch-diameter gravity drain would be installed from 23rd Street SE to the existing junction with the 48-inch-diameter gravity pipe in 21st Street SE. The existing dry wells at 23rd Street SE and 22nd Street SE would be removed. Conveyance piping to these dry wells would be connected to the new 30-inch-diameter gravity drain. The conveyance piping, along 25th Street SE, to the problematic dry well will be replaced with a new 12-inch-diameter gravity drain because the existing conveyance is lower than the proposed conveyance piping along D Street SE. Additional dry wells at 26th Street SE and 27th Street SE would be removed. Conveyance piping along 26th Street SE will also be replaced with a 12-inch-diameter gravity drain, because the existing conveyance flows to the east. A sixth dry well system, located at 27th Street SE and F Street SE, will be replaced with a gravity drain. A 12-inch-diameter gravity drain will be installed along F Street SE and connect to the existing manhole at the intersection at 26th Street SE.	
Recommended predesign requirement	None	
LOS goal(s) addressed	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates the city roadways to an impassable level no more than once every 25 years. (LOS Goal 4)	
Cost estimate	Gravity piping: 990 feet of 30-inch-diameter pipe, 630 feet of 24-inch-diameter pipe, and 1,610 feet of 12-inch-diameter pipe	$906,000
	Subtotal line-item costs	*$906,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs).	$163,000
	Construction contingency (20% of all above construction costs)	$214,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$122,000
	Subtotal construction costs	*$1,405,000*
	Administration, engineering design, and permitting (30% of construction costs)	$422,000
	CIP 11 project cost	**$1,827,000**



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1 inch = 300 feet

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Figure 7-10
Project 7: D St. SE
Storm Improvements

Project number	8	
Project name	23rd St. SE Drainage Improvements	
Location	23rd and K streets SE	
Priority	3	
Schedule	Begin construction 2018	
Problem summary	A new 12-inch-diameter stormwater gravity drain was installed along K Street SE, south of 23rd Street SE, in 2014 to address localized flooding. This piping increased the tributary area to the 8-inch-diameter gravity drain along 23rd Street SE. Modeling results indicate that the existing 8-inch-diameter gravity drain along 23rd Street SE does not meet the LOS.	
Description	This project has a phased approach. Phase 1 consists of installing a new 15-inch-diameter gravity drain along K Street SE from the intersection of 23rd Street SE to the intersection of 21st Street SE (Figure 7-11). The new pipe would connect to the existing 24-inch-diameter system along 21st Street SE, which eventually discharges to the 21st Street Pond. The existing 8-inch-diameter gravity drain pipe conveying flow west from the intersection of K Street SE and 23rd Street SE would be plugged so that all runoff on K Street SE would be conveyed north. Phase 2 consists of installing a new 18-inch-diameter gravity drain along 23rd Street SE from H Street SE to F Street SE. The new pipe would connect to the existing 24-inch-diameter system along 23rd Street SE. This system eventually discharges to the 21st Street Pond. After completion of Phase 1 and prior to implementing Phase 2, the storm system along 23rd Street SE should be monitored during large events to confirm that water levels in pipe are surcharging. An existing detention system in the tributary area was not explicitly modeled during project development, and may manage flows such that simulated surcharging does not occur. If this is the case, then Phase 2 would not be required to meet the City's LOS.	
Recommended predesign requirement	Periodic site inspections by the maintenance crews during storm events to observe water levels in pipes along 23rd Street SE	
LOS goal(s) addressed	Public drainage infrastructure will be designed and maintained so that the annual chance of occurrence of flooding disruption that inundates the city roadways to an impassable level no more than once every 25 years. (LOS Goal 4)	
Cost estimate	Phase 1: Gravity piping: 600 feet of 18-inch-diameter pipe, plug existing 8-inch-diameter pipe	$157,000
	Phase 2: Gravity piping: 560 feet of 21-inch-diameter pipe	$157,000
	Subtotal line-item costs	*$314,000*
	Contractor overhead, profit, and mobilization (18% of subtotal of line-item costs).	$57,000
	Construction contingency (20% of all above construction costs)	$74,000
	Washington State and King County sales tax (9.5% of all above construction costs)	$42,000
	Subtotal construction costs	*$487,000*
	Administration, engineering design, and permitting (30% of construction costs)	*$146,000*
	CIP 8 project cost	**$633,000**

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COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

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0 150 300 600 Feet

1 inch = 300 feet

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Figure 7-11
Project 8: 23rd St. SE
Drainage Improvements

Project number	9	
Project name	Comprehensive Storm Drainage Plan update	
Location	City-wide	
Priority	1	
Schedule	Begin development 2020	
Problem summary	The Storm Drainage Utility is responsible for the maintenance, operations and improvements of the storm drainage system.	
Description	The Comprehensive Storm Drainage Plan would include an update to the capital projects in the existing plan. Projects not completed, but still required to address a problem would be reevaluated and updated based on recent information, such as drainage system inventory, system changes, flow monitoring, flooding, and recent unit costs. It would also include capital projects to address newly identified problems, including projects resulting from the Hillside Drainage Assessment (project number 3) and the flow monitoring proposed in the Implementation Plan (Chapter 8). The plan would include additional activities required to address new regulatory requirements. The plan would include cost-of-service studies to reassess the monthly service fees and SDCs.	
LOS goal(s) addressed	The Comprehensive Storm Drainage Plan guides the City's Storm Drainage Utility with respect to future activities and improvements in order to meet established LOS goals.	
Cost estimate	Update Comprehensive Storm Drainage Plan.....	$300,000
	CIP 9 project cost	**$300,000**

Project number	10	
Project name	Vegetative Waste Sorting Facility	
Location	To be determined	
Priority	1	
Schedule	Purchase property in 2017; develop property 2018	
Problem summary	The Storm Drainage Utility is responsible for the maintenance and operations of the storm drainage system. Pond and drainage ditch maintenance and rehabilitation involves removal of plant material and sediments, which are considered non-hazardous and are suitable for recycling. During fall and winter, debris from storm cleanups also yield materials suitable for recycling. The Storm Drainage Utility currently uses the City-owned Jacobson Tree Farm property for storing and drying of these materials, prior to hauling off-site for recycling. The property is owned by the Parks Department and is scheduled to be repurposed, precluding its use for ongoing M&O activities.	
Description	This project addresses the need for a new site to sort, dry, and store materials removed from drainage ditches, swales, and ponds during maintenance and restoration activities necessary to maintain the storm drainage system. This project includes the purchase of property (preferably located central to maintenance and restoration sites), initial costs to develop the property (i.e., provide power and water), and purchase equipment for sorting and drying of materials.	
LOS goal(s) addressed	The City shall seek to maintain storm drainage infrastructure to ensure proper function of drainage facilities in accordance with Ecology requirements. (LOS Goal 12)	
Cost estimate	Purchase property..... Develop property and purchase equipment.....	$750,000 $75,000
	CIP 10 project cost	**$825,000**

7.3 Programmatic Drainage Projects

To ensure an adequate level of utility funding in the future, the City must consider longer-range programmatic efforts to maintain and/or improve storm drainage service. Table 7-1 lists programmatic projects that should be included in the Storm Drainage Utility budget. These projects are not linked to any specific problem or location, but are included for budgetary purposes. By itemizing these activities, the Storm Drainage Utility can track actual costs to compare with budgeted costs and specifically track how these expenditures address the LOS goals listed in Chapter 3. The items listed in the table below are distributed between the 6- and 20-year CIPs in Chapter 8.

Table 7-1. Summary Programmatic Drainage Projects

CIP number	Project or program name and description	Priority	Total project cost (2014 dollars)
11	**Storm Drainage Infrastructure Repair & Replacement.** This item addresses the need to repair or replace storm drainage infrastructure such as individual pipes, pump station repair and maintenance, and pond improvements. The long-term priorities for R&R should be developed by adhering to LOS Goals 8–9 and 11 regarding the maintenance of a criticality database and the prioritized assessment of critical infrastructure. **LOS Goal Addressed: Goal 10.** "The City shall seek to repair or replace system assets before they exceed their economic lives."	1	$11,000,000
12	**Street Utility Improvements.** The Storm Drainage Utility will seek opportunities to incorporate drainage improvements into transportation and pavement projects on city roads. The majority of storm drainage costs related to projects that bring streets to current design standards are incurred by the City's Transportation Program. **LOS Goal Addressed: Goal 23.** "The City shall continue to fund and provide storm drainage services through the existing storm drainage utility." Seeking opportunities to implement drainage improvements at lower unit costs will help the Storm Drainage Utility remain within its funding limits.	1	$2,000,000

Chapter 8

Implementation Plan

This chapter presents the implementation plan, which brings together information from the preceding chapters to form a work plan of future activities for the Storm Drainage Utility. The information in this chapter serves as a road map to the Storm Drainage Utility staff. This road map outlines the critical elements of plan implementation (e.g., CIP implementation, stormwater monitoring, NPDES Permit compliance, future staffing, and asset management) and links them into a schedule of utility activities.

The implementation plan is divided into six main sections:

- Section 8.1 presents the CIP for both 6-year and 20-year time frames. Section 8.2 describes recommendations for future monitoring and data collection to support future planning activities.
- Section 8.3 contains a summary of activities for NPDES Permit compliance.
- Section 8.4 presents recommendations for future staffing.
- Section 8.5 describes recommendations for continuing the implementation of best practices for asset management.
- Section 8.6 makes recommendations for additional activities that help the Storm Drainage Utility achieve the LOS goals.

The foldout chart (Figure 8-4) at the conclusion of this chapter shows the proposed implementation timeline. Appendix D provides the SEPA determination for the implementation plan.

8.1 6-Year and 20-Year CIP

The 6-year CIP contains near-term capital improvement projects focused on mitigating the most critical existing drainage problems that have been observed and are well understood by the City's staff. These projects are described in detail in Chapter 7. In addition to site-specific projects, the 6-year CIP contains ongoing programmatic efforts, such as the Storm Drainage Utility's participation in the Street Utility Improvement program. Table 8-1 lists all 11 capital improvement projects described in Chapter 7 and lays out annual expenditures for the 6-year CIP time frame. Project timing is based on project priorities weighed with likely budgetary constraints such that costs are distributed somewhat evenly from year to year (see Table 8-1 and Figure 8-1).

Table 8-1. Annual Project Cost Summary for 6-Year CIP

Project number	Project name	Priority	Repair/ Replacement	Upgrade/ Expansion	2016	2017	2018	2019	2020	2021	6-year project cost, $
1	West Main Street Pump Station Upgrade	1		100%	2,968,000						2,968,000
2	37th and I Streets NW Storm Improvements	1		100%	291,000						291,000
3	Hillside Drainage Assessment	1	100%		139,000	150,000					289,000
4A	30th Street NE Area Flooding, Phase 2	2		100%		896,000					896,000
4B	30th Street NE Area Flooding, Phase 3	3		100%				2,124,000			2,124,000
5A	West Hills Drainage Improvements at S 330th St. and 46th Pl. S	2		100%	317,000						317,000
5B	West Hills Drainage Improvements near S 314th St. and 54th Ave. S	3		100%			408,000		304,000		712,000
6	North Airport Area Improvements	2		100%	218,000						218,000
7	D St. SE Storm Improvements	2		100%			1,827,000				1,827,000
8	23rd St. SE Drainage Improvements	3		100%			316,500			316,500	633,000
9	Comprehensive Storm Drainage Plan update	1	35%	65%					300,000		300,000
10	Vegetative Waste Sorting Facility	1	100%			750,000	75,000				825,000
11	Storm Drainage Infrastructure Repair and Replacement Program[a]	1	100%		100,000	1,000,000	100,000	1,000,000	100,000	1,000,000	3,300,000
12	Street Utility Improvements[a]	1	100%		100,000	100,000	100,000	100,000	100,000	100,000	600,000
				Total 6-year CIP cost for priority 1 projects	*3,598,000*	*2,000,000*	*275,000*	*1,100,000*	*500,000*	*1,100,000*	*8,573,000*
				Total 6-year CIP cost for priority 2 projects	*535,000*	*896,000*	*1,827,000*	*0*	*0*	*0*	*3,258,000*
				Total 6-year CIP cost for priority 3 projects	*0*	*0*	*724,500*	*2,124,000*	*304,000*	*316,500*	*3,469,000*
				Total 6-year CIP cost	$4,133,000	$2,896,000	$2,826,500	$3,224,000	$804,000	$1,416,500	$15,300,000

a. Additional project costs included in 20-year CIP.

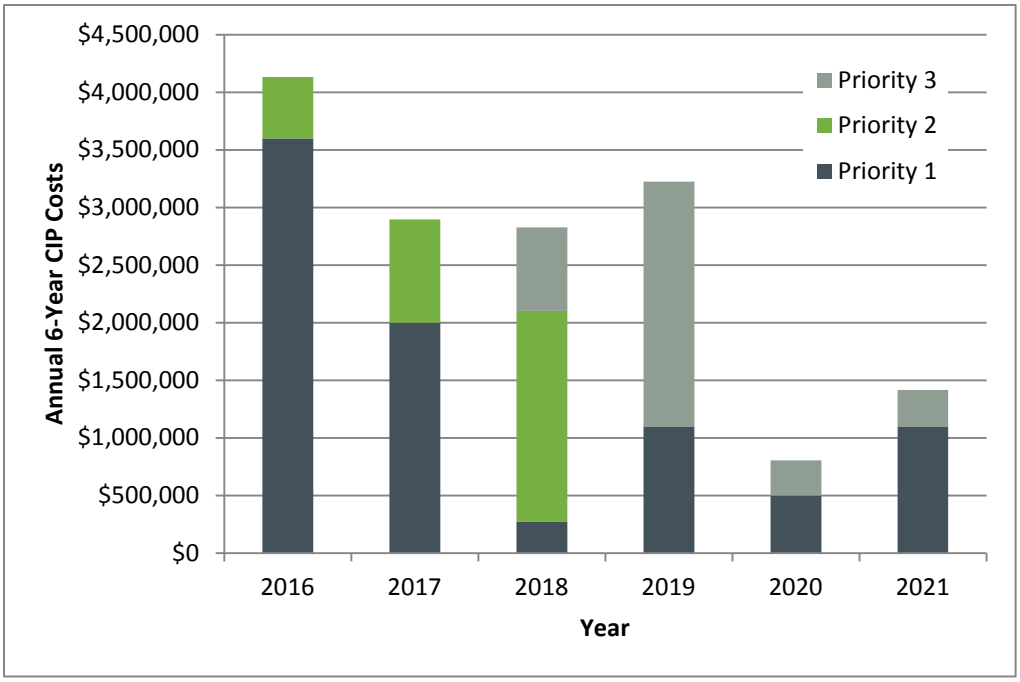


Figure 8-1. Annual Costs for 6-year CIP

Long-term stormwater conveyance demands should remain near current levels because, unlike wastewater planning where population growth brings additional flow demands, most new development and redevelopment projects will be subject to the City's development standards for onsite stormwater control. Local stormwater detention and integrated LID stormwater features should control stormwater flows to maintain approximately existing levels.

After existing drainage problems are addressed, the City will begin to shift its priorities away from responding to known drainage problems toward managing existing storm drainage assets to ensure that LOS goals are continuously met. These long-range capital improvements will focus on programmatic activities, such as R&R, where the R&R schedule is based on asset conditions and prioritizes assets that are nearing the end of their economic life. Table 8-2 summarizes the program expenditures and forecasts total CIP costs for the years 2022 to 2035.

Table 8-2. Cost Summary for 20-Year CIP			
Project number	Program name	Priority	Project costs for 2022–35 (2014 dollars)
11	Storm Drainage Infrastructure Repair and Replacement Program	1	7,700,000
12	Street Utility Improvements	1	1,400,000
	Total 2022–35 CIP cost for priority 1 projects		*9,633,800*
	Total 2022–35 CIP cost for priority 2 projects		*0*
	Total 2022–35 CIP cost for priority 3 projects		*0*
	Total CIP cost (2022–35)		$9,100,000
	Total 20-year CIP cost (2016–35)		$13,000,000

In addition to the identified projects and programs, the City identified two potential problem areas that may warrant a project in the future (see Section 4.5). Projects were not developed for this these areas for the following reasons: (1) existing data were inadequate to understand the potential problem, or (2) stormwater routing to the area may be changing (because of implementation of an upstream City or private project), which could affect the need, sizing, and timing of a project. These potential problem areas require additional data to obtain a better understanding needed to develop a capital improvement project, if warranted. Section 8.2 provides recommendations for activities that will assist with understanding and addressing the potential problems.

8.2 Monitoring

Evaluating the adequacy of the storm drainage system and analyzing potential capital improvements require extensive data. This includes not only infrastructure data such as pipe sizes, invert elevations, and outfall locations, but also stormwater data such as runoff volumes, flow rates, and flooding elevations. The City should continue to collect these types of data and store them in a consistent and organized manner. The following sections describe specific recommendations for additional monitoring data collection for identified potential problems, as well as summarizing ongoing monitoring efforts.

8.2.1 Precipitation

Precipitation is the source of stormwater runoff. Precipitation intensity and duration data are needed to characterize rainfall-runoff processes and adequately design for drainage of stormwater runoff. The City has been collecting precipitation data at City Hall since 1995, and is currently using a Texas Electronics Model TE525 gauge to record precipitation data with network connectivity allowing for data downloading by City staff. The City also has a manual rain gauge where data are collected weekly. These data are used to back up and validate the TE525 gauge data. The City should continue to monitor precipitation at City Hall using this equipment or updated equipment.

8.2.2 Flow

Flow data are used to gain a better understanding of the H&H conditions within a drainage basin. Accurate measurement of flow provides both peak discharge estimates for sizing conveyance capacity within the drainage network and runoff volumes for use in evaluating storm drainage facilities and improvement projects. Two potential problem locations require newly collected flow data to perform model development and calibration, which will support the analysis of problem area (see Section 4.5 for discussion on potential problem areas). Table 8-3 lists each of the recommended flow monitoring sites,

purpose, type of measurement, recommended start year, and approximate duration of monitoring. Figure 8-2 shows the proposed monitoring locations.

Table 8-3. Proposed Flow Monitoring Sites

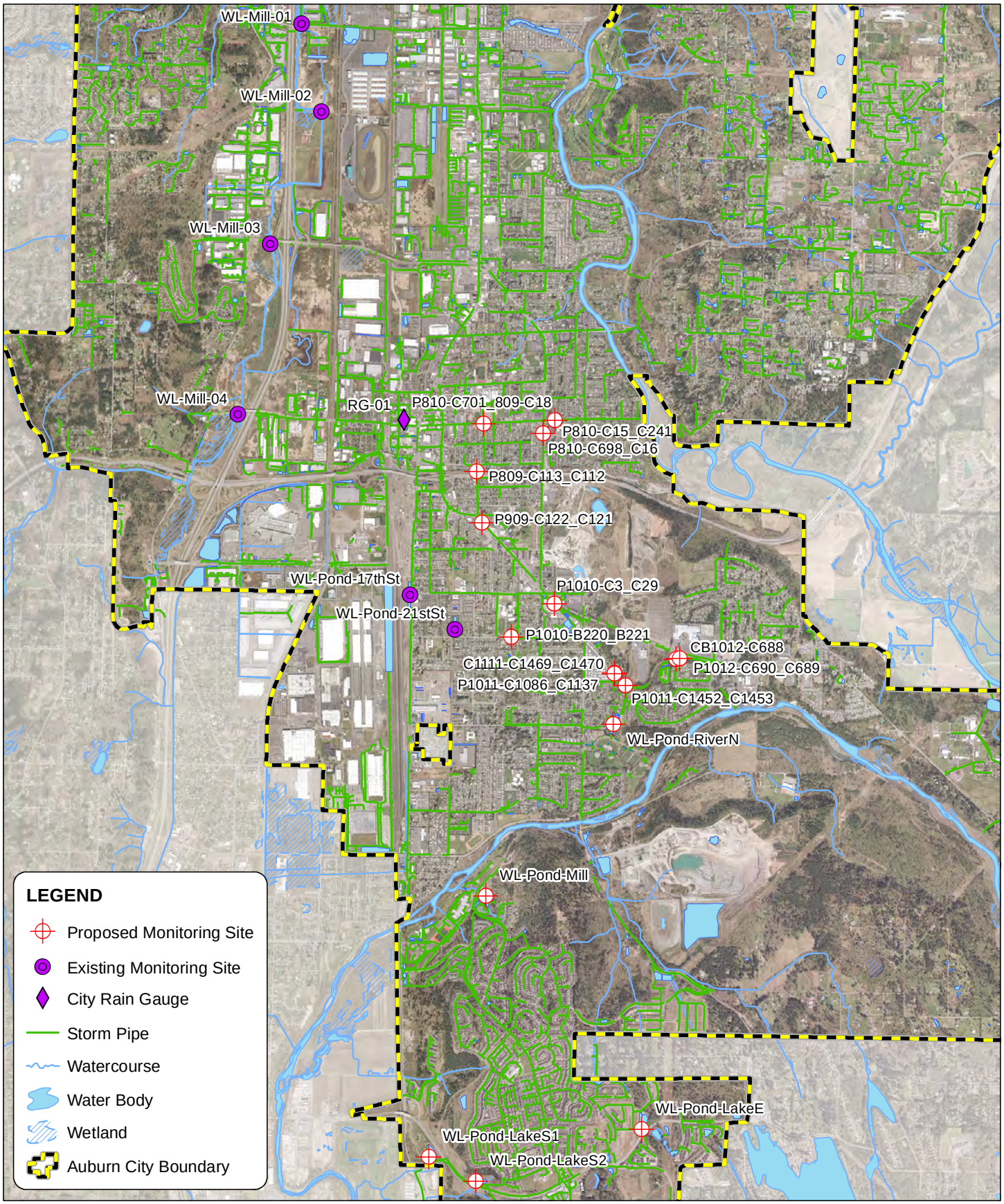
Site number[a]	Location	Purpose	Measurement	Start year	Approx. duration[b]
Potential problem area: Riverwalk Drive and Howard Road (directing tributary area to17th and 21st Street ponds)					
P1012-C690_C689	Intersection of Auburn Way S and Riverwalk Dr. SE	Quantify flow from upstream areas tributary to flow control device in CB1012-C688	Depth and velocity	2016	1 to 2 wet seasons
CB1012-C688	Intersection of Auburn Way S and Riverwalk Dr. SE	Estimate flows to high flow ditch on Riverwalk Dr. SE	Depth	2016	1 to 2 wet seasons
C1111-C1469_C1470	Intersection of Howard Rd. and Riverwalk Dr. SE	Quantify flows to support modeling flows that may be connected to the City's system at CB1011-C1474	Depth and velocity	2016	1 to 2 wet seasons
P1011-C1452_C1453	Howard Rd. between 21st St. SE and Riverwalk Dr. SE	Quantify flows to support modeling flows that may be connected to the City's system at CB1011-C1474	Depth and velocity	2016	1 to 2 wet seasons
P1011-C1086_C1137	Howard Rd. between 21st St. SE and Riverwalk Dr. SE	Quantify flows to support modeling flows that may be connected to the City's system at CB1011-C1474	Depth and velocity	2016	1 to 2 wet seasons
P1010-C3_C29	Howard Rd. near Auburn Way S	Provide data for H&H model calibration (subbasin C)	Depth and velocity	2016	1 to 2 wet seasons
P1010-B220_B221	21st and K Streets SE	Provide data for H&H model calibration (subbasin C) post-CIP (AWS Phase 2)[c]	Depth and velocity	2016	1 to 2 wet seasons
Potential problem area: 2nd and G streets SE					
P909-C122_C121	Auburn Way S, near 9th St. SE	Quantify flows upstream of flow split (at MH 909-C12) between subbasins B and C, and provide data for H&H model calibration	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons
P809-C113_C112	F St. SE, north of SR 18	Quantify flows upstream of sewer crossing, and provide data for H&H model calibration	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons
P810-C701_809-C18	G St. SE and E Main St.	Provide data for H&H model calibration (subbasin C)	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons
P810-C698_C16	M St. SE, south of E Main St.	Provide data for H&H model calibration since M St. Grade Separation and Well 1 Transmission Projects implementation	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons
P810-C15_C241	E Main St. and N St. SE	Estimate backwater effects on drainage system	Depth and velocity	Post-AWS Phase 2[c,d]	1 to 2 wet seasons

a. *P = pipe, C = culvert, CB = catch basin, MH = manhole.*

b. *Data to support CIP need at least one wet season of good data—approximately October through April; if sufficiently large storms occur during the first season, then year 2 data may not be necessary. Monitoring period and duration within a potential problem area should be the same.*

c. *Auburn Way S Flooding, Phase 2 (AWS Phase 2) is planned for construction in 2015.*

d. *Detailed survey of the flow split at MH 909-C12 should be completed prior to flow monitoring, to understand system hydraulics at this location.*



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COMPREHENSIVE STORM DRAINAGE PLAN
December 2015

Brown AND Caldwell

0 2,000 4,000 8,000 Feet

1 inch = 4,000 feet

N

CITY OF AUBURN WASHINGTON

Figure 8-2
Proposed Monitoring Locations

8.2.3 Stream and Pond Water Level

Water level data can also be useful for evaluating the performance of stormwater ponds and assessing the risk of overtopping. Monitoring also will enable the City to identify changes in performance that may indicate excessive sedimentation and the need for active maintenance. Additionally, continued water level monitoring will help the City evaluate changes in Mill Creek water elevations that may occur because of restoration and culvert replacement activities along Mill Creek.

The City should continue its water level monitoring program at selected sites to collect data for the purposes described above. Because water level monitoring is less expensive than flow monitoring, a broader ongoing water level monitoring program is more practical. Water level monitoring equipment should be compatible with telemetric data systems such that each site can be integrated into the City's telemetry system, wherever continuous power and data lines are available. Table 8-4 lists each of the recommended water level monitoring sites, purpose of the monitoring, recommended start year, and approximate duration of monitoring.

Table 8-4. Proposed Water Level Monitoring Sites

Site number	Location	Purpose	Start year	Approx. duration
WL-Mill-01	Mill Creek at 37th St. NW	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Mill-02	Mill Creek at 29th St. NW	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Mill-03	Mill Creek at 15th St. NW	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Mill-04	Mill Creek at West Main St.	Evaluate stages in Mill Creek and assess backwater effects on drainage system	Ongoing since 2011	10 years[a]
WL-Pond-17thSt	17th and A streets SE	Monitor pond performance (water levels and infiltration rates)	Ongoing since 2010	Indefinite[b]
WL-Pond-21stSt	21st and D streets SE	Monitor pond performance (water levels and infiltration rates)	Ongoing since 2011	Indefinite[b]
WL-Pond-RiverN	Riverwalk Dr. SE and U St. SE	Monitor pond performance (water levels and infiltration rates) and evaluate capacity in support of analysis for potential problem area at Riverwalk and Howard Road	2015	Indefinite[b]
WL-Pond-LakeS1	Lakeland South Pond 1	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]
WL-Pond-LakeS2	Lakeland South Pond 2	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]
WL-Pond-LakeEP	Lakeland East Pond	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]
WL-Pond-Mill	Mill Pond (Oravetz Rd. SE)	Monitor water level to evaluate hazard risk (dam safety)	2015	Indefinite[b]

a. Based on need to examine backwater effects on system; if new capital improvements are identified for Mill Creek, additional years may be needed.

b. To be continually reevaluated; if data indicate that stormwater pond is performing adequately or has low risk of failure, then monitoring could cease.

8.2.4 Water Quality

The current NPDES Permit, which is effective through 2018, includes provisions for monitoring and assessment of water quality. Permittees have the option of paying annual fees to participate in statewide monitoring programs, or developing individual monitoring programs to meet the requirement. The City notified Ecology in 2013 that it intends to participate in the statewide monitoring programs. By opting to participate in statewide monitoring programs, the City has agreed to pay program fees to Ecology. Fees totaling $47,710 are due annually, beginning in August 2014. Refer to Section S8 of the current NPDES Permit (Appendix A) for additional information.

8.3 Programmatic Measures for NPDES Compliance

The City of Auburn is covered by the Western Washington Phase II Municipal Stormwater Permit (NPDES Permit). The Permit regulates stormwater discharges from the City's MS4 (see Section 2.3.2). The current version of the Permit will remain in effect through July 2018, when a new version is due to be issued.

The City is actively engaged in stormwater management activities to comply with the Permit, including the following:

- SWMP administration
- Public education and outreach
- Public involvement and participation
- IDDE
- Control of runoff from new development, redevelopment, and construction sites
- Municipal operations and maintenance
- Monitoring and assessment

The City maintains and annually updates its SWMP Plan, which documents new and ongoing stormwater management activities planned for the upcoming year. The current SWMP Plan is available on the City's website.

Updates to City codes, programs, and standards are required by the end of 2016 to comply with the current NPDES Permit. The City is engaging in a process to evaluate, plan, and implement necessary updates to City regulations and programs. The process will engage staff across City departments, the public, and elected officials to evaluate and determine updates. As part of the process, the City developed a Compliance Work Plan to outline and guide compliance activities over the current NPDES Permit term. A copy of the Compliance Work Plan is included as Appendix B. The compliance schedule for key requirements under the current NPDES Permit is shown in Figure 8-3.

One of the key NPDES Permit requirements is adoption of an updated stormwater manual. To meet this requirement, the City may opt to update the Auburn SWMM to maintain equivalency with the 2012 Ecology Stormwater Management Manual for Western Washington. Alternatively, the City could adopt the Ecology manual or an approved equivalent stormwater manual developed by an NPDES Phase I jurisdiction (e.g., City of Tacoma). Potential updates to the SWMM represent a major effort for City staff, and would need to be planned for accordingly.

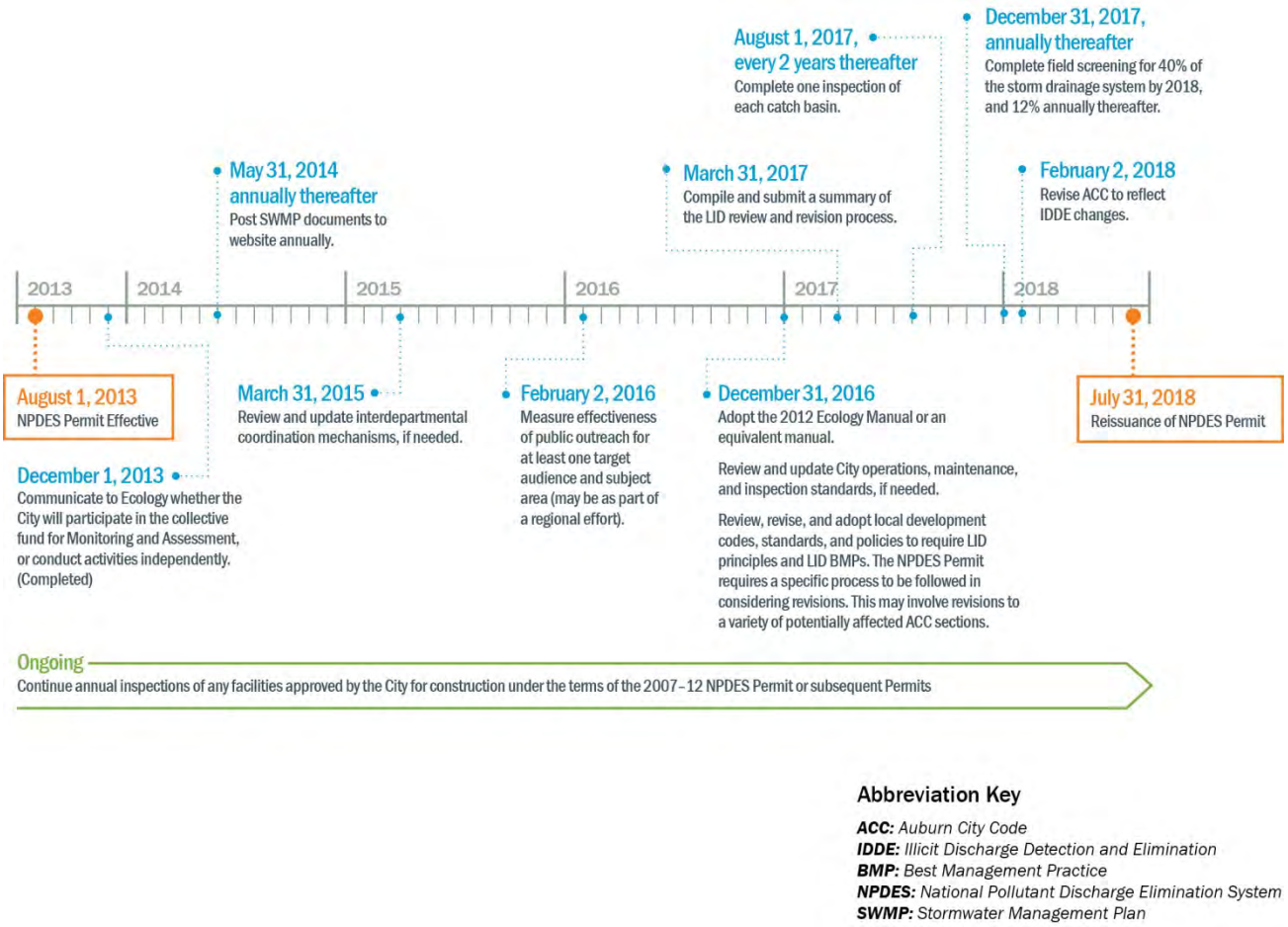


Figure 8-3. NPDES Compliance Schedule

8.4 Future Staffing and Equipment Needs

During this planning effort, current Engineering and M&O staffing were reviewed in light of future activities that will need to be performed to maintain compliance with the NPDES Permit. M&O staffing and equipment were also reviewed in light of existing maintenance goals and future, additional M&O responsibilities. The following sections summarize the additional staffing, staffing responsibilities, and equipment needs for the Storm Drainage Utility.

8.4.1 Engineering Services

This section discusses additional Engineering staffing responsibilities necessary to address requirements of the revised NPDES Permit and other identified storm drainage system deficiencies. Many of the new requirements of the NPDES Permit emphasize implementation of LID practices, such as minimizing impervious surfaces, native vegetation loss, and stormwater runoff. A majority of new development and redevelopment projects will be required to construct new types of onsite LID facilities, which will need to be inspected and maintained to ensure proper function.

Under an NPDES Compliance planning effort, an estimate of the additional efforts required by the City to address NPDES Permit requirements was prepared (Appendix B). The need and timing of additional Engineering staff is summarized as follows:

- In 2016, existing staff will need to accomplish the following NPDES compliance activities:
  - Update public guidance material and checklists to align with new City/NPDES Permit requirements
  - Develop procedures for public LID facility maintenance and oversight of private facilities
  - Update or adopt the Stormwater Manual to meet requirements
  - Develop City planning methods and update ACC to meet new Permit requirements for stormwater, including new runoff control requirements thresholds, BMP performance standards, and LID requirements
  - Update the City Comprehensive Plan related to implementation of LID principles that could affect elements beyond stormwater management implementation such as LOSs, setbacks, zoning densities, etc.
- By 2017, it is estimated that additional staff (1.15 FTEs) will be needed for NPDES compliance activities:
  - Inspect new LID facilities regularly, and purchase and maintain associated field instruments required to perform inspections (1 FTE). Depending on the level of future development, additional staff beyond 1 FTE may be required.
  - Define and organize LID asset classification, coordinate/update maintenance tracking methods, and track and record maintenance of stormwater assets (0.1 FTE).
  - 0.05 FTE to update public education and outreach materials to include additional target audiences, evaluate program effectiveness, and conduct regional coordination (0.05 FTE).

Additional staffing needs described above and their associated costs, assuming an FTE annual salary and benefits are $93,000, are summarized in Table 8-5.

Table 8-5. Future Engineering Services Staffing Needs

Additional Engineering Services activity	Staff needs (in 2017)	Cost
LID facility inspector to inspect new LID facilities regularly, and purchase and maintain associated field instruments required to perform inspections. Depending on the level of future development, additional staff beyond 1 FTE may be required.	1 FTE	$93,000
Define and organize LID asset classification, coordinate/update maintenance tracking methods, and track and record maintenance of stormwater assets.	0.1 FTE	$9,300
Update public education and outreach materials to include additional target audiences, evaluate program effectiveness, and conduct regional coordination.	0.05 FTE	$4,650
	2017 total cost	$106,950

8.4.2 M&O Services

The M&O staffing required to efficiently manage, operate, and maintain the storm drainage system was evaluated in Chapter 6. The analysis indicates that the Storm Drainage Utility is appropriately staffed internally with respect to meeting proactive City goals for current M&O activities. However, an additional 1.2 FTE within the City Vegetation Maintenance Division is required to provide current vegetation maintenance in support of the Stormwater Drainage Utility. Additional staff and equipment will be

needed to meet NPDES Permit requirements and other anticipated future work (see Section 6.6.2). Future M&O and Vegetation Maintenance staffing requirements are described in Section 6.6.2 and summarized in Table 8-6.

Table 8-6. Future Maintenance and Operations Staffing Needs

Additional M&O activity	FTE days required annually	Assumptions/City goal
Drainage ditch and stormwater pond maintenance and restoration		
Drainage ditch maintenance and restoration	216	Six-person crew for 36 days during the summer months.
Stormwater pond restoration	330	Six-person crew for 55 days during the summer months.
Other stormwater M&O activities		
Cartegraph tracking and reporting	111	Approximately 0.5 FTE (1 FTE shared with Sewer and Water utilities).
LID inspection and maintenance	104	One day per week. Two-person crew.
Total	761	
Total number of working days available per FTE	221	365 minus weekends (104), holidays (12), vacation (15), sick (12), and training (1).
Number of additional FTEs required	3.4	761 days required divided by 221 days per FTE year.

Based upon discussions with City staff and analysis of M&O activities discussed in Chapter 6, the Storm Drainage Utility should obtain or upgrade the following utility equipment to improve M&O efficiency:

- CCTV inspection equipment for pipe inspection
- Excavator for drainage ditch and stormwater pond maintenance and restoration
- Excavator mower attachment for pond vegetation maintenance

8.5 Continue Implementation of Best Practices for Asset Management

The 6-year CIP focuses mainly on existing flooding problems where recent storm events have revealed deficiencies in the drainage system. The capital improvement projects are designed to mitigate flooding in these areas and are expected to provide immediate benefits. As current problems are addressed in the near term, the focus of the CIP can begin to shift from a reactive program to a more proactive program, where repair or replacement of storm drainage assets can be prioritized according to the optimal timing for interventions. Ultimately, this process will allow the City to meet customer service levels, effectively manage risks, and minimize the City's costs of ownership.

The following sections present recommendations for future and ongoing asset management activities for the Storm Drainage Utility. Section 8.5 is divided into the following five sub-sections:

- Section 8.5.1 discusses the continued development of the system inventory.
- Section 8.5.2 provides a discussion about ways to optimize the M&O program through criticality-based strategies and use of the CMMS.
- Section 8.5.3 discusses economic life model improvements
- Section 8.5.4 provides a discussion about ways to optimize the M&O and R&R programs with the economic life model.
- Section 8.5.5 summarizes additional M&O activities identified during the M&O evaluations

8.5.1 Continue System Inventory

A comprehensive system inventory is needed for many reasons, including:

- Understanding existing problems
- Developing strategies to address existing problems
- Conducting analysis to support detailed design of capital improvement projects
- Prioritizing maintenance activities
- Budgeting and developing a schedule for R&R

A system inventory includes documenting at a minimum the location, size, length, material, depth, condition, and maintenance history of all drainage assets. The magnitude of the system inventory effort is quite large and the City has made great strides in updating its inventory through dedicated survey staff. Staff have been working throughout the city, quarter section by quarter section. Even though significant progress has been made, of the 137 quarter sections covering the City's storm drainage system, only 32 (about 25 percent) have been inventoried. An additional 11 (8 percent) are in progress. Therefore, it is recommended that the data inventory task be continued as part of future activities, and that the inventory be continually updated to reflect additional data collected during maintenance activities (i.e., condition assessment and frequency of maintenance activities) and drainage system changes through capital improvement projects.

8.5.2 Implement Economic Life Model Using Cartegraph Data

An economic life model containing data for the City's stormwater drainage pipes was developed as part of the 2009 Drainage Plan. The model predicts a probability and a cost of failure for each pipe segment. The model calculates the risk cost of an asset by multiplying the probability of the asset failing by the cost of that asset failing. By comparing the risk cost of each segment to the minimum annualized cost of ownership for an intervention, the optimal economic timing for either rehabilitation or replacing each segment is calculated. A detailed description of the economic life analysis is provided in the 2009 Drainage Plan.

Evaluations completed for this Drainage Plan consisted of developing a software requirement specification (SRS) describing the requirements and calculations required to implement the economic life model for the City's stormwater collection system using Cartegraph CMMS as a primary data source (Brown and Caldwell, 2014). Following the SRS, the City should implement the economic life model as well as the mode improvements described in Section 8.5.3. With continual updates of the internal data into Cartegraph (as described in Section 8.5.1), the model will continue to improve and become more useful for guiding maintenance and R&R activities, as described in Section 8.5.4.

8.5.3 Economic Life Model Improvements

The results from the economic life model are only as accurate as the inputs. Therefore, after implementing the model, improving the accuracy of the information on which the model is built is the focus for future efforts. The data input improvements can be organized into the following three groups of information:

- Need for additional infrastructure information: The economic life model is based on data describing the current conditions of stormwater infrastructure. The completeness and accuracy of these input data (see Section 8.5.1) are crucial to the usefulness of the economic life-cycle analysis results.
- Cost assumptions: Continually verifying and customizing cost information for spot repairs costs (as a function of depth of bury and pipe location), as well as social and environmental costs (i.e., impact of a pipe failure on traffic) will ensure that the model calculates accurate intervention timings and that cost projections represent an accurate spending program for the Storm Drainage Utility.

- **Failure assumptions:** The probability of failure used in the economic life model presumes that the City's segments will fail in a manner described by a specific type of statistical distribution. Such a statistical distribution can be customizable to meet a variety of conditions that influence failure (i.e. asset age, pipe material); however, verifying the parameters used to describe the distribution will require information on actual failure rates. With this information, the probability function can be customized specifically to the Storm Drainage Utility and will better predict optimal intervention timing.

In addition to updates to the pipe model, the model could be expanded to include catch basins and manholes. Including catch basins and manholes in the economic life model will allow M&O staff to identify those facilities with the highest potential cost of failure and that represent the greatest risk to the City, and to better identify which catch basins and manholes are nearing the end of their useful life, allowing M&O staff to better focus their maintenance activities. The information provided by the model (through maintenance records) may help to confirm to Ecology that less frequent catch basin inspections, cleaning and maintenance are sufficient, as compared to the biennial inspections required by the NPDES Permit.

Generally, the approach and calculations used by the model apply equally to catch basins and manholes. However, additional work, as described in the SRS, must be performed to determine the values for some model parameters.

8.5.4 Maintenance and R&R Prioritization

Once the data inventory is complete, and the economic life model is implemented, the City can use the model to estimate and evaluate the risk cost associated with each of its drainage pipe segments, catch basins, and manholes. The model can be used to evaluate the condition of this infrastructure and identify predictive maintenance and R&R needs.

Maintenance activities can be prioritized to focus on the assets for which the City is carrying the majority of its risk. The risk provides justification for focused conditional assessment activities (e.g., CCTV inspections) as part of a risk-based maintenance strategy. In general, risk-based maintenance strategies recommend predictive maintenance and risk mitigation practices for high-risk assets; preventive and routine maintenance for medium-risk assets; and routine maintenance, less-frequent, or even a "run-to-failure" approach for low risk assets.

R&R budget and long-term rate forecasting can be developed, and a business case validation can be made for each segment intervention. The model results can be sorted in multiple ways to develop specific R&R needs such as a prioritized intervention list. The model's benefit/cost ratio can be used to identify interventions that would result in the greatest savings for the lowest price. As multiple segments become due for intervention, the benefit/cost ratio can be used as a means to prioritize where finite R&R funds are spent. As the benefit/cost ratio tends to favor segments that are the most likely to fail (i.e., old segments with poor condition scores) and relatively inexpensive to intervene (e.g., short, small-diameter segments), using cost of failure for segments due for intervention would provide an alternative project priority list. Model results will identify intervention timing for all segments, but high-cost of failure segments (e.g., larger pipes that are expensive to replace) could potentially show lower on an R&R priority list using only benefit/cost.

8.5.5 M&O Activities

In addition to the identified staffing and equipment needs described in Section 8.4, the following M&O opportunities are available to improve existing activities:

- M&O staff are integral to the continual update to the system inventory described in Section 8.5.1. As they perform maintenance activities they should continue to update infrastructure attributes stored in Cartegraph.
- The City should continue the implementation of the NASSCO PACP MACP certified inspection programs to allow integration of inspection and condition assessment results with Cartegraph. The City should provide staff training to ensure assessment consistency including documentation using defined criteria such as leaks/cracks observed, cleanliness, and other specific measures.
- All M&O repair projects should be constructed to established City engineering standards to ensure best practices are being used. It is also recommended that the City develop a more formal procedure for tracking M&O repair projects to ensure that as-built and Cartegraph records are updated when projects are completed.

8.6 Recommendations for Additional Activities

The following sections present recommendations for additional activities for the Storm Drainage Utility. Section 8.6 is divided into the following three sub-sections:

- Section 8.6.1 prescribes an easement review and acquisition program.
- Section 8.6.2 presents a recommendation that a risk assessment be conducted to evaluate the vulnerability of Storm Drainage Utility assets.
- Section 8.6.3 presents recommendations for developing and incorporating sustainability goals with utility activities.

8.6.1 Develop Easement Review and Acquisition Program

As the City implements this Drainage Plan, it needs to develop a process to ensure that it can meet the LOS goal related to having access to City-owned facilities for M&O activities. While developing this plan, a number of drainage issues were evaluated in the West Hill area, which was annexed from King County in 2008. The City's drainage network in this area consists mostly of ditches and culverts. Some of these are located outside of the right-of-way and cross private property without easements. As the data inventory for the annexation areas is completed, the City will likely identify more potential easement gaps. The City should develop a program to identify where easements are needed, and work with the property owners to obtain easements.

8.6.2 Risk Assessment/Asset Vulnerability Analysis

Asset life-cycle analyses described in Section 8.5 examine risk to individual assets, which focus on small-scale modes of failure (e.g., pipe breakage). However, Storm Drainage Utility assets are also vulnerable to failure caused by wide-scale events such as natural disasters. A utility must also consider these risks and take action to mitigate those risks where feasible. Such actions could be in the form of capital improvements or utility programs.

The City should conduct a vulnerability analysis on the entire storm drainage system to examine the potential for natural disasters such as flood, erosion, earthquake, or volcanic activity to cause system failures. The associated probabilities of failure should be weighed with the consequences of failure to determine if action is necessary and to identify appropriate mitigation measures. The proposed mitigation measures should be documented in a plan and should be weighed alongside other capital commitments for prioritization.

8.6.3 Incorporate Sustainability

As the City implements this Drainage Plan, a need to prioritize projects and activities in a repeatable, defensible manner will emerge. This process will need to have a standard method for evaluating all of the LOS goals listed in Chapter 3, including goals related to sustainability.

Under the "protection of the environment" policy category in Table 3-1, the City has a policy to evaluate Storm Drainage Utility activities to emphasize sustainability. The goal associated with this policy is to identify specific areas to measure sustainability by examining how Storm Drainage Utility operations affect energy resources, natural resources, and the community. The examples provided include items such as weighing energy consumption impacts and costs during capital project development, selecting biodegradable and locally produced cleaning and maintenance products, protecting or restoring native soils and vegetation, structuring maintenance and other activities to minimize vehicle miles traveled, and improving communication with stakeholders and the public. However, quantifying these goals and effectively using information in decision making can be challenging.

Traditionally, public works projects are evaluated on initial capital investments and the annual costs of M&O. A project's environmental and community benefits and costs are typically discussed, but in many instances the "hard" costs of capital and M&O are the overriding decision criteria. By more rigorously including environmental and community benefits and costs in the decision process through sustainability analyses, projects and utility operations can be evaluated in a manner that truly considers the full cost of ownership. The following actions are recommended to develop and incorporate sustainability goals within the Storm Drainage Utility.

Define Sustainability. Sustainability means different things to different people and organizations. The United Nations World Commission on Environment and Development defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainable Seattle defines sustainability as the long-term health and vitality of a region, including the cultural, economic, environmental, and social aspects as one whole. Sustainability is often described as the careful and efficient use of natural, cultural, and financial resources in ways that improve the quality of life for communities without depleting the environment. To develop specific and actionable goals around sustainability, it is important for the Storm Drainage Utility to develop its own definition of the concept.

Develop Sustainability Goals. The challenge for the decision maker is to take a general definition and create discernible criteria that can be described and compared in a supportable way and used to make defensible decisions. The City should strive to provide specific metrics around the specific sustainability goals it would like to accomplish (e.g., for a goal of minimizing vehicle miles traveled, a specific metric would be to reduce vehicle travel by 20 percent; or for a goal to protect native vegetation, a specific metric would be retain and protect 40–60 percent of open space on new development sites).

Establish a Method of Evaluation. Once LOS metrics are defined, projects and activities can be evaluated, compared, and prioritized. The City should develop or adopt a consistent and repeatable method for evaluating projects and activities. A recommended approach would be to develop an evaluation process that builds upon the concept of life-cycle costing by also including consideration and quantification, in economic terms, of environmental and community impacts to determine the full cost of a specific alternative. Such a quantitative approach considers environmental and community risks and costs, which provides economic support for a decision at the management and policy level.

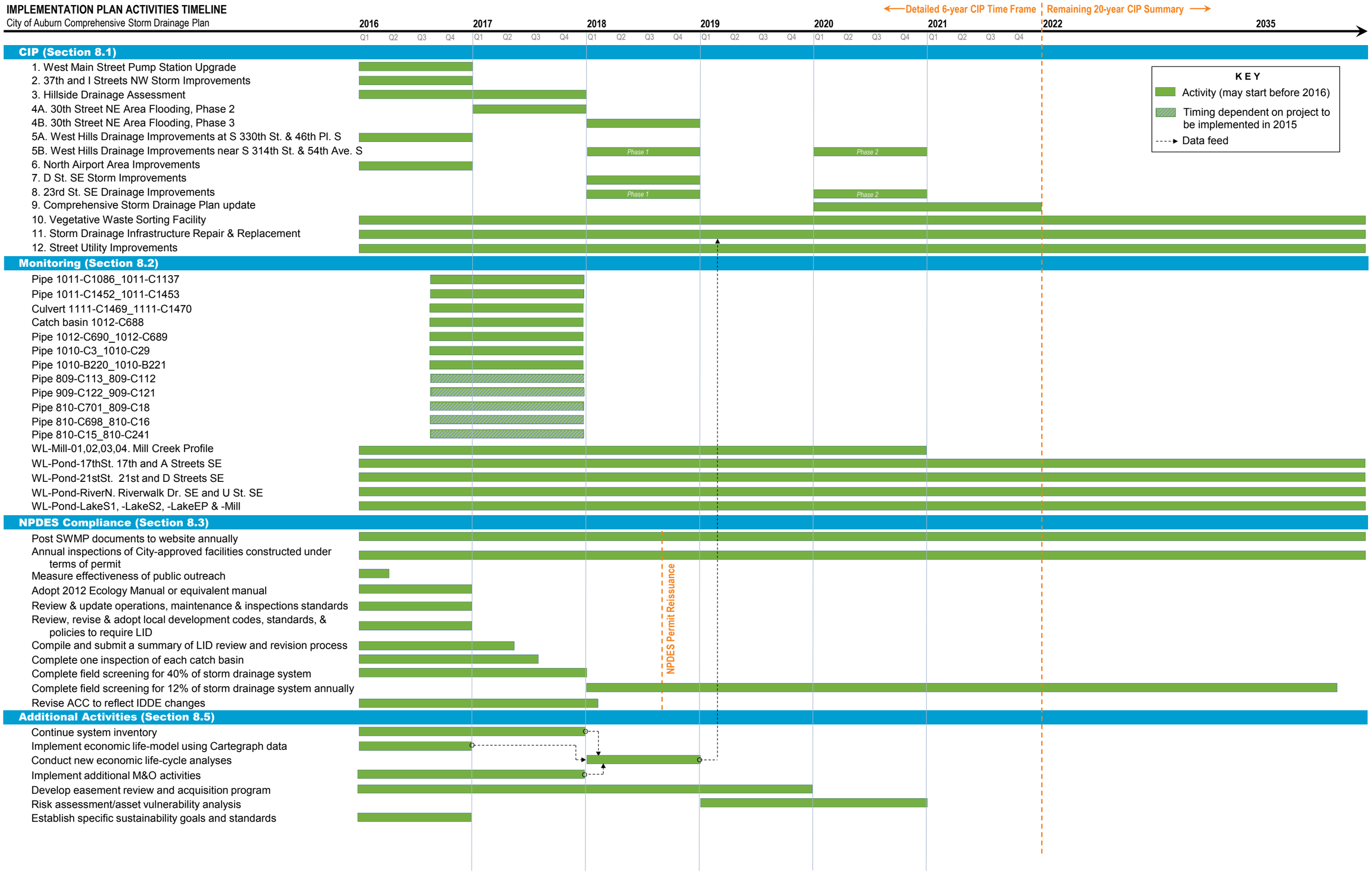
Other evaluation options could include a sustainability checklist, measuring a project or operations capacity to meet individual sustainability goals, or tools such as the Institute for Sustainable Infrastructure Envision rating system, which is a planning and design framework for measuring and incorporating sustainability into infrastructure projects, or SalmonSafe, which assesses and certifies projects for water quality protection. These types of tools look beyond monetized costs and benefits to

provide both quantitative and qualitative assessments of the environmental and community impacts of infrastructure projects. Other sustainability tools and project certification or evaluation processes are also available, or the City could develop its own evaluation process specific to its sustainability goals and the Storm Drainage Utility's projects and operations.

The above-described actions provide a mechanism for incorporating sustainability into Storm Drainage Utility projects and activities. Investigations are conducted to evaluate projects and activities with respect to LOS criteria and metrics. Gaps are identified and alternatives are developed for reducing or eliminating those gaps. Alternatives can be evaluated, compared, and ranked through a life-cycle present value benefit/cost analysis, considering not only budgetary impacts but also risks, environmental considerations, and societal costs and benefits. By applying a repeatable, defensible process that includes environmental and community factors, the City can prioritize projects and activities based on both full costs of ownership and a project's ability to meet or exceed LOS sustainability requirements.

IMPLEMENTATION PLAN ACTIVITIES TIMELINE

City of Auburn Comprehensive Storm Drainage Plan



Chapter 9

Finance

The objective of the financial plan is to identify the total cost of providing storm drainage service and to provide a financial program that allows the Storm Drainage Utility to remain financially viable during execution of the identified CIP. This viability analysis considers the historical financial condition of the Storm Drainage Utility, the sufficiency of Storm Drainage Utility revenues to meet current and future financial and policy obligations, and the financial impact of executing the CIP. Furthermore, the financial plan provides a review of the Storm Drainage Utility's rate structure with respect to rate adequacy and customer affordability.

9.1 Past Financial Performance

This section includes a historical (2008–13) summary of financial performance as reported by the City of Auburn on the statement of revenues, expenses, and changes in net position and the statement of net position, specific to the Storm Drainage Utility.

9.1.1 Statement of Revenues, Expenses, and Changes in Net Position

Table 9-1 shows a consolidated statement of revenues, expenses, and changes in net position for the period 2008–13.

Operating income (including depreciation expense) was positive in 2010, 2011, and 2013. Operating income grew from an operating loss of $29,000 in 2008 to an operating income of $863,000 in 2013. Furthermore, from 2008 to 2013 operating revenues grew by over $3 million, which represents a 59 percent increase. This increase outpaced operating expenses by 18 percent. Depreciation is a non-cash expenditure, so even though operating income has been negative in some years, operating cash flow was positive every year.

A few key financial ratios are discussed below. Unless otherwise noted, the stated benchmarks are based on industry standards.

- *M&O coverage ratio* (operating revenues divided by operating expenses):
  - Benchmark: A ratio of 1.0 or higher is a desirable result, indicative of sufficient revenues to meet cash operating expenses as well as to cover depreciation expense.
  - Results: From 2008 through 2013, the ratio has ranged from 0.9 to 1.1, which is a positive result overall.
- *Operating ratio* (total operating expenses excluding depreciation divided by total operating revenues):
  - Benchmark: A ratio greater than 90 percent indicates that there is little room for new debt service and capital replacement without additional rate increases. A ratio greater than 100 percent indicates that cash operating expenses exceed operating revenues and is indicative of an unsustainable financial condition.
  - Results: From 2008 through 2013, the ratio has ranged from 71 percent to 86 percent, which is a positive result in every year.

- *Debt service coverage ratio* (operating and interest revenues less M&O expenses excluding depreciation, divided by annual debt service):
  - Benchmark: Revenue bonds typically have a legal minimum coverage requirement of 1.25.
  - Results: From 2008 through 2013, the coverage ratio has ranged from 3.2 to 10.8, each year well above the benchmark. The Storm Drainage Utility has used revenue bond debt only in this historical period; state loans have not been used.

Table 9-1. Statement of Revenues, Expenses and Changes in Fund Net Position

	2008	2009	2010	2011	2012	2013
OPERATING REVENUES:						
Charges for services	$ 5,159,389	$ 6,000,761	$ 6,441,726	$ 6,938,375	$ 7,479,580	$ 8,184,303
Other Operating Revenue	997	102	272	-	-	-
Total Operating Revenues	5,160,386	6,000,863	6,441,998	6,938,375	7,479,580	8,184,303
OPERATING EXPENSES:						
Operations and Maintenance	1,551,406	2,186,976	1,727,711	1,923,604	3,123,618	2,113,050
Administration	1,979,083	2,298,330	2,428,345	2,746,980	2,641,157	2,919,570
Depreciation/Amortization	1,241,980	1,087,555	1,088,529	1,278,402	1,456,342	1,529,701
Other Operating Expenses	417,130	535,284	585,743	646,871	704,221	759,178
Total Operating Expenses	5,189,599	6,108,145	5,830,328	6,595,857	7,925,338	7,321,499
OPERATING INCOME(LOSS)	(29,213)	(107,282)	611,670	342,518	(445,758)	862,804
NON OPERATING REVENUE (EXPENSES)						
Interest Revenue	295,975	60,479	47,875	20,865	18,299	20,944
Other Non-Operating Revenue	77,300	1,047,703	172,791	511,617	803,570	356,010
Interest Expense	(37,224)	(25,120)	(271,964)	(133,448)	(99,496)	(351,913)
Other Non-Operating Expenses	-	(1,141,807)	(892,089)	(22,716)	(895)	(53,055)
Total Non-Operating Revenue (expenses)	336,051	(58,745)	(943,387)	376,318	721,478	(28,014)
INCOME(LOSS) BEFORE CONTRIBUTIONS AND TRANSFERS	306,838	(166,027)	(331,717)	718,836	275,720	834,790
CAPITAL CONTRIBUTIONS	920,944	750,141	1,727,140	6,193,834	1,966,564	1,033,128
TRANSFERS IN	-		-	-	-	-
TRANSFERS OUT	(159,100)	(138,000)	(59,580)	(96,800)	(50,000)	(124,000)
Changes in Net Position	1,068,682	446,114	1,335,843	6,815,870	2,192,284	1,743,918
Net Position, January 1, as Previously Reported	38,105,695	39,174,377	39,620,491	40,956,334	47,772,204	49,964,488
Change in Accounting Principle						(21,471)
Net Position, January 1, as Restated	-	-	-	-	-	49,943,017
Net Position, December 31	39,174,377	39,620,491	40,956,334	47,772,204	49,964,488	51,686,935

9.1.2 Statement of Net Position

Table 9-2 shows the consolidated statement of net position for the period 2008–13.

Table 9-2. Statement of Net Position

	2008	2009	2010	2011	2012	2013
ASSETS						
Current Assets						
Cash and Cash Equivalents	$ 6,328,751	$ 3,902,561	$ 2,783,583	$ 6,693,599	$ 7,954,723	$ 8,894,035
Investments	1,052,500	1,017,813	2,510,325	-	-	997,290
Restricted Cash						
Bond Payments	442,329	95,746	348,279	357,864	473,264	829,406
Customer Deposits	-	-	-	-	-	-
Other	479,991	425,608	4,451,444	2,128,832	1,413,688	5,726,428
Customer Accounts	720,823	733,644	795,710	855,486	923,999	931,782
Other Receivables	4,521	4,521	4,627	-	-	955
Due From Other Governmental Units	-	1,019,200	90,608	444,779	705,853	222,677
Inventories	8,764	11,831	7,880	7,299	5,533	7,566
Total Current Assets	9,037,679	7,210,924	10,992,456	10,487,859	11,477,060	17,610,139
Non Current Assets						
Long Term Contracts and Notes	-	-	-	-	-	-
Capital Assets						
Land	5,686,254	5,686,254	5,686,254	5,686,254	5,686,254	5,686,254
Buildings and Equipment	201,255	297,853	201,254	201,254	201,254	219,214
Improvements Other Than Buildings	38,271,397	38,697,313	44,739,930	50,815,888	55,581,417	56,162,320
Construction in Progress	808,357	4,027,852	755,866	3,403,168	1,083,761	2,922,064
Less: Accumulated Depreciation	(12,887,006)	(13,974,561)	(15,057,455)	(16,335,857)	(17,792,199)	(19,321,900)
Total Capital Assets (Net of A/D)	32,080,257	34,734,711	36,325,849	43,770,707	44,760,487	45,667,952
Total Non-Current Assets	32,080,257	34,734,711	36,325,849	43,770,707	44,760,487	45,667,952
Total Assets	41,117,936	41,945,635	47,318,305	54,258,566	56,237,547	63,278,091
LIABILITIES						
Current Liabilities						
Current Payables	218,480	931,383	333,818	522,001	393,826	657,995
Current Deposits	-	-	-	-	-	-
Loans Payable-Current	-	-	-	-	-	-
Employee Leave Benefits-Current	92,777	143,232	122,244	136,131	149,928	168,396
Revenue Bonds Payable-Current	398,500	71,500	75,400	79,300	198,705	405,186
General Obligation Bonds Payable-Current	-	-	-	-		-
Accrued Interest	43,829	24,246	272,879	278,564	274,559	424,221
Deposits	-	-	-	-	-	-
Total Current Liabilities	753,586	1,170,361	804,341	1,015,996	1,017,018	1,655,798
Non Current Liabilities						
Unearned Revenue	597,204	597,204	597,204	597,204	597,204	597,204
Employee Leave Benefits	11,443	47,338	63,911	61,793	52,017	50,214
Loans Payable	-	-	-	-	-	-
Revenue Bonds Payable	581,326	510,241	4,896,515	4,811,369	4,606,820	9,287,940
General Obligation Bonds Payable	-	-	-	-	-	-
Total Non Current Liabilities	1,189,973	1,154,783	5,557,630	5,470,366	5,256,041	9,935,358
Total Liabilities	1,943,559	2,325,144	6,361,971	6,486,362	6,273,059	11,591,156
NET ASSETS						
Invested In Capital Assets, Net of Related Debt	31,100,432	34,152,970	34,942,276	40,145,011	40,504,264	35,974,826
Restricted for:						
Debt Service	179,991	221,354	800,751	810,336	925,485	1,605,820
Capital Projects	-	-	-	-	-	4,537,224
Rate Stabilization	-	300,000	410,629	411,386	412,165	412,791
Unrestricted	7,893,954	4,946,167	4,802,678	6,405,471	8,122,574	9,156,274
Total Net Position	$ 39,174,377	$ 39,620,491	$ 40,956,334	$ 47,772,204	$ 49,964,488	$ 51,686,935

This statement shows that the City's net storm drainage assets, which measures the cost of assets (net of depreciation) remaining after liabilities are paid, increased from $39.2 million to $51.7 million over the 2008–13 time period; this represents a 32 percent increase. This includes an overall increase in the current assets from $9 million in 2008 to $17.6 million in 2013, which represents a 95 percent increase. Cash and cash equivalents have increased by $2.6 million over this same period.

Non-current assets, which represent assets required for use or consumption beyond 1 year, have seen a 42 percent increase, from $32.1 million in 2008 to $45.7 million in 2013. A more detailed look at the change in capital assets over this period reveals that improvements other than buildings have increased by nearly $18 million, which represents a 47 percent increase. Construction in progress has increased by $2.1 million during this same time period.

A few key financial ratios are discussed below. Unless otherwise noted, the stated benchmarks are based on industry standards.

Liquidity

- *Current ratio* (unrestricted current assets divided by current liabilities):
  - Benchmark: A ratio of 2.0 or higher is considered good in terms of healthy liquidity. The current ratio is a measure of short-term financial strength and answers the question: Are current assets able to cover expected current liabilities in the coming year?
  - Results: From 2008 through 2013, the current ratio has ranged from 4.2 to 9.8, well above the recommended benchmark in each year.

Efficiency

- *Accounts receivable collection period* (customer receivables on balance sheet x 365 days then divided by annual sales):
  - Benchmark: Generally, less than 30 days is considered very good.
  - Results: Decreased from 51 days in 2008 to 42 days in 2013. This is a positive trend.

Capital Structure

- *Debt to net capital assets ratio* (total outstanding debt divided by capital assets net of accumulated depreciation):
  - Benchmark: For utilities, having a capital structure of at least 40 percent equity and less than 60 percent debt is considered a healthy capital structure, with adequate future borrowing capacity and a manageable debt service burden. The City's capital structure policy is even more conservative: 50 percent debt and 50 percent equity.
  - Results: Increased from 3 percent debt in 2008 to 21 percent debt in 2013. The ratio increased from 11 percent in 2012 to 21 percent in 2013 resulting from the 2013 CIP Revenue Bond. Despite this increase, this ratio is still well within both the industry and City benchmarks for maximum outstanding debt.

9.1.3 Outstanding Debt Principal

Table 9-3 outlines the City's outstanding debt principal as of the end of 2013.

The Storm Drainage Utility has three outstanding revenue bonds. The total outstanding principal on these bonds is $9.2 million.

Table 9-3. Outstanding Debt		
Debt Description	Principal Outstanding	Maturity Year
2005 Refinance Revenue Bond	$ 265,200	2016
2010 CIP Revenue Bonds	$ 4,255,888	2030
2013 CIP Revenue Bonds	$ 4,653,600	2032
Total	$ 9,174,688	

9.2 Available Capital Funding Resources

Feasible long-term capital funding strategies should be defined to ensure that adequate resources are available to fund the CIP identified in this Plan. In addition to the Storm Drainage Utility's resources such as accumulated cash reserves, capital revenues, bond proceeds, and SDCs, capital needs can also be met from outside sources such as grants, low-interest loans, and other debt financing. The following is a summary of internal Storm Drainage Utility resources, government programs and resources, and public debt financing.

9.2.1 Internal Utility Resources

Storm Drainage Utility resources appropriate for funding capital needs include accumulated cash in the capital "account," bond proceeds, and capital revenues, such as SDCs. Capital-related revenues are discussed below.

9.2.1.1 Utility Funds and Cash Reserves

User charges (rates) paid by the Storm Drainage Utility's customers are the primary funding source for all Storm Drainage Utility activities. The rates cover total annual costs associated with operating and maintaining the system. Rates can pay for capital improvement projects in two ways: either paying for debt service or directly paying for capital projects. Although funding the capital costs directly through rates does not result in the additional interest expense associated with issuing debt, this approach can cause large and/or volatile rate increases.

9.2.1.2 System Development Charges

An SDC, as provided for by RCW 35.92.025, refers to a one-time charge imposed on new customers as a condition of connection to the Storm Drainage Utility system. The purpose of the SDC is twofold: (1) to promote equity between new and existing customers, and (2) to provide a source of revenue to fund capital projects. Equity is served by providing a vehicle for new customers to share the cost of infrastructure investment. SDC revenues provide a source of cash flow used to support Storm Drainage Utility capital needs; revenue can be used only to fund Storm Drainage Utility capital projects or to pay debt service incurred to finance those projects.

In the absence of an SDC, growth-related capital costs would be borne in large part by existing customers. In addition, the net investment in the Storm Drainage Utility already collected from existing customers, whether through rates, charges, and/or assessments, would be diluted by the addition of new customers, effectively subsidizing new customers with prior customers' payments. To establish equity, an SDC should recover a proportionate share of the existing and future infrastructure costs from a new customer. From a financial perspective, a new customer should become financially equivalent to an existing customer by paying the SDC.

Table 9-4 summarizes the City's current SDC schedule.

Table 9-4. Current System Development Charge Schedule	
Type	SDC
Single Family Residences & Duplexes (on Individual Parcels)	$1,162 per Parcel
Other Parcels	$1,162 per Equivalent Service Unit

9.2.1.3 Local Facilities Charge

While an SDC is the manner by which new customers pay their share of general facilities costs, local facilities funding is used to pay the cost of local facilities that connect each property to the system infrastructure. Local facilities funding is often overlooked in a rate forecast because it is funded up front either by connecting customers or developers, or through an assessment to properties—but never from rates. Although these funding mechanisms do not provide a capital revenue source toward funding CIP costs, a discussion of these charges is included in this chapter because of their impact on new customers.

Several mechanisms can be considered toward funding local facilities. One of the following scenarios typically occurs:

- The Storm Drainage Utility charges a connection fee based on the cost of the local facilities (under the same authority as the SDC)
- A developer funds extension of the system to its development and turns those facilities over to the Storm Drainage Utility (contributed capital)
- A local assessment is set up called a utility local improvement district (ULID), which collects tax revenue from benefited properties

A local facilities charge (LFC) is a variation of the SDC authorized through RCW 35.92.025. It is a city-imposed charge to recover the cost related to service extension to local properties. Often called a front-footage charge and imposed on the basis of footage of main "fronting" a particular property, it is usually implemented as a reimbursement mechanism to a city for the cost of a local facility that directly serves a property. It is a form of connection charge and, as such, can accumulate up to 10 years of interest. It typically applies in instances where no developer-installed facilities are needed through developer extension because of the prior existence of available mains already serving the developing property.

The developer extension is a requirement that a developer install onsite and sometimes offsite improvements as a condition of extending service. These are in addition to the SDC required and must be built to city standards. The city is authorized to enter into developer extension agreements under RCW 35.91.020. Part of the agreement between the city and the developer for the developer to extend service might include a latecomer agreement, resulting in a latecomer charge to new connections to the developer extension.

Latecomer charges are a variation of developer extensions whereby a new customer connecting to a developer-installed improvement makes a payment to the city based on their share of the developers cost (RCW 35.91.020). The city passes this on to the developer that installed the facilities. This is part of the developer extension process, and defines the allocation of costs and records latecomer obligations on the title of affected properties. No interest is allowed, and the reimbursement agreement is in effect for a period of 20 years, unless a longer duration is approved by the city.

ULID is another mechanism for funding infrastructure that assesses benefited properties based on the special benefit received by the construction of specific facilities (RCW 35.43.042). Most often used for local facilities, some ULIDs also recover related general facilities costs. Substantial legal and procedural requirements can make this process relatively expensive, and there are mechanisms by which a ULID can be rejected by a majority of property ownership within the assessment district boundary. These

instruments are not often used to finance storm drainage facilities because it has proved difficult to demonstrate required special benefit to properties to be assessed.

9.2.2 Government Programs and Resources

This section outlines government programs and resources potentially available for financing.

9.2.2.1 Grants and Low-Cost Loans Overview

Historically, federal and state grant programs were available to local utilities for capital funding assistance. However, these assistance programs have been mostly eliminated, substantially reduced in scope and amount, or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, even the benefit of low-interest loans makes the effort of applying worthwhile. Grants and low-cost loans for Washington State utilities are available from various Washington State departments. Several grant and loan programs for which the City might be eligible are described in greater detail below.

9.2.2.2 Department of Commerce

A September 2014 document from the Washington State Department of Commerce summarizes various loan and grant programs available for storm drainage projects ("Summary of Some Grant and Loan Programs for Drinking Water and Wastewater Projects," found at http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf. A few of those programs are described below.

Community Economic Revitalization Board (CERB). CERB, a division of the Washington State Department of Commerce, offers primarily low-cost loans; grants are made available only to the extent that a loan is not reasonably possible. The CERB targets public facility funding for economically disadvantaged communities, specifically for job creation and retention. Priority criteria include unemployment rates, number of jobs created and/or retained, wage rates, projected private investment, and estimated state and local revenues generated by the project. According to its website, "CERB funds a variety of projects that create jobs including (but not limited to) domestic and industrial water, storm and sewer water projects, telecommunications and port facilities." Eligible applicants include cities, towns, port districts, special purpose districts, federally recognized Indian tribes, and municipal corporations.

Funding details for the 2013–15 Program are as follows per the Washington Commerce Department website: "$9 million was appropriated to CERB for the 2013–15 Biennium. By state law, CERB must award 75 percent of this funding to projects in rural counties. The Board has also allocated $2,182,500 to be available for construction and planning grants on a first-come, first-served basis."

Program	Funding Limitations
Committed Private Sector Partner Construction	• $2 million per project load award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 20% cash match required (minimum, percent of total project cost)
Prospective Development Construction	Available to rural communities only. • $2 million per project load award limit • Up to $300,000 or 50% of total award, **whichever is less**, may be grant funds. • 20% cash match required (minimum, percent of total project cost)
Planning/Economic Feasibility Studies	• $50,000 grant per project award limit • 25% cash match required (minimum, percent of total project cost)

Further details are available at:

- http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/
- http://www.commerce.wa.gov/Documents/2013-15_Policies.pdf
- http://www.commerce.wa.gov/commissions/CommunityEconomicRevitalizationBoard/Pages/CERB-Traditional-Programs.aspx

Public Works Board (PWB) Financial Assistance. The PWB's goal is to provide community access to financial and technical resources that help sustain local infrastructure. Cities, towns, counties, and special-purpose districts are eligible to receive financial assistance for qualifying projects. When funding is available, the following tools are accessible:

- Construction Loan Program (http://www.pwb.wa.gov/financial-assistance/Construction/Pages/default.aspx):
  - Funding cycle: Per the PWB website, the governor's proposed 2015–17 budget offers $69.7 million for 19 projects.
  - Program description: Low-interest loans for local governments to finance public infrastructure construction and rehabilitation. Eligible projects must improve public health and safety, respond to environmental issues, promote economic development, or upgrade system performance.
  - Terms: For non-distressed communities, a term of 5 years or less has an interest rate of 1.28 percent and a term from 6 to 20 years has an interest rate of 2.55 percent.
- Pre-Construction Loan Program (http://www.pwb.wa.gov/financial-assistance/Pre-Construction/Pages/default.aspx):
  - Funding cycle: No funding has been allocated to the pre-construction loan program for the 2013–15 biennium.
  - Program description: Local governments may apply for low-interest loans to finance pre-construction activities to prepare a project for construction.
  - Terms: Terms are limited to a 5-year repayment period (the loan term may be converted to 20 years once the project has secured construction funding) with a 1 percent interest rate.
- Emergency Loan Program (http://www.pwb.wa.gov/financial-assistance/Emergency-Loan/Pages/default.aspx):
  - Funding cycle: No funding has been allocated to the Emergency Loan Program for the 2013–15 biennium.
  - Program description: The Emergency Loan Program provides funding to address public-works emergencies, thereby helping to provide immediate restoration of critical public-works services and facilities.
  - Terms: Funds are limited to $500,000 per jurisdiction per biennium, and come with a 20-year term (or the life of the project), and a 3 percent interest rate. No local match is required.
- Energy and Water Efficiency (EWE) Loan Program (http://www.pwb.wa.gov/financial-assistance/Energy-Water/Pages/default.aspx):
  - Funding cycle: No funding has been allocated to the EWE Loan Program for the 2013–15 biennium.
  - Program description: The EWE Loan Program is designed to encourage energy, water, and efficiency upgrades to existing infrastructure by providing low-cost loans.
  - Terms: The maximum loan amount is $1 million. The interest rate is dependent upon the term of the loan. Loans less than 5 years receive a 0.50 percent interest rate. Loans between 5 and 10

years receive a 1 percent interest rate. Loans between 11 and 20 years receive a 1.50 percent interest rate.

- Further general resources are available at:
  - http://www.pwb.wa.gov/financial-assistance/Pages/default.aspx
  - http://www.pwb.wa.gov/Documents/FINAL-MASTER-GUIDELINES.pdf
  - http://www.commerce.wa.gov/Documents/9-2-14_multi-program_funding_program_summary.pdf

9.2.2.3 Department of Ecology: Integrated Water Quality Funding Program

This year, Ecology received 227 applications requesting more than $352 million in financial assistance. Ecology is proposing grant and loan funding for 165 projects totaling approximately $229 million.

- State Water Pollution Control Revolving Fund and Centennial Clean Water Program
  - Design projects associated with publicly owned wastewater and stormwater facilities. The integrated program also funds planning and implementation of nonpoint source pollution control activities. Terms for State fiscal year 2016 include either 2.4 percent interest for 6–20-year term or 1.2 percent for 5-year term loans. Forgivable loan principal terms are available for distressed communities.
  - Further general resources are available at: http://www.ecy.wa.gov/programs/wq/funding/cycles/FY2016/index.html
- Stormwater Financial Assistance Program (SFAP)
  - Stormwater grant assistance is available for projects not required by permit. The SFAP is available for both cities and counties. The maximum grant award per jurisdiction is $250,000.
  - Further general resources are available at:
    - http://www.ecy.wa.gov/programs/wq/funding/FundPrgms/OthPrgms/StWa12a/FY12aStWa.html
    - http://www.ecy.wa.gov/programs/wq/funding/Training/FY2016/SFY16ApplicantStormwaterSession.pdf

9.2.3 Public Debt Financing

This section describes potentially available public debt financing tools.

9.2.3.1 General Obligation Bonds

General obligation (GO) bonds are bonds secured by the full faith and credit of the issuing agency, committing all available tax and revenue resources to debt repayment. With this high level of commitment, GO bonds have relatively low interest rates and few financial restrictions. However, the authority to issue GO bonds is restricted in terms of the amount and use of the funds, as defined by Washington constitution and statute. Specifically, the amount of debt that can be issued is linked to assessed valuation.

RCW 39.36.020 states:

> (ii) Counties, cities, and towns are limited to an indebtedness amount not exceeding one and one-half percent of the value of the taxable property in such counties, cities, or towns without the assent of three-fifths of the voters therein voting at an election held for that purpose.

(b) In cases requiring such assent counties, cities, towns, and public hospital districts are limited to a total indebtedness of two and one-half percent of the value of the taxable property therein.

While bonding capacity can limit availability of GO bonds for utility purposes, these can sometimes play a valuable role in project financing. A rate savings may be realized through two avenues: the lower interest rate and related bond costs, and the extension of repayment obligation to all tax-paying properties (not just developed properties) through the authorization of an *ad valorem* property tax levy.

9.2.3.2 Revenue Bonds

Revenue bonds are commonly used to fund utility capital improvements. The debt is secured by the revenues of the issuing utility and the debt obligation does not extend to the city's other revenue sources. With this limited commitment, revenue bonds typically bear higher interest rates than GO bonds and also require security conditions related to the maintenance of dedicated reserves (a bond reserve) and financial performance (added bond debt service coverage). The City agrees to satisfy these requirements by ordinance as a condition of bond sale.

Revenue bonds can be issued in Washington without a public vote. There is no bonding limit, except perhaps the practical limit of the utility's ability to generate sufficient revenue to repay the debt and provide coverage. In some cases, poor credit might make issuing bonds problematic.

9.2.4 Capital Resource Funding Summary

An ideal funding strategy would include the use of grants and low-cost loans when debt issuance is required. However, these resources are very limited and competitive in nature and do not provide a reliable source of funding for planning purposes. It is recommended that the City pursue these funding avenues but assume bond financing to meet needs above the Storm Drainage Utility's available cash resources. GO bonds may be useful for special circumstances, but because bonding capacity limits are most often reserved for other City (non-Storm Drainage Utility) purposes, revenue bonds are a more secure financing mechanism for Storm Drainage Utility needs. The capital financing strategy developed to fund the updated CIP follows the funding priority below:

1. Available grant funds and/or developer contributions
2. Interest earnings on allocated fund balances
3. Other miscellaneous capital resources
4. Annual revenue collections from SDCs
5. Annual transfers of rate-funded capital or excess cash (above minimum balance targets) from operating accounts
6. Accumulated capital cash reserves
7. Revenue bond financing

9.3 Financial Plan

The Storm Drainage Utility is an enterprise fund that is responsible for funding all of its related costs. It is not dependent upon general tax revenues or General Fund resources. The primary source of funding for the Storm Drainage Utility is collections from service charges. The City controls the LOS charges by ordinance and, subject to statutory authority, can adjust user charges as needed to meet financial objectives.

The financial plan can provide a qualified assurance of financial feasibility only if it considers the "total system" costs of providing service—both operating and capital. To meet these objectives, the following elements are completed:

- *Capital funding plan:* The capital funding plan identifies the total CIP obligations for the capital planning period 2014–35, although the Storm Drainage Utility's capital plan in this Drainage Plan begins in 2016. The plan defines a strategy for funding the CIP including an analysis of available resources from rate revenues, existing reserves, SDCs, debt financing, and any special resources that may be readily available (e.g., grants, developer contributions, etc.). The capital funding plan impacts the financial plan through use of debt financing (resulting in annual debt service) and the assumed rate revenue resources available for capital funding. The capital funding plan is discussed in Section 9.3.3.
- *Financial forecast:* This forecast identifies annual non-capital costs associated with the operation, maintenance, and administration of the system. Included in the financial plan is a reserve analysis that forecasts cash flow and fund balance activity along with testing for satisfaction of actual or recommended minimum fund balance policies. The financial plan ultimately evaluates the sufficiency of Storm Drainage Utility revenues in meeting all obligations, including operating expenses, debt service, and reserve contributions, as well as any debt service coverage requirements associated with long-term debt. The financial forecast analysis is discussed in Section 9.4.

9.3.1 Utility Fund Structure

The City tracks the Storm Drainage Utility's revenues and expenditures in a single fund: Fund 432. Conceptually, Storm Drainage Utility expenditures can be divided into three main types of costs: operating, capital, and debt service. For modeling purposes, it was assumed that the single fund for the Storm Drainage Utility is split among three "accounts": operating, capital, and debt reserves). Municipal utilities commonly maintain separate operating, capital, and debt reserves. The initial allocation of the beginning fund balance is discussed in Section 9.4.

- *Operations:* Serves as an operating account where operating revenues are deposited and operating expenses are paid.
- *Capital projects:* Serves as a capital account where capital revenues are deposited and capital expenditures are paid. Examples of capital revenues include SDCs, grant proceeds, debt proceeds, and contributions from rates.
- *Restricted bond reserve:* Serves as a restricted account set up to comply with revenue bond covenants.

Splitting a single fund into three separate "accounts" allows the City to apply the City's and industry standard reserve targets to each account. Minimum balance thresholds for these accounts are discussed in Section 9.3.2 below.

9.3.2 Financial Policies

A brief summary of adopted or recommended financial policies for the Storm Drainage Utility is provided below. Adopted policies are drawn from the "Process/Policies" section within the City's Adopted 2015–16 budget.

9.3.2.1 Reserve Policies

Utility reserves serve multiple functions: they can be used to address variability and timing of expenditures and receipts; occasional disruptions in activities, costs, or revenues; utility debt obligations; and many other functions. The collective use of individual reserves helps to limit the City's exposure to revenue shortfalls, meet long-term capital obligations, and reduce the potential for bond coverage defaults.

- *Operating reserve:* An operating reserve is designed to provide a liquidity cushion; it protects the utility from the risk of short-term variation in the timing of revenue collection or payment of expenses. Like other types of reserves, operating reserves also serve another purpose: they help to smooth rate increases over time. Target funding levels for an operating reserve are generally expressed as a certain number of days of M&O expenses, with the minimum requirement varying with the expected revenue volatility. Industry practice for utility operating reserves ranges from 30 days (8 percent) to 120 days (33 percent) of M&O expenses, with the lower end more appropriate for utilities with stable revenue streams and the higher end of the range more appropriate for utilities with significant seasonal or consumption-based fluctuations.

  The City's adopted policy states that the Storm Drainage Utility's target operating reserves should be approximately 60 days (page 36, "Process/Policies"). This is the target assumed in the financial forecast. Based on the City's 2015 budgeted expenditures (excluding depreciation), a 60-day target equates to $1.2 million.
- *Capital contingency reserve:* A capital contingency reserve is cash set aside in case of an emergency should a piece of equipment or a portion of the Storm Drainage Utility's infrastructure fail unexpectedly. The reserve could also be used for other unanticipated capital needs, including capital project cost overruns. Various approaches are used in the industry to set an appropriate level for this reserve, such as (1) choosing a percentage of a utility system's total fixed assets, or (2) determining the cost of replacing highly critical assets or facilities. Following common industry practice, this analysis assumes a minimum capital fund balance equal to 1 percent of the original cost of plant in service.
- *Bond reserve:* Bond covenants often establish reserve requirements as a means of protecting an agency against the risk of nonpayment. This bond reserve can be funded with cash on hand, but is more often funded at the time of borrowing as part of the bond principal. A reserve amount equal to annual debt service is targeted.

9.3.2.2 System Reinvestment Policies

The purpose of system reinvestment funding is to provide for the ongoing rate funding for the replacement of system facilities. Each year, the Storm Drainage Utility assets lose value, and as they lose value they are moving toward eventual replacement. That accumulating loss in value and future liability is typically measured for reporting purposes through annual depreciation expense. This is based on the original cost of the asset divided by its anticipated useful life. While this expense reflects the consumption of the existing asset and its original investment, the replacement of that asset will likely cost much more, after factoring in inflation and construction conditions. Therefore, the added annual replacement liability is often even greater than the annual depreciation expense. It is prudent to establish a system reinvestment policy that attempts to recover at least a portion of the annual depreciation expense from rate funding. Providing a certain amount of rate-funded capital reinvestment is an approach to ensure that the system does not become too heavily dependent on debt.

The City's adopted policy is to phase in system reinvestment funding over 10 years in 10 percent increments beginning in 2012. To keep rates at their currently adopted levels through 2017, the system reinvestment strategy for the financial plan begins in 2015 at 40 percent and increases by 10 percent per year until 100 percent of the target is funded.

9.3.2.3 Debt Policies

Revenue bond covenants typically establish a minimum debt service coverage as a way to protect bondholders against the risk of nonpayment. City policy and the City's current bond covenants both require bonded debt service coverage of 1.25.

The City also has another debt-related policy, which is to maintain a capital structure that does not exceed 50 percent debt. This is more conservative than the typical industry standard of 60 percent debt and 40 percent equity. The City's capital structure from the 2013 financial statement was well below the threshold at 21 percent debt and 79 percent equity. This forecast projects that the debt level will be 13 percent by 2021, remaining well within the industry-standard limit of 60 percent debt and 40 percent equity.

9.3.3 Capital Funding Plan

The CIP developed for this Drainage Plan contains 14 different projects valued at $25 million ($34 million in inflated dollars) over the 2016–35 planning period (excluding the 2014 estimated and 2015 budgeted capital figures). Costs are stated in 2014 dollars and are escalated to the year of planned spending at an annual inflation rate of 3.5 percent per year.

Table 9-5 summarizes the expected annual capital expenditures, using 2014 estimated and 2015 budgeted capital expenditures.

Table 9-5. Drainage CIP

Year	2014 $	Inflated $
2014	$ 9,154,705	$ 9,154,705
2015	$ 4,964,848	$ 5,138,618
2016	$ 4,133,000	$ 4,427,373
2017	$ 2,896,000	$ 3,210,847
2018	$ 2,773,500	$ 3,182,655
2019	$ 3,247,100	$ 3,856,536
2020	$ 828,300	$ 1,018,192
2021	$ 1,442,100	$ 1,834,754
8 Year Total	$ 29,439,553	$ 31,823,680
2022-2035	$ 9,633,800	$ 16,197,872
Grand Total	$ 39,073,353	$ 48,021,552

A capital funding plan is developed to identify the total resources available to pay for the CIP and determine if new debt financing is required. After allocating the estimated beginning 2015 fund balance first to the debt reserve and secondly to the operating reserve, more than $8.6 million was available for capital.

The SDC is projected to generate an average annual revenue stream of roughly $800,000. This is based on an assumed ESU growth rate of 1 percent per year. The growth percentage is drawn from a 2012 analysis provided by the City's storm drainage engineer, who projected ESUs through 2018. An account growth of 1.8 percent is used in the rate revenue projection in the financial forecast. Using an ESU growth rate that is lower than customer account growth is a reasonable and conservative assumption after evaluating historical SDC revenues.

The SDC revenue projection assumes the current SDC of $1,162 plus an annual Construction Cost Index adjustment starting in 2016.

Table 9-6 summarizes the capital funding plan.

Table 9-6. Capital Financing Plan					
Year	Capital Expenditures	Capital Expenditures Inflated	Revenue Bond Financing	Cash Funding	Total Financial Resources
2014	$ 9,154,705	$ 9,154,705	$ -	$ 9,154,705	$ 9,154,705
2015	4,964,848	5,138,618	-	5,138,618	5,138,618
2016	4,133,000	4,427,373	-	4,427,373	4,427,373
2017	2,896,000	3,210,847	-	3,210,847	3,210,847
2018	2,773,500	3,182,655	492,824	2,689,831	3,182,655
2019	3,247,100	3,856,536	1,858,962	1,997,574	3,856,536
2020	828,300	1,018,192	-	1,018,192	1,018,192
2021	1,442,100	1,834,754	-	1,834,754	1,834,754
8-Year Total	$ 29,439,553	$ 31,823,680	$ 2,351,786	$ 29,471,893	$ 31,823,680
2022-2035	$ 9,633,800	$ 16,197,872	$ -	$ 16,197,872	$ 16,197,872
Grand Total	$ 39,073,353	$ 48,021,552	$ 2,351,786	$ 45,669,766	$ 48,021,552

9.4 Financial Forecast

The financial forecast, or revenue requirement analysis, forecasts the amount of annual rate revenue needed throughout the 2014–21 planning horizon. The analysis incorporates operating revenues, M&O expenses, debt service payments, rate-funded capital needs, and any other identified revenues or expenses related to Storm Drainage Utility operations, and determines the sufficiency of the current level of rates. Revenue needs are also impacted by debt covenants (typically applicable to revenue bonds) and specific fiscal policies and financial goals of the Storm Drainage Utility. For this analysis, two revenue sufficiency "tests" have been developed to reflect the financial goals and constraints of the Storm Drainage Utility: (1) cash needs must be met, and (2) debt coverage requirements must be realized. In order to operate successfully with respect to these goals, both tests of revenue sufficiency described below must be met.

9.4.1 Cash Test

The cash flow test identifies all known cash requirements for the Storm Drainage Utility in each year of the planning period. Capital needs are identified and a capital funding strategy is established. This may include the use of debt, cash reserves, outside assistance, and rate funding. Cash requirements to be funded from rates are determined. Typically, these include M&O expenses, debt service payments, system reinvestment funding or directly funded capital outlays, and any additions to specified reserve balances. The total annual cash needs of the Storm Drainage Utility are then compared to total operating revenues (under current rates) to forecast annual revenue surpluses or shortfalls.

9.4.2 Coverage Test

The coverage test is based on a commitment made by the City when issuing revenue bonds. For purposes of this analysis, revenue bond debt is assumed for any needed debt issuance. As a security condition of issuance, the City is required per covenant to agree that the revenue bond debt would have a higher priority for payment (a senior lien) compared to most other Storm Drainage Utility expenditures; the only outlays with a higher lien are M&O expenses. Debt service coverage is expressed as a multiplier of the annual revenue bond debt service payment. For example, a 1.0 coverage factor would imply that no additional cushion is required. A 1.25 coverage factor means revenues must be sufficient to pay M&O

expenses, annual revenue bond debt service payments, plus an additional 25 percent of annual revenue bond debt service payments. The excess cash flow derived from the added coverage, if any, can be used for any Storm Drainage Utility purpose, including funding capital projects. The existing coverage requirement policy on the City's outstanding revenue bonds is 1.25 times bond debt. In determining the annual revenue requirement, both the cash and coverage sufficiency tests must be met—the test with the greatest deficiency drives the level of needed rate increase in any given year.

The financial forecast projects the amount of operating and capital expenditures to determine the annual amount of revenue required. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates in meeting the total revenue requirements of the system. In addition to annual operating costs, the revenue of the Storm Drainage Utility must also meet debt covenant requirements and minimum reserve level targets.

9.4.3 Financial Forecast Assumptions

The financial forecast is developed from the City's adopted 2015–16 biennial budget documents along with other key factors and assumptions to develop a complete portrayal of the Storm Drainage Utility's annual financial obligations. The forecast covers the 2014–21 planning period. The following is a list of the key revenue and expense factors and assumptions used to develop the forecast:

9.4.3.1 Revenue and Fund Balance

The following revenue and fund balance assumptions are used to develop the forecast:

- Customer growth: Based on a review of 5 years of historical data, annual customer account growth has been 1.8 percent per year.
- Adopted rate increases: The City adopted annual rate increases through 2017 of roughly 2.5 percent, which are incorporated into the revenue figures in the forecast. The analysis shows that through 2017, no additional rate increases are needed above the adopted levels.
- Miscellaneous revenues are conservatively assumed to stay at their currently budgeted levels. Miscellaneous revenues include late penalties, applications, etc. The Build America Bonds (BAB) subsidy for the 2010 Revenue Bond is expected to gradually decline in proportion to the annual decline in interest expense.
- Fund balances are based on the budgeted beginning balance in 2015. Depending on resource availability, the balance was allocated to the "accounts" using the following methodology:
  - Debt reserve: amount equal to highest annual debt service on existing debt
  - Operating reserve: amount equal to the operating reserve target of 60 days
  - Capital reserve: remaining funds

  The estimated beginning fund balance in 2015 was approximately $10.6 million, which is enough to fully fund the debt reserve, provide 60 days in the operating reserve, and provide over $8.6 million in the capital reserve.
- Interest earnings initially assume a rate of 0.09 percent applied to the beginning of year cash balances based on existing Local Government Investment Pool rates, phasing toward 0.25 percent over the long term.

9.4.3.2 Expenditures

The following expenditure assumptions are used to develop the forecast:

- General operating expenses are escalated from the budgeted figures at 2.5 percent per year, labor costs at 2.5 percent per year, and benefits at 5.5 percent per year.
- State taxes are calculated based on prevailing tax rates.

- Existing debt service schedules were provided by the City and include three existing revenue bond issues. These obligations represent nearly $795,000 in annual debt service principal and interest payments in 2015.
- This Drainage Plan identifies additional staffing levels and equipment purchases needed above the 2015 and 2016 budgeted levels. The additional staff is needed for vegetation maintenance, NPDES compliance activities, which include LID facility inspection, maintenance tracking, and public education and outreach.
  - Full-time engineering staff with salaries plus benefits totaling $107,000 starting in 2017 and continuing throughout the study period.
  - Full-time system maintenance staff with salaries and benefits totaling $320,000 starting in 2017 and continuing throughout the study period. This includes a 50 percent share of the asset management specialist to be shared with the Sewer Utility.
  - Full-time vegetation maintenance staff with salaries and benefits totaling $112,000 starting in 2017 and continuing throughout the study period.
  - One-time equipment purchases in 2017 consisting of CCTV inspection equipment for $250,000,an excavator for $180,000, and an excavator mower attachment for $30,000.
- Future debt service has been added as outlined in the capital funding plan. The forecast assumes a revenue bond interest rate of 4.30 percent based on prevailing rates, as well as an issuance cost of 1 percent with a 20-year term. City policy dictates a minimum debt service coverage requirement of 1.25.

The City should review the proposed rates and rate assumptions annually to ensure that the rate projections developed remain adequate. Any significant changes should be incorporated into the financial plan and future rates should be adjusted as needed.

Table 9-7 summarizes the annual revenue requirement for the 2014–21 planning horizon based on the forecast of revenues, expenditures, fund balances, fiscal policies, and capital funding.

Table 9-7. Financial Forecast								
Revenue Requirements	2014	2015	2016	2017	2018	2019	2020	2021
Assuming Existing Rates:								
Revenue								
Rate Revenues	$ 8,727,224	$ 9,106,422	$ 9,502,096	$ 9,914,962	$10,093,431	$10,275,113	$10,460,065	$10,648,346
Non-Rate Revenues	2,133,878	960,113	176,479	173,808	171,731	169,614	167,462	164,803
Total Revenue	$10,861,102	$10,066,535	$ 9,678,575	$10,088,770	$10,265,162	$10,444,727	$10,627,527	$10,813,149
Expenses								
Cash Operating Expenses	$ 7,000,356	$ 7,323,914	$ 7,249,903	$ 8,342,836	$ 8,151,980	$ 8,399,583	$ 8,656,021	$ 8,921,664
Existing Debt Service	796,781	795,239	777,111	774,579	776,275	776,413	774,467	774,396
New Debt Service	-	-	-	-	40,716	194,299	194,299	194,299
Rate-Funded System Reinvestment	-	550,558	734,017	940,032	1,120,686	1,268,271	1,479,931	1,646,473
Additions to Operating Reserve	-	-	-	-	120,221	40,702	38,266	47,555
Total Expenses	$ 7,797,136	$ 8,669,711	$ 8,761,031	$10,057,448	$10,209,877	$10,679,269	$11,142,985	$11,584,387
Cash Surplus / (Deficiency) Before Rate Increases	$ 3,063,965	$ 1,396,824	$ 917,544	$ 31,322	$ 55,285	$ (234,542)	$ (515,458)	$ (771,238)
Annual Rate Adjustment		0.00%	0.00%	0.00%	0.00%	2.49%	2.82%	2.40%
Cumulative Annual Rate Adjustment		0.00%	0.00%	0.00%	0.00%	2.49%	5.39%	7.92%
After Rate Increases:								
Rate Revenues	$ 8,727,224	$ 9,106,422	$ 9,502,096	$ 9,914,962	$10,093,431	$10,531,443	$11,023,407	$11,491,230
Cash Surplus / (Deficiency) After Rate Increases	3,064,000	1,396,800	917,500	31,300	175,500	40,700	38,300	47,600
Debt Service Coverage - Revenue Bonds	5.69	4.34	3.99	3.25	3.54	3.17	3.40	3.61

The last row of Table 9-7 shows the projected debt service coverage for bonded debt. Bonded debt service coverage—which legally cannot drop below 1.25—is projected to stay at or above 3.17 throughout the life of the forecast.

In 2012, the City Council adopted annual rate increases of 2.5 percent in 2015, 2016, and 2017. This analysis shows that the adopted rates will generate sufficient revenue to meet operating expenses and the Storm Drainage Utility policy goals as discussed herein for the 2015–17 period. Based on the assumptions in the forecast, no incremental rate increases (above adopted amounts) are needed through 2017.

Based on the financial forecast, no rate increase is needed in 2018. Rate increases averaging about 2.6 percent per year are needed in 2019 and beyond to cover projected M&O expenses, debt service payments, system reinvestment funding, and other stated financial policy objectives. While no rate increase is projected in 2018, it may be prudent to adopt a smaller set of increases over 4 years (2018–21) rather than adopt a higher set of increases over 3 years (2019–21).

9.4.4 City Funds and Reserve Balances

Table 9-8 shows a summary of the projected ending City operating, capital, and debt reserve balances through 2021. The operating reserve ends at 60 days of operating expenditures; the capital reserve ends at over $4 million, which is above the minimum target of about $1 million; and the debt reserve ends at nearly $1 million, which is enough to cover 1 year of annual debt service.

Table 9-8. Cash Balance Summary								
Ending Reserves	2014	2015	2016	2017	2018	2019	2020	2021
Operating	$ 1,150,743	$ 1,203,931	$ 1,188,509	$ 1,219,831	$ 1,340,051	$ 1,380,753	$ 1,419,020	$ 1,466,575
Capital	8,362,881	6,169,948	4,170,692	2,689,831	1,997,574	2,125,099	3,482,614	4,233,887
Debt	796,781	795,239	776,414	776,414	817,130	970,712	970,712	970,712
Total	$ 10,310,405	$ 8,169,117	$ 6,135,614	$ 4,686,075	$ 4,154,755	$ 4,476,564	$ 5,872,347	$ 6,671,174

9.5 Existing Rate Structure and Projected Schedule

The City's existing rate structure is composed of a single-family rate class and six non-single-family rate classes. The rate schedule for the single-family customer class consists of a base monthly charge. The rate schedule for non-single-family customers consists of a base monthly charge and an additional charge per ESU based on the characteristics of a customer's parcel.

Low-income, single-family residential customers are provided a 50 percent discount to the rates presented. To qualify for a low-income discount, a customer must be 62 years old or older and meet low-income guidelines as defined by the U.S. Department of Housing and Urban Development (ACC 13.24 and 13.24.030).

A recent detailed review of the City's rate structure has been completed in the 2014 Retail Rate Study and recommends incorporating cost-of-service adjustments among various rate classes.

Table 9-9 presents the City's existing rate schedule for each customer class under the adopted rates through 2017. No rate increases above adopted levels are necessary through 2017. The table then incorporates necessary rate increases starting in 2018 and continuing through 2021.

Table 9-9. Projected Rate Schedule								
Monthly Rate Schedule	Adopted 2014	Adopted 2015	Adopted 2016	Adopted 2017	Projected 2018	Projected 2019	Projected 2020	Projected 2021
Annual:		0.00%	0.00%	0.00%	0.00%	2.49%	2.82%	2.40%
Cumulative:		0.00%	0.00%	0.00%	0.00%	2.49%	5.39%	7.92%
Single Family	$18.78	$19.25	$19.73	$20.22	$20.22	$20.72	$21.31	$21.82
Non-Single Family								
Base Charge	$11.68	$11.97	$12.27	$12.58	$12.58	$12.89	$13.26	$13.58
ESU Charges								
Non-Single-Family	$14.95	$15.32	$15.71	$16.10	$16.10	$16.50	$16.97	$17.37
NSF w/Detention	$12.01	$12.31	$12.62	$12.93	$12.93	$13.25	$13.63	$13.95
NSF w/Retention	$7.42	$7.61	$7.80	$8.00	$8.00	$8.20	$8.43	$8.63
NSF w/Water Quality Treatment	$8.98	$9.21	$9.44	$9.67	$9.67	$9.91	$10.19	$10.44
NSF w/Detention and Water Quality Treatment	$6.78	$6.95	$7.13	$7.31	$7.31	$7.49	$7.70	$7.89
NSF w/Retention and Water Quality Treatment	$4.25	$4.35	$4.46	$4.57	$4.57	$4.68	$4.82	$4.93

Low Income Discount: 50%
Rate Increases Applied "Across the Board"
Rate increases shown in 2015, 2016, and 2017 reflect already-adopted annual increases of 2.5%

9.6 Affordability

The Washington State Department of Health and the PWB have historically used an affordability index to prioritize low-cost loan awards. The typical threshold looks at whether a system's rates exceed 1.5 to 2.0 percent of the median household income for the demographic area. As a result, if monthly bills are less than 1.5 percent of the median household income for the demographic area, they are generally considered affordable.

According to City staff, the median household income for the City of Auburn in 2012 was $49,996. This figure was inflated to $51,810 at 2014 levels assuming annual Consumer Price Index adjustments. Table 9-10 presents the City's estimated single-family rate with the projected rate increases for the forecast period. The affordability mark (monthly bill * 12 ÷ median income) averages 0.4 percent throughout the study period. As shown in the following table, the City's rates remain well within the affordability range throughout the planning horizon.

Table 9-10 below presents the results of the affordability test.

Table 9-10. Affordability Test

Year	Inflation	Median HH Income	Projected Monthly Bill	% of Median HH Income
2014	2.50%	$51,810	$18.78	0.43%
2015	2.50%	$53,106	$19.25	0.43%
2016	2.50%	$54,433	$19.73	0.43%
2017	2.50%	$55,794	$20.22	0.43%
2018	2.50%	$57,189	$20.22	0.42%
2019	2.50%	$58,619	$20.72	0.42%
2020	2.50%	$60,084	$21.31	0.43%
2021	2.50%	$61,586	$21.82	0.43%

9.7 Conclusion

The financial analysis indicates that the adopted rates in 2015, 2016, and 2017 are sufficient to meet the Storm Drainage Utility financial obligations as presented in this forecast. No additional rate increases are proposed for 2015–17. Based on the forecast, no rate increase is required in 2018. Rate increases for 2019–21 average about 2.6 percent per year, for a cumulative increase of 7.9 percent.

This evaluation also finds that the rates with projected rate increases would remain well within the defined threshold of affordability.

Chapter 10

Limitations

This document was prepared solely for City of Auburn in accordance with professional standards at the time the services were performed and in accordance with the contract between City of Auburn and Brown and Caldwell dated December 6, 2013. This document is governed by the specific scope of work authorized by City of Auburn; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by City of Auburn and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Chapter 11

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Appendix A: Western Washington Phase II Municipal Stormwater Permit

Issuance Date:	August 1, 2012
Effective Date:	August 1, 2013
Expiration Date:	July 31, 2018
Modification Date:	January 16, 2014

Western Washington Phase II Municipal Stormwater Permit

National Pollutant Discharge Elimination System and
State Waste Discharge General Permit
for discharges from Small Municipal Separate Storm Sewers
in Western Washington

State of Washington
Department of Ecology
Olympia, Washington 98504-7600

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1251 *et seq.*

Until this permit expires, is modified, or revoked, Permittees that have properly obtained coverage under this permit are authorized to discharge to waters of the state in accordance with the special and general conditions which follow.

Heather R. Bartlett
Water Quality Program Manager
Department of Ecology

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SPECIAL AND GENERAL CONDITIONS

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SPECIAL CONDITIONS

S1. PERMIT COVERAGE AREA AND PERMITTEES

A. Geographic Area of Permit Coverage

This Permit is applicable to owners or operators of regulated small municipal separate storm sewer systems (MS4s) located west of the eastern boundaries of the following counties: Whatcom, Skagit, Snohomish, King, Pierce, Lewis and Skamania.

1. For all cities required to obtain coverage under this permit, the geographic area of coverage is the entire incorporated area of the city.

2. For all counties required to have coverage under this Permit, the geographic area of coverage is the urbanized areas and urban growth areas associated with permitted cities under the jurisdictional control of the county. The geographic area of coverage also includes any urban growth area contiguous to permitted urbanized areas under the jurisdictional control of the county.

3. For Whatcom County, the geographic area of coverage also includes the unincorporated Birch Bay urban growth area.

4. For Secondary Permittees required to obtain coverage under this permit, the minimum geographic area of coverage is all areas identified under S1.A.1 and S1.A.2. At the time of permit coverage, the Washington State Department of Ecology (Ecology) may establish a geographic area of coverage specific to an individual Secondary Permittee.

5. All regulated small MS4s owned or operated by the Permittees named in S1.D.2.a(i) and (ii),and S1.D.2.b and located in another city or county area requiring coverage under this permit or the *Phase I Municipal Stormwater Permit* or the *Eastern Washington Phase II Municipal Stormwater Permit* are also covered under this permit.

B. Regulated Small Municipal Separate Storm Sewer Systems (MS4s)

All operators of regulated small MS4s are required to apply for and obtain coverage under this Permit or be permitted under a separate individual permit, unless waived or exempted in accordance with condition S1.C.

1. A regulated small MS4:

   a. Is a "Small MS4" as defined in the *Definitions and Acronyms* section at the end of this Permit; and

   b. Is located within, or partially located within, an urbanized area as defined by the latest decennial census conducted by the U.S. Bureau of Census, or

designated by Ecology pursuant to 40 CFR 123.35(b) or 40 CFR 122.26(f); and

c. Discharges stormwater from the MS4 to a surface water of Washington State; and

d. Is not eligible for a waiver or exemption under S1.C. below.

2. All other operators of MS4s, including special purpose districts, which meet the criteria for a regulated small MS4 shall obtain coverage under this Permit. Other operators of small MS4s may include, but are not limited to: flood control, or diking and drainage districts, schools including universities, and correctional facilities that own or operate a small MS4 serving non-agricultural land uses.

3. Any other operators of small MS4s may be required by Ecology to obtain coverage under this permit or an alternative NPDES permit if Ecology determines the small MS4 is a significant source of pollution to surface waters of the state. Notification of Ecology's determination that permit coverage is required will be through the issuance of an Administrative Order issued in accordance with RCW 90.48.

4. The owner or operator of a regulated small MS4 may obtain coverage under this Permit as a Permittee, Co-Permittee, or Secondary Permittee as defined in S1.D.1. below.

5. Pursuant to 40 CFR 122.26(f), any person or organization may petition Ecology to require that additional small MS4s obtain coverage under this Permit. The process for petitioning Ecology is:

   a. The person or organization shall submit a complete petition in writing to Ecology. A complete petition shall address each of the relevant factors for petitions outlined on Ecology's website.

   b. In making its determination on the petition, Ecology may request additional information from either the petitioner or the entity that is the subject of the petition.

   c. Ecology will make a final determination on a complete petition within 180 days of receipt of the petition and inform both the petitioner and the MS4 of the decision, in writing.

   d. If Ecology's final determination is that the candidate MS4 will be regulated, Ecology will issue an order to the operator of the MS4 requiring them to obtain coverage under this Permit. The order will specify:

      i. The geographic area of permit coverage for the MS4;

ii. Any modified dates or deadlines for developing and implementing this Permit, as appropriate to the MS4, and for submitting their first annual report; and

iii. A deadline for the operator of the MS4 to submit a complete Notice of Intent (see Appendix 5) to Ecology.

C. Owners and operators of an otherwise regulated small MS4 are not required to obtain coverage under this Permit if:

1. The small MS4 is operated by:

a. A federal entity, including any department, agency or instrumentality of the executive, legislative, and judicial branches of the Federal government of the United States.

b. Federally recognized Indian Tribes located within Indian Country, including all trust or restricted lands within the 1873 Survey Area of the Puyallup Tribe of Indians; or

c. The Washington State Department of Transportation.

or:

2. The portions of the small MS4 located within the census defined urban area(s) serve a total population of less than 1000 people and a, b, and c, below all apply:

a. The small MS4 is not contributing substantially to the pollutant loadings of a physically interconnected MS4 that is regulated by the NPDES stormwater program.

b. The discharge of pollutants from the small MS4 has not been identified as a cause of impairment of any water body to which the MS4 discharges.

c. In areas where an EPA approved TMDL has been completed, stormwater controls on the MS4 have not been identified as being necessary.

In determining the total population served, both resident and commuter populations shall be included. For example:

- For publicly operated school complexes including universities and colleges the total population served would include the sum of the average annual student enrollment plus staff.

- For flood control, diking, and drainage districts the total population served would include residential population and any non-residents regularly employed in the areas served by the small MS4.

D. Obtaining coverage under this Permit

All operators of regulated small MS4s are required to apply for and obtain coverage in accordance with this section, unless waived or exempted in accordance with section S1.C.

1. Unless otherwise noted, the term "Permittee" shall include a city, town, or county Permittee, New Permittee, Co-Permittee, Secondary Permittee, and New Secondary Permittee as defined below:

   a. "Permittee" is a city, town, or county owning or operating a regulated small MS4 applying and receiving a permit as a single entity.

   b. "New Permittee" is a city, town, or county that is subject to the *Western Washington Phase II Municipal Stormwater General Permit* and was not subject to the permit prior to August 1, 2013.

   c. "Co-Permittee" is any owner or operator of a regulated small MS4 that is applying in a cooperative agreement with at least one other applicant for coverage under this Permit. Co-Permittees own or operate a regulated small MS4 located within or in proximity to another regulated small MS4.

   d. A "Secondary Permittee" is an operator of a regulated small MS4 that is not a city, town or county. Secondary Permittees include special purpose districts and other MS4s that meet the criteria for a regulated small MS4 in S1.B. above.

   e. "New Secondary Permittee" is a Secondary Permittee that is covered under a municipal stormwater general permit and was not covered by the permit prior to August 1, 2013.

2. Operators of regulated small MS4s have submitted or shall submit to Ecology either a Notice of Intent (NOI) for Coverage under National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater General Permit provided in Appendix 5 or a Duty to Reapply - NOI.

   a. The following Permittees and Secondary Permittees submitted a *Duty to Reapply - NOI* to Ecology prior to August 19, 2011:

      i. Cities and towns: Aberdeen, Algona, Anacortes, Arlington, Auburn, Bainbridge Island, Battle Ground, Bellevue, Bellingham, Black Diamond, Bonney Lake, Bothell, Bremerton, Brier, Buckley, Burien, Burlington, Camas, Centralia, Clyde Hill, Covington, Des Moines, DuPont, Duvall, Edgewood, Edmonds, Enumclaw, Everett, Federal Way, Ferndale, Fife, Fircrest, Gig Harbor, Granite Falls, Issaquah, Kelso, Kenmore, Kent, Kirkland, Lacey, Lake Forest Park, Lake Stevens, Lakewood, Longview, Lynnwood, Maple Valley, Marysville,

Medina, Mercer Island, Mill Creek, Milton, Monroe, Mountlake Terrace, Mount Vernon, Mukilteo, Newcastle, Normandy Park, Oak Harbor, Olympia, Orting, Pacific, Port Orchard, Port Angeles, Poulsbo, Puyallup, Redmond, Renton, Sammamish, SeaTac, Sedro-Woolley, Shoreline, Snohomish, Steilacoom, Sumner, Tukwila, Tumwater, University Place, Vancouver, Washougal, and Woodinville.

ii. Counties: Cowlitz, Kitsap, Thurston, Skagit, and Whatcom.

iii. Secondary Permittees: Bainbridge Island School District #303, Bellingham School District, Bellingham Technical College, Cascadia College, Central Kitsap School District, Centralia College, Clark College, Consolidated Diking Improvement District #1 of Cowlitz County, Edmonds Community College, Evergreen College, Highline Community College, Kelso School District, Kent School District, Longview School District, Lower Columbia College, Port of Anacortes, Port of Bellingham, Port of Olympia, Port of Skagit County, Port of Vancouver, Skagit County Drainage District #19, Skagit Valley College, University of Washington Bothell, Washington State University Vancouver, Washington State General Administration (Capitol Campus), Washington Department of Corrections, Western Washington University, and Whatcom Community College.

b. Operators of regulated small MS4s have submitted or shall submit to Ecology a Notice of Intent (NOI) for Coverage under National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater General Permit provided in Appendix 5 before the effective date of this permit, with the following exceptions:

i. Operators of regulated small MS4s located in the Cities of Lynden and Snoqualmie shall submit a NOI or application to Ecology no later than 30 days after the effective date of this permit.

ii. Operators of regulated small MS4s listed in S1.D.2.a do not need to submit a new application to be covered under this permit.

c. For operators of regulated small MS4s listed in S1.D.2.a, coverage under this permit is automatic and begins on the effective date of this permit, unless the operator chooses to opt out of this General Permit. Any operator of a regulated small MS4 that is opting out of this permit shall submit an application for an individual MS4 permit in accordance with 40 CFR 122.33(b)(2)(ii) no later than the effective date of this permit.

d. Operators of regulated small MS4s which want to be covered under this permit as Co-Permittees shall each submit a NOI to Ecology.

e. Operators of regulated small MS4s which are relying on another entity to satisfy all of their permit obligations shall submit a NOI to Ecology.

f. Operators of small MS4s designated by Ecology pursuant to S1.B.3 of this permit shall submit a NOI to Ecology within 120 days of receiving notification from Ecology that permit coverage is required.

3. Application Requirements

a. For NOIs submitted after the issuance date of this Permit, the applicant shall include a certification that the public notification requirements of WAC 173-226-130(5) have been satisfied. Ecology will notify applicants in writing of their status concerning coverage under this Permit within 90 days of Ecology's receipt of a complete NOI.

b. Each Permittee applying as a Co-Permittee shall submit a NOI provided in Appendix 5. The NOI shall clearly identify the areas of the MS4 for which the Co-Permittee is responsible.

c. Permittees relying on another entity or entities to satisfy one or more of their permit obligations shall notify Ecology in writing. The notification shall include a summary of the permit obligations that will be carried out by another entity. The summary shall identify the other entity or entities and shall be signed by the other entity or entities. During the term of the permit, Permittees may terminate or amend shared responsibility arrangements by notifying Ecology, provided this does not alter implementation deadlines.

d. Secondary Permittees required to obtain coverage under this Permit, and the *Phase I Municipal Stormwater Permit* or the *Eastern Washington Phase II Municipal Stormwater Permit* may obtain coverage by submitting a single NOI.

S2. AUTHORIZED DISCHARGES

A. This Permit authorizes the discharge of stormwater to surface waters and to ground waters of the state from MS4s owned or operated by each Permittee covered under this permit, in the geographic area covered pursuant to S1.A. These discharges are subject to the following limitations:

1. Discharges to ground waters of the state through facilities regulated under the Underground Injection Control (UIC) program, chapter 173-218 WAC, are not authorized under this Permit.

2. Discharges to ground waters not subject to regulation under the federal Clean Water Act are authorized in this permit only under state authorities, chapter 90.48 RCW, the Water Pollution Control Act.

B. This Permit authorizes discharges of non-stormwater flows to surface waters and to ground waters of the state from MS4s owned or operated by each Permittee covered under this permit, in the geographic area covered pursuant to S1.A, only under one or more of the following conditions:

1. The discharge is authorized by a separate NPDES or State Waste Discharge permit.

2. The discharge is from emergency fire fighting activities.

3. The discharge is from another illicit or non-stormwater discharge that is managed by the Permittee as provided in Special Condition S5.C.3 or S6.C.3.

These discharges are also subject to the limitations in S2.A.1 and S.2.A.2 above.

C. This Permit does not relieve entities that cause illicit discharges, including spills of oil or hazardous substances, from responsibilities and liabilities under state and federal laws and regulations pertaining to those discharges.

D. Discharges from MS4s constructed after the effective date of this permit shall receive all applicable state and local permits and use authorizations, including compliance with chapter 43.21C RCW (the State Environmental Policy Act).

E. This Permit does not authorize discharges of stormwater to waters within Indian Country or to waters subject to water quality standards of Indian Tribes, including portions of the Puyallup River and other waters on trust or restricted lands within the 1873 Survey Area of the Puyallup Tribe of Indians Reservation, except where authority has been specifically delegated to Ecology by the U.S. Environmental Protection Agency. The exclusion of such discharges from this Permit does not waive any rights the State may have with respect to the regulation of the discharges.

S3. RESPONSIBILITIES OF PERMITTEES

A. Each Permittee covered under this Permit is responsible for compliance with the terms of this Permit for the regulated small MS4s that they own or operate. Compliance with (1) or (2) below is required as applicable to each Permittee, whether the Permittee has applied for coverage as a Permittee, Co-Permittee, or Secondary Permittee.

1. All city, town and county Permittees are required to comply with all conditions of this Permit, including any appendices referenced therein, except for Special Condition S6 Stormwater Management Program for Secondary Permittees.

2. All Secondary Permittees are required to comply with all conditions of this Permit, including any appendices referenced therein, except for section S5 Stormwater Management Program for Cities, Towns, and Counties and S8.B, S8.C, and S8.D Monitoring.

B. Permittees may rely on another entity to satisfy one or more of the requirements of this Permit. Permittees that are relying on another entity to satisfy one or more of their permit obligations remain responsible for permit compliance if the other entity fails to implement permit conditions. Permittees may rely on another entity provided all the requirements of 40 CFR 122.35(a) are satisfied, including but not limited to:

1. The other entity, in fact, implements the Permit requirements.

2. The other entity agrees to take on responsibility for implementation of the Permit requirement(s) as indicated on the NOI.

S4. COMPLIANCE WITH STANDARDS

A. In accordance with RCW 90.48.520, the discharge of toxicants to waters of the state of Washington which would violate any water quality standard, including toxicant standards, sediment criteria, and dilution zone criteria is prohibited. The required response to such discharges is defined in section S4.F, below.

B. This Permit does not authorize a discharge which would be a violation of Washington State Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Quality Standards (chapter 173-200 WAC), Sediment Management Standards (chapter 173-204 WAC), or human health-based criteria in the national Toxics Rule (Federal Register, Vol. 57, NO. 246, Dec. 22, 1992, pages 60848-60923). The required response to such discharges is defined in section S4.F, below.

C. The Permittee shall reduce the discharge of pollutants to the maximum extent practicable (MEP).

D. The Permittee shall use all known, available, and reasonable methods of prevention, control and treatment (AKART) to prevent and control pollution of waters of the state of Washington.

E. In order to meet the goals of the Clean Water Act, and comply with S4.A, S4.B, S4.C, and S4.D each Permittee shall comply with all of the applicable requirements of this Permit as identified in S3. Responsibilities of Permittees.

F. A Permittee remains in compliance with S4 despite any discharges prohibited by S4.A or S4.B, when the Permittee undertakes the following response toward long-term water quality improvement:

1. A Permittee shall notify Ecology in writing within 30 days of becoming aware, based on credible site-specific information that a discharge from the MS4 owned or operated by the Permittee is causing or contributing to a known or likely violation of Water Quality Standards in the receiving water. Written notification provided under this subsection shall, at a minimum, identify the source of the site-specific information, describe the nature and extent of the known or likely violation in the receiving water, and explain the reasons why the MS4 discharge is

believed to be causing or contributing to the problem. For ongoing or continuing violations, a single written notification to Ecology will fulfill this requirement.

2. In the event that Ecology determines, based on a notification provided under S4.F.1 or through any other means, that a discharge from an MS4 owned or operated by the Permittee is causing or contributing to a violation of Water Quality Standards in a receiving water, Ecology will notify the Permittee in writing that an adaptive management response outlined in S4.F.3 below is required, unless:

    a. Ecology also determines that the violation of Water Quality Standards is already being addressed by a Total Maximum Daily Load (TMDL) or other enforceable water quality cleanup plan; or

    b. Ecology concludes the MS4 contribution to the violation will be eliminated through implementation of other permit requirements.

3. Adaptive Management Response

    a. Within 60 days of receiving a notification under S4.F.2, or by an alternative date established by Ecology, the Permittee shall review its Stormwater Management Program (SWMP) and submit a report to Ecology. The report shall include:

        i. A description of the operational and/or structural BMPs that are currently being implemented to prevent or reduce any pollutants that are causing or contributing to the violation of Water Quality Standards, including a qualitative assessment of the effectiveness of each best management practice (BMP).

        ii. A description of potential additional operational and/or structural BMPs that will or may be implemented in order to apply AKART on a site-specific basis to prevent or reduce any pollutants that are causing or contributing to the violation of Water Quality Standards.

        iii. A description of the potential monitoring or other assessment and evaluation efforts that will or may be implemented to monitor, assess, or evaluate the effectiveness of the additional BMPs.

        iv. A schedule for implementing the additional BMPs including, as appropriate: funding, training, purchasing, construction, monitoring, and other assessment and evaluation components of implementation.

    b. Ecology will, in writing, acknowledge receipt of the report within a reasonable time and notify the Permittee when it expects to complete its review of the report. Ecology will either approve the additional BMPs and implementation schedule or require the Permittee to modify the report as

needed to meet AKART on a site-specific basis. If modifications are required, Ecology will specify a reasonable time frame in which the Permittee shall submit and Ecology will review the revised report.

c. The Permittee shall implement the additional BMPs, pursuant to the schedule approved by Ecology, beginning immediately upon receipt of written notification of approval.

d. The Permittee shall include with each subsequent annual report a summary of the status of implementation and the results of any monitoring, assessment or evaluation efforts conducted during the reporting period. If, based on the information provided under this subsection, Ecology determines that modification of the BMPs or implementation schedule is necessary to meet AKART on a site-specific basis, the Permittee shall make such modifications as Ecology directs. In the event there are ongoing violations of water quality standards despite the implementation of the BMP approach of this section, the Permittee may be subject to compliance schedules to eliminate the violation under WAC 173-201A-510(4) and WAC 173-226-180 or other enforcement orders as Ecology deems appropriate during the term of this permit.

e. A TMDL or other enforceable water quality cleanup plan that has been approved and is being implemented to address the MS4's contribution to the Water Quality Standards violation supersedes and terminates the S4.F.3 implementation plan.

f. Provided the Permittee is implementing the approved adaptive management response under this section, the Permittee remains in compliance with Condition S4, despite any on-going violations of Water Quality Standards identified under S4.A or B above.

g. The adaptive management process provided under Section S.4.F is not intended to create a shield for the Permittee from any liability it may face under 42 U.S.C. 9601 *et seq*. or chapter 70.105D RCW.

G. Ecology may modify or revoke and reissue this General Permit in accordance with G14 General Permit Modification and Revocation, if Ecology becomes aware of additional control measures, management practices or other actions beyond what is required in this Permit that are necessary to:

1. Reduce the discharge of pollutants to the MEP,

2. Comply with the state AKART requirements, or

3. Control the discharge of toxicants to waters of the State of Washington.

S5. STORMWATER MANAGEMENT PROGRAM FOR CITIES, TOWNS, AND COUNTIES

A. Each Permittee shall develop and implement a Stormwater Management Program (SWMP). A SWMP is a set of actions and activities comprising the components listed in S5 and any additional actions necessary, to meet the requirements of applicable TMDLs pursuant to S7 *Compliance with TMDL Requirements*, and S8 *Monitoring and Assessment*. This section applies to all cities, towns, and counties covered under this Permit, including cities, towns, and counties that are Co-Permittees. Where the term "Permittee" is used in this section the requirements apply to all cities, towns, and counties covered under this Permit.

New Permittees subject to this permit as described in S1.D.1.b shall fully meet the requirements in S5 as modified in footnotes below, or as specified in an alternate schedule as a condition of coverage by Ecology. Permittees obtaining coverage after the issuance date of this permit shall fully meet the requirements in S5 as specified in an alternate schedule as a condition of coverage by Ecology.

1. At a minimum the Permittee's SWMP shall be implemented throughout the geographic area subject to this Permit as described in S1.A.[1]

2. Each Permittee shall prepare written documentation of the SWMP, called the SWMP Plan. The SWMP Plan shall be organized according to the program components in S5.C or a format approved by Ecology, and shall be updated at least annually for submittal with the Permittee's annual reports to Ecology (see S9 Reporting and Record Keeping). The SWMP Plan shall be written to inform the public of the planned SWMP activities for the upcoming calendar year, and shall include a description of:

    a. Planned activities for each of the program components included in S5.C.

    b. Any additional planned actions to meet the requirements of applicable TMDLs pursuant to S7 Compliance with Total Maximum Daily Load Requirements.

    c. Any additional planned actions to meet the requirements of S8 Monitoring.

3. The SWMP shall include an ongoing program for gathering, tracking, maintaining, and using information to evaluate SWMP development, implementation and permit compliance and to set priorities.

[1] New Permittees shall fully develop and implement the SWMP in accordance with the schedules contained in this section no later than February 2, 2018.

a. Each Permittee shall track the cost or estimated cost of development and implementation of each component of the SWMP.[2] This information shall be provided to Ecology upon request.

b. Each Permittee shall track the number of inspections, official enforcement actions and types of public education activities as required by the respective program component. This information shall be included in the annual report.

4. Permittees shall continue implementation of existing stormwater management programs until they begin implementation of the updated stormwater management program in accordance with the terms of this permit, including implementation schedules.

5. Coordination among Permittees

a. Coordination among entities covered under municipal stormwater NPDES permits may be necessary to comply with certain conditions of the SWMP. The SWMP should include, when needed, coordination mechanisms among entities covered under a municipal stormwater NPDES permit to encourage coordinated stormwater-related policies, programs and projects within adjoining or shared areas, including:

i. Coordination mechanisms clarifying roles and responsibilities for the control of pollutants between physically interconnected MS4s covered by a municipal stormwater permit.

ii. Coordinating stormwater management activities for shared water bodies among Permittees to avoid conflicting plans, policies and regulations.

b. The SWMP shall include coordination mechanisms among departments within each jurisdiction to eliminate barriers to compliance with the terms of this permit. Permittees shall include a written description of internal coordination mechanisms in the Annual Report due no later than March 31, 2015.

B. The SWMP shall be designed to reduce the discharge of pollutants from regulated small MS4s to the MEP, meet state AKART requirements, and protect water quality.

C. The SWMP shall include the components listed below. To the extent allowable under state or federal law, all components are mandatory for city, town or county Permittees covered under this permit.

[2] New Permittees shall begin implementing the requirements of S5.A.3.a no later than August 1, 2015.

1. **Public Education and Outreach**

The SWMP shall include an education and outreach program designed to reduce or eliminate behaviors and practices that cause or contribute to adverse stormwater impacts and encourage the public to participate in stewardship activities. The education program may be developed and implemented locally or regionally.

The minimum performance measures are:

a. Each Permittee shall provide an education and outreach program for the area served by the MS4. The program shall be designed to educate target audiences about the stormwater problem and provide specific actions they can follow to minimize the problem.[3]

i. To build general awareness, Permittees shall select from the following target audiences and subject areas:

(a) General public (including school age children), and businesses (including home-based and mobile businesses)

- General impacts of stormwater on surface waters.
- Impacts from impervious surfaces.
- Impacts of illicit discharges and how to report them.
- Low impact development (LID) principles and LID BMPs.
- Opportunities to become involved in stewardship activities.

(b) Engineers, contractors, developers and land use planners

- Technical standards for stormwater site and erosion control plans.
- LID principles and LID BMPs.
- Stormwater treatment and flow control BMPs/facilities.

ii. To effect behavior change, Permittees shall select from the following target audiences and BMPs:

[3] New Permittees shall begin implementing the requirements of S5.C.1 no later than August 1, 2015.

(a) General public (which may include school age children), businesses (including home-based and mobile businesses)

- Use and storage of automotive chemicals, hazardous cleaning supplies, carwash soaps and other hazardous materials.
- Equipment maintenance.
- Prevention of illicit discharges.

(b) Residents, landscapers and property managers/owners

- Yard care techniques protective of water quality.
- Use and storage of pesticides and fertilizers and other household chemicals.
- Carpet cleaning and auto repair and maintenance.
- Vehicle, equipment and home/building maintenance.
- Pet waste management and disposal.
- LID principles and LID BMPs.
- Stormwater facility maintenance.
- Dumpster and trash compactor maintenance.

b. Each Permittee shall create stewardship opportunities and/or partner with existing organizations to encourage residents to participate in activities such as stream teams, storm drain marking, volunteer monitoring, riparian plantings and education activities.

c. Each Permittee shall measure the understanding and adoption of the targeted behaviors for at least one target audience in at least one subject area. No later than February 2, 2016, Permittees shall use the resulting measurements to direct education and outreach resources most effectively, as well as to evaluate changes in adoption of the targeted behaviors.[4] Permittees may meet this requirement individually or as a member of a regional group.

[4] By no later than August 1, 2017, new Permittees shall begin using the results of measurements to direct education and outreach resources more effectively, as well as to evaluate changes in adopted behaviors.

2. **Public Involvement and Participation**

Permittees shall provide ongoing opportunities for public involvement and participation through advisory councils, public hearings, watershed committees, participation in developing rate-structures or other similar activities. Each Permittee shall comply with applicable state and local public notice requirements when developing elements of the SWMP.

The minimum performance measures are:

a. Permittees shall create opportunities for the public to participate in the decision-making processes involving the development, implementation and update of the Permittee's SWMP.[5]

b. Each Permittee shall post on their website their SWMP Plan and the annual report required under S9.A no later than May 31 each year. All other submittals shall be available to the public upon request. To comply with the posting requirement, a Permittee that does not maintain a website may submit the updated SWMP in electronic format to Ecology for posting on Ecology's website.

3. **Illicit Discharge Detection and Elimination**

The SWMP shall include an ongoing program designed to prevent, detect, characterize, trace and eliminate illicit connections and illicit discharges into the MS4.

The minimum performance measures are:

a. Mapping of the MS4 shall continue on an ongoing basis.[6] MS4 maps shall be periodically updated. Update maps if necessary to meet the requirements of this section no later than February 2, 2018. At a minimum, maps shall include the following information:

i. Known MS4 outfalls and known MS4 discharge points.

ii. Receiving waters, other than ground water.

iii. Stormwater treatment and flow control BMPs/facilities owned or operated by the Permittee.

[5] New Permittees shall develop and begin to implement requirements of S5.C.2.a no later than August 1, 2014.

[6] New Permittees shall meet the requirements to map the MS4 according to S5.C.3.a no later than February 2, 2018, except where otherwise noted in this section.

iv. Tributary conveyances to all known outfalls and discharge points with a 24 inch nominal diameter or larger, or an equivalent cross-sectional area for non-pipe systems. The following attributes shall be mapped:

- Tributary conveyance type, material, and size where known.
- Associated drainage areas.
- Land use.

v. All connections to the MS4 authorized or allowed by the Permittee after February 16, 2007.[7]

vi. Connections between the MS4 owned or operated by the Permittee and other municipalities or public entities.

vii. Geographic areas served by the Permittee's MS4 that do not discharge stormwater to surface waters.

viii. To the extent consistent with national security laws and directives, each Permittee shall make available to Ecology upon request, MS4 map(s) depicting the information required in S5.C.3.a.i through vi above. The preferred format for mapping will be an electronic format with fully described mapping standards. An example description is available on Ecology website.

ix. Upon request, and to the extent appropriate, Permittees shall provide mapping information to federally-recognized Indian Tribes, municipalities, and other Permittees. This permit does not preclude Permittees from recovering reasonable costs associated with fulfilling mapping information requests by federally-recognized Indian Tribes, municipalities, and other Permittees.

b. Each Permittee shall implement an ordinance or other regulatory mechanism to effectively prohibit non-stormwater, illicit discharges into the Permittee's MS4 to the maximum extent allowable under state and federal law.[8]

i. Allowable Discharges: The regulatory mechanism does **not** need to prohibit the following categories of non-stormwater discharges:

- Diverted stream flows
- Rising ground waters

[7] New Permittees shall meet the requirements of S5.C.3.a.v. after August 1, 2013 for all connections to the MS4 authorized after August 1, 2013.

[8] New Permittees shall meet the requirements of S5.C.3.b no later than February 2, 2016.

- Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(b)(20))
- Uncontaminated pumped ground water
- Foundation drains
- Air conditioning condensation
- Irrigation water from agricultural sources that is commingled with urban stormwater
- Springs
- Uncontaminated water from crawl space pumps
- Footing drains
- Flows from riparian habitats and wetlands
- Non-stormwater discharges authorized by another NPDES or state waste discharge permit
- Discharges from emergency fire fighting activities in accordance with S2 Authorized Discharges

ii. Conditionally Allowable Discharges: The regulatory mechanism may allow the following categories of non-stormwater discharges only if the stated conditions are met:

- Discharges from potable water sources, including but not limited to water line flushing, hyperchlorinated water line flushing, fire hydrant system flushing, and pipeline hydrostatic test water. Planned discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted, if necessary, and volumetrically and velocity controlled to prevent re-suspension of sediments in the MS4.
- Discharges from lawn watering and other irrigation runoff. These discharges shall be minimized through, at a minimum, public education activities (see section S5.C.1) and water conservation efforts.
- Dechlorinated swimming pool, spa and hot tub discharges. The discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted and reoxygenized if necessary, volumetrically and velocity controlled to prevent re-suspension of sediments in the MS4.

Discharges shall be thermally controlled to prevent an increase in temperature of the receiving water. Swimming pool cleaning wastewater and filter backwash shall not be discharged to the MS4.

- Street and sidewalk wash water, water used to control dust, and routine external building washdown that does not use detergents. The Permittee shall reduce these discharges through, at a minimum, public education activities (see section S5.C.1) and/or water conservation efforts. To avoid washing pollutants into the MS4, Permittees shall minimize the amount of street wash and dust control water used.

- Other non-stormwater discharges. The discharges shall be in compliance with the requirements of a pollution prevention plan reviewed by the Permittee, which addresses control of such discharges.

iii. The Permittee shall further address any category of discharges in (i) or (ii) above if the discharges are identified as significant sources of pollutants to waters of the State.

iv. The ordinance or other regulatory mechanism shall include escalating enforcement procedures and actions.

v. The Permittee shall implement a compliance strategy that includes informal compliance actions such as public education and technical assistance as well as the enforcement provisions of the ordinance or other regulatory mechanism. To implement an effective compliance strategy, the Permittee's ordinance or other regulatory mechanism may need to include the following tools:

- The application of operational and/or structural source control BMPs for pollutant generating sources associated with existing land uses and activities where necessary to prevent illicit discharges. The source control BMPs referenced in this subsection are in Volume IV of the *Stormwater Management Manual for Western Washington*, or an equivalent manual approved by Ecology under the 2013 Phase I Permit.

- The maintenance of stormwater facilities which discharge into the Permittee's MS4 in accordance with maintenance standards established under S5.C.4 and/or S5.C.5 where necessary to prevent illicit discharges.

vi. The Permittee's ordinance or other regulatory mechanism in effect as of the effective date of this permit shall be revised if necessary to meet the requirements of this section no later than February 2, 2018.

c. Each Permittee shall implement an ongoing program designed to detect and identify non-stormwater discharges and illicit connections into the Permittee's MS4.[9] The program shall include the following components:

i. Procedures for conducting investigations of the Permittee's MS4, including field screening and methods for identifying potential sources.

The Permittee shall implement a field screening methodology appropriate to the characteristics of the MS4 and water quality concerns. Screening for illicit connections may be conducted using: *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, Center for Watershed Protection, October 2004, or another methodology of comparable or improved effectiveness. The Permittee shall document the field screening methodology in the relevant Annual Report.

All Permittees, except for the City of Aberdeen, shall complete field screening for at least 40% of the MS4 no later than December 31, 2017,[10] and on average 12% each year thereafter. The City of Aberdeen shall complete field screening for at least 40% of the system no later than June 30, 2018 and on average 12% each year thereafter.

ii. A publicly listed and publicized hotline or other telephone number for public reporting of spills and other illicit discharges.[11]

iii. An ongoing training program for all municipal field staff, who, as part of their normal job responsibilities, might come into contact with or otherwise observe an illicit discharge and/or illicit connection to the MS4, on the identification of an illicit discharge and/or connection, and on the proper procedures for reporting and responding to the illicit discharge and/or connection. Follow-up training shall be provided as needed to address changes in procedures, techniques, requirements, or

[9] New Permittees shall fully implement the requirements of S5.C.3.c no later than February 2, 2018, except where otherwise noted in this section.

[10] New Permittees shall complete S5.C.3.c.i requirements for field screening covering at least 12% of the MS4 within the Permittee's coverage area no later than December 31, 2017, and on average 12% each year thereafter.

[11] New Permittees shall implement the requirements of S5.C.3.c.ii no later than August 1, 2015.

staffing. Permittees shall document and maintain records of the trainings provided and the staff trained.[12]

iv. Permittees shall inform public employees, businesses, and the general public of hazards associated with illicit discharges and improper disposal of waste.[13]

d. Each Permittee shall implement an ongoing program designed to address illicit discharges, including spills and illicit connections, into the Permittee's MS4.[14] The program shall include:

i. Procedures for characterizing the nature of, and potential public or environmental threat posed by, any illicit discharges found by or reported to the Permittee. Procedures shall address the evaluation of whether the discharge must be immediately contained and steps to be taken for containment of the discharge.

ii. Procedures for tracing the source of an illicit discharge; including visual inspections, and when necessary, opening manholes, using mobile cameras, collecting and analyzing water samples, and/or other detailed inspection procedures.

iii. Procedures for eliminating the discharge; including notification of appropriate authorities; notification of the property owner; technical assistance; follow-up inspections; and use of the compliance strategy developed pursuant to S5.C.3.b.v, including escalating enforcement and legal actions if the discharge is not eliminated.

iv. Compliance with the provisions in (i), (ii), and (iii), above, shall be achieved by meeting the following timelines:

- Immediately respond to all illicit discharges, including spills, which are determined to constitute a threat to human health, welfare, or the environment, consistent with General Condition G3.

- Investigate (or refer to the appropriate agency with the authority to act) within 7 days, on average, any complaints, reports or monitoring information that indicates a potential illicit discharge.

[12] New Permittees shall develop and begin implementing the ongoing training program described in S5.C.3.c.iii no later than February 2, 2016.

[13] New Permittees shall inform public employees, businesses, and the general public of hazards associated with illicit discharges no later than February 2, 2017.

[14] New Permittees shall fully develop and implement the requirements of S5.C.3.d no later than February 2, 2018.

- Initiate an investigation within 21 days of any report or discovery of a suspected illicit connection to determine the source of the connection, the nature and volume of discharge through the connection, and the party responsible for the connection.

- Upon confirmation of an illicit connection, use the compliance strategy in a documented effort to eliminate the illicit connection within 6 months. All known illicit connections to the MS4 shall be eliminated.

e. Permittees shall train staff who are responsible for identification, investigation, termination, cleanup, and reporting of illicit discharges, including spills, and illicit connections, to conduct these activities. Follow-up training shall be provided as needed to address changes in procedures, techniques, requirements or staffing. Permittees shall document and maintain records of the training provided and the staff trained.[15]

f. Recordkeeping: Permittees shall track and maintain records of the activities conducted to meet the requirements of this section.

4. **Controlling Runoff from New Development, Redevelopment and Construction Sites**

Each Permittee shall implement and enforce a program to reduce pollutants in stormwater runoff to a regulated small MS4 from new development, redevelopment and construction site activities. The program shall apply to private and public development, including roads.[16]

The minimum performance measures are:

a. Implement an ordinance or other enforceable mechanism that addresses runoff from new development, redevelopment, and construction site projects. Except for Permittees in Lewis and Cowlitz Counties and the City of Aberdeen, the ordinance or other enforceable mechanism to implement (i) through (iii), below, shall be adopted and effective no later than December 31, 2016. The local program adopted to meet the requirements of S5.C.4.a(i) through (iii), below shall apply to all applications[17] submitted on or after January 1, 2017 and shall apply to applications submitted prior to January 1, 2017, which have

[15] New Permittees shall meet the requirements of S5.C.3.e no later than February 2, 2016.

[16] New Permittees shall meet the requirements of S5.C.4 no later than December 31, 2017, except where otherwise specified in this section.

[17] In this context, "application" means, at a minimum a complete project description, site plan, and, if applicable, SEPA checklist. Permittees may establish additional elements of a completed application.

not started construction[18] by January 1, 2022[19].

For Permittees in Lewis and Cowlitz Counties the ordinance or other enforceable mechanism to implement (i) through (iii), below, shall be adopted and effective no later than June 30, 2017. The local program adopted to meet the requirements of S5.C.4.a(i) through (iii), below shall apply to all applications submitted on or after July 1, 2017 and shall apply to applications submitted prior to July 1, 2017, which have not started construction by June 30, 2022.

For the City of Aberdeen the ordinance or other enforceable mechanism to implement (i) through (iii), below, shall be adopted and effective no later than June 30, 2018. The local program adopted to meet the requirements of S5.C.4.a(i) through (iii), below shall apply to all applications submitted on or after July 1, 2018 and shall apply to applications submitted prior to July 1, 2018, which have not started construction by June 30, 2023.

The ordinance or other enforceable mechanism shall include, at a minimum:

i. The Minimum Requirements, thresholds, and definitions in Appendix 1 or a program approved by Ecology under the 2013 NPDES Phase I Municipal Stormwater Permit, for new development, redevelopment, and construction sites. Adjustment and variance criteria equivalent to those in Appendix 1 shall be included. More stringent requirements may be used, and/or certain requirements may be tailored to local circumstances through the use of Ecology-approved basin plans or other similar water quality and quantity planning efforts. Such local requirements and thresholds shall provide equal protection of receiving waters and equal levels of pollutant control to those provided in Appendix 1.

ii. The local requirements shall include the following requirements, limitations, and criteria that, when used to implement the minimum requirements in Appendix 1 (or program approved by Ecology under the 2013 Phase I Permit) will protect water quality, reduce the

[18] In this context "started construction" means the site work associated with, and directly related to the approved project has begun. For example: grading the project site to final grade or utility installation. Simply clearing the project site does not constitute the start of construction. Permittees may establish additional requirements related to the start of construction.

[19] New Permittees shall meet the requirements of S5.C.4.a no later than December 31, 2017. The local program shall apply to all applications submitted on or after January 1, 2018 and shall apply to applications submitted prior to January 1, 2018, which have not started construction by January 1, 2023.

discharge of pollutants to the MEP, and satisfy the State requirement under chapter 90.48 RCW to apply AKART prior to discharge:

(a) Site planning requirements

(b) BMP selection criteria

(c) BMP design criteria

(d) BMP infeasibility criteria

(e) LID competing needs criteria

(f) BMP limitations

Permittees shall document how the criteria and requirements will protect water quality, reduce the discharge of pollutants to the MEP, and satisfy State AKART requirements.

Permittees who choose to use the requirements, limitations, and criteria above in the *Stormwater Management Manual for Western Washington,* or a program approved by Ecology under the 2013 Phase I Permit, may cite this choice as their sole documentation to meet this requirement.

iii. The legal authority, through the approval process for new development and redevelopment, to inspect and enforce maintenance standards for private stormwater facilities approved under the provisions of this section that discharge to the Permittee's MS4.

b. The program shall include a permitting process with site plan review, inspection and enforcement capability to meet the standards listed in (i) through (iv) below, for both private and public projects, using qualified personnel (as defined in *Definitions and Acronyms*). At a minimum, this program shall be applied to all sites that meet the minimum thresholds adopted pursuant to S5.C.4.a.i, above.

i. Review of all stormwater site plans for proposed development activities.

ii. Inspect, prior to clearing and construction, all permitted development sites that have a high potential for sediment transport as determined through plan review based on definitions and requirements in Appendix 7 Determining Construction Site Sediment Damage Potential. As an alternative to evaluating each site according to Appendix 7, Permittees may choose to inspect all construction sites that meet the minimum thresholds adopted pursuant to S5.C.4.a.i, above.

iii. Inspect all permitted development sites during construction to verify proper installation and maintenance of required erosion and sediment controls. Enforce as necessary based on the inspection.

iv. Inspect all permitted development sites upon completion of construction and prior to final approval or occupancy to ensure proper installation of permanent stormwater facilities. Verify that a maintenance plan is completed and responsibility for maintenance is assigned for stormwater treatment and flow control BMPs/facilities. Enforce as necessary based on the inspection.

v. Compliance with the inspection requirements in (ii), (iii) and (iv) above, shall be determined by the presence and records of an established inspection program designed to inspect all sites. Compliance during this permit term shall be determined by achieving at least 80% of scheduled inspections.

vi. An enforcement strategy shall be implemented to respond to issues of non-compliance.

c. The program shall include provisions to verify adequate long-term operation and maintenance (O&M) of stormwater treatment and flow control BMPs/facilities that are permitted and constructed pursuant to (b) above. Except for Permittees located in Lewis or Cowlitz Counties and the City of Aberdeen, these provisions shall be in place no later than December 31, 2016. [20] For Permittees in Lewis and Cowlitz Counties, the provisions shall be in place no later than June 30, 2017. For the City of Aberdeen, the provisions shall be in place no later than June 30, 2018. The provisions shall include:

i. Implementation of an ordinance or other enforceable mechanism that clearly identifies the party responsible for maintenance, requires inspection of facilities in accordance with the requirements in (ii) through (iv) below, and establishes enforcement procedures.

ii. Each Permittee shall establish maintenance standards that are as protective or more protective of facility function than those specified in Chapter 4 of Volume V of the *Stormwater Management Manual for Western Washington*. For facilities which do not have maintenance standards, the Permittee shall develop a maintenance standard.

The purpose of the maintenance standard is to determine if maintenance is required. The maintenance standard is not a measure of the facility's required condition at all times between inspections.

[20] New Permittees shall meet the requirements of S5.C.4.c no later than December 31, 2017.

Exceeding the maintenance standard between the period of inspections is not a permit violation.

iii. Annual inspections of all stormwater treatment and flow control BMPs/facilities that discharge to the MS4 and were permitted by the Permittee according to S5.C.4.b, including those permitted in accordance with requirements adopted pursuant to the 2007-2012 Ecology municipal stormwater permits, unless there are maintenance records to justify a different frequency.

Permittees may reduce the inspection frequency based on maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records, the Permittee may substitute written statements to document a specific less frequent inspection schedule. Written statements shall be based on actual inspection and maintenance experience and shall be certified in accordance with G19 Certification and Signature.

iv. Inspections of all permanent stormwater treatment and flow control BMPs/facilities and catch basins in new residential developments every six months until 90% of the lots are constructed (or when construction is stopped and the site is fully stabilized) to identify maintenance needs and enforce compliance with maintenance standards as needed.

v. Compliance with the inspection requirements in (iii) and (iv) above shall be determined by the presence and records of an established inspection program designed to inspect all sites. Compliance during this permit term shall be determined by achieving at least 80% of scheduled inspections.

vi. Unless there are circumstances beyond the Permittee's control, when an inspection identifies an exceedance of the maintenance standard, maintenance shall be performed:

- Within 1 year for typical maintenance of facilities, except catch basins.
- Within 6 months for catch basins.
- Within 2 years for maintenance that requires capital construction of less than $25,000.

Circumstances beyond the Permittee's control include denial or delay of access by property owners, denial or delay of necessary permit approvals, and unexpected reallocations of maintenance staff to perform emergency work. For each exceedance of the required

timeframe, the Permittee shall document the circumstances and how they were beyond their control.

vii. The program shall include a procedure for keeping records of inspections and enforcement actions by staff, including inspection reports, warning letters, notices of violations, and other enforcement records. Records of maintenance inspections and maintenance activities shall be maintained.

d. The program shall make available as applicable copies of the "Notice of Intent for Construction Activity" and copies of the "Notice of Intent for Industrial Activity" to representatives of proposed new development and redevelopment. Permittees shall continue to enforce local ordinances controlling runoff from sites that are also covered by stormwater permits issued by Ecology.[21]

e. Each Permittee shall ensure that all staff whose primary job duties are implementing the program to control stormwater runoff from new development, redevelopment, and construction sites, including permitting, plan review, construction site inspections, and enforcement, are trained to conduct these activities. Follow-up training shall be provided as needed to address changes in procedures, techniques or staffing. Permittees shall document and maintain records of the training provided and the staff trained.[22]

f. Low impact development code-related requirements.

i. No later than December 31, 2016,[23] Permittees shall review, revise and make effective their local development-related codes, rules, standards, or other enforceable documents to incorporate and require LID principles and LID BMPs. For Permittees in Lewis and Cowlitz Counties, the deadline for this requirement is no later than June 30, 2017; for the City of Aberdeen, the deadline for this requirement is no later than June 30, 2018.

The intent of the revisions shall be to make LID the preferred and commonly-used approach to site development. The revisions shall be designed to minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations. Permittees shall conduct a similar review and revision process, and consider the range of issues, outlined in the following document: *Integrating LID*

[21] New Permittees shall meet the requirements of S5.C.4.d beginning no later than August 1, 2013.

[22] New Permittees shall meet the requirements of S5.C.4.e no later than December 31, 2017.

[23] New Permittees shall meet the requirements of S5.C.4.f.i no later than December 31, 2017.

into Local Codes: A Guidebook for Local Governments (Puget Sound Partnership, 2012).

ii. Except for Permittees in Lewis and Cowlitz Counties and the City of Aberdeen, each Permittee shall submit a summary of the results of the review and revision process in (i) above with the annual report due no later than March 31, 2017[24]. Permittees in Lewis and Cowlitz Counties shall submit the summary with the annual report due no later than March 31, 2018. The City of Aberdeen shall submit the summary with the Fifth Year annual report. This summary shall include, at a minimum, a list of the participants (job title, brief job description, and department represented), the codes, rules, standards, and other enforceable documents reviewed, and the revisions made to those documents which incorporate and require LID principles and LID BMPs. The summary shall include existing requirements for LID principles and LID BMPs in development-related codes. The summary shall be organized as follows:

(a) Measures to minimize impervious surfaces;

(b) Measures to minimize loss of native vegetation; and

(c) Other measures to minimize stormwater runoff.

g. Watershed-scale stormwater planning

The objective of watershed-scale stormwater planning is to identify a stormwater management strategy or strategies that would result in hydrologic and water quality conditions that fully support "existing uses," and "designated uses," as those terms are defined in WAC 173-201A-020, throughout the stream system.

Each City or County Permittee[25] that has all or part of its coverage area in a watershed selected by a Phase I county for watershed-scale stormwater planning under condition S5.C.5.c of the *Phase I Municipal Stormwater Permit* must fully participate in the watershed-scale stormwater planning process as described in S5.C.4.g, below. Permittees may choose to participate in a coordinated scope of work and schedule with one or more of the Permittees within the selected watershed, or conduct their scope of work independently.

[24] New Permittees shall meet the S5.C.4.f.ii reporting requirement in the annual report covering calendar year 2017 and due no later than March 31, 2018.

[25] This section applies to the Phase II Permittees within King County's selected watershed: the cities of Redmond and Woodinville. Bothell has minimal acreage in the Snohomish County watershed and is not required to participate.

i. No later than August 13, 2015, each Permittee within a selected watershed must submit to Ecology documentation of its approach to coordinate with other Permittees within the watershed, including:

(a) A list of the municipal stormwater Permittees with whom the Permittee will undertake watershed-scale planning under a common scope of work; and a description of the coordination and dispute resolution procedures agreed to by all of the Permittees operating under the common scope of work; and

(b) A description of planned coordination and dispute resolution procedures for providing and receiving feedback from Permittees operating under different scopes of work within the same watershed, including procedures to:

1) Review, provide comment, and revise methods and assumptions to meet S5.C.4.g.ii (a) through (d);

2) Review, provide comment, and revise present- and future-condition B-IBI scores, pollutant concentrations, temperature and hydrologic metrics used for calibrating the model;

3) Share the results of the modeling performed by the Permittee with all other Permittees in the watershed;

4) Adjust the Permittee's proposed changes to development-related codes, rules, standards, plans, and potential future structural stormwater control projects in response to feedback so that the planning objectives, as described in S5.C.4.g above, are projected to be met throughout the watershed.

(c) It is not a permit violation if other entities, over whose actions the Permittee has limited or no control, refuse to participate in the coordination plan described in S5.C.4.g.i.

ii. No later than November 4, 2015 the Permittee must submit a scope of work and a schedule to Ecology for the complete watershed-scale stormwater planning process. The scope of work and schedule are subject to Ecology's review and approval. If Ecology takes longer than 90 days to provide a written response, the required deadline for submitting a final watershed-scale stormwater plan to Ecology will be automatically extended by the number of days Ecology exceeds 90 days, but no later than July 30, 2018.

The scope of work and schedule must apply to the geographic extent of the jurisdictions of the Permittees listed under S5.C.4.g.i (a) above and, at a minimum, describe:

(a) An assessment of existing hydrologic, biologic, and water quality conditions within the selected watershed, and an assessment of the current status of the aquatic community. This assessment can be based on existing data where such data are available. Where such data are not available, or are not sufficient, the scope of work and schedule must include the collection of such data.

The existing conditions assessment must, at a minimum, include the following:

1) Water quality conditions as established through sampling during base flows and storm flows for, at a minimum, the following chemical parameters: dissolved copper, dissolved zinc, temperature, and fecal coliform. Permittees must identify or collect data from locations upgradient and downgradient of stream sections influenced by MS4 discharges.

2) Continuous flow monitoring of the stream to provide the data necessary to calibrate a continuous runoff model to the selected watershed. Permittees must identify or collect flow monitoring data from locations upgradient and downgradient of stream sections influenced by MS4 discharges.

3) Macroinvertebrate data for the purpose of estimating current Benthic Index of Biotic Integrity (B-IBI) scores and comparing them with the scores predicted by the existing values of the hydrologic metrics in S5.C.4.g.ii (d).

4) The status of the aquatic community, including the presence and distribution of salmonid uses, using data from existing sources.

(b) Efforts to compile and/or generate maps of the selected watershed to identify the existing distribution and totals of general soil types, vegetative land cover, impervious land covers, and regulated and other MS4s. Maps must be sufficient to allow construction of a rainfall/runoff model representation of the watershed. Maps must also identify areas within the watershed appropriate for special attention in regard to hydrologic and water quality impacts. For example: headwater wetlands and critical aquifer recharge areas.

(c) How the Permittee will use the existing conditions assessment from S5.C.4.g.ii (a) and the maps described in S5.C.4.g.ii (b) to

calibrate a continuous runoff model to reflect the existing hydrologic, water quality, and biologic (as represented by B-IBI score) conditions.

(d) How the Permittee will use the model calibrated in S5.C.4.g.ii (c) to estimate hydrologic changes from the historic condition; and to predict the future hydrologic, biologic, and water quality conditions at full build-out under existing or proposed comprehensive land use management plan(s) for the watershed. Future biologic conditions must be estimated by using a correlation of hydrologic metrics with B-IBI scores for *Puget Sound Lowland Streams*[26], or other similar correlation if approved by Ecology. Future water quality conditions must be described through estimation of concentrations of, at a minimum, dissolved copper, dissolved zinc, temperature, and fecal coliform.

(e) How, if the estimation in S5.C.4.g.ii (d) predicts water quality standards will not be met, the Permittee will use the calibrated watershed model to evaluate stormwater management strategies to meet the standards. The same hydrologic metrics and correlated B-IBI scores, and water quality parameters used in S5.C.4.g.ii (d) must be used to evaluate the effectiveness of strategies.

1) Stormwater management strategies to be evaluated for all jurisdictions in the watershed must include:

- Changes to development-related codes, rules, standards, and plans.
- Potential future structural stormwater control projects.

2) Stormwater management strategies evaluated may also include:

- Basin-specific stormwater control requirements for new development and redevelopment as allowed by Section 7 of Appendix 1.
- Strategies to encourage redevelopment and infill, and an assessment of options for efficient, effective runoff

[26] DeGasperi, C.L., Berge, H. B., Whiting, K. R., Burkey, J. J., Cassin, J. L. and Fuerstenberg, R. R. (2009), Linking Hydrologic Alteration to Biological Impairment in Urbanizing Streams of the Puget Lowland, Washington, USA. JAWRA Journal of the American Water Resources Association, 45: 512-533. Doi: 10.1111/j.1752-1688.2009.00306.x

controls for redevelopment projects, such as regional facilities, in lieu of individual site requirements.

(f) How the permittee will create an implementation plan and schedule that includes: potential future actions to implement the identified stormwater management strategies, responsible parties, estimated costs, and potential funding mechanisms.

(g) A public review and comment process that, at a minimum, focuses on the draft watershed-scale stormwater plan. The public review must allow for public comment from all governmental entities with jurisdiction within the watershed.

iii. The watershed-scale stormwater planning process, as documented in the scope of work and schedule, may include an evaluation of strategies to preserve or improve other factors that influence maintenance of the existing and designated uses of the stream. Examples include: channel restoration, in-stream culvert replacement, quality of the riparian zone, gravel disturbance regime, and presence and distribution of large woody debris.

iv. Each Permittee (or group of Permittees operating under a single scope of work, as described above) must submit a final watershed-scale stormwater plan to Ecology no later April 4, 2018. The plan must summarize results of the modeling and planning process, describe results of the evaluation of strategies under S5.C.4.g.ii (e), and include the implementation plan and schedule developed pursuant to S5.C.4.g.ii (f).

5. **Municipal Operations and Maintenance**

Each Permittee shall implement an operations and maintenance (O&M) program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations.[27]

The minimum performance measures are:

a. Each Permittee shall implement maintenance standards that are as protective, or more protective, of facility function than those specified in Chapter 4 of Volume V of the *Stormwater Management Manual for Western Washington*. For facilities which do not have maintenance standards, the Permittee shall develop a maintenance standard. Except for Permittees located in Lewis and

[27] New Permittees shall develop and implement the requirements of S5.C.5 no later than December 31, 2017 except where otherwise noted in this section.

Cowlitz Counties and the City of Aberdeen, no later than December 31, 2016, Permittees shall update their maintenance standards as necessary to meet the requirements of this section.[28] For Permittees in Lewis and Cowlitz Counties, this requirement shall apply no later than June 30, 2017; for the City of Aberdeen this requirement shall apply no later than June 30, 2018.

i. The purpose of the maintenance standard is to determine if maintenance is required. The maintenance standard is not a measure of the facility's required condition at all times between inspections. Exceeding the maintenance standard between inspections and/or maintenance is not a permit violation.

ii. Unless there are circumstances beyond the Permittee's control, when an inspection identifies an exceedance of the maintenance standard, maintenance shall be performed:

- Within 1 year for typical maintenance of facilities, except catch basins.
- Within 6 months for catch basins.
- Within 2 years for maintenance that requires capital construction of less than $25,000.

Circumstances beyond the Permittee's control include denial or delay of access by property owners, denial or delay of necessary permit approvals, and unexpected reallocations of maintenance staff to perform emergency work. For each exceedance of the required timeframe, the Permittee shall document the circumstances and how they were beyond their control.

b. Annual inspection of all municipally owned or operated permanent stormwater treatment and flow control BMPs/facilities, and taking appropriate maintenance actions in accordance with the adopted maintenance standards.[29]

Permittees may reduce the inspection frequency based on maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records, the Permittee may substitute written statements to document a specific less frequent inspection schedule. Written

[28] New Permittees shall adopt the updated maintenance standards in Chapter 4 of Volume V of the *Stormwater Management Manual for Western Washington* or an Ecology-approved program under the 2013 Phase I Permit no later than December 31, 2017.

[29] New Permittees shall begin annual inspections of municipally owned or operated stormwater treatment and flow control facilities/BMPs no later than December 31, 2017.

statements shall be based on actual inspection and maintenance experience and shall be certified in accordance with G19 Certification and Signature.

c. Spot checks of potentially damaged permanent stormwater treatment and flow control BMPs/facilities after major storm events (24 hour storm event with a 10 year or greater recurrence interval). If spot checks indicate widespread damage/maintenance needs, inspect all stormwater treatment and flow control BMPs/facilities that may be affected. Conduct repairs or take appropriate maintenance action in accordance with maintenance standards established above, based on the results of the inspections.

d. Except for the City of Aberdeen, inspection of all catch basins and inlets owned or operated by the Permittee at least once no later than August 1, 2017 and every two years thereafter. [30] For the City of Aberdeen, the deadline for this requirement shall be no later than June 30, 2018. Clean catch basins if the inspection indicates cleaning is needed to comply with maintenance standards established in the *Stormwater Management Manual for Western Washington*. Decant water shall be disposed of in accordance with Appendix 6 *Street Waste Disposal*.

The following alternatives to the standard approach of inspecting all catch basins once no later than August 1, 2017 and every two years thereafter (except no later than June 30, 2018 and every two years thereafter for the City of Aberdeen) may be applied to all or portions of the system:

i. The catch basin inspection schedule of every two years may be changed as appropriate to meet the maintenance standards based on maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records for catch basins, the Permittee may substitute written statements to document a specific, less frequent inspection schedule. Written statements shall be based on actual inspection and maintenance experiences and shall be certified in accordance with G19 Certification and Signature.

ii. Inspections at least once by August 1, 2017 and every two years thereafter may be conducted on a “circuit basis” whereby 25% of catch basins and inlets within each circuit are inspected to identify maintenance needs. Include an inspection of the catch basin immediately upstream of any system outfall or discharge point, if applicable. Clean all catch basins within a given circuit for which the

[30] New Permittees shall inspect and, if needed, clean all catch basins and inlets owned or operated by the Permittee in accordance with the requirements of S5.C.5.d once during the permit term, to be completed no later than February 2, 2018.

inspection indicates cleaning is needed to comply with maintenance standards established under S5.C.5.a, above.

iii. The Permittee may clean all pipes, ditches, catch basins, and inlets within a circuit once during the permit term. Circuits selected for this alternative must drain to a single point.

e. Compliance with the inspection requirements in b, c, and d above shall be determined by the presence of an established inspection program designed to inspect all sites and achieving at least 95% of inspections.

f. Implement practices, policies and procedures to reduce stormwater impacts associated with runoff from all lands owned or maintained by the Permittee, and road maintenance activities under the functional control of the Permittee. Lands owned or maintained by the Permittee include, but are not limited to, streets, parking lots, roads, highways, buildings, parks, open space, road right-of-ways, maintenance yards, and stormwater treatment and flow control BMPs/facilities. The following activities shall be addressed:

- Pipe cleaning
- Cleaning of culverts that convey stormwater in ditch systems
- Ditch maintenance
- Street cleaning
- Road repair and resurfacing, including pavement grinding
- Snow and ice control
- Utility installation
- Pavement striping maintenance
- Maintaining roadside areas, including vegetation management
- Dust control
- Application of fertilizers, pesticides, and herbicides according to the instructions for their use, including reducing nutrients and pesticides using alternatives that minimize environmental impacts
- Sediment and erosion control
- Landscape maintenance and vegetation disposal
- Trash and pet waste management
- Building exterior cleaning and maintenance

g. Implement an ongoing training program for employees of the Permittee whose primary construction, operations or maintenance job functions may impact stormwater quality. The training program shall address the importance of protecting water quality, operation and maintenance standards, inspection procedures, selecting appropriate BMPs, ways to perform their job activities to prevent or minimize impacts to water quality, and procedures for reporting water quality concerns. Follow-up training shall be provided as needed to address changes in procedures, techniques, requirements, or staffing. Permittees shall document and maintain records of training provided and the staff trained.

h. Implement a Stormwater Pollution Prevention Plan (SWPPP) for all heavy equipment maintenance or storage yards, and material storage facilities owned or operated by the Permittee in areas subject to this Permit that are not required to have coverage under the *General NPDES Permit for Stormwater Discharges Associated with Industrial Activities* or another NPDES permit that authorizes stormwater discharges associated with the activity. A schedule for implementation of structural BMPs shall be included in the SWPPP. Generic SWPPPs that can be applied at multiple sites may be used to comply with this requirement. The SWPPP shall include periodic visual observation of discharges from the facility to evaluate the effectiveness of the BMP.

i. Maintain records of inspections and maintenance or repair activities conducted by the Permittee.

S6. STORMWATER MANAGEMENT PROGRAM FOR SECONDARY PERMITTEES

A. This section applies to all Secondary Permittees and all New Secondary Permittees, whether coverage under this Permit is obtained individually or as a Co-Permittee with a city, town, county or another Secondary Permittee.

New Secondary Permittees subject to this Permit shall fully meet the requirements of this section as modified in footnotes in S6.D below, or as established as a condition of coverage by Ecology.

1. To the extent allowable under state, federal or local law, all components are mandatory for each Secondary Permittee covered under this Permit, whether covered as an individual Permittee or as a Co-Permittee.

2. Each Secondary Permittee shall develop and implement a stormwater management program (SWMP). A SWMP is a set of actions and activities comprising the components listed in S6 and any additional actions necessary to meet the requirements of applicable TMDLs pursuant to S7 Compliance with TMDL Requirements, and S8 Monitoring and Assessment. The SWMP shall be designed to reduce the discharge of pollutants from regulated small MS4s to the MEP and protect water quality.

3. Unless an alternate implementation schedule is established by Ecology as a condition of permit coverage, the SWMP shall be developed and implemented in accordance with the schedules contained in this section and shall be fully developed and implemented no later than four and one-half years from the initial permit coverage date. Secondary Permittees that are already implementing some or all of the required SWMP components shall continue implementation of those components.

4. Secondary Permittees may implement parts of their SWMP in accordance with the schedule for cities, towns, and counties in S5, provided they have signed a memorandum of understanding or other agreement to jointly implement the activity or activities with one or more jurisdictions listed in S1.D.2.a or S1.D.2.b, and submitted a copy of the agreement to Ecology.

5. Each Secondary Permittee shall prepare written documentation of the SWMP, called the SWMP Plan. The SWMP Plan shall include a description of program activities for the upcoming calendar year.

B. Coordination

Secondary Permittees shall coordinate stormwater-related policies, programs and projects within a watershed and interconnected MS4s. Where relevant and appropriate, the SWMP shall coordinate among departments of the Secondary Permittee to ensure compliance with the terms of this Permit.

C. Legal Authority

To the extent allowable under state law and federal law, each Secondary Permittee shall be able to demonstrate that they can operate pursuant to legal authority which authorizes or enables the Secondary Permittee to control discharges to and from MS4s owned or operated by the Secondary Permittee.

This legal authority may be a combination of statutes, ordinances, permits, contracts, orders, interagency agreements, or similar instruments.

D. Stormwater Management Program for Secondary Permittees

The SWMP for Secondary Permittees shall include the following components:

1. **Public Education and Outreach**

Each Secondary Permittee shall implement the following stormwater education strategies:

a. Storm drain inlets owned or operated by the Secondary Permittee that are located in maintenance yards, in parking lots, along sidewalks, and at

pedestrian access points shall be clearly labeled with a message similar to "Dump no waste – Drains to water body".[31]

As identified during visual inspection and regular maintenance of storm drain inlets per the requirements of S6.D.3.d and S6.D.6.a.i below, or as otherwise reported to the Secondary Permittee, any inlet having a label that is no longer clearly visible and/or easily readable shall be re-labeled within 90 days.

b. Each year beginning no later than three years from the initial date of permit coverage, public ports, colleges, and universities shall distribute educational information to tenants and residents on the impact of stormwater discharges on receiving waters, and steps that can be taken to reduce pollutants in stormwater runoff. Distribution may be by hard copy or electronic means. Appropriate topics may include:

   i. How stormwater runoff affects local water bodies.

   ii. Proper use and application of pesticides and fertilizers.

   iii. Benefits of using well-adapted vegetation.

   iv. Alternative equipment washing practices, including cars and trucks, that minimize pollutants in stormwater.

   v. Benefits of proper vehicle maintenance and alternative transportation choices; proper handling and disposal of vehicle wastes, including the location of hazardous waste collection facilities in the area.

   vi. Hazards associated with illicit connections and illicit discharges.

   vii. Benefits of litter control of pet waste.

2. **Public Involvement and Participation**

Each year, no later than May 31, each Secondary Permittee shall:

a. Make the annual report available on the Permittee's website.

b. Make available on the Permittee's website the latest updated version of the SWMP Plan.

c. A Secondary Permittee that does not maintain a website may submit the updated SWMP Plan and annual report in electronic format to Ecology for posting on Ecology's website.

[31] New Secondary Permittees shall label all inlets as described in S6.D.1.a no later than four years from the initial date of permit coverage.

3. **Illicit Discharge Detection and Elimination**

Each Secondary Permittee shall:

a. From the initial date of permit coverage, comply with all relevant ordinances, rules, and regulations of the local jurisdiction(s) in which the Secondary Permittee is located that govern non-stormwater discharges.

b. Implement appropriate policies prohibiting illicit discharges,[32] and an enforcement plan to ensure compliance with illicit discharge policies.[33] These policies shall address, at a minimum: illicit connections, non-stormwater discharges, including spills of hazardous materials, and improper disposal of pet waste and litter.

i. Allowable discharges: The policies do not need to prohibit the following categories of non-stormwater discharges:

- Diverted stream flows
- Rising ground waters
- Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(b)(20))
- Uncontaminated pumped ground water
- Foundation drains.
- Air conditioning condensation
- Irrigation water from agricultural sources that is commingled with urban stormwater
- Springs
- Uncontaminated water from crawl space pumps
- Footing drains
- Flows from riparian habitats and wetlands

[32] New Secondary Permittees shall develop and implement appropriate policies prohibiting illicit discharges, and identify possible enforcement mechanisms as described in S6.D.3.b no later than one year from the initial date of permit coverage.

[33] New Secondary Permittees shall develop and implement an enforcement plan as described in S6.D.3.b no later than 18 months from the initial date of permit coverage.

- Discharges from emergency fire fighting activities in accordance with S2 Authorized Discharges
- Non-stormwater discharges authorized by another NPDES or state waste discharge permit

ii. Conditionally allowable discharges: The policies may allow the following categories of non-stormwater discharges only if the stated conditions are met and such discharges are allowed by local codes:

- Discharges from potable water sources, including but not limited to water line flushing, hyperchlorinated water line flushing, fire hydrant system flushing, and pipeline hydrostatic test water. Planned discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted if necessary, and volumetrically and velocity controlled to prevent resuspension of sediments in the MS4.
- Discharges from lawn watering and other irrigation runoff. These discharges shall be minimized through, at a minimum, public education activities and water conservation efforts conducted by the Secondary Permittee and/or the local jurisdiction.
- Dechlorinated swimming pool, spa and hot tub discharges. The discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted and reoxygenated if necessary, and volumetrically and velocity controlled to prevent resuspension of sediments in the MS4. Discharges shall be thermally controlled to prevent an increase in temperature of the receiving water. Swimming pool cleaning wastewater and filter backwash shall not be discharged to the MS4.
- Street and sidewalk wash water, water used to control dust, and routine external building washdown that does not use detergents. The Secondary Permittee shall reduce these discharges through, at a minimum, public education activities and/or water conservation efforts conducted by the Secondary Permittee and/or the local jurisdiction. To avoid washing pollutants into the MS4, the Secondary Permittee shall minimize the amount of street wash and dust control water used.

- Other non-stormwater discharges shall be in compliance with the requirements of a pollution prevention plan reviewed by the Permittee which addresses control of such discharges.

iii. The Secondary Permittee shall address any category of discharges in (i) or (ii) above if the discharge is identified as a significant source of pollutants to waters of the State.

c. Maintain a storm sewer system map showing the locations of all known MS4 outfalls and discharge points, labeling the receiving waters (other than ground water) and delineating the areas contributing runoff to each outfall and discharge point. Make the map (or completed portions of the map) available on request to Ecology and to the extent appropriate, to other Permittees. The preferred format for mapping is an electronic format with fully described mapping standards. An example description is provided on Ecology's website.[34]

d. Conduct field inspections and visually inspect for illicit discharges at all known MS4 outfalls and discharge points. Visually inspect at least one third (on average) of all known outfalls and discharge points each year beginning no later than two years from the initial date of permit coverage. Implement procedures to identify and remove any illicit discharges. Keep records of inspections and follow-up activities.

e. Implement a spill response plan that includes coordination with a qualified spill responder.[35]

f. No later than two years from initial date of permit coverage, provide staff training or coordinate with existing training efforts to educate staff on proper BMPs for preventing illicit discharges, including spills. Train all Secondary Permittee staff who, as part of their normal job responsibilities, have a role in preventing such illicit discharges.

4. **Construction Site Stormwater Runoff Control**

From the initial date of permit coverage, each Secondary Permittee shall:

a. Comply with all relevant ordinances, rules, and regulations of the local jurisdiction(s) in which the Secondary Permittee is located that govern construction phase stormwater pollution prevention measures.

[34] New Secondary Permittees shall meet the requirements of S6.D.3.c no later than four and one-half years from the initial date of permit coverage.

[35] New Secondary Permittees shall develop and implement a spill response plan as described in S6.D.3.e no later than four and one-half years from the initial date of permit coverage.

b. Ensure that all construction projects under the functional control of the Secondary Permittee which require a construction stormwater permit obtain coverage under the *NPDES General Permit for Stormwater Discharges Associated with Construction Activitie*s or an individual NPDES permit prior to discharging construction related stormwater.

c. Coordinate with the local jurisdiction regarding projects owned or operated by other entities which discharge into the Secondary Permittee's MS4, to assist the local jurisdiction with achieving compliance with all relevant ordinances, rules, and regulations of the local jurisdiction(s).

d. Provide training or coordinate with existing training efforts to educate relevant staff in erosion and sediment control BMPs and requirements, or hire trained contractors to perform the work.

e. Coordinate as requested with Ecology or the local jurisdiction to provide access for inspection of construction sites or other land disturbances which are under the functional control of the Secondary Permittee during land disturbing activities and/or construction period.

5. **Post-Construction Stormwater Management for New Development and Redevelopment**

From the initial date of permit coverage, each Secondary Permittee shall:

a. Comply with all relevant ordinances, rules and regulations of the local jurisdiction(s) in which the Secondary Permittee is located that govern post-construction stormwater pollution prevention measures.

b. Coordinate with the local jurisdiction regarding projects owned or operated by other entities which discharge into the Secondary Permittee's MS4, to assist the local jurisdiction with achieving compliance with all relevant ordinances, rules and regulations of the local jurisdiction(s).

6. **Pollution Prevention and Good Housekeeping for Municipal Operations**

Each Secondary Permittee shall:

a. Implement a municipal operation and maintenance (O&M) plan to minimize stormwater pollution from activities conducted by the Secondary Permittee. The O&M Plan shall include appropriate pollution prevention and good housekeeping procedures for all of the following operations, activities, and/or

types of facilities that are present within the Secondary Permittee's boundaries and under the functional control of the Secondary Permittee.[36]

i. **Stormwater collection and conveyance systems**, including catch basins, stormwater pipes, open channels, culverts, and stormwater treatment and flow control BMPs/facilities. The O&M Plan shall address, at a minimum: scheduled inspections and maintenance activities, including cleaning and proper disposal of waste removed from the system. Secondary Permittees shall properly maintain stormwater collection and conveyance systems owned or operated by the Secondary Permittee and regularly inspect and maintain all stormwater facilities to ensure facility function.

Secondary Permittees shall establish maintenance standards that are as protective or more protective of facility function than those specified in Chapter 4 Volume V of the *Stormwater Management Manual for Western Washington*. Secondary Permittees shall review their maintenance standards to ensure they are consistent with the requirements of this section.

Secondary Permittees shall conduct spot checks of potentially damaged permanent stormwater treatment and flow control BMPs/facilities following major storm events (24 hour storm event with a 10 year or greater recurrence interval).

ii. **Roads, highways, and parking lots**. The O&M Plan shall address, but is not limited to: deicing, anti-icing, and snow removal practices; snow disposal areas; material (e.g., salt, sand, or other chemical) storage areas; all-season BMPs to reduce road and parking lot debris and other pollutants from entering the MS4.

iii. **Vehicle fleets**. The O&M Plan shall address, but is not limited to: storage, washing, and maintenance of Secondary Permittee vehicle fleets; and fueling facilities. Secondary Permittees shall conduct all vehicle and equipment washing and maintenance in a self-contained covered building or in designated wash and/or maintenance areas.

iv. **External building maintenance**. The O&M Plan shall address, building exterior cleaning and maintenance including cleaning, washing, painting; and maintenance and management of dumpsters; and other maintenance activities.

[36] New Secondary Permittees shall develop and implement the operation and maintenance plan described in S6.D.6.a no later than three years from initial date of permit coverage.

v. **Parks and open space**. The O&M Plan shall address, but is not limited to: proper application of fertilizer, pesticides, and herbicides; sediment and erosion control; BMPs for landscape maintenance and vegetation disposal; and trash and pet waste management.

vi. **Material storage facilities and heavy equipment maintenance or storage yards**. Secondary Permittees shall develop and implement a Stormwater Pollution Prevention Plan to protect water quality at each of these facilities owned or operated by the Secondary Permittee and not covered under the *General NPDES Permit for Stormwater Discharges Associated with Industrial Activities* or under another NPDES permit that authorizes stormwater discharges associated with the activity.

vii. **Other facilities that would reasonably be expected to discharge contaminated runoff**. The O&M Plan shall address proper stormwater pollution prevention practices for each facility.

b. From the initial date of permit coverage, Secondary Permittees shall also have permit coverage for all facilities operated by the Secondary Permittee that are required to be covered under the *General NPDES Permit for Stormwater Discharges Associated with Industrial Activities* or another NPDES permit that authorizes discharges associated with the activity.

c. The O&M Plan shall include sufficient documentation and records as necessary to demonstrate compliance with the O&M Plan requirements in S6.D.6.a.(i) through (vii) above.

d. No later than three years from the initial date of permit coverage, Secondary Permittees shall implement a program designed to train all employees whose primary construction, operations, or maintenance job functions may impact stormwater quality. The training shall address:

i. The importance of protecting water quality.

ii. The requirements of this Permit.

iii. Operation and maintenance requirements.

iv. Inspection procedures.

v. Ways to perform their job activities to prevent or minimize impacts to water quality.

vi. Procedures for reporting water quality concerns, including potential illicit discharges (including spills).

S7. COMPLIANCE WITH TOTAL MAXIMUM DAILY LOAD REQUIREMENTS

The following requirements apply if an applicable TMDL is approved for stormwater discharges from MS4s owned or operated by the Permittee. Applicable TMDLs are TMDLs which have been approved by EPA on or before the issuance date of this Permit or prior to the date that Ecology issues coverage under this permit, whichever is later.

A. For applicable TMDLs listed in Appendix 2, affected Permittees shall comply with the specific requirements identified in Appendix 2. Each Permittee shall keep records of all actions required by this Permit that are relevant to applicable TMDLs within their jurisdiction. The status of the TMDL implementation shall be included as part of the annual report submitted to Ecology. Each annual report shall include a summary of relevant SWMP and Appendix 2 activities conducted in the TMDL area to address the applicable TMDL parameter(s).

B. For applicable TMDLs not listed in Appendix 2, compliance with this Permit shall constitute compliance with those TMDLs.

C. For TMDLs that are approved by EPA after this Permit is issued, Ecology may establish TMDL related permit requirements through future permit modification if Ecology determines implementation of actions, monitoring or reporting necessary to demonstrate reasonable further progress toward achieving TMDL waste load allocations, and other targets, are not occurring and shall be implemented during the term of this Permit or when this Permit is reissued. Permittees are encouraged to participate in development of TMDLs within their jurisdiction and to begin implementation.

S8. MONITORING AND ASSESSMENT

A. All Permittees including Secondary Permittees shall provide, in each annual report, a description of any stormwater monitoring or stormwater-related studies conducted by the Permittee during the reporting period. If other stormwater monitoring or stormwater-related studies were conducted on behalf of the Permittee during the reporting period, or if stormwater-related investigations conducted by other entities were reported to the Permittee during the reporting period, a brief description of the type of information gathered or received shall be included in the annual report.

Permittees are <u>not</u> required to provide descriptions of any monitoring, studies, or analyses conducted as part of the Regional Stormwater Monitoring Program (RSMP) in annual reports. If a Permittee conducts independent monitoring in accordance with requirements in S8.B or S8.C below, annual reporting of such monitoring must follow the requirements specified in those sections.

B. Status and trends monitoring. By December 1, 2013, each city and county Permittee listed in S1.D.2.a(i) and S1.D.2.a(ii) located in Clallam, Island, King, Kitsap, Pierce, Skagit, Snohomish, Thurston, or Whatcom County shall notify Ecology in writing which of the following two options for status and trends monitoring the Permittee

chooses to carry out during this permit cycle. Either option will fully satisfy the Permittee's obligations under this section (S8.B). Each Permittee shall select a single option for the duration of this permit term.

1. **Status and Trends Monitoring Option #1**: Each Permittee that chooses this option shall pay into a collective fund to implement RSMP small streams and marine nearshore status and trends monitoring in Puget Sound. The payments into the collective fund are due to Ecology annually beginning August 15, 2014. The payment amounts are (Permittees are listed alphabetically, by county):

Permittee	Annual payment amount	Permittee	Annual payment amount
Clallam Co.	N/A	Pierce Co.	N/A
Port Angeles	$4,732	Bonney Lake	$4,075
Island Co.	N/A	Buckley	$1,129
Oak Harbor	$5,719	DuPont	$1,936
King Co.	N/A	Edgewood	$2,350
Algona	$678	Fife	$2,005
Auburn	$16,914	Fircrest	$1,549
Bellevue	$30,009	Gig Harbor	$1,836
Black Diamond	$1,023	Lakewood	$14,367
Bothell	$8,163	Milton	$1,597
Burien	$11,238	Orting	$1,525
Clyde Hill	$695	Puyallup	$9,498
Covington	$4,307	Steilacoom	$1,538
Des Moines	$7,152	Sumner	$2,217
Duvall	$1,463	University Place	$7,704
Enumclaw	$2,806	Skagit Co.	$1,257
Federal Way	$21,673	Burlington	$2,194
Issaquah	$6,632	Anacortes	$4,102
Kenmore	$5,042	Mount Vernon	$7,574
Kent	$27,441	Sedro Woolley	$2,452
Kirkland	$12,116	Snohomish Co.	N/A
Lake Forest Park	$3,135	Arlington	$4,219
Maple Valley	$5,648	Brier	$1,585

Medina	$728	Edmonds	$9,987
Mercer Island	$5,589	Everett	$25,419
Newcastle	$2,431	Granite Falls	$824
Normandy Park	$1,597	Lake Stevens	$6,512
Pacific	$1,540	Lynnwood	$8,829
Redmond	$13,143	Marysville	$14,172
Renton	$21,055	Mill Creek	$4,566
Sammamish	$10,028	Monroe	$4,073
SeaTac	$6,322	Mountlake Terrace	$5,118
Shoreline	$13,327	Mukilteo	$4,920
Tukwila	$4,444	Snohomish	$2,276
Woodinville	$2,771	Thurston Co.	$12,841
Kitsap Co.	$17,133	Lacey	$9,799
Bainbridge Island	$5,709	Olympia	$11,110
Bremerton	$8,837	Tumwater	$4,095
Port Orchard	$2,664	Whatcom Co.	$3,714
Poulsbo	$2,187	Bellingham	$18,936
		Ferndale	$2,737

Or

2. **Status and Trends Monitoring Option #2**: Each Permittee that chooses this option shall conduct status and trends monitoring as follows:

   a. Beginning no later than October 31, 2014, conduct wadeable stream water quality, benthos, habitat, and sediment chemistry monitoring according to the Ecology-approved Quality Assurance Project Plan (QAPP) for RSMP Small Streams Status and Trends Monitoring.

      i. Permittees with population less than 10,000 in the permit coverage area shall conduct this monitoring at the first two qualified monitoring locations (as listed sequentially among the potential monitoring locations defined in the RSMP QAPP) that are located within the jurisdiction's boundaries. Counties shall monitor the first location inside UGA boundaries and the first location outside UGA boundaries.

      ii. Permittees with population equal to or greater than 10,000 and fewer than 50,000 in the permit coverage area shall conduct this monitoring at the first four qualified monitoring locations (as listed sequentially among the potential monitoring locations defined in the RSMP QAPP)

that are located within the jurisdiction's boundaries. Counties shall monitor the first two locations inside UGA boundaries and the first two locations outside UGA boundaries.

iii. Permittees with population equal to or greater than 50,000 in the permit coverage area shall conduct this monitoring at the first eight qualified monitoring locations (as listed sequentially among the potential monitoring locations defined in the RSMP QAPP) that are located within the jurisdiction's boundaries. Counties shall monitor the first four locations inside UGA boundaries and the first four locations outside UGA boundaries.

Permittees with population equal to or greater than 50,000 in the permit coverage area and located entirely inland (*i.e.*, having no Puget Sound shoreline boundary) shall conduct this monitoring at an additional four monitoring locations (as listed sequentially among the potential monitoring locations defined in the RSMP QAPP), for a total of 12 monitoring locations.

If fewer than the total required number (8 or 12) of monitoring locations located in the Permittees' coverage area meet the criteria for sampling defined in the RSMP QAPP, then the Permittee shall conduct this monitoring at all of the monitoring locations that meet the criteria.

And

b. Beginning no later than October 1, 2015, Permittees with Puget Sound shoreline shall conduct sediment chemistry, mussel, and bacteria monitoring according to the Ecology-approved QAPPs for RSMP Marine Nearshore Status and Trends Monitoring.

i. Permittees with population less than 10,000 shall conduct this monitoring at the first two qualified monitoring locations each, for sediment and for mussels and bacteria (as listed sequentially among the potential monitoring locations defined in the RSMP QAPPs), that are located adjacent to the jurisdiction's Puget Sound shoreline boundary.

ii. Permittees with population equal to or greater than 10,000 and fewer than 50,000 in the permit coverage area shall conduct this monitoring at the first four qualified monitoring locations each, for sediment and for mussels and bacteria (as listed sequentially among the potential monitoring locations defined in the RSMP QAPPs), that are located adjacent to the jurisdiction's Puget Sound shoreline boundary.

iii. Permittees with population equal to or greater than 50,000 in the permit coverage area shall conduct this monitoring at the first six qualified monitoring locations each, for sediment and for mussels and bacteria (as listed sequentially among the potential monitoring locations defined in the RSMP QAPPs), that are located adjacent to the jurisdiction's Puget Sound shoreline boundary.

And

c. Data and analyses shall be reported annually in accordance with the Ecology-approved QAPPs.

C. Stormwater management program effectiveness studies. By December 1, 2013, each city and county Permittee listed in S1.D.2.a(i) and S1.D.2.a(ii) shall notify Ecology in writing which of the following two options for effectiveness studies the Permittee chooses to carry out during this permit cycle. Either option will fully satisfy the Permittee's obligations under this section (S8.C). Each Permittee shall select a single option for the duration of this permit term.

1. **Effectiveness Studies Option #1**: Each Permittee that chooses this option shall pay into a collective fund to implement RSMP effectiveness studies. The payments into the collective fund are due to Ecology annually beginning August 15, 2014. The payment amounts are (Permittees are listed alphabetically, by county):

Permittee	Annual payment amount	Permittee	Annual payment amount
Clallam Co.	N/A	Lewis Co.	N/A
Port Angeles	$7,885	Centralia	$6,334
Clark Co.	N/A	Pierce Co.	N/A
Battle Ground	$7,079	Bonney Lake	$6,790
Camas	$7,002	Buckley	$1,882
Vancouver	$67,335	DuPont	$3,226
Washougal	$5,716	Edgewood	$3,916
Cowlitz Co.	$1,384	Fife	$3,340
Kelso	$4,793	Fircrest	$2,581
Longview	$14,687	Gig Harbor	$3,059
Grays Harbor Co.	N/A	Lakewood	$23,938
Aberdeen	$6,693	Milton	$2,661

Island Co.	N/A	Orting	$2,541
Oak Harbor	$9,528	Puyallup	$15,826
King Co.	N/A	Steilacoom	$2,563
Algona	$1,129	Sumner	$3,694
Auburn	$28,182	University Place	$12,836
Bellevue	$50,001	Skagit Co.	$2,094
Black Diamond	$1,705	Burlington	$3,655
Bothell	$13,601	Anacortes	$6,835
Burien	$18,724	Mount Vernon	$12,620
Clyde Hill	$1,157	Sedro Woolley	$4,085
Covington	$7,177	Snohomish Co.	N/A
Des Moines	$11,916	Arlington	$7,030
Duvall	$2,437	Brier	$2,640
Enumclaw	$4,675	Edmonds	$16,640
Federal Way	$36,111	Everett	$42,352
Issaquah	$11,050	Granite Falls	$1,373
Kenmore	$8,401	Lake Stevens	$10,850
Kent	$45,721	Lynnwood	$14,711
Kirkland	$20,187	Marysville	$23,613
Lake Forest Park	$5,224	Mill Creek	$7,608
Maple Valley	$9,410	Monroe	$6,786
Medina	$1,212	Mountlake Terrace	$8,527
Mercer Island	$9,313	Mukilteo	$8,198
Newcastle	$4,050	Snohomish	$3,792
Normandy Park	$2,661	Thurston Co.	$21,395
Pacific	$2,565	Lacey	$16,326
Redmond	$21,899	Olympia	$18,511
Renton	$35,082	Tumwater	$6,823
Sammamish	$16,709	Whatcom Co.	$6,188
SeaTac	$10,533	Bellingham	$31,550
Shoreline	$22,205	Ferndale	$4,561
Tukwila	$7,405		

Woodinville	$4,618
Kitsap Co.	$28,547
Bainbridge Island	$9,512
Bremerton	$14,724
Port Orchard	$4,439
Poulsbo	$3,643

Or

2. **Effectiveness Studies Option #2**: Each Permittee that chooses this option shall conduct stormwater discharge monitoring in accordance with Appendix 9 and the following:

   a. By February 2, 2014, each Permittee shall submit to Ecology a draft stormwater discharge monitoring QAPP for review and approval. If Ecology does not request changes within 90 days, the draft QAPP is considered approved. Final QAPPs shall be submitted to Ecology as soon as possible following finalization.

      i. Each Permittee with population fewer than 10,000 in the permit coverage area shall conduct stormwater discharge monitoring at one discharge monitoring location.

      ii. Each Permittee with population equal to or greater than 10,000 but fewer than 50,000 in the permit coverage area shall conduct stormwater discharge monitoring at two discharge monitoring locations.

      iii. Each Permittee with population equal to or greater than 50,000 but fewer than 100,000 in the permit coverage area shall conduct stormwater discharge monitoring at three discharge monitoring locations.

      iv. Each Permittee with population 100,000 or more in the permit coverage area shall conduct stormwater discharge monitoring at four discharge monitoring locations.

   b. Permittees shall document in the QAPP why selected discharge monitoring locations are of interest for long term stormwater discharge monitoring and associated stormwater management program effectiveness evaluations. Permittees are encouraged to monitor at locations chosen and submitted in the annual reports that were due March 31, 2011.

   c. Flow monitoring at discharge monitoring locations shall be implemented beginning no later than October 1, 2014. Stormwater discharge monitoring

shall be fully implemented no later than October 1, 2015. All monitoring shall be conducted in accordance with an Ecology-approved QAPP.

D. Source identification and diagnostic monitoring. Each city and county Permittee listed in S1.D.2.a(i) and S1.D.2.a(ii) shall pay into a collective fund to implement the RSMP Source Identification Information Repository (SIDIR). The payments into the collective fund are due to Ecology annually beginning August 15, 2014. The payment amounts are (Permittees are listed alphabetically, by county):

Permittee	Annual payment amount	Permittee	Annual payment amount
Clallam Co.	N/A	Lewis Co.	N/A
Port Angeles	$731	Centralia	$587
Clark Co.	N/A	Pierce Co.	N/A
Battle Ground	$657	Bonney Lake	$630
Camas	$649	Buckley	$175
Vancouver	$6,245	DuPont	$299
Washougal	$530	Edgewood	$363
Cowlitz Co.	$128	Fife	$310
Kelso	$444	Fircrest	$239
Longview	$1,362	Gig Harbor	$284
Grays Harbor Co.	N/A	Lakewood	$2,220
Aberdeen	$621	Milton	$247
Island Co.	N/A	Orting	$236
Oak Harbor	$884	Puyallup	$1,468
King Co.	N/A	Steilacoom	$238
Algona	$105	Sumner	$343
Auburn	$2,614	University Place	$1,190
Bellevue	$4,637	Skagit Co.	$194
Black Diamond	$158	Burlington	$339
Bothell	$1,261	Anacortes	$634
Burien	$1,736	Mount Vernon	$1,170
Clyde Hill	$107	Sedro Woolley	$379
Covington	$666	Snohomish Co.	N/A

Des Moines	$1,105	Arlington	$652
Duvall	$226	Brier	$245
Enumclaw	$434	Edmonds	$1,543
Federal Way	$3,349	Everett	$3,928
Issaquah	$1,025	Granite Falls	$127
Kenmore	$779	Lake Stevens	$1,006
Kent	$4,240	Lynnwood	$1,364
Kirkland	$1,872	Marysville	$2,190
Lake Forest Park	$484	Mill Creek	$706
Maple Valley	$873	Monroe	$629
Medina	$112	Mountlake Terrace	$791
Mercer Island	$864	Mukilteo	$760
Newcastle	$376	Snohomish	$352
Normandy Park	$247	Thurston Co.	$1,984
Pacific	$238	Lacey	$1,514
Redmond	$2,031	Olympia	$1,717
Renton	$3,253	Tumwater	$633
Sammamish	$1,550	Whatcom Co.	$574
SeaTac	$977	Bellingham	$2,926
Shoreline	$2,059	Ferndale	$423
Tukwila	$687		
Woodinville	$428		
Kitsap Co.	$2,647		
Bainbridge Island	$882		
Bremerton	$1,365		
Port Orchard	$412		
Poulsbo	$338		

S9. REPORTING REQUIREMENTS

A. No later than March 31 of each year beginning in 2015, each Permittee shall submit an annual report. The reporting period for the first annual report will be from January

1, 2014 through December 31, 2014. The reporting period for all subsequent annual reports will be the previous calendar year unless otherwise specified.

Permittees must submit annual reports electronically using Ecology's Water Quality Permitting Portal (WQWebPortal) available on Ecology's website at: http://www.ecy.wa.gov/programs/wq/permits/paris/portal.html unless otherwise directed by Ecology.

Permittees unable to submit electronically through Ecology's WQWebPortal must contact Ecology to request a waiver and obtain instructions on how to submit an annual report in an alternative format.

B. Each Permittee is required to keep all records related to this permit and the SWMP for at least five years.

C. Each Permittee shall make all records related to this permit and the Permittee's SWMP available to the public at reasonable times during business hours. The Permittee will provide a copy of the most recent annual report to any individual or entity, upon request.

1. A reasonable charge may be assessed by the Permittee for making photocopies of records.

2. The Permittee may require reasonable advance notice of intent to review records related to this Permit.

D. The annual report for cities, towns, and counties

Each annual report shall include the following:

1. A copy of the Permittee's current SWMP Plan as required by S5.A.2.

2. Submittal of the annual report form as provided by Ecology pursuant to S9.A, describing the status of implementation of the requirements of this permit during the reporting period.

3. Attachments to the annual report form including summaries, descriptions, reports, and other information as required, or as applicable, to meet the requirements of this permit during the reporting period. Refer to Appendix 3 for annual report questions.

4. If applicable, notice that the MS4 is relying on another governmental entity to satisfy any of the obligations under this permit.

5. Certification and signature pursuant to G19.D, and notification of any changes to authorization pursuant to G19.C.

6. A notification of any annexations, incorporations or jurisdictional boundary changes resulting in an increase or decrease in the Permittee's geographic area of permit coverage during the reporting period.

E. Annual report for Secondary Permittees

Each annual report shall include the following:

1. Submittal of the annual report form as provided by Ecology pursuant to S9.A, describing the status of implementation of the requirements of this permit during the reporting period.

2. Attachments to the annual report form including summaries, descriptions, reports, and other information as required, or as applicable, to meet the requirements of this permit during the reporting period. Refer to Appendix 4 for annual report questions.

3. If applicable, notice that the MS4 is relying on another governmental entity to satisfy any of the obligations under this permit.

4. Certification and signature pursuant to G19.D, and notification of any changes to authorization pursuant to G19.C.

5. A notification of any jurisdictional boundary changes resulting in an increase or decrease in the Secondary Permittee's geographic area of permit coverage during the reporting period.

GENERAL CONDITIONS

G1. DISCHARGE VIOLATIONS

All discharges and activities authorized by this Permit shall be consistent with the terms and conditions of this Permit.

G2. PROPER OPERATION AND MAINTENANCE

The Permittee shall at all times properly operate and maintain all facilities and systems of collection, treatment, and control (and related appurtenances) which are installed or used by the Permittee for pollution control to achieve compliance with the terms and conditions of this Permit.

G3. NOTIFICATION OF DISCHARGE, INCLUDING SPILLS

If a Permittee has knowledge of a discharge, including spills, into or from a MS4 which could constitute a threat to human health, welfare, or the environment, the Permittee shall

A. Take appropriate action to correct or minimize the threat to human health, welfare and/or the environment.

B. Notify the Ecology regional office and other appropriate spill response authorities immediately but in no case later than within 24 hours of obtaining that knowledge. Ecology's Northwest Regional Office 24-hour number is 425-649-7000 and Ecology's Southwest Regional Office the number is 360-407-6300.

C. Immediately report spills or other discharges which might cause bacterial contamination of marine waters, such as discharges resulting from broken sewer lines and failing onsite septic systems, to the Ecology regional office and to the Department of Health, Shellfish Program. The Department of Health's shellfish number is 360-236-3330 (business hours) or 360-789-8962 (24-hours).

D. Immediately report spills or discharges of oils or hazardous substances to the Ecology regional office and to the Washington Emergency Management Division at 1-800-258-5990.

G4. BYPASS PROHIBITED

The intentional bypass of stormwater from all or any portion of a stormwater treatment BMP whenever the design capacity of the treatment BMP is not exceeded, is prohibited unless the following conditions are met:

A. Bypass is: (1) unavoidable to prevent loss of life, personal injury, or severe property damage; or (2) necessary to perform construction or maintenance-related activities essential to meet the requirements of the Clean Water Act (CWA); and

B. There are no feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated stormwater, or maintenance during normal dry periods.

"Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

G5. RIGHT OF ENTRY

The Permittee shall allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law at reasonable times:

A. To enter upon the Permittee's premises where a discharge is located or where any records must be kept under the terms and conditions of this Permit;

B. To have access to, and copy at reasonable cost and at reasonable times, any records that must be kept under the terms of the Permit;

C. To inspect at reasonable times any monitoring equipment or method of monitoring required in the Permit;

D. To inspect at reasonable times any collection, treatment, pollution management, or discharge facilities; and

E. To sample at reasonable times any discharge of pollutants.

G6. DUTY TO MITIGATE

The Permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this Permit which has a reasonable likelihood of adversely affecting human health or the environment.

G7. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G8. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in the Permit shall be construed as excusing the Permittee from compliance with any other applicable federal, state, or local statutes, ordinances, or regulations.

G9. MONITORING

A. Representative Sampling:

Samples and measurements taken to meet the requirements of this Permit shall be representative of the volume and nature of the monitored discharge, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

B. Records Retention:

The Permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this Permit, and records of all data used to complete the application for this permit, for a period of at least five years. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by the Ecology. On request, monitoring data and analysis shall be provided to Ecology.

C. Recording of Results:

For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place and time of sampling; (2) the individual who performed the sampling or measurement; (3) the dates the analyses were performed; (4) who performed the analyses; (5) the analytical techniques or methods used; and (6) the results of all analyses.

D. Test Procedures:

All sampling and analytical methods used to meet the monitoring requirements in this Permit shall conform to the Guidelines Establishing Test Procedures for the Analysis of Pollutants contained in 40 CFR Part 136, unless otherwise specified in this permit or approved in writing by Ecology.

E. Flow Measurement:

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements is consistent with the accepted industry standard for that type of device. Frequency of calibration shall be in conformance with manufacturer's recommendations or at a minimum frequency of at least one calibration per year. Calibration records should be maintained for a minimum of three years.

F. Lab Accreditation:

All monitoring data, except for flow, temperature, conductivity, pH, total residual chlorine, and other exceptions approved by Ecology, shall be prepared by a laboratory registered or accredited under the provisions of, Accreditation of Environmental Laboratories, chapter 173-50 WAC. Soils and hazardous waste data are exempted from this requirement pending accreditation of laboratories for analysis of these media by Ecology. Quick methods of field detection of pollutants including nutrients, surfactants, salinity, and other parameters are exempted from this requirement when

the purpose of the sampling is identification and removal of a suspected illicit discharge.

G. Additional Monitoring:

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G10. REMOVED SUBSTANCES

With the exception of decant from street waste vehicles, the Permittee shall not allow collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of stormwater to be resuspended or reintroduced to the storm sewer system or to waters of the state. Decant from street waste vehicles resulting from cleaning stormwater facilities may be reintroduced only when other practical means are not available and only in accordance with the Street Waste Disposal Guidelines in Appendix 6. Solids generated from maintenance of the MS4 may be reclaimed, recycled, or reused when allowed by local codes and ordinances. Soils that are identified as contaminated pursuant to chapter 173-350 WAC shall be disposed at a qualified solid waste disposal facility (see Appendix 6).

G11. SEVERABILITY

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this Permit shall not be affected thereby.

G12. REVOCATION OF COVERAGE

The director may terminate coverage under this General Permit in accordance with chapter 43.21B RCW and chapter 173-226 WAC. Cases where coverage may be terminated include, but are not limited to the following:

A. Violation of any term or condition of this general permit;

B. Obtaining coverage under this general permit by misrepresentation or failure to disclose fully all relevant facts;

C. A change in any condition that requires either a temporary or permanent reduction or elimination of the permitted discharge;

D. A determination that the permitted activity endangers human health or the environment, or contributes significantly to water quality standards violations;

E. Failure or refusal of the Permittee to allow entry as required in chapter 90.48.090 RCW;

F. Nonpayment of permit fees assessed pursuant to chapter 90.48.465 RCW;

Revocation of coverage under this general permit may be initiated by Ecology or requested by any interested person.

G13. TRANSFER OF COVERAGE

The director may require any discharger authorized by this General Permit to apply for and obtain an individual permit in accordance with chapter 43.21B RCW and chapter 173-226 WAC.

G14. GENERAL PERMIT MODIFICATION AND REVOCATION

This General Permit may be modified, revoked and reissued, or terminated in accordance with the provisions of WAC 173-226-230. Grounds for modification, revocation and reissuance, or termination include, but are not limited to the following:

A. A change occurs in the technology or practices for control or abatement of pollutants applicable to the category of dischargers covered under this General Permit;

B. Effluent limitation guidelines or standards are promulgated pursuant to the CWA or chapter 90.48 RCW, for the category of dischargers covered under this General Permit;

C. A water quality management plan containing requirements applicable to the category of dischargers covered under this General Permit is approved; or

D. Information is obtained which indicates that cumulative effects on the environment from dischargers covered under this General Permit are unacceptable.

E. Changes in state law that reference this permit.

G15. REPORTING A CAUSE FOR MODIFICATION OR REVOCATION

A Permittee who knows or has reason to believe that any activity has occurred or will occur which would constitute cause for modification or revocation and reissuance under Condition G12, G14, or 40 CFR 122.62 must report such plans, or such information, to Ecology so that a decision can be made on whether action to modify, or revoke and reissue this Permit will be required. Ecology may then require submission of a new or amended application. Submission of such application does not relieve the Permittee of the duty to comply with this Permit until it is modified or reissued.

G16. APPEALS

A. The terms and conditions of this General Permit, as they apply to the appropriate class of dischargers, are subject to appeal within thirty days of issuance of this General Permit, in accordance with chapter 43.21B RCW, and chapter 173-226 WAC.

B. The terms and conditions of this General Permit, as they apply to an individual discharger, are appealable in accordance with chapter 43.21B RCW within thirty days of the effective date of coverage of that discharger. Consideration of an appeal of General Permit coverage of an individual discharger is limited to the General Permit's applicability or nonapplicability to that individual discharger.

C. The appeal of General Permit coverage of an individual discharger does not affect any other dischargers covered under this General Permit. If the terms and conditions of this General Permit are found to be inapplicable to any individual discharger(s), the matter shall be remanded to Ecology for consideration of issuance of an individual permit or permits.

D. Modifications of this Permit are appealable in accordance with chapter 43.21B RCW and chapter 173-226 WAC.

G17. PENALTIES

40 CFR 122.41(a)(2) and (3), 40 CFR 122.41(j)(5), and 40 CFR 122.41(k)(2) are hereby incorporated into this Permit by reference.

G18. DUTY TO REAPPLY

The Permittee shall apply for permit renewal at least 180 days prior to the specified expiration date of this permit.

G19. CERTIFICATION AND SIGNATURE

All formal submittals to Ecology shall be signed and certified.

A. All permit applications shall be signed by either a principal executive officer or ranking elected official.

B. All formal submittals required by this Permit shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to Ecology, and

2. The authorization specifies either an individual or a position having responsibility for the overall development and implementation of the stormwater management program. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

C. Changes to authorization. If an authorization under condition G19.B.2 is no longer accurate because a different individual or position has responsibility for the overall development and implementation of the stormwater management program, a new authorization satisfying the requirements of condition G19.B.2 must be submitted to

Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a formal submittal under this Permit shall make the following certification:

"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 gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering 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 willful violations."

G20. NON-COMPLIANCE NOTIFICATION

In the event a Permittee is unable to comply with any of the terms and conditions of this Permit, the Permittee must:

A. Notify Ecology of the failure to comply with the permit terms and conditions in writing within 30 days of becoming aware that the non-compliance has occurred. The written notification must include all of the following:

1. A description of the non-compliance, including dates.

2. Beginning and end dates of the non-compliance, and if the compliance has not been corrected, the anticipated date of correction.

3. Steps taken or planned to reduce, eliminate, or prevent reoccurrence of the non-compliance.

B. Take appropriate action to stop or correct the condition of non-compliance.

G21. UPSETS

Permittees must meet the conditions of 40 CFR 122.41(n) regarding "Upsets." The conditions are as follows:

A. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

B. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of paragraph (C) of this condition are met. Any determination made

during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, will not constitute final administrative action subject to judicial review.

C. Conditions necessary for demonstration of upset. A Permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that the Permittee can identify the cause(s) of the upset;

2. The permitted facility was at the time being properly operated; and

3. The Permittee submitted notice of the upset as required in 40 CFR 122.41(l)(6)(ii)(B) (24-hour notice of noncompliance).

4. The Permittee complied with any remedial measures required under 40 CFR 122.41(d) (Duty to Mitigate).

D. Burden of proof. In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

DEFINITIONS AND ACRONYMS

This section includes definitions for terms used in the body of the permit and in all the appendices except Appendix 1. Terms defined in Appendix 1 are necessary to implement requirements related to Appendix 1.

40 CFR means Title 40 of the Code of Federal Regulations, which is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the federal government.

AKART means all known, available, and reasonable methods of prevention, control and treatment. See also State Water Pollution Control Act, chapter 90.48.010 RCW and chapter 90.48.520 RCW.

All known, available and reasonable methods of prevention, control and treatment refers to the State Water Pollution Control Act, chapter 90.48.010 RCW and chapter 90.48.520 RCW.

Applicable TMDL means a TMDL which has been approved by EPA on or before the issuance date of this Permit, or prior to the date that Ecology issues coverage under this Permit, whichever is later.

Beneficial Uses means uses of waters of the state, which include but are not limited to use for domestic, stock watering, industrial, commercial, agricultural, irrigation, mining, fish and wildlife maintenance and enhancement, recreation, generation of electric power and preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public waters of the state.

Best Management Practices are the schedules of activities, prohibitions of practices, maintenance procedures, and structural and/or managerial practices approved by Ecology that, when used singly or in combination, prevent or reduce the release of pollutants and other adverse impacts to waters of Washington State.

BMP means Best Management Practice.

Bypass means the diversion of stormwater from any portion of a stormwater treatment facility.

Census defined urban area means Urbanized Area.

Circuit means a portion of a MS4 discharging to a single point or serving a discrete area determined by traffic volumes, land use, topography or the configuration of the MS4.

Component or **Program Component** means an element of the Stormwater Management Program listed in S5 Stormwater Management Program for Cities, Towns, and Counties or S6 Stormwater Management Program for Secondary Permittees, S7 Compliance with Total Maximum Daily Load Requirements, or S8 Monitoring of this permit.

Conveyance system means that portion of the municipal separate storm sewer system designed or used for conveying stormwater.

Co-Permittee means an owner or operator of an MS4 which is in a cooperative agreement with at least one other applicant for coverage under this permit. A Co-Permittee is an owner or operator of a regulated MS4 located within or in proximity to another regulated MS4. A Co-

Permittee is only responsible for permit conditions relating to discharges from the MS4 the Co-Permittee owns or operates. See also 40 CFR 122.26(b)(1)

CWA means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub.L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. (6-483 and Pub. L. 97-117, 33 U.S.C. 1251 *et seq*.).

Director means the Director of the Washington State Department of Ecology, or an authorized representative.

Discharge Point means the location where a discharge leaves the Permittee's MS4 through the Permittee's MS4 facilities/BMPs designed to infiltrate.

Entity means a governmental body, or a public or private organization.

EPA means the U.S. Environmental Protection Agency.

General Permit means a permit which covers multiple dischargers of a point source category within a designated geographical area, in lieu of individual permits being issued to each discharger.

Ground water means water in a saturated zone or stratum beneath the surface of the land or below a surface water body. Refer to chapter 173-200 WAC.

Hazardous substance means any liquid, solid, gas, or sludge, including any material, substance, product, commodity, or waste, regardless of quantity, that exhibits any of the physical, chemical, or biological properties described in WAC 173-303-090 or WAC 173-303-100.

Heavy equipment maintenance or storage yard means an uncovered area where any heavy equipment, such as mowing equipment, excavators, dump trucks, backhoes, or bulldozers are washed or maintained, or where at least five pieces of heavy equipment are stored on a long-term basis.

Highway means a main public road connecting towns and cities.

Hydraulically near means runoff from the site discharges to the sensitive feature without significant natural attenuation of flows that allows for suspended solids removal. See Appendix 7 Determining Construction Site Sediment Damage Potential for a more detailed definition.

Hyperchlorinated means water that contains more than 10 mg/Liter chlorine.

Illicit connection means any infrastructure connection to the MS4 that is not intended, permitted or used for collecting and conveying stormwater or non-stormwater discharges allowed as specified in this permit (S5.C.3 and S6.D.3). Examples include sanitary sewer connections, floor drains, channels, pipelines, conduits, inlets, or outlets that are connected directly to the MS4.

Illicit discharge means any discharge to a MS4 that is not composed entirely of stormwater or of non-stormwater discharges allowed as specified in this permit (S5.C.3 and S6.D.3).

Impervious surface means a non-vegetated surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A non-

vegetated surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or stormwater areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.

Land disturbing activity means any activity that results in a change in the existing soil cover (both vegetative and non-vegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered land disturbing activity. Vegetation maintenance practices, including landscape maintenance and gardening, are not considered land disturbing activity. Stormwater facility maintenance is not considered land disturbing activity if conducted according to established standards and procedures.

LID means Low Impact Development.

LID BMP means low impact development best management practices.

LID Principles means land use management strategies that emphasize conservation, use of on-site natural features, and site planning to minimize impervious surfaces, native vegetation loss, and stormwater runoff.

Low Impact Development means a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

Low impact development best management practices means distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to, bioretention,rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, vegetated roofs, minimum excavation foundations, and water re-use.

Material Storage Facilities means an uncovered area where bulk materials (liquid, solid, granular, etc.) are stored in piles, barrels, tanks, bins, crates, or other means.

Maximum Extent Practicable refers to paragraph 402(p)(3)(B)(iii) of the federal Clean Water Act which reads as follows: Permits for discharges from municipal storm sewers shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques, and system, design, and engineering methods, and other such provisions as the Administrator or the State determines appropriate for the control of such pollutants.

MEP means Maximum Extent Practicable.

MS4 means municipal separate storm sewer system.

Municipal Separate Storm Sewer System means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

(i) Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of Washington State.

(ii) Designed or used for collecting or conveying stormwater.

(iii) Which is not a combined sewer;

(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.; and

(v) Which is defined as "large" or "medium" or "small" or otherwise designated by Ecology pursuant to 40 CFR 122.26.

National Pollutant Discharge Elimination System means the national program for issuing, modifying, revoking, and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington State Department of Ecology.

Native vegetation means vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include trees such as Douglas Fir, western hemlock, western red cedar, alder, big-leaf maple; shrubs such as willow, elderberry, salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.

New development means land disturbing activities, including Class IV General Forest Practices that are conversions from timber land to other uses; structural development, including construction or installation of a building or other structure; creation of hard surfaces; and subdivision, short subdivision and binding site plans, as defined and applied in chapter 58.17 RCW. Projects meeting the definition of redevelopment shall not be considered new development. Refer to Appendix 1 for a definition of hard surfaces.

New Permittee means a city, town, or county that is subject to the *Western Washington Municipal Stormwater General Permit* and was not subject to the permit prior to August 1, 2013.

New Secondary Permittee means a Secondary Permittee that is covered under a municipal stormwater general permit and was not covered by the permit prior to August 1, 2013.

NOI means Notice of Intent.

Notice of Intent means the application for, or a request for coverage under a General Permit pursuant to WAC 173-226-200.

Notice of Intent for Construction Activity means the application form for coverage under the *Construction Stormwater General Permit.*

Notice of Intent for Industrial Activity means the application form for coverage under the *General Permit for Stormwater Discharges Associated with Industrial Activities*.

NPDES means National Pollutant Discharge Elimination System.

Outfall means a point source as defined by 40 CFR 122.2 at the point where a discharge leaves the Permittee's MS4 and enters a surface receiving waterbody or surface receiving waters. Outfall does not include pipes, tunnels, or other conveyances which connect segments of the same stream or other surface waters and are used to convey primarily surface waters (i.e., culverts).

Permittee unless otherwise noted, the term "Permittee" includes city, town, or county Permittee, Co-Permittee, New Permittee, Secondary Permittee, and New Secondary Permittee.

Physically Interconnected means that one MS4 is connected to another storm sewer system in such a way that it allows for direct discharges to the second system. For example, the roads with drainage systems and municipal streets of one entity are physically connected directly to a storm sewer system belonging to another entity.

Project site means that portion of a property, properties, or right-of-ways subject to land disturbing activities, new hard surfaces, or replaced hard surfaces. Refer to Appendix 1 for a definition of hard surfaces.

QAPP means Quality Assurance Project Plan.

Qualified Personnel means someone who has had professional training in the aspects of stormwater management for which they are responsible and are under the functional control of the Permittee. Qualified Personnel may be staff members, contractors, or volunteers.

Quality Assurance Project Plan means a document that describes the objectives of an environmental study and the procedures to be followed to achieve those objectives.

RCW means the Revised Code of Washington State.

Receiving waterbody or **receiving waters** means naturally and/or reconstructed naturally occurring surface water bodies, such as creeks, streams, rivers, lakes, wetlands, estuaries, and marine waters, or ground water, to which a MS4 discharges.

Redevelopment means, on a site that is already substantially developed (i.e., has 35% or more of existing hard surface coverage), the creation or addition of hard surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure; replacement of hard surface that is not part of a routine maintenance activity; and land disturbing activities. Refer to Appendix 1 for a definition of hard surfaces.

Regional Stormwater Monitoring Program means, for all of western Washington, a stormwater-focused monitoring and assessment program consisting of these components: status and trends monitoring in small streams and marine nearshore areas, stormwater management program effectiveness studies, and a source identification information repository (SIDIR). The priorities and scope for the RSMP are set by a formal stakeholder group. For this permit term, RSMP status and trends monitoring will be conducted in the Puget Sound basin only.

Regulated Small Municipal Separate Storm Sewer System means a Municipal Separate Storm Sewer System which is automatically designated for inclusion in the Phase II stormwater permitting program by its location within an Urbanized Area, or by designation by Ecology and is not eligible for a waiver or exemption under S1.C.

RSMP means Regional Stormwater Monitoring Program.

Runoff is water that travels across the land surface and discharges to water bodies either directly or through a collection and conveyance system. See also "Stormwater."

Secondary Permittee is an operator of a regulated small MS4 which is not a city, town or county. Secondary Permittees include special purpose districts and other public entities that meet the criteria in S1.B.

Sediment/Erosion-Sensitive Feature means an area subject to significant degradation due to the effect of construction runoff, or areas requiring special protection to prevent erosion. See Appendix 7 Determining Construction Site Sediment Transport Potential for a more detailed definition.

Shared water bodies means water bodies, including downstream segments, lakes and estuaries that receive discharges from more than one Permittee.

SIDIR means Source Identification Information Repository.

Significant contributor means a discharge that contributes a loading of pollutants considered to be sufficient to cause or exacerbate the deterioration of receiving water quality or instream habitat conditions.

Small Municipal Separate Storm Sewer System means an MS4 that is not defined as "large" or "medium" pursuant to 40 CFR 122.26(b)(4) & (7) or designated under 40 CFR 122.26 (a)(1)(v).

Source control BMP means a structure or operation that is intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. The *SWMMWW* separates source control BMPs into two types. Structural Source Control BMPs are physical, structural, or mechanical devices, or facilities that are intended to prevent pollutants from entering stormwater. Operational BMPs are non-structural practices that prevent or reduce pollutants from entering stormwater. See Volume IV of the *SWMMWW* for details.

Stormwater means runoff during and following precipitation and snowmelt events, including surface runoff, drainage or interflow.

Stormwater Associated with Industrial and Construction Activity means the discharge from any conveyance which is used for collecting and conveying stormwater, which is directly related to manufacturing, processing or raw materials storage areas at an industrial plant, or associated with clearing, grading and/or excavation, and is required to have an NPDES permit in accordance with 40 CFR 122.26.

Stormwater Management Program means a set of actions and activities designed to reduce the discharge of pollutants from the MS4 to the MEP and to protect water quality, and comprising the components listed in S5 (for cities, towns, and counties) or S6 (for Secondary Permittees) of this Permit and any additional actions necessary to meet the requirements of applicable TMDLs pursuant to S7 *Compliance with TMDL Requirements,* and S8 *Monitoring and Assessment*.

Stormwater Treatment and Flow Control BMPs/Facilities means detention facilities, treatment BMPs/facilities, bioretention, vegetated roofs, and permeable pavements that help meet Appendix 1 Minimum Requirements #6 (treatment), #7 (flow control), or both.

SWMMWW or Stormwater Management Manual for Western Washington means *Stormwater Management Manual for Western Washington (as amended in 2014)*

SWMP means Stormwater Management Program.

TMDL means Total Maximum Daily Load.

Total Maximum Daily Load means a water cleanup plan. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure that the water body can be used for the purposes the state has designated. The calculation must also account for seasonable variation in water quality. Water quality standards are set by states, territories, and tribes. They identify the uses for each water body, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.

Tributary conveyance means pipes, ditches, catch basins, and inlets owned or operated by the Permittee and designed or used for collecting and conveying stormwater.

UGA means Urban Growth Area.

Urban Growth Area means those areas designated by a county pursuant to RCW 36.70A.110.

Urbanized Area is a federally-designated land area comprising one or more places and the adjacent densely settled surrounding area that together have a residential population of at least 50,000 and an overall population density of at least 1,000 people per square mile. Urbanized Areas are designated by the U.S. Census Bureau based on the most recent decennial census.

Vehicle Maintenance or Storage Facility means an uncovered area where any vehicles are regularly washed or maintained, or where at least 10 vehicles are stored.

Water Quality Standards means Surface Water Quality Standards, chapter 173-201A WAC, Ground Water Quality Standards, chapter 173-200 WAC, and Sediment Management Standards, chapter 173-204 WAC.

Waters of the State includes those waters as defined as "waters of the United States" in 40 CFR Subpart 122.2 within the geographic boundaries of Washington State and "waters of the state" as defined in chapter 90.48 RCW which includes lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and water courses within the jurisdiction of the State of Washington.

Waters of the United States refers to the definition in 40 CFR 122.2.

APPENDIX 1 – Minimum Technical Requirements for New Development and Redevelopment

Section 1. Exemptions

Unless otherwise indicated in this Section 1, the practices described in this section are exempt from the Minimum Requirements, even if such practices meet the definition of new development or redevelopment.

Forest practices:

Forest practices regulated under Title 222 WAC, except for Class IV General forest practices that are conversions from timberland to other uses, are exempt from the provisions of the minimum requirements.

Commercial agriculture:

Commercial agriculture practices involving working the land for production are generally exempt. However, the conversion from timberland to agriculture, and the construction of impervious surfaces are not exempt.

Oil and Gas Field Activities or Operations:

Construction of drilling sites, waste management pits, and access roads, as well as construction of transportation and treatment infrastructure such as pipelines natural gas treatment plants, natural gas pipeline compressor stations, and crude oil pumping stations are exempt. Operators are encouraged to implement and maintain Best Management Practices to minimize erosion and control sediment during and after construction activities to help ensure protection of surface water quality during storm events.

Pavement Maintenance:

The following pavement maintenance practices are exempt: pothole and square cut patching, overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage, shoulder grading, reshaping/regrading drainage systems, crack sealing, resurfacing with in-kind material without expanding the road prism, pavement preservation activities that do not expand the road prism, and vegetation maintenance.

The following pavement maintenance practices are not categorically exempt. The extent to which this Appendix applies is explained for each circumstance.

- Removing and replacing a paved surface to base course or lower, or repairing the pavement base: If impervious surfaces are not expanded, Minimum Requirements #1 - #5 apply.
- Extending the pavement edge without increasing the size of the road prism, or paving graveled shoulders: These are considered new impervious surfaces and are subject to the minimum requirements that are triggered when the thresholds identified for new or redevelopment projects are met.
- Resurfacing by upgrading from dirt to gravel, asphalt, or concrete; upgrading from gravel to asphalt, or concrete; or upgrading from a bituminous surface treatment ("chip seal") to asphalt or concrete: These are considered new impervious surfaces and are subject to the minimum requirements that are triggered when the thresholds identified for new or redevelopment projects are met.

Underground utility projects:

Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics are only subject to Minimum Requirement #2, Construction Stormwater Pollution Prevention.

Section 2. Definitions Related to Minimum Requirements

***Arterial* –** A road or street primarily for through traffic. The term generally includes roads or streets considered collectors. It does not include local access roads which are generally limited to providing access to abutting property. See also RCW 35.78.010, RCW 36.86.070, and RCW 47.05.021.

***Bioretention* –** Engineered facilities that treat stormwater by passing it through a specified soil profile, and either retain or detain the treated stormwater for flow attenuation. Refer to the *Stormwater Management Manual for Western Washington (SWMMWW)*, Chapter 7 of Volume V for Bioretention BMP types and design specifications.

***Certified Erosion and Sediment Control Lead (CESCL)* –** means an individual who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by the Washington Department of Ecology (Ecology) (see BMP C160 in the *Stormwater Management Manual* for *Western Washington (SWMMWW)*). A CESCL is knowledgeable in the principles and practices of erosion and sediment control. The CESCL must have the skills to assess site conditions and construction activities that could impact the quality of stormwater and, the effectiveness of erosion and sediment control measures used to control the quality of stormwater discharges. Certification is obtained through an Ecology approved erosion and sediment control course. Course listings are provided online at Ecology's website.

Commercial Agriculture – means those activities conducted on lands defined in RCW 84.34.020(2) and activities involved in the production of crops or livestock for commercial trade. An activity ceases to be considered commercial agriculture when the area on which it is conducted is proposed for conversion to a nonagricultural use or has lain idle for more than five years, unless the idle land is registered in a federal or state soils conservation program, or unless the activity is maintenance of irrigation ditches, laterals, canals, or drainage ditches related to an existing and ongoing agricultural activity.

Converted vegetation (areas) – The surfaces on a project site where native vegetation, pasture, scrub/shrub, or unmaintained non-native vegetation (e.g., Himalayan blackberry, scotch broom) are converted to lawn or landscaped areas, or where native vegetation is converted to pasture.

Discharge Point – the location where a discharge leaves the Permittee's MS4 through the Permittee's MS4 facilities/BMPs designed to infiltrate.

Effective Impervious surface – Those impervious surfaces that are connected via sheet flow or discrete conveyance to a drainage system. Impervious surfaces are considered ineffective if: 1) the runoff is dispersed through at least one hundred feet of native vegetation in accordance with BMP T5.30 – "Full Dispersion" as described in Chapter 5 of Volume V of the *Stormwater Management Manual for Western Washington (SWMMWW)*; 2) residential roof runoff is infiltrated in accordance with Downspout Full Infiltration Systems in BMP T5.10A in Volume III of the *SWMMWW*; or 3) approved continuous runoff modeling methods indicate that the entire runoff file is infiltrated.

Erodible or leachable materials – Wastes, chemicals, or other substances that measurably alter the physical or chemical characteristics of runoff when exposed to rainfall. Examples include erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage.

Hard Surface – An impervious surface, a permeable pavement, or a vegetated roof.

Highway – A main public road connecting towns and cities

Impervious surface – A non-vegetated surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A non-vegetated surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether the thresholds for application of minimum requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of runoff modeling.

Land disturbing activity – Any activity that results in a change in the existing soil cover (both vegetative and non-vegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling, and excavation. Compaction that is

associated with stabilization of structures and road construction shall also be considered a land disturbing activity. Vegetation maintenance practices, including landscape maintenance and gardening, are not considered land-disturbing activity. Stormwater facility maintenance is not considered land disturbing activity if conducted according to established standards and procedures.

Low Impact Development (LID) – A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

LID Best Management Practices – Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to, bioretention,rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs, and water re-use.

LID Principles – Land use management strategies that emphasize conservation, use of on-site natural features, and site planning to minimize impervious surfaces, native vegetation loss, and stormwater runoff.

Maintenance – Repair and maintenance includes activities conducted on currently serviceable structures, facilities, and equipment that involves no expansion or use beyond that previously existing and results in no significant adverse hydrologic impact. It includes those usual activities taken to prevent a decline, lapse, or cessation in the use of structures and systems. Those usual activities may include replacement of dysfunctional facilities, including cases where environmental permits require replacing an existing structure with a different type structure, as long as the functioning characteristics of the original structure are not changed. One example is the replacement of a collapsed, fish blocking, round culvert with a new box culvert under the same span, or width, of roadway. In regard to stormwater facilities, maintenance includes assessment to ensure ongoing proper operation, removal of built up pollutants (i.e. sediments), replacement of failed or failing treatment media, and other actions taken to correct defects as identified in the maintenance standards of Chapter 4, Volume V of the *Stormwater Management Manual for Western Washington (SWMMWW).* See also Pavement Maintenance exemptions in Section 1 of this Appendix.

Native vegetation – Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include trees such as Douglas Fir, western hemlock, western red cedar, alder, big-leaf maple, and vine maple; shrubs such as willow, elderberry, salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed.

New development – Land disturbing activities, including Class IV -general forest practices that are conversions from timber land to other uses; structural development, including construction or installation of a building or other structure; creation of hard surfaces; and subdivision, short

subdivision and binding site plans, as defined and applied in Chapter 58.17 RCW. Projects meeting the definition of redevelopment shall not be considered new development.

Outfall – a point source as defined by 40 CFR 122.2 at the point where a discharge leaves the permittee's MS4 and enters a surface receiving waterbody or surface receiving waters. Outfall does not include pipes, tunnels, or other conveyances which connect segments of the same stream or other surface waters and are used to convey primarily surface waters (i.e., culverts).

On-site Stormwater Management BMPs: As used in this appendix, a synonym for Low Impact Development BMPs.

Permeable pavement – Pervious concrete, porous asphalt, permeable pavers or other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir.

Pervious Surface – Any surface material that allows stormwater to infiltrate into the ground. Examples include lawn, landscape, pasture, native vegetation areas, and permeable pavements.

Pollution-generating hard surface (PGHS) – Those hard surfaces considered to be a significant source of pollutants in stormwater runoff. See the listing of surfaces under pollution-generating impervious surface.

Pollution-generating impervious surface (PGIS) – Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities (as further defined in the glossary of the *Stormwater Management Manual for Western Washington* (SWMMWW)); storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall; metal roofs unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating); or roofs that are subject to venting significant amounts of dusts, mists, or fumes from manufacturing, commercial, or other indoor activities.

Pollution-generating pervious surfaces (PGPS) – Any non-impervious surface subject to vehicular use, industrial activities (as further defined in the glossary of the *Stormwater Management Manual for Western Washington (SWMMWW*); or storage of erodible or leachable materials, wastes, or chemicals, and that receive direct rainfall or run-on or blow-in of rainfall, use of pesticides and fertilizers, or loss of soil. Typical PGPS include permeable pavement subject to vehicular use, lawns, and landscaped areas including: golf courses, parks, cemeteries, and sports fields (natural and artificial turf).

Pre-developed condition – The native vegetation and soils that existed at a site prior to the influence of Euro-American settlement. The pre-developed condition shall be assumed to be a forested land cover unless reasonable, historic information is provided that indicates the site was prairie prior to settlement.

Project site – That portion of a property, properties, or right of way subject to land disturbing activities, new hard surfaces, or replaced hard surfaces.

Rain Garden – A non-engineered shallow landscaped depression, with compost-amended native soils and adapted plants. The depression is designed to pond and temporarily store stormwater runoff from adjacent areas, and to allow stormwater to pass through the amended soil profile.

Receiving waterbody or Receiving waters – naturally and/or reconstructed naturally occurring surface water bodies, such as creeks, streams, rivers, lakes, wetlands, estuaries, and marine waters, or groundwater, to which a MS4 discharges.

Redevelopment – On a site that is already substantially developed (i.e., has 35% or more of existing hard surface coverage), the creation or addition of hard surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure; replacement of hard surface that is not part of a routine maintenance activity; and land disturbing activities.

Replaced hard surface – For structures, the removal and replacement of hard surfaces down to the foundation. For other hard surfaces, the removal down to bare soil or base course and replacement.

Replaced impervious surface – For structures, the removal and replacement of impervious surfaces down to the foundation. For other impervious surfaces, the removal down to bare soil or base course and replacement.

Site – The area defined by the legal boundaries of a parcel or parcels of land that is (are) subject to new development or redevelopment. For road projects, the length of the project site and the right-of-way boundaries define the site.

Source control BMP – A structure or operation that is intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. The *Stormwater Management Manual for Western Washington* (S*WMMWW)* separates source control BMPs into two types. *Structural Source Control BMPs* are physical, structural, or mechanical devices, or facilities that are intended to prevent pollutants from entering stormwater. *Operational BMPs* are non-structural practices that prevent or reduce pollutants from entering stormwater. See Volume IV of the *SWMMWW* for details.

Threshold Discharge Area – An on-site area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream (as determined by the shortest flowpath). The examples in Figure 2.1 below illustrate this definition. The purpose of this definition is to clarify how the thresholds of this appendix are applied to project sites with multiple discharge points.

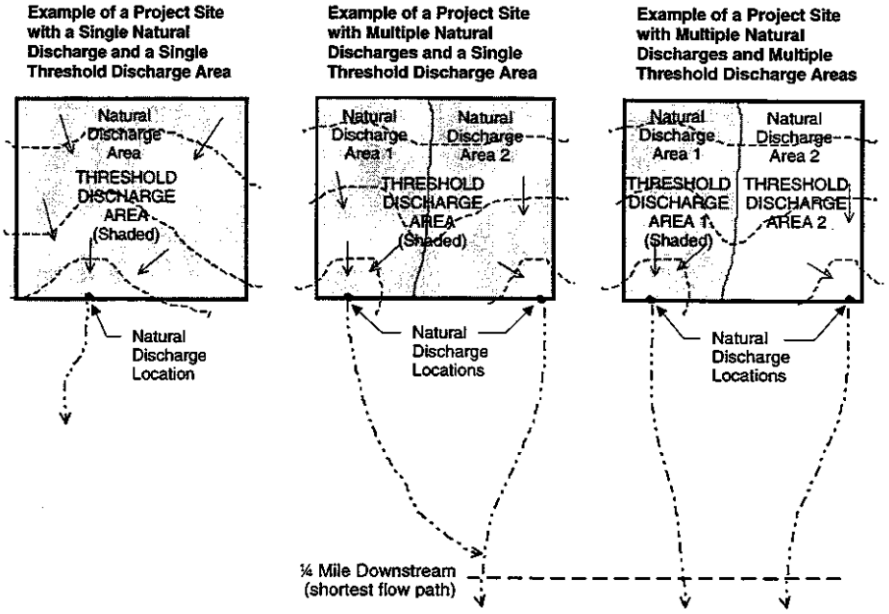

Figure 2.1 Threshold Discharge Areas

Vehicular Use – Regular use of an impervious or pervious surface by motor vehicles. The following are subject to regular vehicular use: roads, un-vegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unrestricted access fire lanes, vehicular equipment storage yards, and airport runways.

The following are not considered subject to regular vehicular use: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles, restricted access fire lanes, and infrequently used maintenance access roads.

Wetland – Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from non-wetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from non-wetland areas to mitigate the conversion of wetlands.

Section 3. Applicability of the Minimum Requirements

3.1 Thresholds

Not all of the Minimum Requirements apply to every development or redevelopment project. The applicability varies depending on the project type and size. This section identifies thresholds that determine the applicability of the Minimum Requirements to projects. Use the flow charts in Figures 3.1, 3.2, and 3.3 to determine which of the Minimum Requirements apply. The Minimum Requirements themselves are presented in Section 4 of this Appendix.

Use the thresholds in sections 3.2 and 3.3 at the time of application for a subdivision, plat, short plat, building permit, or other construction permit. The plat or short plat approval shall identify all stormwater BMPs that are required for each lot. For projects involving only land disturbing activities, (e.g., clearing or grading), the thresholds apply at the time of application for the permit allowing or authorizing that activity. Note the exemption in Section 1 for forest practices other than Class IV General.

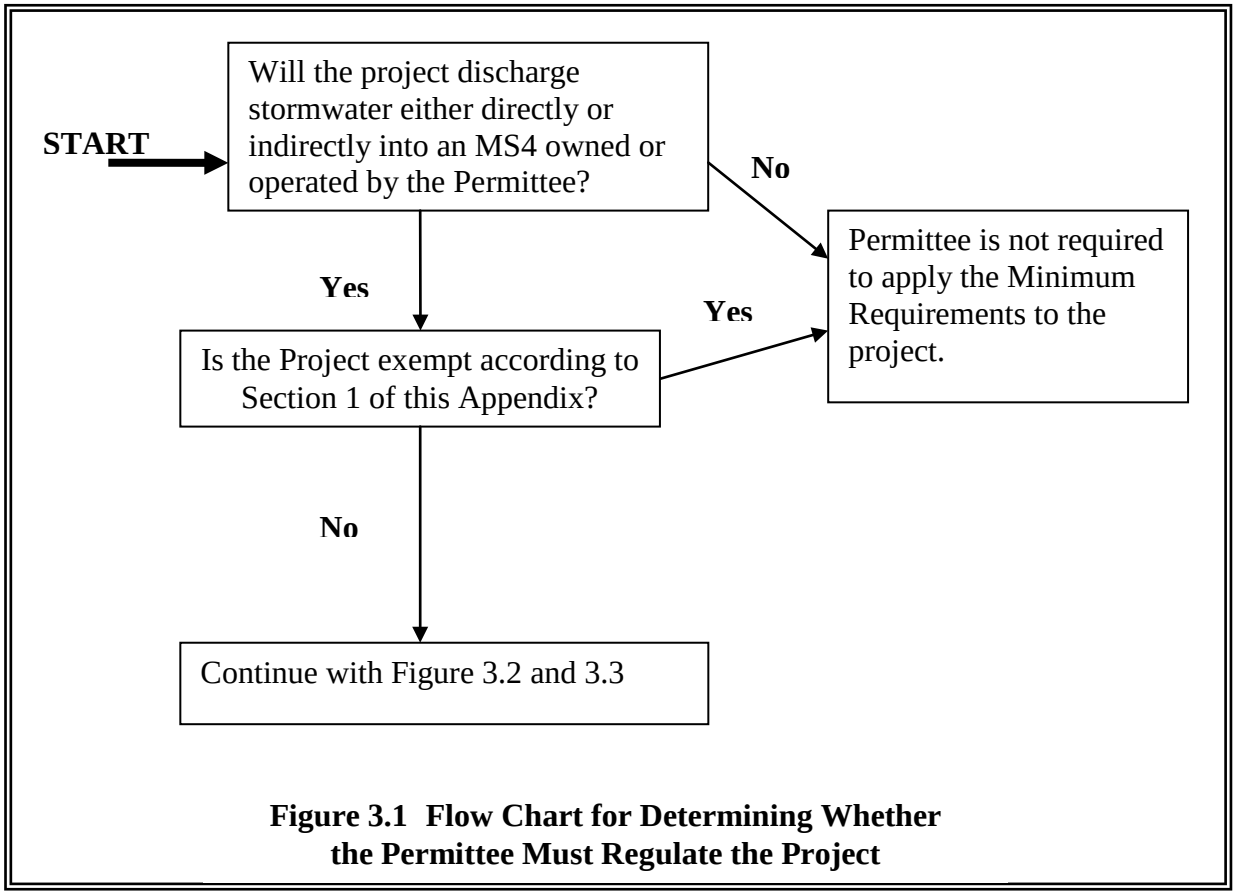

Figure 3.1 Flow Chart for Determining Whether the Permittee Must Regulate the Project

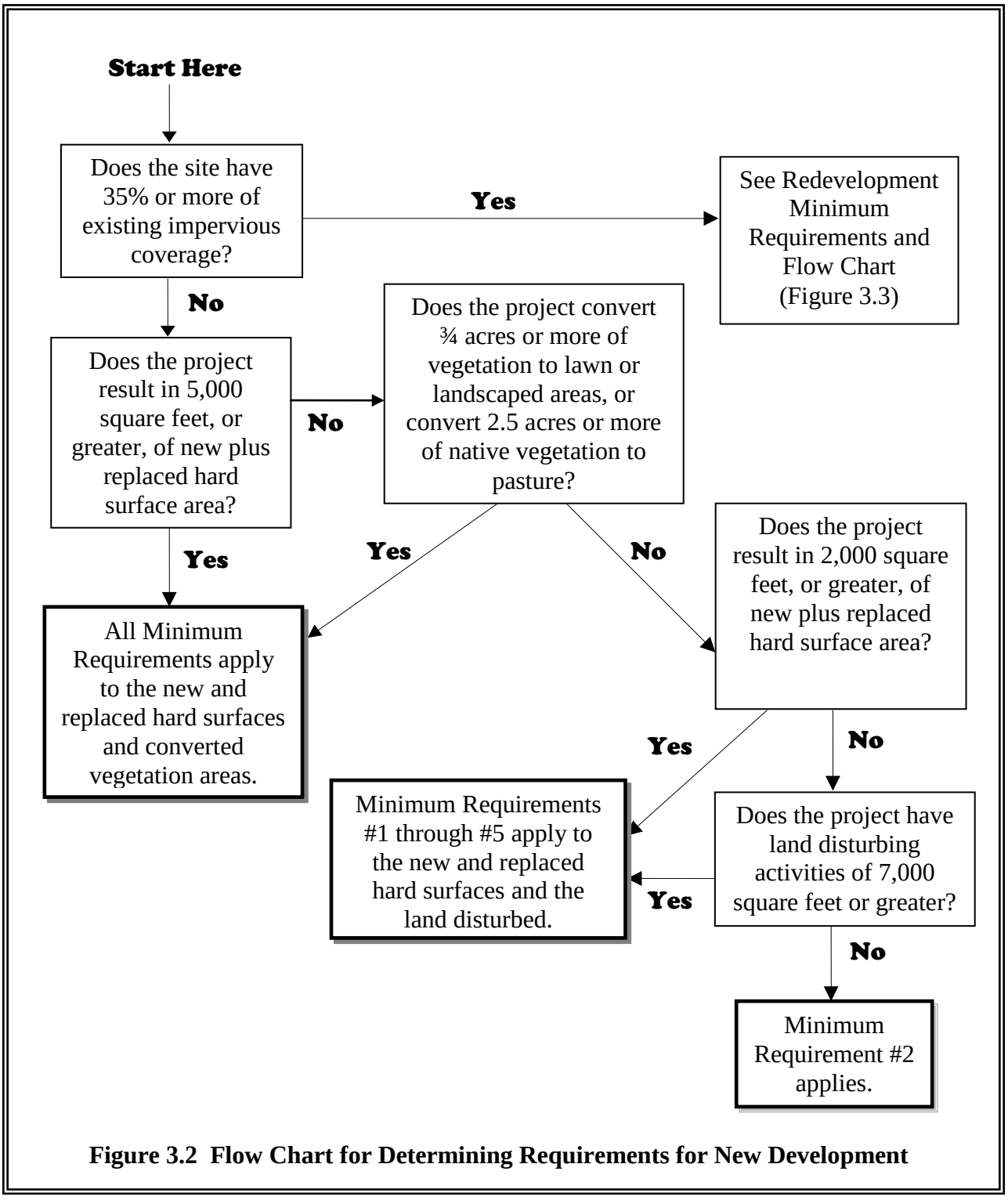

Figure 3.2 Flow Chart for Determining Requirements for New Development

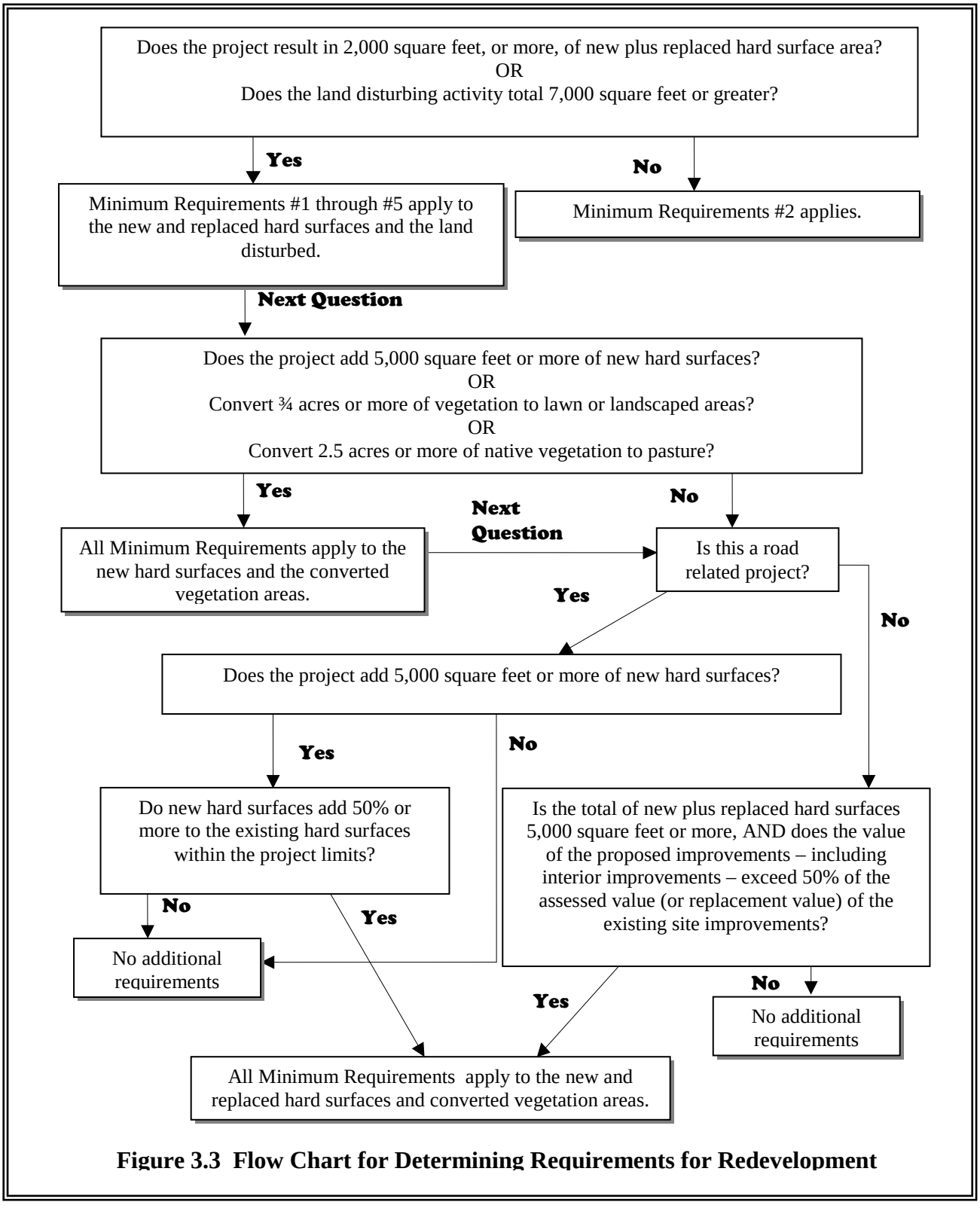

Figure 3.3 Flow Chart for Determining Requirements for Redevelopment

3.2 New Development

All new development shall be required to comply with Minimum Requirement #2.

The following new development shall comply with Minimum Requirements #1 through #5 for the new and replaced hard surfaces and the land disturbed:

- Results in 2,000 square feet, or greater, of new plus replaced hard surface area, or
- Has land disturbing activity of 7,000 square feet or greater.

The following new development shall comply with Minimum Requirements #1 through #9 for the new and replaced hard surfaces and the converted vegetation areas:

- Results in 5,000 square feet, or greater, of new plus replaced hard surface area, or
- Converts ¾ acres, or more, of vegetation to lawn or landscaped areas, or
- Converts 2.5 acres, or more, of native vegetation to pasture.

3.3 Redevelopment

All redevelopment shall be required to comply with Minimum Requirement #2.

The following redevelopment shall comply with Minimum Requirements #1 through #5 for the new and replaced hard surfaces and the land disturbed:

- Results in 2,000 square feet, or more, of new plus replaced hard surface area, or
- Has land disturbing activity of 7,000 square feet or greater.

The following redevelopment shall comply with Minimum Requirements #1 through #9 for the new hard surfaces and converted vegetation areas:

- Adds 5,000 square feet or more of new hard surfaces or,
- Converts ¾ acres, or more, of vegetation to lawn or landscaped areas, or
- Converts 2.5 acres, or more, of native vegetation to pasture.

The local government may allow the Minimum Requirements to be met for an equivalent (flow and pollution characteristics) area within the same site. For public road projects, the equivalent area does not have to be within the project limits, but must drain to the same receiving water.

3.4 Additional Requirements for Re-development Project Sites

For road-related projects, runoff from the replaced and new hard surfaces (including pavement, shoulders, curbs, and sidewalks) and the converted vegetation areas shall meet all the Minimum Requirements if the new hard surfaces total 5,000 square feet or more and total 50% or more of the existing hard surfaces within the project limits. The project limits shall be defined by the length of the project and the width of the right-of-way.

Other types of redevelopment projects shall comply with Minimum Requirements #1 through #9 for the new and replaced hard surfaces and the converted vegetation areas if the total of new plus replaced hard surfaces is 5,000 square feet or more, and the valuation of proposed improvements – including interior improvements – exceeds 50% of the assessed value of the existing site improvements.

The Permittee may exempt or institute a stop-loss provision for redevelopment projects from compliance with Minimum Requirement #5 On-site Stormwater Management, Minimum Requirement #6 Runoff Treatment, Minimum Requirement #7 Flow Control and/or Minimum Requirement #8 Wetlands Protection as applied to the replaced hard surfaces if the Permittee has adopted a plan and a schedule that fulfills those requirements in regional facilities.

The Permittee may grant a variance/exception to the application of the flow control requirements to replaced impervious surfaces if such application imposes a severe economic hardship. See Section 6 of this Appendix.

3.5 Modification of the Minimum Requirements

Basin Planning is encouraged and may be used to tailor Minimum Requirement #5 On-site Stormwater Management, Minimum Requirement #6 Runoff Treatment, Minimum Requirement #7 Flow Control, and/or Minimum Requirement #8 Wetlands Protection. Basin planning may also be used to demonstrate an equivalent level of treatment, flow control, and/or wetland protection through the construction and use of regional stormwater facilities. See Section 7 of this Appendix for details on Basin Planning and how Permittees may use basin planning to modify the Minimum Requirements in Section 4.

Section 4. Minimum Requirements

This Section describes the Minimum Requirements for stormwater management at new development and redevelopment sites. Section 3 of this Appendix should be consulted to determine which of the minimum requirements below apply to any given project. Figures 3.2 and 3.3 should be consulted to determine whether the minimum requirements apply to new surfaces, replaced surfaces, or new and replaced surfaces.

4.1 Minimum Requirement #1: Preparation of Stormwater Site Plans

The permittee shall require a Stormwater Site Plan from all projects meeting the thresholds in Section 3.1 of this Appendix. Stormwater Site Plans shall use site-appropriate development principles, as required and encouraged by local development codes, to retain native vegetation and minimize impervious surfaces to the extent feasible. Stormwater Site Plans shall be prepared in accordance with Chapter 3 of Volume 1 of the *Stormwater Management Manual for Western Washington (SWMMWW)*.

4.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan (SWPPP)

Permittees may choose to allow compliance with this Minimum Requirement to be achieved for an individual site if the site is covered under Ecology's *General NPDES Permit for Stormwater Discharges Associated with Construction Activities* and fully implementing the requirements of that permit.

Thresholds

All new development and redevelopment projects are responsible for preventing erosion and discharge of sediment and other pollutants into receiving waters.

Permittees must require a Construction Stormwater Pollution Prevention Plan (SWPPP) for all projects which result in 2,000 sq. ft. or more of new plus replaced hard surface area, or which disturb 7,000 sq. ft. or more of land.

Projects below those thresholds are not required to prepare a Construction SWPPP, but must consider all of the Elements listed below for Construction SWPPPs and develop controls for all elements that pertain to the project site. The Permittee may develop an abbreviated SWPPP format to meet the SWPPP requirement under this permit for project sites that will disturb less than 1 acre.

General Requirements

The SWPPP shall include a narrative and drawings. All BMPs shall be clearly referenced in the narrative and marked on the drawings. The SWPPP narrative shall include documentation to explain and justify the pollution prevention decisions made for the project. Each of the thirteen elements listed below must be considered and included in the SWPPP unless site conditions render the element unnecessary and the exemption from that element is clearly justified in the narrative of the SWPPP.

Clearing and grading activities for developments shall be permitted only if conducted pursuant to an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. These permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements, or tree retention areas as may be required by local jurisdictions, shall be delineated on the site plans and the development site.

The SWPPP shall be implemented beginning with initial land disturbance and until final stabilization. Sediment and Erosion control BMPs shall be consistent with the BMPs contained in chapter 4 of Volume II of the *Stormwater Management Manual for Western Washington* (SWMMWW).

Seasonal Work Limitations - From October 1 through April 30, clearing, grading, and other soil disturbing activities may only be authorized by the Permittee if silt-laden runoff will be prevented from leaving the site through a combination of the following:

1. Site conditions including existing vegetative coverage, slope, soil type and proximity to receiving waters; and
2. Limitations on activities and the extent of disturbed areas; and
3. Proposed erosion and sediment control measures.

Based on the information provided and/or local weather conditions, the Permittee may expand or restrict the seasonal limitation on site disturbance. The following activities are exempt from the seasonal clearing and grading limitations:

1. Routine maintenance and necessary repair of erosion and sediment control BMPs,
2. Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil, and
3. Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

Construction Stormwater Pollution Prevention Plan (SWPPP) Elements

1. Preserve Vegetation/Mark Clearing Limits:

a. Before beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area.

b. Retain the duff layer, native top soil, and natural vegetation in an undisturbed state to the maximum degree practicable.

2. Establish Construction Access:

a. Limit construction vehicle access and exit to one route, if possible.

b. Stabilize access points with a pad of quarry spalls, crushed rock, or other equivalent BMPs, to minimize tracking of sediment onto public roads.

c. Locate wheel wash or tire baths on-site, if the stabilized constructions entrance is not effective in preventing tracking sediment onto roads.

d. If sediment is tracked off site, clean the affected roadways thoroughly at the end of each day, or more frequently as necessary (for example, during wet weather). Remove sediment from roads by shoveling, sweeping, or pick up and transport the sediment to a controlled sediment disposal area.

e. Conduct street washing only after sediment is removed in accordance with 2.d, above.

f. Control street wash wastewater by pumping back on-site, or otherwise prevent it from discharging into systems tributary to waters of the State.

3. Control Flow Rates:

a. Protect properties and waterways downstream of development sites from erosion and the associated discharge of turbid waters due to increases in the velocity and peak volumetric flow rate of stormwater runoff from the project site.

b. Where necessary to comply with 3.a, above, construct stormwater retention or detention facilities as one of the first steps in grading. Assure that detention facilities function properly before constructing site improvements (e.g., impervious surfaces).

c. If permanent infiltration ponds are used for flow control during construction, protect these facilities from siltation during the construction phase.

4. Install Sediment Controls:

a. Design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants.

b. Construct sediment control BMPs (sediment ponds, traps, filters, etc.) as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.

c. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.

d. Direct stormwater runoff from disturbed areas through a sediment pond or other appropriate sediment removal BMP, before the runoff leaves a construction site or before discharge to an infiltration facility. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard in 3.a, above.

e. Locate BMPs intended to trap sediment on-site in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages.

f. Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.

5. Stabilize Soils:

a. Stabilize exposed and unworked soils by application of effective BMPs that prevent erosion. Applicable BMPs include, but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base early on areas to be paved, and dust control.

b. Control stormwater volume and velocity within the site to minimize soil erosion.

c. Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.

d. Soils must not remain exposed and unworked for more than the time periods set forth below to prevent erosion:

- During the dry season (May 1 – September 30): 7 days
- During the wet season (October 1 – April 30): 2 days

e. Stabilize soils at the end of the shift before a holiday or weekend if needed based on the weather forecast.

f. Stabilize soil stockpiles from erosion, protect with sediment trapping measures, and where possible, locate away from storm drain inlets, waterways and drainage channels.

g. Minimize the amount of soil exposed during construction activity.

h. Minimize the disturbance of steep slopes.

i. Minimize soil compaction and, unless infeasible, preserve topsoil.

6. Protect Slopes:

a. Design and construct cut-and-fill slopes in a manner to minimize erosion. Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).

b. Divert off-site stormwater (run-on) or ground water away from slopes and disturbed areas with interceptor dikes, pipes and/or swales. Off-site stormwater should be managed separately from stormwater generated on the site.

c. At the top of slopes, collect drainage in pipe slope drains or protected channels to prevent erosion.

- Temporary pipe slope drains must handle the peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year 1-hour flow rate predicted by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis must use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model to predict flows, bare soil areas should be modeled as "landscaped area."

d. Place excavated material on the uphill side of trenches, consistent with safety and space considerations.

e. Place check dams at regular intervals within constructed channels that are cut down a slope.

7. Protect Drain Inlets:

a. Protect storm drain inlets made operable during construction so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.

b. Clean or remove and replace inlet protection devices when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

8. Stabilize Channels and Outlets:

a. Design, construct, and stabilize all on-site conveyance channels to prevent erosion from the following expected peak flows:

- Channels must handle the peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate indicated by an approved continuous runoff model, increased by a factor of 1.6, may be used. The hydrologic analysis must use the existing land cover condition for predicting flow rates from tributary areas outside the project limits. For tributary areas on the project site, the analysis shall use the temporary or permanent project land cover condition, whichever will produce the highest flow rates. If using the Western Washington Hydrology Model to predict flows, bare soil areas should be modeled as "landscaped area."

b. Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches at the outlets of all conveyance systems.

9. Control Pollutants:

a. Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.

b. Handle and dispose all pollutants, including waste materials and demolition debris that occur on-site in a manner that does not cause contamination of stormwater.

c. Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and other materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment. Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.

d. Conduct maintenance, fueling and repair of heavy equipment and vehicles using spill prevention and control measures. Clean contaminated surfaces immediately following any spill incident.

e. Discharge wheel wash or tire bath wastewater to a separate on-site treatment system that prevents discharge to surface water, such as closed-loop recirculation or upland application, or to the sanitary sewer, with local sewer district approval.

f. Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label requirements for application rates and procedures.

g. Use BMPs to prevent contamination of stormwater runoff by pH modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, concrete pumping and mixer washout waters.

h. Adjust the pH of stormwater if necessary to prevent violations of water quality standards.

i. Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.

j. Obtain written approval from Ecology before using chemical treatment other than CO2 or dry ice to adjust pH.

10. Control De-Watering:

a. Discharge foundation, vault, and trench de-watering water, which have similar characteristics to stormwater runoff at the site, into a controlled conveyance system before discharge to a sediment trap or sediment pond.

b. Discharge clean, non-turbid de-watering water, such as well-point ground water, to systems tributary to, or directly into surface waters of the State, as specified in 8, above, provided the de-watering flow does not cause erosion or flooding of receiving waters. Do not route clean dewatering water through stormwater sediment ponds. Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site.

c. Handle highly turbid or otherwise contaminated dewatering water separately from stormwater.

d. Other treatment or disposal options may include:

(i) Infiltration

(ii) Transport off-site in vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters.

(iii) Ecology-approved on-site chemical treatment or other suitable treatment technologies.

(iv) Sanitary or combined sewer discharge with local sewer district approval, if there is no other option.

(v) Use of a sedimentation bag that discharges to a ditch or swale for small volumes of localized dewatering.

11. Maintain BMPs:

a. Maintain and repair all temporary and permanent erosion and sediment control BMPs as needed to assure continued performance of their intended function in accordance with BMP specifications.

b. Remove all temporary erosion and sediment control BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.

12. Manage the Project:

a. Phase development projects to the maximum degree practicable and take into account seasonal work limitations.

b. Inspection and monitoring – Inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function.

c. Maintaining an updated construction SWPPP – Maintain, update, and implement the SWPPP.

d. Projects that disturb one or more acres must have site inspections conducted by a Certified Erosion and Sediment Control Lead (CESCL). Project sites disturbing less than one acre may have a CESCL or a person without CESCL certification conduct inspections. By the initiation of construction, the SWPPP must identify the CESCL or inspector, who must be present on-site or on-call at all times.

13. Protect Low Impact Development BMPs

a. Protect all Bioretention and Rain Garden BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden BMPs. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment-laden Bioretention/rain garden soils, and replacing the removed soils with soils meeting the design specification.

b. Prevent compacting Bioretention and Rain Garden BMPs by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.

c. Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements or base materials.

d. Pavements fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures from the local stormwater manual or the manufacturer's procedures.

e. Keep all heavy equipment off existing soils under LID BMPs that have been excavated to final grade to retain the infiltration rate of the soils.

4.3 Minimum Requirement #3: Source Control of Pollution

All known, available and reasonable source control BMPs must be required for all projects approved by the Permittee. Source control BMPs must be selected, designed, and maintained in accordance with Volume IV of the *Stormwater Management Manual for Western Washington* or an approved equivalent manual approved by Ecology.

4.4 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

Natural drainage patterns shall be maintained, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and down gradient properties. All outfalls require energy dissipation.

4.5 Minimum Requirement #5: On-site Stormwater Management

Applicability

Except as provided below, the Permittee must require On-site Stormwater Management BMPs in accordance with the following project thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible without causing flooding or erosion impacts.

Projects qualifying as flow control exempt in accordance with Section 4.7 of this Appendix do not have to achieve the LID performance standard, nor consider bioretention, rain gardens, permeable pavement, and full dispersion if using List #1 or List #2. However, those projects must implement BMP T5.13; BMPs T5.10A, B, or C; and BMP T5.11or T5.12, if feasible.

Project Thresholds

1. Projects triggering only Minimum Requirements #1 through #5 shall either:

    a. Use On-site Stormwater Management BMPs from List #1 for all surfaces within each type of surface in List #1; or

    b. Demonstrate compliance with the LID Performance Standard. Projects selecting this option cannot use Rain Gardens. They may choose to use Bioretention BMPs as described in the *SWMMWW*[1].

2. Projects triggering Minimum Requirements #1 through #9 must meet the requirements in Table 4.1

[1] All references to the *Stormwater Management Manual for Western Washington* are to the 2014 amended version.

Table 4.1: On-site Stormwater Management Requirements for Projects Triggering Minimum Requirements #1 - #9

Project Type and Location	Requirement
New development on any parcel inside the UGA, or new development outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13; or List #2 (applicant option).
New development outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13.
Redevelopment on any parcel inside the UGA, or redevelopment outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13; or List #2 (applicant option).
Redevelopment outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13.

NOTE: This table refers to the Urban Growth Area (UGA) as designated under the Growth Management Act (GMA) (chapter 36.70A RCW) of the State of Washington. If the Permittee is located in a county that is not subject to planning under the GMA, the city limits shall be used instead.

Low Impact Development Performance Standard

Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Refer to the Standard Flow Control Requirement section in Minimum Requirement #7 for information about the assignment of the pre-developed condition. Project sites that must also meet minimum requirement #7 shall match flow durations between 8% of the 2-year flow through the full 50-year flow.

List #1: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #5

For each surface, consider the BMP's in the order listed for that type of surface. Use the first BMP that is considered feasible. No other On-site Stormwater Management BMP is necessary for that surface. Feasibility shall be determined by evaluation against:

1. Design criteria, limitations, and infeasibility criteria identified for each BMP in the *SWMMWW*; and

2. Competing Needs Criteria listed in Chapter 5 of Volume V of the *SWMMWW*.

Lawn and landscaped areas:

- Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V of the *SWMMWW*

Roofs:

1. Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V of the *SWMMWW*, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Section 3.1.1 of Volume III of the *SWMMWW*.
2. Rain Gardens in accordance with BMP T5.14A in Chapter 5 of Volume V, or Bioretention in accordance with Chapter 7 of Volume V of the *SWMMWW*. The rain garden or bioretention facility must have a minimum horizontal projected surface area below the overflow which is at least 5% of the area draining to it.
3. Downspout Dispersion Systems in accordance with BMP T5.10B in Section 3.1.2 of Volume III of the *SWMMWW*.
4. Perforated Stub-out Connections in accordance with BMP T5.10C in Section 3.1.3 of Volume III of the *SWMMWW*.

Other Hard Surfaces:

1. Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V of the *SWMMWW*.
2. Permeable pavement[2] in accordance with BMP T5.15 in Chapter 5 of Volume V of the *SWMMWW*, or Rain Gardens in accordance with BMP T5.14A in Chapter 5 of Volume V, or Bioretention in accordance with Chapter 7 of Volume V of the *SWMMWW*. The rain garden or bioretention facility must have a minimum horizontal projected surface area below the overflow which is at least 5% of the area draining to it.
3. Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Chapter 5 of Volume V of the *SWMMWW*.

List #2: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #9

For each surface, consider the BMPs in the order listed for that type of surface. Use the first BMP that is considered feasible. No other On-site Stormwater Management BMP is necessary for that surface. Feasibility shall be determined by evaluation against:

1. Design criteria, limitations, and infeasibility criteria identified for each BMP in the *SWMMWW*; and

2. Competing Needs Criteria listed in Chapter 5 of Volume V of the *SWMMWW*.

[2] This is not a requirement to pave these surfaces. Where pavement is proposed, it must be permeable to the extent feasible unless full dispersion is employed.

Lawn and landscaped areas:

- Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Chapter 5 of Volume V of the *SWMMWW*

Roofs:

1. Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V of the *SWMMWW*, or Downspout Full Infiltration Systems in accordance with BMP T5.10A in Section 3.1.1 of Volume III of the *SWMMWW*
2. Bioretention (See Chapter 7 of Volume V of the *SWMMWW*) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the of the total surface area draining to it
3. Downspout Dispersion Systems in accordance with BMP T5.10B in Section 3.1.2 of Volume III of the *SWMMWW*
4. Perforated Stub-out Connections in accordance with BMP T5.10C in Section 3.1.3 of Volume III of the *SWMMWW*.

Other Hard Surfaces:

1. Full Dispersion in accordance with BMP T5.30 in Chapter 5 of Volume V of the *SWMMWW*
2. Permeable pavement[2] in accordance with BMP T5.15 in Chapter 5 of Volume V of the *SWMMWW*
3. Bioretention (See Chapter 7, Volume V of the *SWMMWW*) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it**.**
4. Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Chapter 5 of Volume V of the *SWMMWW*

4.6 Minimum Requirement #6: Runoff Treatment

Project Thresholds

When assessing a project against the following thresholds, only consider those hard and pervious surfaces that are subject to this minimum requirement as determined in Section 3 of this Appendix.

The following require construction of stormwater treatment facilities:

- Projects in which the total of pollution-generating hard surface (PGHS) is 5,000 square feet or more in a threshold discharge area of the project, or
- Projects in which the total of pollution-generating pervious surfaces (PGPS) – not including permeable pavements - is three-quarters (3/4) of an acre or more in a threshold discharge area, and from which there will be a surface discharge in a natural or man-made conveyance system from the site.

Treatment-Type Thresholds

1. **Oil Control:**

Treatment to achieve Oil Control applies to projects that have "high-use sites." High-use sites are those that typically generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil. High-use sites include:

a. An area of a commercial or industrial site subject to an expected average daily traffic (ADT) count equal to or greater than 100 vehicles per 1,000 square feet of gross building area;

b. An area of a commercial or industrial site subject to petroleum storage and transfer in excess of 1,500 gallons per year, not including routinely delivered heating oil;

c. An area of a commercial or industrial site subject to parking, storage or maintenance of 25 or more vehicles that are over 10 tons gross weight (trucks, buses, trains, heavy equipment, etc.);

d. A road intersection with a measured ADT count of 25,000 vehicles or more on the main roadway and 15,000 vehicles or more on any intersecting roadway, excluding projects proposing primarily pedestrian or bicycle use improvements.

2. **Phosphorus Treatment:**

The requirement to provide phosphorous control is determined by the local government with jurisdiction (e.g., through a lake management plan), or the Department of Ecology (e.g., through a waste load allocation). The local government may have developed a management plan and implementing ordinances or regulations for control of phosphorus from new/redevelopment for the receiving water(s) of the stormwater drainage. The local government can use the following sources of information for pursuing plans and implementing ordinances and/or regulations:

a. Those waterbodies reported under section 305(b) of the Clean Water Act, and designated as not supporting beneficial uses due to phosphorous;

b. Those listed in Washington State's Nonpoint Source Assessment required under section 319(a) of the Clean Water Act due to nutrients.

3. **Enhanced Treatment:**

Except where specified below under "4. Basic Treatment", Enhanced treatment for reduction in dissolved metals is required for the following project sites that: 1) discharge directly to fresh waters or conveyance systems tributary to fresh waters designated for aquatic life use or that have an existing aquatic life use; or 2) use infiltration strictly for flow control – not treatment – and the discharge is within ¼

mile of a fresh water designated for aquatic life use or that has an existing aquatic life use:

Industrial project sites,
Commercial project sites,
Multi-family project sites, and
High AADT roads as follows:

Within Urban Growth Management Areas:

- Fully controlled and partially controlled limited access highways with Annual Average Daily Traffic (AADT) counts of 15,000 or more
- All other roads with an AADT of 7,500 or greater

Outside of Urban Growth Management Areas:

- Roads with an AADT of 15,000 or greater unless discharging to a 4th Strahler order stream or larger;
- Roads with an AADT of 30,000 or greater if discharging to a 4th Strahler order stream or larger (as determined using 1:24,000 scale maps to delineate stream order).

Any areas of the above-listed project sites that are identified as subject to Basic Treatment requirements (below), are not also subject to Enhanced Treatment requirements. For developments with a mix of land use types, the Enhanced Treatment requirement shall apply when the runoff from the areas subject to the Enhanced Treatment requirement comprise 50% or more of the total runoff within a threshold discharge area.

4. **Basic Treatment:**

Basic Treatment is required in the following circumstances:

- Project sites that discharge to the ground, UNLESS:

  1) The soil suitability criteria for infiltration treatment are met (See Chapter 3, Volume III of the *SWMMWW*), and alternative pretreatment is provided (see Chapter 6, Volume V of the *SWMMWW)*; or

  2) The project site uses infiltration strictly for flow control – not treatment - and the discharge is within ¼-mile of a phosphorus sensitive lake (use a Phosphorus Treatment facility), or

  3) The project site is industrial, commercial, multi-family residential, or a high AADT road (consistent with the Enhanced Treatment-type thresholds listed above) and is within ¼ mile of a fresh water designated for aquatic life use or that has an existing aquatic life use.(use an Enhanced Treatment facility).

- Residential projects not otherwise needing phosphorus control as designated by USEPA, the Department of Ecology, or by the Permittee;
- Project sites discharging directly (or indirectly through a municipal separate storm sewer system) to Basic Treatment Receiving Waters (Appendix I-C of the *SWMMWW*);
- Project sites that drain to fresh water that is not designated for aquatic life use, and does not have an existing aquatic life use; and project sites that drain to waters not tributary to waters designated for aquatic life use or that have an existing aquatic life use;
- Landscaped areas of industrial, commercial, and multi-family project sites, and parking lots of industrial and commercial project sites that do not involve pollution-generating sources (e.g., industrial activities, customer parking, storage of erodible or leachable material, wastes or chemicals) other than parking of employees' private vehicles. For developments with a mix of land use types, the Basic Treatment requirement shall apply when the runoff from the areas subject to the Basic Treatment requirement comprise 50% or more of the total runoff within a threshold discharge area.

Treatment Facility Sizing

Size stormwater treatment facilities for the entire area that drains to them, even if some of those areas are not pollution-generating, or were not included in the project site threshold decisions (Section 3 of this appendix) or the treatment threshold decisions of this minimum requirement.

Water Quality Design Storm Volume: The volume of runoff predicted from a 24-hour storm with a 6-month return frequency (a.k.a., 6-month, 24-hour storm). Wetpool facilities are sized based upon the volume of runoff predicted through use of the Natural Resource Conservation Service curve number equations in Chapter 2 of Volume III of the *SWMMWW*), for the 6-month, 24-hour storm. Alternatively, when using an approved continuous runoff model, the water quality design storm volume shall be equal to the simulated daily volume that represents the upper limit of the range of daily volumes that accounts for 91% of the entire runoff volume over a multi-decade period of record.

Water Quality Design Flow Rate

1. **Preceding Detention Facilities or when Detention Facilities are not required:**

   The flow rate at or below which 91% of the runoff volume, as estimated by an approved continuous runoff model, will be treated. Design criteria for treatment facilities are assigned to achieve the applicable performance goal (e.g., 80% TSS removal) at the water quality design flow rate. At a minimum, 91% of the total runoff volume, as estimated by an approved continuous runoff model, must pass through the treatment facility(ies) at or below the approved hydraulic loading rate for the facility(ies).

2. **Downstream of Detention Facilities:**

   The water quality design flow rate must be the full 2-year release rate from the detention facility.

Treatment Facility Selection, Design, and Maintenance

Stormwater treatment facilities shall be:

- Selected in accordance with the process identified in Chapter 4 of Volume I, and Chapter 2 of Volume V of the *SWMMWW*,
- Designed in accordance with the design criteria in Volume V of the *SWMMWW*, and
- Maintained in accordance with the maintenance schedule in Volume V of the *SWMMWW*.

Additional Requirements

The discharge of untreated stormwater from pollution-generating hard surfaces to ground water must not be authorized by the Permittee, except for the discharge achieved by infiltration or dispersion of runoff through use of On-site Stormwater Management BMPs in accordance with Chapter 5, Volume V and Chapter 7, Volume V of the *SWMMWW*; or by infiltration through soils meeting the soil suitability criteria in Chapter 3 of Volume III of the *SWMMWW*.

4.7 Minimum Requirement #7: Flow Control

Applicability

Except as provided below, the Permittee must require all projects provide flow control to reduce the impacts of stormwater runoff from hard surfaces and land cover conversions. The requirement below applies to projects that discharge stormwater directly, or indirectly through a conveyance system, into a fresh water body.

Flow control is not required for projects that discharge directly to, or indirectly through an MS4 to a water listed in Appendix I-E of the *SWMMWW* subject to the following restrictions:

- Direct discharge to the exempt receiving water does not result in the diversion of drainage from any perennial stream classified as Types 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Types “S”, “F”, or “Np” in the Permanent Water Typing System, or from any category I, II, or III wetland; and
- Flow splitting devices or drainage BMP’s are applied to route natural runoff volumes from the project site to any downstream Type 5 stream or category IV wetland:
  - Design of flow splitting devices or drainage BMP’s will be based on continuous hydrologic modeling analysis. The design will assure that flows

delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50% of the 2-year to the 50-year peak flow.

- Flow splitting devices or drainage BMP's that deliver flow to category IV wetlands will also be designed using continuous hydrologic modeling to preserve pre-project wetland hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction; and

- The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection) and extends to the ordinary high water line of the exempt receiving water; and
- The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected; and
- Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.

If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both this minimum requirement (Minimum Requirement #7) and Minimum Requirement #8 apply.

Permittees may petition Ecology to exempt projects in additional areas. A petition must justify the proposed exemption based upon a hydrologic analysis that demonstrates that the potential stormwater runoff from the exempted area will not significantly increase the erosion forces on the stream channel nor have near-field impacts.

Thresholds

When assessing a project against the following thresholds, consider only those impervious, hard, and pervious surfaces that are subject to this minimum requirement as determined in Section 3 of this Appendix.

The following circumstances require achievement of the standard flow control requirement for western Washington:

- Projects in which the total of effective impervious surfaces is 10,000 square feet or more in a threshold discharge area, or
- Projects that convert ¾ acres or more of vegetation to lawn or landscape, or convert 2.5 acres or more of native vegetation to pasture in a threshold discharge area, and from which there is a surface discharge in a natural or man-made conveyance system from the site, or
- Projects that through a combination of hard surfaces and converted vegetation areas cause a 0.10 cubic feet per second (cfs) increase or greater in the 100-year flow frequency from a threshold discharge area as estimated using the Western

Washington Hydrology Model or other approved model and one-hour time steps (or a 0.15 cfs increase or greater using 15-minute time steps).[3]

Standard Flow Control Requirement

Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched shall be a forested land cover unless:

- Reasonable, historic information is available that indicates the site was prairie prior to settlement (modeled as "pasture" in the Western Washington Hydrology Model); or
- The drainage area of the immediate stream and all subsequent downstream basins have had at least 40% total impervious area since 1985. In this case, the pre-developed condition to be matched shall be the existing land cover condition. The map in Appendix I-G of the *SWMMWW* depicts those areas which meet this criterion. Where basin-specific studies determine a stream channel to be unstable, even though the above criterion is met, the pre-developed condition assumption shall be the "historic" land cover condition, or a land cover condition commensurate with achieving a target flow regime identified by an approved basin study.

This standard requirement is waived for sites that will reliably infiltrate all the runoff from hard surfaces and converted vegetation areas.

Western Washington Alternative Requirement

An alternative requirement may be established through application of watershed-scale hydrological modeling and supporting field observations. Possible reasons for an alternative flow control requirement include:

- Establishment of a stream–specific threshold of significant bedload movement other than the assumed 50% of the 2-year peak flow;
- Zoning and Land Clearing Ordinance restrictions that, in combination with an alternative flow control standard, maintain or reduce the naturally occurring erosive forces on the stream channel; or
- A duration control standard is not necessary for protection, maintenance, or restoration of designated and existing beneficial uses or Clean Water Act compliance.

See Section 7 Basin/Watershed Planning of this Appendix for details on how alternative flow control requirements may be established.

[3] The 0.10 cfs (one-hour time steps) or 0.15 cfs (15-minute time steps) increase should be a comparison of the post-project runoff to the existing condition runoff. For the purpose of applying this threshold, the existing condition is either the pre-project land cover, or the land cover that existed at the site as of a date when the local jurisdiction first adopted flow control requirements into code or rules.

Additional Requirement

Flow Control BMPs shall be selected, designed, and maintained in accordance with Volume III of the *SWMMWW* or an approved equivalent.

4.8 Minimum Requirement #8: Wetlands Protection

Applicability

The requirements below apply only to projects whose stormwater discharges into a wetland, either directly or indirectly through a conveyance system.

Thresholds

The thresholds identified in Minimum Requirement #6 – Runoff Treatment, and Minimum Requirement #7 – Flow Control shall also be applied to determine the applicability of this requirement to discharges to wetlands.

Standard Requirement

Projects shall comply with Guide Sheets #1 through #3 in Appendix I-D of the *SWMMWW*. The hydrologic analysis shall use the existing land cover condition to determine the existing hydrologic conditions unless directed otherwise by a regulatory agency with jurisdiction.

Additional Requirements

Stormwater treatment and flow control facilities shall not be built within a natural vegetated buffer, except for:

- Necessary conveyance systems as approved by the Permittee; or
- As allowed in wetlands approved for hydrologic modification and/or treatment in accordance with Guide Sheet 2 in Appendix I-D of the *SWMMWW*.

An adopted and implemented basin plan prepared in accordance with the provisions of Section 7 of this Appendix may be used to develop requirements for wetlands that are tailored to a specific basin.

4.9 Minimum Requirement #9: Operation and Maintenance

Permittees must require an operation and maintenance manual that is consistent with the provisions in Volume V of the *SWMMWW* for proposed stormwater facilities and BMPs. The party (or parties) responsible for maintenance and operation shall be identified in the operation and maintenance manual. For private facilities approved by the Permittee, a copy of the operation and maintenance manual shall be retained on-site or within reasonable access to the site, and shall be transferred with the property to the new owner. For public facilities, a copy of the operation and maintenance manual shall be retained in the appropriate department. A log of maintenance activity that indicates what actions were taken shall be kept and be available for inspection by the local government.

Section 5. Adjustments

Adjustments to the Minimum Requirements may be granted by the Permittee provided that a written finding of fact is prepared, that addresses the following:

- The adjustment provides substantially equivalent environmental protection.
- Based on sound Engineering practices, the objectives of safety, function, environmental protection and facility maintenance, are met.

Section 6. Exceptions/Variances

Exceptions/variances (exceptions) to the Minimum Requirements may be granted by the Permittee following legal public notice of an application for an exception or variance, legal public notice of the Permittee's decision on the application, and written findings of fact that documents the Permittees determination to grant an exception. Permittees shall keep records, including the written findings of fact, of all local exceptions to the Minimum Requirements.

Project-specific design exceptions based on site-specific conditions do not require prior approval of Ecology. The Permittee must seek prior approval by Ecology for any jurisdiction-wide exception.

The Permittee may grant an exception to the minimum requirements if such application imposes a severe and unexpected economic hardship. To determine whether the application imposes a severe and unexpected economic hardship on the project applicant, the Permittee must consider and document with written findings of fact the following:

- The current (pre-project) use of the site, and
- How the application of the minimum requirement(s) restricts the proposed use of the site compared to the restrictions that existed prior to the adoption of the minimum requirements; and
- The possible remaining uses of the site if the exception were not granted; and
- The uses of the site that would have been allowed prior to the adoption of the minimum requirements; and
- A comparison of the estimated amount and percentage of value loss as a result of the minimum requirements versus the estimated amount and percentage of value loss as a result of requirements that existed prior to adoption of the minimum requirements; and
- The feasibility for the owner to alter the project to apply the minimum requirements.

In addition any exception must meet the following criteria:

- The exception will not increase risk to the public health and welfare, nor be injurious to other properties in the vicinity and/or downstream, and to the quality of waters of the state; and
- The exception is the least possible exception that could be granted to comply with the intent of the Minimum Requirements.

Section 7. Basin/Watershed Planning

Basin/Watershed planning may be used by the Permittee to tailor Minimum Requirement #5 On-site Stormwater Management, Minimum Requirement #6 Runoff Treatment, Minimum Requirement #7 Flow Control, and/or Minimum Requirement #8 Wetlands Protection. Basin planning may also be used to demonstrate an equivalent level of treatment, flow control, and/or wetland protection through the construction and use of regional stormwater facilities.

Basin planning provides a mechanism by which the minimum requirements and implementing BMP's can be evaluated and refined based on an analysis of a basin or watershed. Basin plans may be used to develop control strategies to address impacts from future development and to correct specific problems whose sources are known or suspected. Basin plans can be effective at addressing both long-term cumulative impacts of pollutant loads and short-term acute impacts of pollutant concentrations, as well as hydrologic impacts to streams, wetlands, and ground water resources.

Basin planning will require the use of continuous runoff computer models and field work to verify and support the models. Permittees who are considering the use of basin/watershed plans to modify or tailor one or more of the minimum requirements are encouraged to contact Ecology early in the planning stage.

Some examples of how Basin Planning can alter the minimum requirements are given in Appendix I-A from the *SWMMWW*.

In order for a basin plan to serve as a means of modifying the minimum requirements the following conditions must be met:

- The plan must be formally adopted by all jurisdictions with responsibilities under the plan; and
- All ordinances or regulations called for by the plan must be in effect; and
- The basin plan must be reviewed and approved by Ecology.

APPENDIX 2 – Total Maximum Daily Load (TMDL) Requirements

Additional permit requirements are based on applicable TMDLs in accordance with Special Condition S7 *Compliance with Total Maximum Daily Load Requirements.*

Name of TMDL	**Nooksack River Watershed Bacteria TMDL**
Document(s) for TMDL	*Nooksack River Watershed Bacteria Total Maximum Daily Load*, June 2000. Ecology Publication No. 00-10-036 Nooksack River Watershed Bacteria Total Maximum Daily Load Detailed Implementation Plan, January 2002. Ecology Publication No. 01-10-060 http://www.ecy.wa.gov/programs/wq/tmdl/TMDLsbyWria/TMDLbyWria.html
Location of Original 303(d) Listings	WA-01-1010, WA-01-1012, WA-01-1014, WA-01-1015, WA-01-1016, WA-01-1110, WA-01-1111, WA-01-1115, WA-01-1116, WA-01-1117, WA-01-1118, WA-01-1119, WA-01-1120, WA-01-1125, AR42TO, BX84LO, UZ70KA, LLPL
Area Where TMDL Requirements Apply	TMDL coverage includes areas served by an MS4 draining to the Nooksack River and its tributaries, Fishtrap Creek, Bertrand Creek, Double Ditch drain, Duffner Ditch, Bender road ditch, between Nugents Corner and Marine Drive.
Parameter(s)	Fecal Coliform.
EPA Approval Date	August 8, 2000
MS4 Permittee:	**Phase II Permit: City of Ferndale WAR04-5552** **Phase II Permit: City of Lynden**

Actions Required

City of Ferndale

Continue bacteria sampling under Ecology-approved *Stormwater Quality Monitoring for Fecal Coliform bacteria QAPP* dated 6/19/2009.

- Once the City of Ferndale reduces fecal coliform bacteria below state water quality standards in the current outfall sampling area, the City of Ferndale should designate a new representative area for continued fecal coliform sampling at MS4 outfalls.
- With each annual report, the City of Ferndale shall submit an up to date Stormwater Capital Improvement plan to address existing deficiencies in the stormwater treatment and conveyance system.

City of Lynden

The City of Lynden shall designate a high priority area discharging to its MS4 system for fecal coliform sampling at a representative outfall location, and submit a Stormwater Capital Improvement Plan with each annual report.

- City of Lynden shall designate a high priority sampling location from an MS4 outfall.
- City of Lynden shall submit a fecal coliform Quality Assurance Project Plan (QAPP) to Ecology for review and approval by December 1, 2013. Monitoring shall be ongoing from March 2014 to the end of the permit term.
- With each annual report, City of Lynden shall submit the monitoring results and an up to date Stormwater Capital Improvement Plan to address existing deficiencies in the stormwater treatment and conveyance system.

Name of TMDL	**Stillaguamish River**
EPA Approved Document(s) for TMDL	*Stillaguamish River Watershed Fecal Coliform, Dissolved Oxygen, pH, Arsenic, and Mercury Total Maximum Daily Load (Water Cleanup Plan) - Submittal Report*, May 2005, Ecology Publication No. 05-10-044. http://www.ecy.wa.gov/biblio/0510044.html *Stillaguamish River Watershed Fecal Coliform, Dissolved Oxygen, pH, Arsenic, and Mercury Total Maximum Daily Load (Water Cleanup Plan) - Water Quality Implementation Plan*, June 2007, Ecology Publication No. 07-10-033. http://www.ecy.wa.gov/biblio/0710033.html
Location of Original 303(d) Listings	QJ28UC, HD76OJ, JU33JU, GH05SX, IJ55EP, VJ74AO, 390KRD, OT80TY, QE93BW, ZO73WL, WO38NV, SN06ZT, LU17DC
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and draining to fresh or marine waters within Water Resource Inventory Area (WRIA) 5
Parameter	Fecal Coliform, Dissolved Oxygen
EPA Approval Date	June 21, 2005
MS4 Permittee	Phase I Permit: Snohomish County Phase II Permit: Arlington

Actions Required

Business Inspections: Each Permittee shall inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria. *Commercial animal handling areas* are associated with Standard Industrial Code (SIC) 074 and 075 and include veterinary and pet care/boarding services, animal slaughtering, and support activities for animal production. Facilities where the degradation and transformation of organic

solid waste takes place under controlled conditions designed to promote aerobic decomposition are considered *composting facilities* (definition in accordance with Chapter 173-350 WAC). All qualifying facilities shall be inspected by August 1, 2016 Permittees shall implement an ongoing inspection program to re-inspect facilities with bacteria source control problems a minimum of every three years.

Public Education and Outreach: Each Permittee shall conduct public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior.

Operations & Maintenance: Each Permittee shall install and maintain animal waste collection and/or education stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.

IDDE Field Screening: Each Permittee shall conduct illicit discharge detection and elimination (IDDE) field screening for bacteria sources in MS4 subbasins which discharge to surface waters in the area where these TMDL requirements apply. Phase II cities shall screen 100% of these MS4 subbasins by the expiration date of the permit. Snohomish County shall screen 50% of rural MS4 basins in the TMDL area by the expiration date of the permit unless the option to combine this requirement with the surface water monitoring requirement is selected below. Permittees shall implement the schedules and activities identified in S5.C.8 of the Phase I permit or S5.C.3 of the Western Washington Phase II permit in response to any illicit discharges found.

Surface Water Monitoring: Each Permittee shall select surface water monitoring location(s) as appropriate for characterization and long term trends evaluation of fecal coliform. Each Permittee shall submit a draft QAPP to Ecology for review and approval, no later than February 2, 2015. If Ecology does not request changes within 60 days, the draft QAPP is considered approved. At a minimum, the monitoring program shall:

- Begin by August 1, 2015.
- Collect 12 samples in at least one location per calendar year.
- Submit available data to the Environmental Information Management (EIM) database by May 31 of each year.
- Provide a data summaries and narrative evaluation of the data in each annual report's TMDL summary.
- Be documented in a QAPP which follows *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, July 2004, Ecology Publication No. 04-03-030

Permittees shall follow Ecology-approved QAPPs unless changes are approved by Ecology. Permittees subject to multiple TMDL monitoring requirements may conduct an integrated monitoring program in accordance with an Ecology-approved QAPP. Snohomish County may combine the targeted IDDE field screening requirement, above, with the surface water monitoring requirement as documented in the County's microbial water quality assessment (MWQA), or similar, program per an Ecology-approved QAPP.

Name of TMDL	**Snohomish River Tributaries**
EPA Approved Document(s) for TMDL	*Water Quality Assessment of Tributaries to the Snohomish River and Nonpoint Source Pollution TMDL*, September 1997, Ecology Publication No. 97-334. www.ecy.wa.gov/biblio/97334.html *Snohomish River Tributaries Fecal Coliform Total Maximum Daily Load Submittal Report*, June 2001, Ecology publication No. 00-10-087. www.ecy.wa.gov/biblio/0010087.html *Lower Snohomish River Tributaries Fecal Coliform Bacterial Total Maximum Daily Load: Detailed Implementation Plan*, June 2003, Ecology Publication No. 03-10-031. www.ecy.wa.gov//biblio/0310031.html
Location of Original 303(d) Listings	WA-07-1012, WA-07-015, WA-07-1052, WA-07-1163WA-07-1163, WA-07-1030 and WA-07-040
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and draining to the WASWIS segment number, and all upstream tributaries within the jurisdiction of the Permittee and within the geographic area covered by this permit contributing to waterbodies: Allen Creek, YT94RF: Quilceda Creek, TH58TS: French Creek, XZ24XU: Woods Creek, FZ74HO: Pilchuck River, NF79WA: Marshland Watershed, XW79FQ.
Parameter	Fecal Coliform
EPA Approval Date	August 9, 2001
MS4 Permittee	Phase I Permit: Snohomish County Phase II Permit: Granite Falls, Lake Stevens, Monroe, Snohomish, Marysville, Arlington, Everett

Actions Required

Business Inspections: Each Permittee shall inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria. *Commercial animal handling areas* are associated with Standard Industrial Code (SIC) 074 and 075 and include veterinary and pet care/boarding services, animal slaughtering, and support activities for animal production. Facilities where the degradation and transformation of organic solid waste takes place under controlled conditions designed to promote aerobic decomposition are considered *composting facilities* (definition in accordance with Chapter 173-350 WAC). All qualifying facilities shall be inspected by August 1, 2016. Permittees shall implement an ongoing inspection program to re-inspect facilities with bacteria source control problems a minimum of every three years.

Public Education and Outreach: Each Permittee shall conduct public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior.

Operations & Maintenance: Each Permittee shall install and maintain animal waste collection and/or education stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.

IDDE: Permittees conducting IDDE-related field screening under S5.C.8 of the Phase I permit or S5.C.3 of the Western Washington Phase II permit shall screen for bacteria sources in any screened MS4 subbasins which discharge to surface waters in the TMDL area.

Targeted Source Identification & Elimination: By February 2, 2014, each Permittee shall review the fecal coliform data collected per approved QAPPs under the 2007 Permit. The purpose of this review is to identify a minimum of one high priority area (such as a tributary or a stream segment) that will be the focus of source identification and elimination efforts during this permit cycle. Each Permittee shall prepare written documentation of this review and the identified high priority area; documentation shall be submitted with the Annual Report for 2014. Permittees shall begin to implement source identification and elimination efforts in the MS4 subbasins discharging to the identified high priority area no later than August 1, 2014. Permittees are encouraged to address potential bacteria pollution sources not associated with the MS4. Stormwater quality sampling for bacteria sources is required as part of this focused source identification and elimination effort. Permittees shall implement the schedules and activities identified in S5.C.8 of the Phase I permit or S5.C.3 of the Western Washington Phase II permit in response to any illicit discharges found. Each annual report's TMDL summary shall include qualitative and quantitative information about the source identification and elimination activities, including procedures followed and sampling results, implemented in the selected high priority area(s).

Surface Water Monitoring: Each Permittee shall review the fecal coliform data collected per approved QAPPs under the 2007 Permit and select surface water monitoring location(s) as appropriate for continued characterization and long term trends evaluation of fecal coliform. Each Permittee shall submit a draft revised QAPP to Ecology for review and approval, no later than February 2, 2015. If Ecology does not request changes within 60 days, the draft QAPP is considered approved. At a minimum, the monitoring program shall:

- Begin by August 1, 2015.
- Collect 12 samples in at least one location per calendar year.
- Submit available data to the Environmental Information Management (EIM) database by May 31 of each year.
- Provide data summaries and narrative evaluation of the data in each annual report's TMDL summary.
- Be documented in a QAPP which follows *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, July 2004, Ecology Publication No. 04-03-030.

Permittees shall follow Ecology-approved QAPPs unless changes are approved by Ecology. Permittees subject to multiple TMDL monitoring requirements may conduct an integrated monitoring program in accordance with an Ecology-approved QAPP. Snohomish County may combine the high priority area source identification and elimination requirement with the surface water monitoring requirement as documented in the County's microbial water quality assessment (MWQA), or similar, program per an Ecology-approved QAPP.

Name of TMDL	**North Creek**
EPA Approved Document(s) for TMDL	*North Creek Watershed: Total Maximum Daily Load Evaluation for Fecal Coliform Bacteria*, June 2001, Ecology Publication No. 01-03-020. http://www.ecy.wa.gov/biblio/0103020.html *North Creek Fecal Coliform Total Maximum Daily Load Submittal Report*, June 2002, Ecology publication No. 02-10-020. http://www.ecy.wa.gov/biblio/0210020.html *North Creek Fecal Coliform Bacteria Total Maximum Daily Load: Detailed Implementation Plan*, October 2003, Ecology Publication No. 03-10-047. http://www.ecy.wa.gov/biblio/0310047.html
Location of Original 303(d) Listings	WA-08-1065
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and draining to the portion of the WASWIS segment SM74QQ starting at the confluence with the Sammamish River and including all upstream tributaries contributing to the North Creek segment of WASWIS SM74QQ.
Parameter	Fecal Coliform
EPA Approval Date	August 2, 2002
MS4 Permittee	Phase I Permit: Snohomish County Phase II Permit: Everett, Bothell, Mill Creek

Actions Required

Business Inspections: Each Permittee shall inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria. *Commercial animal handling areas* are associated with Standard Industrial Code (SIC) 074 and 075 and include veterinary and pet care/boarding services, animal slaughtering, and support activities for animal production. Facilities where the degradation and transformation of organic solid waste takes place under controlled conditions designed to promote aerobic decomposition are considered *composting facilities* (definition in accordance with Chapter 173-350 WAC). All qualifying facilities shall be inspected by August 1, 2016. Permittees shall implement an ongoing

inspection program to re-inspect facilities with bacteria source control problems a minimum of every three years.

Public Education and Outreach: Each Permittee shall conduct public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior.

Operations & Maintenance: Each Permittee shall install and maintain animal waste collection and/or education stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.

IDDE: Permittees conducting IDDE-related field screening under S5.C.8 of the Phase I permit or S5.C.3 of the Western Washington Phase II permit shall screen for bacteria sources in any screened MS4 subbasins which discharge to surface waters in the TMDL area.

Targeted Source Identification & Elimination: By February 2, 2014, each Permittee shall review the fecal coliform data collected per approved QAPPs under the 2007 Permit. The purpose of this review is to identify a minimum of one high priority area (such as a tributary or a stream segment) that will be the focus of source identification and elimination efforts during this permit cycle. Each Permittee shall prepare written documentation of this review and the identified high priority area; documentation shall be submitted with the Annual Report for 2014. Permittees shall begin to implement source identification and elimination efforts in the MS4 subbasins discharging to the identified high priority area no later than August 1, 2014. Permittees are encouraged to address potential bacteria pollution sources not associated with the MS4. Stormwater quality sampling for bacteria sources is required as part of this focused source identification and elimination effort. Permittees shall implement the schedules and activities identified in S5.C.8 of the Phase I permit or S5.C.3 of the Western Washington Phase II permit in response to any illicit discharges found. Each annual report's TMDL summary shall include qualitative and quantitative information about the source identification and elimination activities, including procedures followed and sampling results, implemented in the selected high priority area(s).

Surface Water Monitoring: Each Permittee shall review the fecal coliform data collected per approved QAPPs under the 2007 Permit and select surface water monitoring location(s) as appropriate for continued characterization and long term trends evaluation of fecal coliform. Each Permittee shall submit a draft revised QAPP to Ecology for review and approval, no later than February 2, 2015. If Ecology does not request changes within 60 days, the draft QAPP is considered approved. At a minimum, the monitoring program shall:

- Begin by August 1, 2015.
- Collect 12 samples in at least one location per calendar year.
- Submit available data to the Environmental Information Management (EIM) database by May 31 of each year.

- Provide data summaries and narrative evaluation of the data in each annual report's TMDL summary.
- Be documented in a QAPP which follows *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*, July 2004, Ecology Publication No. 04-03-030.

Permittees shall follow Ecology-approved QAPPs unless changes are approved by Ecology. Permittees subject to multiple TMDL monitoring requirements may conduct an integrated monitoring program in accordance with an Ecology-approved QAPP. Snohomish County may combine the high priority area source identification and elimination requirement with the surface water monitoring requirement as documented in the County's microbial water quality assessment (MWQA), or similar, program per an Ecology-approved QAPP.

Name of TMDL	**Swamp Creek**
EPA Approved Document(s) for TMDL	*Swamp Creek Fecal Coliform Bacteria Total Maximum Daily Load: Water Quality Improvement Report and Implementation Plan*, June 2006, Ecology Publication No. 06-10-021. http://www.ecy.wa.gov/biblio/0610021.html
Location of Original 303(d) Listings	WA-08-1060
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees municipal stormwater permit and draining to the portion of the WASWIS segment SM74QQ starting at the confluence with the Sammamish River and including all upstream tributaries contributing to the Swamp Creek segment of WASWIS GJ57UL.
Parameter	Fecal Coliform
EPA Approval Date	August 16, 2006
MS4 Permittee	Phase I Permit: Snohomish County Phase II Permit: Everett, Bothell, Lynnwood, Brier, Mountlake Terrace, Kenmore

Actions Required

Business Inspections: Each Permittee shall inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria. *Commercial animal handling areas* are associated with Standard Industrial Code (SIC) 074 and 075 and include veterinary and pet care/boarding services, animal slaughtering, and support activities for animal production. Facilities where the degradation and transformation of organic solid waste takes place under controlled conditions designed to promote aerobic decomposition are considered *composting facilities* (definition in accordance with Chapter 173-350 WAC). All qualifying facilities shall be inspected by August 1, 2016. Permittees shall implement an ongoing inspection program to re-inspect facilities with bacteria source control problems a minimum of every three years.

Public Education and Outreach: Each Permittee shall conduct public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior.

Operations & Maintenance: Each Permittee shall install and maintain animal waste collection and/or education stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.

IDDE: Permittees conducting IDDE-related field screening under S5.C.8 of the Phase I permit or S5.C.3 of the Western Washington Phase II permit shall screen for bacteria sources in any screened MS4 subbasins which discharge to surface waters in the TMDL area.

Targeted Source Identification & Elimination: By February 2, 2014, each Permittee shall review the fecal coliform data collected per approved QAPPs under the 2007 Permit. The purpose of this review is to identify a minimum of one high priority area (such as a tributary or a stream segment) that will be the focus of source identification and elimination efforts during this permit cycle. Each Permittee shall prepare written documentation of this review and the identified high priority area; documentation shall be submitted with the Annual Report for 2014. Permittees shall begin to implement source identification and elimination efforts in the MS4 subbasins discharging to the identified high priority area no later than August 1, 2014. Permittees are encouraged to address potential bacteria pollution sources not associated with the MS4. Stormwater quality sampling for bacteria sources is required as part of this focused source identification and elimination effort. Permittees shall implement the schedules and activities identified in S5.C.8 of the Phase I permit or S5.C.3 of the Western Washington Phase II permit in response to any illicit discharges found. Each annual report's TMDL summary shall include qualitative and quantitative information about the source identification and elimination activities, including procedures followed and sampling results, implemented in the selected high priority area(s).

Surface Water Monitoring: Each Permittee shall review the fecal coliform data collected per approved QAPPs under the 2007 Permit and select surface water monitoring location(s) as appropriate for continued characterization and long term trends evaluation of fecal coliform. Each Permittee shall submit a draft revised QAPP to Ecology for review and approval, no later than February 2, 2015. If Ecology does not request changes within 60 days, the draft QAPP is considered approved. At a minimum, the monitoring program shall:

- Begin by August 1, 2015.
- Collect 12 samples in at least one location per calendar year.
- Submit available data to the Environmental Information Management (EIM) database by May 31 of each year.
- Provide data summaries and narrative evaluation of the data in each annual report's TMDL summary.
- Be documented in a QAPP which follows *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies,* July 2004, Ecology Publication No. 04-03-030.

Permittees shall follow Ecology-approved QAPPs unless changes are approved by Ecology. Permittees subject to multiple TMDL monitoring requirements may conduct an integrated monitoring program in accordance with an Ecology-approved QAPP. Snohomish County may combine the high priority area source identification and elimination requirement with the surface water monitoring requirement as documented in the County's microbial water quality assessment (MWQA), or similar, program per an Ecology-approved QAPP.

Name of TMDL	**Bear-Evans Watershed**
Document(s) for TMDL	*Bear-Evans Watershed Fecal Coliform Bacteria Total Maximum Daily Load, Water Quality Improvement Report*, June 2008, Ecology Publication No. 08-10-026. https://fortress.wa.gov/ecy/publications/summarypages/0810026.html *Bear-Evans Watershed Temperature, Dissolved Oxygen and Fecal Coliform Bacteria Total Maximum Daily Load, Water Quality Implementation Plan*, March 2011, Ecology Publication No. 11-10-024. http://www.ecy.wa.gov/biblio/1110024.html
Location of Original 303(d) Listings	Bear Creek (EW54VY, BA64JJ, WR69YU)) Cottage Lake Creek (NO74J5) Unnamed Tributary to Bear Creek (EU47RU) Evans Creek (MI67EG)
Area Where TMDL Requirements Apply	Bear Creek and Evans Creek watersheds (includes Cottage Lake watershed)
Parameter	Fecal Coliform
EPA Approval Date	August 11, 2008
MS4 Permittee	Phase I: King County Phase II: No actions identified for Phase II Permittees

Actions Required

King County

- Install and maintain animal waste education and/or collection stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.
- Designate areas discharging via the MS4 to the TMDL area as high priority areas for illicit discharge detection and elimination. Complete IDDE field screening for bacteria sources in 50 percent of MS4 subbasins, including rural MS4 subbasins, by February 2, 2017, and implement the schedules and activities identified in S5.C.8 of the Phase I permit for response to any illicit discharges found.

Name of TMDL	**Cottage Lake**
EPA Approved Document(s) for TMDL	*Cottage Lake, Total Phosphorus, Total Maximum Daily Load Analysis, Submittal Report*, June 2004, Ecology Publication No. 03-10-085. http://www.ecy.wa.gov/biblio/0310085.html *Cottage Lake, Total Phosphorus, Total Maximum Daily Load, Water Quality Implementation Plan*, March 2007, Ecology Publication No. 06-10-066. http://www.ecy.wa.gov/biblio/0610066.html
Location of Original 303(d) Listings	WA-08-9070 & 49ITVC
Area Where TMDL Requirements Apply	Cottage Lake and tributaries to Cottage Lake
Parameter	Total Phosphorus
EPA Approval Date	September 2004
MS4 Permittee	Phase I: King County

Action Required

King County shall apply phosphorus control treatment requirements to new and redevelopment projects, as applicable, throughout the Cottage Lake watershed, including all tributaries to Cottage Lake. King County's Department of Development and Environmental Services (DDES) shall not rely on the quarter mile/15 percent distance downstream clause in King County's Surface Water Design Manual.

Name of TMDL	**Issaquah Creek Basin Water Cleanup Plan for Fecal Coliform Bacteria**
Document(s) for TMDL	*Issaquah Creek Basin Water Cleanup Plan for Fecal Coliform Bacteria: Total Maximum Daily Load Submittal Report*, June 2004. Ecology Publication No. 04-10-055. http://www.ecy.wa.gov/pubs/0410055.pdf
Location of Original 303(d) Listings	Issaquah Creek, TF310B (WA-08-1110) North Fork Issaquah Creek, CZ80NC (WA-08-1110) Tibbetts Creek, MB51QQ, EA48LQ (WA-08-1115)
Area Where TMDL Requirements Apply	These requirements apply to areas served by MS4s within the TMDL coverage area.

Parameter(s)	Fecal Coliform Bacteria
EPA Approval Date	October 1, 2004
MS4 Permittee:	**Phase I Permit:** King County **Phase II Permit:** City of Issaquah, WAR04-5518

Actions Required

City of Issaquah

- Designate areas discharging via the MS4 to Tributary 0170 and to the Lewis Lane Outfall as the highest priority areas for illicit discharge detection and elimination routine field screening efforts. Complete field screening for bacteria sources by December 31, 2014 and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found.
- Install and maintain pet waste education and collection stations at municipal parks and other Permittee owned and operated lands adjacent to streams. Focus on locations where people commonly walk their dogs.

King County

- Install and maintain animal waste education and/or collection stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.
- Designate areas discharging via MS4 to the TMDL area as high priority areas for illicit discharge detection and elimination. Complete IDDE field screening for bacteria sources in 50 percent of the MS4 subbasins, including rural MS4 subbasins, by August 1, 2018, and implement the schedules and activities identified in S5.C.8 of the Phase I permit for response to any illicit discharges found.

Name of TMDL	**Little Bear Creek Fecal Coliform Water Quality Improvement Project**
Document(s) for TMDL	*Little Bear Creek Fecal Coliform Total Maximum Daily Load (Water Cleanup Plan),* May 2005, Ecology Publication No. 05-10-034. http://www.ecy.wa.gov/biblio/0510034.html
Location of Original 303(d) Listings	Little Bear Creek, UT96KR (WA-08-1085).
Area Where TMDL Requirements Apply	These requirements apply to areas served by MS4s within the TMDL coverage area.
Parameter(s)	Fecal coliform bacteria

EPA Approval Date	July 1, 2005
MS4 Permittee:	Phase I Permit: Snohomish County Phase II Permit: City of Woodinville, WAR04-5545

Actions Required

City of Woodinville

- By December 31, 2014, complete field screening of Little Bear Creek to identify potential illicit discharges or connections. Conduct bacteria sampling from any flowing outfall, in accordance with protocols in *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection*, October 2004, or another methodology of comparable or improved effectiveness. Implement related schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found.
- Confirm that pet waste collection stations are installed and maintained in all public lands/parks adjacent to Little Bear Creek.

Snohomish County

- Prioritize and conduct bacteria source identification and elimination in high priority MS4 subbasins that discharge to surface waters in the area where these TMDL requirements apply. In order to prioritize bacteria source identification and elimination activities based on surface water quality data, Snohomish County shall incorporate the Little Bear Creek watershed into the County's microbial water quality assessment (MWQA), or similar, monitoring program in accordance with the schedule for QAPP development and approval required for the Snohomish River Tributaries TMDL.
- Inspect commercial animal handling areas and commercial composting facilities to ensure implementation of source control BMPs for bacteria. *Commercial animal handling areas* are associated with Standard Industrial Code (SIC) 074 and 075 and include veterinary and pet care/boarding services, animal slaughtering, and support activities for animal production. Facilities where the degradation and transformation of organic solid waste takes place under controlled conditions designed to promote aerobic decomposition are considered *composting facilities* (definition in accordance with Chapter 173-350 WAC). All qualifying facilities must be inspected by August 1, 2016. Permittees shall implement an ongoing inspection program to re-inspect facilities with bacteria source control problems every three years.
- Conduct public education and outreach activities to increase awareness of bacterial pollution problems and promote proper pet waste management behavior.
- Install and maintain animal waste collection and/or education stations at municipal parks and other Permittee owned and operated lands reasonably expected to have substantial domestic animal (dog and horse) use and the potential for pollution of stormwater.

Name of TMDL	**Puyallup Watershed Water Quality Improvement Project**
Document(s) for TMDL	*Puyallup River Watershed Fecal Coliform Total Maximum Daily Load – Water Quality Improvement Report and Implementation Plan*, June 2011, Ecology Publication No. 11-10-040. http://www.ecy.wa.gov/biblio/1110040.html
Location of Original 303(d) Listings	Puyallup River 16712, 7498, White River 16711, 16708, 16709, Clear Creek 7501, Swan Creek 7514, Boise Creek 16706
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and discharging to water bodies listed within the specific requirement in this TMDL section.
Parameter	Fecal Coliform
EPA Approval Date	September 2011
MS4 Permittee	Phase I Permit: King County, Pierce County Phase II Permit: Auburn, Edgewood, Enumclaw, Puyallup, Sumner

Actions Required

City of Auburn

- Beginning no later than October 1, 2013, conduct twice monthly wet weather sampling of stormwater discharges to the White River at Auburn Riverside High School to determine if specific discharges from Auburn's MS4 exceed the water quality criteria for fecal coliform bacteria.
    - Data shall be collected for one wet season.
    - Data shall be collected in accordance with an Ecology-approved QAPP.
    - Data collected since EPA TMDL approval can be used to meet this requirement.
- For any of the outfalls monitored, above showing discharges that exceed water quality criteria for primary contact recreation: designate those areas discharging via the MS4 of concern as high priority areas for illicit discharge detection and elimination efforts and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found beginning no later than August 1, 2014.
- Install and maintain pet waste education and collection stations at municipal parks and other Permittee owned and operated lands adjacent to streams. Focus on locations where people commonly walk their dogs.

City of Edgewood

- Designate areas discharging via the MS4 to Jovita Creek as the highest priority areas for illicit discharge detection and elimination routine field screening and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit.

City of Enumclaw

- Designate areas discharging via the MS4 to Boise Creek from creek mile 1.7 to 1.0 as the highest priority areas for illicit discharge detection and elimination routine field screening. Implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit, and implement a pet waste education program in this area according to S5.C.1 of the permit.

King County

- Designate areas discharging via the MS4 to Boise Creek as high priority areas for illicit discharge detection and elimination. Complete IDDE field screening for bacteria sources in 100 percent of the MS4 subbasins, including rural subbasins, by February 2, 2016 and implement the schedules and activities identified in S5.C.8 of the Phase I permit for response to any illicit discharges found. Field screening must include activities for both the dry season (May through September) and the wet season (October through April).
- Inventory commercial animal handling areas (associated with Standard Industrial Code 074 and 075) in areas discharging via the MS4 to Boise Creek and conduct inspections of these areas as part of the Source Control program required in S5.C.7 of the Phase I permit. All qualifying facilities must be inspected by August 1, 2016. The Permittee shall implement an ongoing inspection program to re-inspect facilities or areas with bacteria source control problems every three years.
- Designate areas discharging via the MS4 to Jovita Creek as high priority areas for illicit discharge detection and elimination field screening, and implement the schedules and activities identified in S5.C.8 of the Phase I permit.

Pierce County

- Designate areas discharging via MS4 to Swan Creek as high priority areas for illicit discharge detection and elimination efforts. Complete field screening by December 31, 2014 and implement the schedules and activities identified in S5.C.8 of the Phase I permit.
- Designate areas discharging via MS4 to Salmon Creek as high priority areas for illicit discharge detection and elimination field screening and implement the schedules and activities identified in S5.C.8 of the Phase I permit.
- Designate areas discharging via the MS4 to Alderton Creek as high priority areas for illicit discharge detection and elimination field screening and implement the schedules and activities identified in S5.C.8 of the Phase I permit.
- Designate areas discharging via the MS4 to upper Deer Creek as high priority areas for illicit discharge detection and elimination field screening and implement the schedules and activities identified in S5.C.8 of the Phase I permit.

City of Puyallup

- Designate areas discharging via the MS4 to Deer Creek as high priority areas for illicit discharge detection and elimination field screening and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit. Focus investigation on field screening during dry weather (May through September).

City of Sumner

- Designate areas discharging via the MS4 to Salmon Creek as the highest priority areas for illicit discharge detection and elimination routine field screening and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit.

Name of TMDL	**Clarks Creek Fecal Coliform TMDL**
Document(s) for TMDL	*Clarks Creek Watershed Fecal Coliform Bacteria Total Maximum Daily Load (Water Quality Improvement Report)*, May 2008, Ecology Publication No. 07-10-110. http://www.ecy.wa.gov/biblio/0710110.html *Clarks Creek Watershed Fecal Coliform Bacteria Total Maximum Daily Load (Water Quality Implementation Plan)*, December 2009, Ecology Publication No. 09-10-081. http://www.ecy.wa.gov/biblio/0910081.html
Location of Original 303(d) Listings	Clarks Creek 7497, 7501, Meeker Creek 7508, 7507
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and discharging to water bodies listed within the specific requirement in this TMDL section.
Parameter	Fecal Coliform
EPA Approval Date	June 4, 2008
MS4 Permittee	Phase II Permit: Puyallup

Actions Required

City of Puyallup

- Designate areas discharging via the MS4 to Meeker Creek as high priority areas for illicit discharge detection and elimination field screening and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit.

Name of TMDL	**South Prairie Creek Water Quality Improvement Project**
Document(s) for TMDL	*South Prairie Creek Bacteria and Temperature Total Maximum Daily Load (Water Cleanup Plan): Submittal Report*, June 2003, Ecology Publication No. 03-10-055. http://www.ecy.wa.gov/biblio/0310055.html *South Prairie Creek Bacteria and Temperature Total Maximum Daily Load (Water Cleanup Plan): Detailed Implementation Plan*, July 2006, Ecology Publication No. 06-10-018. http://www.ecy.wa.gov/biblio/0610018.html
Location of Original 303(d) Listings	South Prairie Creek VC19MO (WA-10-1085), Wilkeson Creek NX07HW (WA-10-1087)
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and discharging to water bodies listed within the specific requirement in this TMDL section.
Parameter	Fecal Coliform
EPA Approval Date	August 6, 2003
MS4 Permittee	Phase I Permit: Pierce County Phase II Permit: Buckley

Actions Required

Pierce County

- Designate areas discharging via the MS4 to Tributary 1 upstream of SR162 as high priority areas for illicit discharge detection and elimination efforts. Complete field screening by December 31, 2013 and implement the schedules and activities identified in S5.C.8 of the Phase I permit for response to any illicit discharges found. Investigation must include activities for both the dry season (May through September) and the wet season (October through April).
- Designate areas discharging to Pierce County MS4 outfalls and conveyances upstream of SR165 along Spiketon Road, Mundy Loss Road, and Spiketon Ditch Road as high priority areas for illicit discharge detection and elimination efforts. Complete field screening by December 31, 2013 and implement the schedules and activities identified in S5.C.8 of the Phase I permit for response to any illicit discharges found. Investigation must include activities for both the dry season (May through September) and the wet season (October through April).

City of Buckley

- Designate areas discharging via the MS4 to Spiketon Creek as the highest priority areas for illicit discharge detection and elimination routine field screening and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit.

Name of TMDL	**Nisqually River Basin Water Quality Improvement Project**
Document(s) for TMDL	*Nisqually Watershed Bacteria and Dissolved Oxygen Total Maximum Daily Load (Water Cleanup Plan): Submittal Report*, June 2005, Ecology Publication No. 05-10-040. http://www.ecy.wa.gov/biblio/0510040.html *Nisqually River Basin Fecal Coliform Bacteria and Dissolved Oxygen Total Maximum Daily Load: Water Quality Implementation Plan (WQIP)*, June 2007, Ecology Publication No. 07-10-016. http://www.ecy.wa.gov/biblio/0710016.html
Location of Original 303(d) Listings	Nisqually Reach 390KRD (WA-PS-0290), Nisqually River OE72JI (WA-11-1010), McAllister Creek LD26OX (WA-11-2000), Ohop Creek MW64EV (WA-11-1024), Red Salmon Creek NoID (WA-PS-0290)
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and discharging to water bodies listed within the specific requirement in this TMDL section.
Parameter	Fecal Coliform, Dissolved Oxygen
EPA Approval Date	August 5, 2005
MS4 Permittee	Phase I Permit: Pierce County Phase II Permit: Thurston County

Actions Required

Pierce County

- Designate areas discharging via the MS4 to Ohop Creek and Lynch Creek as high priority areas for illicit discharge detection and elimination efforts. Complete field screening by December 31, 2014 and implement the schedules and activities identified in S5.C.8 of the Phase I permit for response to any illicit discharges found.

Thurston County

- Annually implement the following best management practices for reducing fecal coliform bacteria in areas discharging to the Nisqually Reach via the MS4 in accordance with S5.C.1 and S5.C.5 of the Western Washington Phase II Permit:
    a. Reach households in targeted watershed through mailings, door hangers etc. to increase awareness of the sources of bacteria pollution.
    b. Adequately maintain vegetation around stormwater facilities, ditches, and ponds.

Name of TMDL	**Henderson Inlet Watershed Fecal Coliform Bacteria Water Quality Improvement Project**
Document(s) for TMDL	*Henderson Inlet Watershed Fecal Coliform Bacteria, Dissolved Oxygen, pH, and Temperature Total Maximum Daily Load Study*, March 2006, Ecology Publication No. 06-03-012. http://www.ecy.wa.gov/biblio/0603012.html *Henderson Inlet Watershed Fecal Coliform Bacteria, Dissolved Oxygen, and pH Total Maximum Daily Load: Water Quality Improvement Report Implementation Strategy*, October 2006, Ecology Publication No. 06-10-058. http://www.ecy.wa.gov/biblio/0610058.html *Henderson Inlet Watershed Fecal Coliform Bacteria Total Maximum Daily Load: Water Quality Implementation Plan*, July 2008, Ecology Publication No. 08-10-040. http://www.ecy.wa.gov/biblio/0810040.html
Location of Original 303(d) Listings	Henderson Inlet 390KRD (WA-13-0010), Dobbs Creek UNK000 (WA-13-1400), Sleepy Creek UNK000 (WA-13-1700), Woodard Creek MJ83ZH (WA-13-1600), Woodland Creek JH31LN (WA-13-1500)
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the permittees municipal stormwater permit and discharging to water bodies listed within the specific requirement in this TMDL section.
Parameter	Fecal Coliform, Dissolved Oxygen, pH, Temperature
EPA Approval Date	January 8, 2007
MS4 Permittee	Phase II Permit: Lacey, Olympia, Thurston County

Actions Required

Thurston County

1. Annually implement the following best management practices in areas discharging to the Henderson Inlet via the MS4 in accordance with S5.C.4 of the Western Washington Phase II Permit:
   a. Require phosphorus control for new and redevelopment projects that discharge via the MS4 to Woodard Creek and meet the project thresholds in Appendix 1, Minimum Requirement #6: Runoff Treatment of the Western Washington Phase II permit.
2. Annually implement the following best management practices for reducing fecal coliform in areas discharging to the Henderson Inlet via the MS4 in accordance with S5.C.3 of the Western Washington Phase II Permit:
   a. Designate areas discharging via the MS4 to Woodland Creek from river mile 1.6 to 0.2 and Jorgenson Creek upstream of Pleasant Glade Road as high priority areas for illicit discharge detection and elimination field screening. Implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit. Investigation

shall include stormwater ponds and on-site septic systems as potential fecal coliform sources, and sampling of wet-weather discharges (November through April).

3. Annually implement the following best management practices for reducing fecal coliform in areas discharging to the Henderson Inlet via the MS4 in accordance with S5.C.1 of the Western Washington Phase II Permit.
   a. Continue supporting the Watershed Septic System Operations and Maintenance Program. Develop a targeted educational plan delivering:
      i. Technical assistance to landowners through at least one presentation or workshop annually.
      ii. Technical assistance to landowners through one publication or targeted letter annually.
      iii. A resource webpage on the city's website.
   b. Continue offering public education and outreach efforts for fecal coliform reduction such as brochures, signage and pet waste stations to homeowner associations.

City of Lacey

1. Annually implement the following best management practices in areas discharging to the Henderson Inlet via the MS4 in accordance with S5.C. 1 of the Western Washington Phase II Permit:
   a. Continue the Private Stormwater Facilities Maintenance Program, providing commercial and residential stormwater facility/BMP owners educational resources for facility function and maintenance requirements.
   b. Offer bacteria pollution reduction brochures, signage and pet waste stations to homeowners associations.
   c. Maintain pet waste bag dispenser units in City parks.
   d. Install educational signage at City facilities/property.
   e. Develop a targeted educational plan for septic system owners that includes; goals, target audiences, messages, format, distribution and evaluation methods by December 31, 2016. Permittees may meet requirement individually or through regional efforts.
2. Continue developing and implementing a fecal coliform bacteria wet weather sampling program for the College Regional Stormwater Facility by December 31, 2013 in accordance with the illicit discharge detection and elimination efforts and activities identified in S5.C.3 of the Western Washington Phase II permit.
   a. Submit a plan to Ecology for approval by November 1, 2013. The sampling program shall establish a regularly scheduled sampling schedule (at least two times per year, as feasible and consistent with the city's Wet Weather Discharge Plan) during the wet season (November through April), specific sampling locations, sampling protocols, parameters, analytical methods and timelines for implementation.

b. If sampling results indicate potential illicit discharges, conduct an investigation in accordance with S5.C.3 of the Western Washington Phase II permit.
c. Submit a summary of sampling and investigations with each annual report.

3. Develop and implement a coordinated plan with the City of Olympia to monitor and reduce fecal coliform bacteria discharges from the Fones/Taylor wetland treatment facilities by December 31, 2014 in accordance with S5.C.3 of the Western Washington Phase II permit.
    a. Submit a program plan to Ecology that includes a timeline for implementation, sampling frequencies and identifies, at the minimum, who will be responsible for sampling, investigations and enforcement by December 31, 2013.
    b. If sampling results indicate potential illicit discharges, conduct an investigation in accordance with S5.C.3 of the Western Washington Phase II permit.
    c. Submit a summary of the coordinated efforts with sampling, investigation and enforcement actions taken with the annual reports.
4. Annually implement the following best management practices in areas discharging to the Henderson Inlet via the MS4 in accordance with S5.C.5 of the Western Washington Phase II Permit:
    - Continue re-vegetation and nuisance vegetation management along Woodland Creek and its tributaries.

City of Olympia

1. Annually implement the following BMPs in areas discharging to the Henderson Inlet via the MS4 in accordance with S5.C.4 of the Western Washington Phase II permit:
    - Require phosphorus control for new and redevelopment projects that discharge via MS4 to Woodard Creek and meet the project thresholds in Appendix 1, Minimum Requirement #6: Runoff Treatment of the Western Washington Phase II permit.
2. Develop and implement a coordinated plan with the City of Lacey to monitor and reduce fecal coliform bacteria discharges from the Fones/Taylor wetland treatment facilities by December 31, 2014 in accordance with S5.C.3 Illicit Discharge Detection and Elimination of the Western Washington Phase II permit.
    a. Submit a program plan to Ecology that includes a timeline for implementation, sampling frequencies and identifies, at the minimum, who will be responsible for sampling, investigations and enforcement by December 31, 2013.
    b. If sampling results indicate potential illicit discharges, conduct an investigation in accordance with S5.C.3 of the Western Washington Phase II permit.
    c. Submit a summary of the coordinated efforts with sampling, investigation and enforcement actions taken with each annual report.

Name of TMDL	**Sinclair and Dyes Inlets Fecal Coliform Bacteria Total Maximum Daily Load**
Document(s) for TMDL	*Sinclair and Dyes Inlets Fecal Coliform Bacteria Total Maximum Daily Load (TMDL) Water Quality Implementation Plan*, In Draft, Ecology Publication No. 11-10-051. *Fecal Coliform Model Verification Sampling Plan (Winter 2004)*, February 19, 2004. http://www.ecy.wa.gov/programs/wq/tmdl/sinclair-dyes_inlets/w2004_fc_sap_final_ecy.pdf *Fecal Coliform Total Maximum Daily Load Study Plan for Sinclair and Dyes Inlet*, October 4, 2002. http://www.ecy.wa.gov/programs/wq/tmdl/sinclair-dyes_inlets/fc_tmdl_studyplan_final_draft_print.pdf
Location of Original 303(d) Listings	Dyes Inlet & Port Washington Narrows (WA-15-0020) Gorst Creek (WA-15-4000) Blackjack Creek (WA-15-4200) Annapolis Creek (WA-15-4400) Beaver Creek (WA-15-4900) Clear Creek (WA-15-5000) Barker Creek (WA-15-5100) Sinclair Inlet (WA-15-0040)
Area Where TMDL Requirements Apply	These requirements apply to areas served by MS4s listed below within the TMDL coverage area.
Parameter(s)	Fecal coliform bacteria
EPA Approval Date	July 5, 2012
MS4 Permittee:	Phase II Permit: City of Bainbridge Island, WAR04-5503; City of Bremerton, WAR04-5507; City of Port Orchard, WAR04-5536; Kitsap County, WAR04-5546

Actions Required

City of Bainbridge Island

- If a minimum of 10 monthly ambient water quality samples collected under a previous monitoring program approved by Ecology in nearshore areas below Lynwood Center between 2011 and 2013 indicate that this area does NOT meet water quality standards, then by December 1, 2014, the City shall designate those areas discharging via MS4 either directly or to creeks that discharge to shoreline areas along Rich Passage as the highest priority areas for illicit discharge detection and elimination field screening. The City shall implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found.

- By December 31, 2016, review and, if necessary, increase the frequency of inspection and cleanout of catch basins (under S5.C.4 and 5 of the Western Washington Phase II permit) to maintain catch basin sediment levels below 60 percent full. Focus on MS4 areas that drain to nearshore areas along Rich Passage below Lynwood Center and the northern shoreline of Fletcher Bay near DOH site 457.
- Use appropriate investigative tools to ensure that contaminated stormwater is not contributing to the fecal coliform bacteria exceedances at DOH site 457, offshore Fletcher Bay.
- Install and maintain pet waste education and collection stations at Permittee owned and operated lands adjacent to stream and marine shorelines. Focus on locations where people commonly walk their dogs.

City of Bremerton

- Designate areas discharging via MS4 to Phinney and Ostrich Bay Creeks, to the eastern shoreline of Oyster Bay near DOH site 487, and to shorelines along Port Washington Narrows as the highest priority areas for illicit discharge detection and elimination routine field screening and, beginning no later than August 1, 2014 implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found.
- By December 31, 2016, review and, if necessary, increase the frequency of inspection and cleanout of catch basins (under S5.C.4 and 5 of the Western Washington Phase II permit) to maintain catch basin sediment levels below 60 percent full. Focus on MS4 areas that drain to Phinney and Ostrich Bay Creeks, to the eastern shoreline of Oyster Bay near DOH site 487 and to shorelines along Port Washington Narrows.
- Install and maintain pet waste education and collection stations at municipal parks and other Permittee owned and operated lands adjacent to stream and marine shorelines. Focus on locations where people commonly walk their dogs.

City of Port Orchard

- Designate areas discharging via MS4 to Blackjack, Annapolis, and Karcher Creeks and to shorelines along Sinclair Inlet as the highest priority areas for illicit discharge detection and elimination routine field screening and, beginning August 1, 2014, implement the associated schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found.
- By December 31, 2016, review and, if necessary, increase the frequency of inspection and cleanout of catch basins (under S5.C.4 and 5 of the Western Washington Phase II permit to maintain catch basin sediment levels below 60% full. Focus on MS4 areas that drain to Blackjack, Annapolis, and Karcher Creeks and to shorelines along Sinclair Inlet.

- Install and maintain pet waste education and collection stations at municipal parks and other Permittee owned and operated lands adjacent to stream and marine shorelines. Focus on locations where people commonly walk their dogs.

Kitsap County

- Designate areas discharging via MS4 to Barker, Clear, Strawberry, Ostrich Bay, and Phinney creeks and shorelines at the head of Dyes Inlet as the highest priority areas for illicit discharge detection and elimination routine field screening (including agricultural land use inventories in rural areas) and, beginning no later than August 1, 2014, implement the associated schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found. onduct illicit discharge detection and elimination efforts in MS4 areas that discharge to Beaver, Pahrmann, Sacco, and upper Blackjack creeks and to the western shoreline of Chico Bay near DOH site 471 as resources allow.
- By December 31, 2016, review and, if necessary, increase the frequency of inspection and cleanout of catch basins (in accordance with S5.C.4 and 5 of the Western Washington Phase II permit) to maintain catch basin sediment levels below 60% full. Focus on areas within the Sinclair and Dyes Inlet watershed with closed conveyance systems and catch basins.
- Install and maintain pet waste education and collection stations at municipal parks and other Permittee owned and operated lands adjacent to stream and marine shorelines. Focus on locations where people commonly walk their dogs.

Name of TMDL	**Grays Harbor/Chehalis Watershed Fecal Coliform Bacteria Total Maximum Daily Load**
Document(s) for TMDL	*Grays Harbor/Chehalis Watershed Fecal Coliform Bacteria Total Maximum Daily Load Submittal Report*, December 2001, Ecology Publication No. 01-10-025. http://www.ecy.wa.gov/biblio/0110025.html *Quality Assurance Project Plan: Grays Harbor Fecal Coliform Bacteria Monitoring to Characterize Water Quality in Urban Stormwater Drains*, October 2010, Ecology Publication No. 10-10-066. http://www.ecy.wa.gov/biblio/1010066.html
Location of Original 303(d) Listings	Outer Grays Harbor 390KRD (WA-22-0020), Inner Grays Harbor 390KRD (WA-22-030), Inner Grays Harbor DS29ZH (WA-22-0030), Chehalis River PB33WC (WA-22-4040)
Area Where TMDL Requirements Apply	Requirements apply in all areas regulated under the Permittees' municipal stormwater permit and discharging to water bodies listed within the specific requirement in this TMDL section.
Parameter	Fecal Coliform

EPA Approval Date	December 2002
MS4 Permittee	Phase II Permit: Aberdeen

Actions Required

City of Aberdeen

1. Implement the schedules and activities identified in S5.C.1 of the Western Washington Phase II Permit. No later than February 28, 2015, develop a Public Education and Outreach and Involvement plan. The plan shall target the reduction of fecal coliform pollution by increasing public awareness, effecting behavior changes and shall include: goals, target audiences, messages, format, distribution, and evaluation methods.
    a. The plan shall include at least the following elements and be fully implemented prior to the expiration date of the permit:
        i. Target the residents of the three high priority water bodies identified under the 2007-2012 permit.
        ii. Reach households in targeted watersheds through mailings, door hangers or similar outreach tools.
        iii. Reach 4-6th grade students.
    b. Design and implement a program which notifies residents, in a timely manner, when bacteria pollution that poses a public health concern (such as a wastewater overflow) reaches the MS4.
    c. Conduct two public education surveys gauging resident's knowledge of the sources of bacteria and preventing bacteria pollution. One survey should measure resident's knowledge of bacteria pollution before outreach and the other should measure knowledge and likelihood of action after outreach.
    d. Design and implement a stream team program where two citizen stream teams are formed to participate in stewardship activities.
    e. Install and maintain pet waste bag dispenser units and explanatory signs in public areas with dog usage.
    f. By December 31, 2014, develop an inventory of sources that have potential for bacteria runoff such as manure-composting facilities, stables, kennels.
        i. Develop a targeted manure management educational plan for such facility owners delivering at least one presentation or letter annually and developing a resource webpage on the city's website.
2. Designate areas discharging to the MS4 urban drains identified in the TMDL as the highest priority areas for illicit discharge detection and elimination routine field screening efforts and implement the schedules and activities identified in S5.C.3 of the Western

Washington Phase II permit. Field screening and source tracing methodology (see S5.C.3.c) must be consistent with the *Quality Assurance Project Plan: Grays Harbor Fecal Coliform Bacteria Monitoring to Characterize Water Quality in Urban Stormwater Drains, October 2010*.

a. Implement a regulatory mechanism to control pet waste.
b. Designate areas discharging via MS4 to the following discharge points: 501-ABDN, 510-MST, and 514-MST as high priority areas for illicit discharge detection and elimination efforts.
    i. Complete field screening by December 31, 2014 and implement the schedules and priority area for illicit discharge detection and elimination field screening identified in S5.C.3 of the Western Washington Phase II permit. Investigation must include activities for both the dry season (May through October) and the wet season (November through April).
    ii. Beginning no later than October 31, 2014, conduct twice monthly wet weather sampling of the discharge points 501-ABDN, 510-MST, and 514-MST to determine if specific discharges from Aberdeen's MS4 exceed the water quality criteria for fecal coliform bacteria.
        - Data shall be collected for two wet season.
        - Data shall be collected in accordance with an Ecology-approved QAPP.
        - Samples must be analyzed using an Ecology accredited lab.
        - If sampling results indicate potential illicit discharges, conduct an investigation in accordance with S5.C.3 *Illicit Discharge Detection and Elimination* of the Western Washington Phase II permit.
        - Data shall be submitted to Ecology in an approved format with the annual reports.

Appendix 3 - Annual Report Questions for Cities, Towns and Counties

Permittees are required to submit the following information in an online annual report form, or an alternative format provided by Ecology if requested, pursuant to Special Condition S9.A.

1. **Attach** updated annual Stormwater Management Program Plan (SWMP Plan). (S5.A.2)

2. **Attach** a copy of any annexations, incorporations or boundary changes resulting in an increase or decrease in the Permittee's geographic area of permit coverage during the reporting period per S9.D.5.

3. Implemented an ongoing program to gather, track, and maintain information per S5.A.3, including costs or estimated costs of implementing the SWMP.

4. Coordinated among departments within the jurisdiction to eliminate barriers to permit compliance. (S5.A.5.b)

4b. **Attach** a written description of internal coordination mechanisms. (*Required to be submitted* no later than March 31, 2015, S5.A.5.b)

5. **Attach** description of public education and outreach efforts conducted per S5.C.1.a.i and ii.

6. Created stewardship opportunities (or partnered with others) to encourage resident participation in activities such as those described in S5.C.1.b.

7. Used results of measuring the understanding and adoption of targeted behaviors among at least one audience in at least one subject area to direct education and outreach resources and evaluate changes in adoption of targeted behaviors. (*Required* no later than February 2, 2016, S5.C.1.b)

7b. **Attach** description of how this requirement was met.

8. Describe in *Comments* field the opportunities created for the public to participate in the decision making processes involving the development, implementation and updates of the Permittee's SWMP. (S5.C.2.a)

9. Posted the updated SWMP Plan and latest annual report on your website no later than May 31. (S5.C.2.b)

9b. List the website address in *Comments* field.

10. Maintained a map of the MS4 including the requirements listed in S5.C.3.a.i.-vi.

11. Implemented a compliance strategy, including informal compliance actions as well as enforcement provisions of the regulatory mechanism described in S5.C.3.b. (S5.C.3.b.v)

12. Updated, if necessary, the regulatory mechanism to effectively prohibit illicit discharges into the MS4 per S5.C.3.b.vi. (*Required* no later than February 2, 2018)

12b. If Yes, cite the code reference in *Comments* field

13. Implemented procedures for conducting illicit discharge investigations in accordance with S5.C.3.c.i.

13b. Cite methodology in *Comments* field

14. Percentage of MS4 coverage area screened in reporting year per S5.C.3.c.i. (*Required to screen* 40% of MS4 no later than December 31, 2017 (except no later than June 30, 2018 for the City of Aberdeen) and 12% on average each year thereafter. (S5.C.3)

15. List the hotline telephone number for public reporting of spills and other illicit discharges in the *Comments* field. (S5.C.3.c.ii)

15b. Number of hotline calls received.

16. Implemented an ongoing illicit discharge training program for all municipal field staff per S5.C.3.c.iii.

17. Informed public employees, businesses, and the general public of hazards associated with illicit discharges and improper disposal of waste.

17b. Describe actions in *Comments* field. (S5.C.3.c.iv)

18. Implemented an ongoing program to characterize, trace, and eliminate illicit discharges into the MS4 per S5.C.3.d.

19. Number of illicit discharges, including illicit connections, eliminated during the reporting year. (S5.C.3.d.iv)

20. **Attach** a summary of actions taken to characterize, trace and eliminate each illicit discharge found by or reported to the permittee. For each illicit discharge, include a description of actions according to required timeline per S5.C.3.d.iv

21. Municipal illicit discharge detection staff are trained to conduct illicit discharge detection and elimination activities as described in S5.C.3.e.

22. Implemented an ordinance or other enforceable mechanism to address runoff from new development, redevelopment and construction sites per the requirements of S5.C.4.a.

23. Revised ordinance or other enforceable mechanism to effectively address runoff from new development, redevelopment and construction sites per the requirements of S5.C.4.a.i-iii. (*Required* no later than December 31, 2016, except no later than June 30, 2017 for Permittees in Lewis and Cowlitz counties, and no later than June 30, 2018 for the City of Aberdeen)

23b. Cite code reference in *Comments* field.

24. Number of exceptions granted to the minimum requirements in Appendix 1. (S5.C.4.a.i., and Section 6 of Appendix 1)

25. Number of variances granted to the minimum requirements in Appendix 1. (S5.C.4.a.i., and Section 6 of Appendix 1)

26. Reviewed *Stormwater Site Plans* for all proposed development activities that meet the thresholds adopted pursuant to S5.C.4.a.i. (S5.C.4.b.i)

26b. Number of site plans reviewed during the reporting period.

27. Inspected, prior to clearing and construction, permitted development sites that have a high potential for sediment transport as determined through plan review based on definitions and requirements in Appendix 7 *Determining Construction Site Sediment Damage Potential*, or alternatively, inspected all construction sites meeting the minimum thresholds adopted pursuant to S5.C.4.a.i. (S5.C.4.b.ii)

27b. Number of construction sites inspected per S5.C.4.b.ii.

28. Inspected permitted development sites during construction to verify proper installation and maintenance of required erosion and sediment controls. (S5.C.4.b.iii)

28b. Number of construction sites inspected per S5.C.4.b.iii.

29. Number of enforcement actions taken during the reporting period (based on construction phase inspections at new development and redevelopment projects). (S5.C.4.b.ii, iii and v)

30. Inspected all permitted development sites that meet the thresholds in S5.C.4.a.i upon completion of construction and prior to final approval or occupancy to ensure proper installation of permanent stormwater facilities. (S5.C.4.b.iv)

31. Achieved at least 80% of scheduled construction-related inspections. (S5.C.4.b.ii-iv)

32. Verified a maintenance plan is completed and responsibility for maintenance is assigned for projects. (S5.C.4.b.iv)

33. Implemented provisions to verify adequate long-term operation and maintenance (O&M) of stormwater treatment and flow control BMPs/facilities that are permitted and constructed pursuant to S5.C.4. a and b. (S5.C.4.c)

34. Updated provisions to verify long-term operation and maintenance of stormwater treatment and flow control BMPs/facilities that are permitted pursuant to S5.C.4.a and b. (*Required* no later than December 31, 2016, except no later than June 30, 2017 for Permittees in Lewis and Cowlitz counties, and no later than June 30 2018 for the City of Aberdeen, S5.C.4.c.i and ii

35. Annually inspected stormwater treatment and flow control BMPs/facilities per S5.C.4.c.iii.

35b. If using reduced inspection frequency for the first time during this permit cycle, **attach** documentation per S5.C.4.c.iii

36. Inspected new residential stormwater treatment and flow control BMPs/facilities and catch basins every 6 months per S5.C.4.c.iv to identify maintenance needs and enforce compliance with maintenance standards.

37. Achieved at least 80% of scheduled inspections to verify adequate long-term O&M. (S5.C4.c.v)

38. Verified that maintenance was performed per the schedule in S5.C.4.c.vi when an inspection identified an exceedance of the maintenance standard.

38b. **Attach** documentation of any maintenance delays. (S5.C.4.c.vi)

39. Provided copies of the *Notice of Intent for Construction Activity* and *Notice of Intent for Industrial Activity* to representatives of proposed new development and redevelopment. (S5.C.4.e)

40. All staff responsible for implementing the program to control stormwater runoff from new development, redevelopment, and construction sites, including permitting, plan review, construction site inspections, and enforcement are trained to conduct these activities. (S5.C.4.f)

41. Reviewed, revised and made effective the low impact development-related enforceable documents per S5.C.4.f.i. (*Required* by December 31, 2016, except by June 30, 2017 for Permittees in Lewis and Cowlitz counties, and by June 30, 2018 for the City of Aberdeen)

41b. **Attach** a summary of the LID review and revision process that includes the requirements listed in S5.C.4.f.ii. (*Required* with annual report due no later than March 31, 2017, except no later than March 31, 2018 for Permittees in Lewis and Cowlitz counties, and with the Fifth Year annual report for the City of Aberdeen)

42. Where applicable, participated and cooperated with the watershed-scale stormwater planning process led by a Phase I county. (S5.C.4.g)

43. Updated and implemented maintenance standards as protective, or more protective, of facility function as those specified in Chapter 4 of Volume V of the *Stormwater Management Manual for Western Washington (as amended in 2014).* (*Required* no later than December 31, 2016, except no later than June 30, 2017 for Permittees in Lewis and Cowlitz counties, and no later than June 30, 2018 for the City of Aberdeen, S5.C.5.a)

44. Applied a maintenance standard that is not specified in the *Stormwater Management Manual for Western Washington.*

44b. Please note in the *Comments* field what kinds of facilities are covered by this alternative maintenance standard. (S5.C.5.a)

45. Performed timely maintenance per S5.C.5.a.ii.

46. Annually inspected all municipally owned or operated permanent stormwater treatment and flow control BMPs/facilities. (S5.C.5.b)

46b. Number of known municipally owned or operated stormwater treatment and flow control BMPs/facilities. (S5.C.5.b)

46c. Number of facilities inspected during the reporting period. (S5.C.5.b)

46d. Number of facilities for which maintenance was performed during the reporting period. (S5.C.5.b)

47. If using reduced inspection frequency for the first time during this permit cycle, **attach** documentation per S5.C.5.b.

48. Conducted spot checks and inspections (if necessary) of potentially damaged stormwater facilities after major storms as per S5.C.5.c.

49. Inspected all municipally owned or operated catch basins and inlets as per S5.C.5.d, or used an alternative approach. (*Required* once no later than August 1, 2017 and every two years thereafter, except once no later than June 30, 2018 and every two years thereafter for the City of Aberdeen)

49b. Number of known catch basins.

49c. Number of catch basins inspected during the reporting period.

49d. Number of catch basins cleaned during the reporting period.

50. **Attach** documentation of alternative catch basin cleaning approach, if used. (S5.C.5.d.i or ii)

51. Implemented practices, policies and procedures to reduce stormwater impacts associated with runoff from all lands owned or maintained by the Permittee, and road maintenance activities under the functional control of the Permittee. *(*S5.C.5.f)

52. Implemented an ongoing training program for Permittee employees whose primary construction, operations or maintenance job functions may impact stormwater quality. (S5.C.5.g.)

53. Implemented a *Stormwater Pollution Prevention Plan* for all heavy equipment maintenance or storage yards, and material storage facilities owned or operated by the Permittee in areas subject to this Permit that are not required to have coverage under an NPDES permit that covers stormwater discharges associated with the activity. *(*S5.C.5.h)

54. Complied with the Total Maximum Daily Load (TMDL)-specific requirements identified in Appendix 2. (S7.A)

55. For TMDLs listed in Appendix 2: **Attach** a summary of relevant SWMP and Appendix 2 activities to address the applicable TMDL parameter(s). (S7.A)

56. **Attach** a description of any stormwater monitoring or stormwater-related studies as described in S8.A.

57. Participated in cost-sharing for the regional stormwater monitoring program (RSMP) for status and trends monitoring. (S8.B.1)

57b. If choosing to conduct monitoring in accordance with S8.B.2., **attach** a data report in accordance with the approved QAPP. (*Required* to begin monitoring no later than October 31, 2014)

58. Participated in cost-sharing for the regional stormwater monitoring program (RSMP) for effectiveness studies. (S8.D.1) *(Required* to begin no later than August 15, 2014)

58b. If choosing to conduct discharge monitoring, **attach** an annual stormwater monitoring report in accordance with S8.C.2 and Appendix 9. (*Required to submit reports* beginning March 31, 2016)

59. Contributed to the RSMP for source identification and diagnostic monitoring information repository in accordance with S8.D. *(Required* to begin no later than August 15, 2014)

60. Notified Ecology in accordance with G3 of any discharge into or from the Permittees MS4 which could constitute a threat to human health, welfare or the environment. (G3)

61. Number of G3 notifications provided to Ecology.

62. Took appropriate action to correct or minimize the threat to human health, welfare, and/or the environment per G3.A.

63. Notified Ecology within 30 days of becoming aware that a discharge from the Permittee's MS4 caused or contributed to a known or likely violation of water quality standards in the receiving water. (S4.F.1)

64. If requested, submitted an Adaptive Management Response report in accordance with S4.F.3.a.

65. **Attach** a summary of the status of implementation of any actions taken pursuant to S4.F.3 and the status of any monitoring, assessment, or evaluation efforts conducted during the reporting period. (S4.F.3.d)

66. Notified Ecology of the failure to comply with the permit terms and conditions within 30 days of becoming aware of the non-compliance. (G20)

67. Number of non-compliance notifications (G20) provided in reporting year.

67b. List permit conditions described in non-compliance notification(s) in *Comments* field.

APPENDIX 4 – Annual Report Questions for Secondary Permittees

VI. Status Report Covering Calendar Year _____

Secondary Permittees are required to submit annual reports online or in a format provided by Ecology, pursuant to Special Condition S9.A

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1. YES □ NO □ NA □ **Attach** a notification of any jurisdictional boundary changes resulting in an increase or decrease in the Secondary Permittee's geographic area of coverage during the reporting period. (*Required annually,* S9.F.4)

Comments:

S6.D Stormwater Management Program

S6.D.1 Public Education and Outreach

2. YES □ NO □ Labeled all storm drain inlets owned or operated by the Secondary Permittee that are located in maintenance yards, in parking lots, along sidewalks, and at pedestrian access points. (*Required no later than* 4 years from initial date of permit coverage, S6.D.1.a)

Comments:

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3. YES □ NO □ Re-labeled all storm drain inlets with labels when no longer clearly visible and/or easily readable within 90 days. (*Required after* four years from initial date of permit coverage, S6.D.1.a)

Comments:

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4. YES □ NO □ NA □ (Public ports, colleges, and universities only) Distributed educational information to tenants and residents about the impact of stormwater discharges on receiving waters and steps that can be taken to reduce pollutants in stormwater runoff. (*Required no later than* 3 years from initial date of permit coverage, S6.D.1.b)

Comments:

S6.D2 Public Involvement and Participation

5. YES □ NO □ Made the annual report and SWMP Plan available on website. (*Required no later than May 31, annually*, S6.D.2)

Comments:

S6.D.3 Illicit Discharge Detection and Elimination

6. YES □ NO □	Complied with all relevant ordinances, rules, and regulations of the local jurisdiction(s) that govern non-stormwater discharges. (*Required* after initial date of permit coverage, S6.D.3.a) *Comments:*
7. YES □ NO □	Implemented policies prohibiting illicit discharges. (*Required no later than* 1 year from initial date of permit coverage, S6.D.3.b) *Comments:*
8. YES □ NO □	Implemented an enforcement plan to ensure compliance with policies to prohibit illicit discharges. (*Required* 18 months from initial date of permit coverage, S6.D.3.b) *Comments:*
9. YES □ NO □	Developed a map of the storm sewer system showing the features listed in S6.D.3.c. (*Required no later than* four and one-half years from initial date of permit coverage, S6.D.3.c) *Comments:*
10. YES □ NO □	Maintained a map of the MS4 showing all the features listed in S6.D.3.c. (*Required* after four and one half years from initial date of permit coverage, S6.D.3.c) *Comments:*
10b. YES □ NO □	If applicable, made the map available on request to Ecology or others. (*Required* after four and one half years from initial date of permit coverage, S6.D.3.c) *Comments:*
11. YES □ NO □	Conducted field inspections and visually inspected for illicit discharges at approximately one third of all known MS4 outfalls. (*Required to begin no later than* 2 years from initial date of permit coverage, S6.D.3.d) *Comments:*

12. YES □ NO □	Implemented procedures to identify and remove illicit discharges. (*Required no later than* 2 years from initial date of permit coverage, S6.D.3.d) *Comments:*
13. YES □NO □	Number of illicit discharges, including illicit connections, eliminated during the reporting period: (S6.D.3.d) *Comments:*
13b. YES □ NO □	**Attach** a summary of each illicit discharge discovered and actions taken to eliminate each of the discharges. (S6.D.3.d) *Comments:*
14. YES □ NO □	Implemented a spill response plan that includes coordination with a qualified spill responder. (*Required no later than* four and one-half years from initial date of permit coverage, S6.D.3.e) *Comments:*
15. YES □ NO □	Provided staff training or coordinated with existing training to educate staff on proper BMPs for preventing illicit discharges, including spills, as described in S6.D.3.f. (*Required no later than* 2 years from initial date of permit coverage) *Comments:*

S6.D.4 Construction Site Stormwater Control

16. YES □ NO □ NA □ Complied with all relevant ordinances, rules, and regulations of the local jurisdiction(s) that govern construction phase stormwater pollution prevention measures, if applicable. (*Required after* initial date of permit coverage, S6.D.4.a)

Comments:

17. YES □ NO □ Ensured that all applicable construction projects under the functional control of the Secondary Permittee obtained NPDES permit coverage. (*Required after* initial date of permit coverage, S6.D.4.b)

Comments:

18. YES □ NO □ NA □ Coordinated with the local jurisdiction on projects owned or operated by other entities that discharge into the Secondary Permittee's MS4 as per S5.D.4.c. (*Required* after initial date of permit coverage)

Comments:

19. YES □ NO □ NA □ Provided training for relevant staff in erosion and sediment control BMPs and requirements, or hired trained contractors to perform the work. (*Required after* initial date of permit coverage, S6.D.4.d)

Comments:

20. YES □ NO □ NA □ Provided access, as requested, for inspection of construction sites under the control of the Secondary Permittee during the land disturbing activities and/or the construction period. (*Required* after initial date of permit coverage, S6.D.4.e)

Comments:

S6.D.5 Post-Construction Stormwater Management for New Development and Redevelopment

21. YES □ NO □ Complied with all relevant ordinances, rules, and regulations of the local jurisdiction(s) that govern post-construction stormwater pollution prevention measures, including proper operation and maintenance of the MS4. (*Required* after initial date of permit coverage, S6.D.5.a)

Comments:

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22. YES □NO □ Coordinated with local jurisdiction regarding projects owned or operated by other entities which discharge into the Secondary Permittee's MS4. (*Required* after initial date of permit coverage, S6.D.5.b)

Comments:

S6.D.6 Pollution Prevention and Good Housekeeping for Municipal Operations

23**.** YES □ NO □ Implemented an Operation and Maintenance program. (*Required no later than* 3 years from initial date of permit coverage, S6.D.6.a)

Comments:

24**.** YES □ NO □ Established and implemented maintenance standards for stormwater collection and conveyance systems as described in S6.D.6.a.i. (*Required no later than* 3 years from initial date of permit coverage, S6.D.6.a.i)

Comments:

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25. YES □ NO □ Conducted spot checks of potentially damaged permanent stormwater treatment and flow control BMPs/facilities after major storms. (*Required to begin no later than* 3 years from initial date of permit coverage, S6.D.6.a.i)

Comments:

26**.** YES □ NO □ Developed and implemented a Stormwater Pollution Prevention Plan (SWPPP) for material storage facilities, heavy equipment maintenance or storage yards not covered by another NPDES permit that authorizes stormwater discharges associated with the activity. (*Required no later than* 3 years from initial date of permit coverage, S6.D.6.a.vi)

Comments:

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27. YES ☐ NO ☐ NA ☐ Have NPDES permit coverage for *Stormwater Discharges Associated with Industrial Activities* for all applicable industrial facilities operated by the Secondary Permittee, or another NPDES permit that regulates surface water discharges associated with the activity. (*Required after* initial date of permit coverage, S6.D.6.b)

Comments:

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28. YES ☐ NO ☐ Implemented a program designed to train staff to carry out the Operations and Maintenance plan as described in S6.D.6.d. (*Required to begin no later than* 3 years from initial date of permit coverage)

Comments:

S7. Compliance with Total Maximum Daily Load Requirements

29. YES ☐ NO ☐ Is there an approved Total Maximum Daily Load (TMDL) applicable to stormwater discharges from a MS4 owned or operated by the Permittee? (S7)

Comments:

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30. YES ☐ NO ☐ NA ☐ Complied with the specific requirements identified in Appendix 2. (S7.A)

Comments:

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31. YES ☐ NO ☐ NA ☐ Attached status report of TMDL implementation. (S7.A)

Comments:

General Conditions

32. YES ☐ NO ☐ NA ☐ Notified Ecology of the failure to comply with the permit terms and conditions within 30 days of becoming aware of the non-compliance. (G20)

Comments:

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33. YES ☐ NO ☐ Notified Ecology immediately in cases where the Secondary Permittee becomes aware of a discharge into or from the Permittee's MS4 which

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may constitute a threat to human health, welfare, or the environment. (G3)

Comments:

34**.** YES ☐ NO ☐ Took appropriate action to correct or minimize discharges into or from the MS4 which could constitute a threat to human health, welfare, or the environment. (G3.A)

Comments:

S4 Compliance with Standards

35**.** YES ☐ NO ☐ NA ☐ If applicable, attached a summary of the status of implementation of any actions taken pursuant to S4.F, and the status of any monitoring, assessment, or evaluation efforts conducted during the reporting period. (S4.F.3.d)

Comments:

A. Information Collection (S8.B)

List below the results of information collected and analyzed by the MS4 during the reporting period, including monitoring data (if any) or monitoring-related studies and how to contact the MS4 for additional information. In addition, summarize the results of information collected by another entity and indicate how more complete information can be obtained.

DEPARTMENT OF ECOLOGY
State of Washington

APPENDIX 5: Notice of Intent (NOI) for Coverage under a National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater General Permit

Introduction

This form must be used by all entities seeking initial coverage under one or more of the following municipal separate storm sewer permits:

- **Phase I Municipal Stormwater Permit** – "National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Large and Medium Municipal Separate Storm Sewer Systems"
- **Western Washington Phase II Municipal Stormwater Permit** – "National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Small Municipal Separate Storm Sewers in Western Washington"
- **Eastern Washington Phase II Municipal Stormwater Permit** – "National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Small Municipal Separate Storm Sewers in Eastern Washington"

The Department of Ecology (Ecology) will use the information provided to determine if coverage under one or more of the above municipal stormwater general permits is required and/or appropriate. Please answer all questions accurately and completely. If a question does not apply, answer NA to that question. See instructions at the back of the form for more information.

Operators of municipal separate storm sewer systems (MS4s) seeking permit coverage must complete this application and return it to Ecology. You may print this form and complete it by hand, or download the form from Ecology's Web site and fill it out electronically. The form is available at: www.ecy.wa.gov/biblio/ecy070207.html.

A certified signature is needed to complete the application. Please reference supporting documents in the text and attach as necessary.

Mail completed NOI to:

Department of Ecology
Water Quality Program
Municipal Stormwater Permits
P.O. Box 47696
Olympia, WA 98504-7696

Ecology will send each applicant an acknowledgment of receipt. If you have questions about this application, please contact the appropriate Ecology employee listed at www.ecy.wa.gov/programs/wq/stormwater/municipal/municontacts.html , or call Ecology's Water Quality Program at 360-407-6600.

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Part 1 - Owner/Operator Information

A. Applicant Information		
Name of city, county, or special district:		
Mailing Address:		
PO Box (Optional) :		
City:	State:	Zip:
B. Responsible Official or Representative		
Name:		
Title:		
Phone:		
Email:		
Mailing Address:		
PO Box (Optional) :		
City:	State:	Zip:
C. Billing Address, if different		
Name:		
Mailing Address:		
PO Box (Optional) :		
City:	State:	Zip:
D. Primary Contact Person		
Name:		
Title:		
Phone No. Business: Ext. :		
Email:		
Fax No. (Optional):		
Mailing Address:		
PO Box (Optional):		
City:	State:	Zip:

E. Ownership Status (check appropriate box)
☐ City or Town ☐ County ☐ Federal ☐ Federally-recognized Indian Tribe
Special Purpose District:(secondary permittee) ☐ Diking/drainage district ☐ Port ☐ Flood control district ☐ University ☐ Public school district ☐ Park district ☐ State agency (give name) _____ ☐ Other (please describe) _____

Part 2 – Permits under which the applicant is requesting coverage (see instructions)

- ☐ Phase I Municipal Stormwater Permit
- ☐ Western Washington Phase II Municipal Stormwater Permit
- ☐ Eastern Washington Phase II Municipal Stormwater Permit

If you own or operate MS4s that are located in areas covered by more than one permit, please list the locations of all of the MS4s for which you are requesting permit coverage.

Part 3 – Population served by the MS4

Estimated resident population (public entities that are not cities, towns, or counties also include commuter populations) served by the MS4 within the geographic area(s) covered by the permits: _____

Part 4 – Map(s)

A. Is part of the MS4 located within Indian Country (within a reservation or on land held in trust for a tribe)? For the Puyallup reservation only, check "yes" if MS4 is located on trust lands and "no" if any part of the MS4 is located on fee lands. ☐ Yes ☐ No

B. <u>For special purpose districts only</u>, attach a map or maps delineating the geographic area served by the MS4. ☐ Attach map(s) to this form
☐ Not applicable

Part 5 – Co-Permittee information

Complete this part of the NOI only if you are applying as a Co-Permittee with another entity to meet the requirements of the permit. Permittees that apply as Co-Permittees are responsible for meeting permit conditions related to their discharge(s).

If you are applying with another entity or entities as Co-Permittee(s) please include, as an attachment to this NOI, a summary of the permit obligations that will be carried out jointly among Co-Permittees. The summary must identify the other Co-Permittee(s) and must be signed by the other Co-Permittee(s).

☐ Attach a summary of joint permit obligations
☐ Summary is signed by all Co-Permittees
☐ Not Applicable

Part 6 - Relying on another entity to satisfy permit requirement(s)

Complete this part of the NOI only if you are relying on another entity to satisfy all of the requirements of the permit. Permittees that rely on another entity to satisfy all of their permit obligations remain responsible for permit compliance if the other entity fails to implement the permit conditions. Permittees may rely on another entity provided:

1. The other entity agrees to take on responsibility for implementation of the permit requirement(s),

   AND

2. The other entity implements the permit requirements.

If you are relying on another entity or entities to satisfy all of the permit obligations, please include as an attachment to this NOI a summary of the permit obligations that will be carried out by another entity. The summary must identify the other entity or entities and must be signed by the other entity or entities.

☐ Attach summary of permit obligations carried out by another entity
☐ Summary is signed by all other entities
☐ Not Applicable

Part 7 – Public Notice

A public notice must be published at least ***once each week for two consecutive weeks*** in a ***single*** newspaper of general circulation in the county or city in which the district or entity is located. See the NOI instructions for the public notice language requirements. Permit coverage will not be granted sooner than ***31 days*** after the date of the second public notice.

Submit the NOI and public notice to Ecology before the date of the first public notice. A copy of the NOI and public notice may be faxed to (360) 407-6426.

Name of the newspaper that will publish the public notices: _____

Provide the **exact** dates (mm/dd/yy) that the first and second public notices will appear in the newspaper:

Date of the first notice ____/____/____

Date of second notice ____/____/____

Part 8 - Certification

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. 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.

Print or type name of responsible official or representative	**Title**
Signature of responsible official or representative	/ / **Date**

If you need this document in a format for the visually impaired, call the Water Quality Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

INSTRUCTIONS

These instructions will help you prepare an application, referred to as a Notice of Intent (NOI), for coverage under a National Pollutant Discharge Elimination System (NPDES) General Permit and State Waste Discharge Permit for stormwater discharges associated with MS4s in Washington State.

Questions?

If you have questions, please contact the Ecology employee who manages the permit in the county or counties in which your facility or district is located available at http://www.ecy.wa.gov/programs/wq/stormwater/municipal/municontacts.html or, call Ecology's Water Quality Program office at 360-407-6600, and the receptionist will direct you to a staff member who can assist you.

Who must apply?

Federal and state law requires all operators of **regulated MS4s** to apply for and obtain coverage under this permit or to be permitted under a separate individual permit, unless it qualifies for a waiver or exemption in accordance with conditions described below (see *Who does not need to apply?).*

1. A **regulated MS4** is a municipal separate storm sewer system that:
   - Is located within, or partially within, the unincorporated areas of Clark, King, Pierce or Snohomish counties; or
   - Is located within, or partially within, the cites of Seattle or Tacoma; or
   - Is located within the other areas defined in the permits. See list of cities and counties in Part 2 of the line-by-line instructions or Ecology's maps of permit coverage www.ecy.wa.gov/programs/wq/stormwater/phase_2/maps.html for more information on these locations; or
   - Is designated by Ecology

   AND
   - Discharges stormwater from the MS4 to a water of the United States; and
   - Is not eligible for an exemption or a waiver.
2. All owners or operators of MS4s that meet the criteria listed above must obtain coverage under this permit. Owners or operators of MS4s may also include, but are not limited to: public flood control districts, public diking, and drainage districts, public schools including universities, and correctional facilities that own or operate an MS4 serving non-agricultural land uses.
3. If Ecology determines the MS4 is a significant source of pollution to surface waters of the state, Ecology may require any other operators of small MS4s to obtain permit coverage. Ecology will notify the affected MS4 that permit coverage is required by issuing an administrative order (see RCW 90.48).

Who does not need to apply?

If either of the following conditions applies, state and federal laws do not require a MS4 to obtain permit coverage:

If the portions of the MS4 located within the census defined urban area(s) that discharge to surface waters serve a total population of less than 1000 people** and **all** the conditions below apply, then the MS4 qualifies for a waiver and need not apply:

- The MS4 is not contributing substantially to the pollutant loadings of a physically interconnected MS4 that is regulated by the NPDES stormwater program.

- The discharge of pollutants from the MS4 has not been identified as a cause of impairment of any water body to which the MS4 discharges.
- In areas where an EPA approved Total Maximum Daily Load (TMDL), or water quality improvement plan for impaired waters, has been completed, stormwater controls on the MS4 have not been identified as being necessary.

***In determining the total population served, cities and counties include resident populations; other public entities include resident and commuter populations as follows:*

- *For publicly operated school complexes including universities and colleges, the total population served includes the sum of the average annual student enrollment plus staff.*
- *For flood control, diking, and drainage districts, the total population served includes residential population and any non-residents regularly employed in the areas served by the MS4.*

Exempt MS4s are those owned or operated by:

- A federal entity, including any department, agency or instrumentality of the executive, legislative, and judicial branch of the Federal government of the United States; or
- Federally recognized Indian Tribes located within Indian Country, including all trust or restricted lands within the 1873 Survey Area of the Puyallup Tribe of Indians.

Federal and tribal MS4s are not covered under this permit but may need coverage under a permit issued by the USEPA.

When to apply

Submit the NOI to the Department of Ecology on or before the date of the first public notice required in part 7 of this NOI. Ecology must have the permit application during the public comment period required by this NOI in order to provide the public access to the applications as required by state law (WAC 173-226-130(5)).

Ecology cannot grant permit coverage until 31 days after the date of the second public notice.

Upon receipt of a complete NOI, Ecology will notify the applicant by mail of confirmation of coverage under the permit. An NOI is deemed complete only after the 30-day public comment period and all other requested information has been supplied. Permit coverage will begin on the date specified in Ecology's letter of confirmation.

Where to apply

Mail the signed NOI to: Washington Department of Ecology
Water Quality Program
Municipal Stormwater Permits
P.O. Box 47696
Olympia, WA 98504-7696

Fees

There is no application fee. Ecology will bill the applicant(s) for permit fees after permit coverage is issued in accordance with Chapter 173-224 WAC. Call the Permit Fee Unit of Ecology at 360-407-6425 for questions relating to permit fees.

Line-by-line Instructions

Part 1 – Owner/Operator information

A. Applicant information - Fill out the name and mailing address of the city, county, or public entity that will receive coverage under the permit.
B. Responsible Official or Representative – Fill out the name, address and contact information for the principal executive officer or ranking elected official responsible for signing the application. See Part 8 for more information.
C. Billing information - If a separate department or office handles billing, enter the appropriate contact information. There is an annual permit fee associated with this permit.
D. Primary Contact person - Enter the name, title, address, phone number, and email for the person who will be in charge of developing the stormwater management program and meeting the stormwater permit requirements.
E. Ownership status - Check the appropriate box indicating the ownership status (e.g., city, county, or special district type).

Part 2 – Permit(s) under which the applicant is requesting coverage

Check the box that corresponds to the permit(s) under which you are applying for coverage. The geographic locations covered by each permit break down as follows:

- **Phase I** – covers entities within, or partially within the unincorporated areas of Clark, King, Pierce, or Snohomish counties; or the cities of Seattle or Tacoma.
- **Phase II Western Washington** – covers entities in the census-defined urban areas of western Washington, and associated urban growth areas, some cities with populations over 10,000 or areas otherwise designated by Ecology.
- **Phase II Eastern Washington –** covers entities in the census-defined urban areas of eastern Washington, and associated urban growth areas, and some cities with populations over 10,000 or areas otherwise designated by Ecology.

Note: Applicants may submit a single NOI to request coverage of all of the MS4s that they own or operate. For example, a single NOI may be submitted to cover the main campus and any satellite campuses of a university that may require permit coverage. Applicants requesting coverage for multiple sites/locations must list the locations for each site/location for which coverage is being requested. When more than one permit is checked, Ecology will consult with the applicant to determine whether to assign all the sites to separate permits or to one permit that will provide coverage.

Part 3 – Population served by the MS4

Provide an estimate of the population served by the MS4 within the geographic area(s) covered by the permits. Cities, towns, and counties include only the resident population. For special purpose districts and other public entities that are not cities, towns, or counties, the estimate must include both resident and commuter populations. For example, a university may have a resident population of students who live on campus and a commuter population of students and employees who commute to campus. (See above for information on determining the commuter population in *Who does not need to apply?)*

Part 4 – Map requirements

A. Is part of the MS4 located within Indian Country (within a reservation or on land held in trust for a tribe)? For the Puyallup reservation only, check "yes" if MS4 is located on trust lands and "no" if any part of the MS4 is located on fee lands. The portion of the MS4 that is located on tribal lands will not be covered under these permits.
B. For special purpose districts only, attach a map or maps delineating the geographic area served by the MS4.

Part 5 – Co-Permittee information

Complete this part of the NOI only if you are applying with another entity as Co-Permittees to meet the requirements of this permit. Permittees that apply as Co-Permittees are responsible for meeting permit conditions related to their discharge(s).

If you are applying as a Co-Permittee with another entity or entities, please include as an attachment to this NOI a summary of the permit obligations that will be carried out jointly among Co-Permittees. The summary must identify the other Co-Permittee(s) and must be signed by the other Co-Permittee(s).

Part 6 - Relying on another entity to satisfy permit requirement(s)

Complete this part of the NOI only if you are relying on another entity to satisfy all of the requirements of the permit. Permittees may rely on another entity provided the entity satisfies all of the requirements it agrees to undertake (see 40 CFR 122.35(a)).

That other entity **must agree** to take responsibility and **implement** the permit requirement(s). Permittees that rely on another entity to satisfy all of their permit obligations remain responsible for permit compliance with those obligations if the other entity fails to implement the permit conditions.

If you are relying on another entity or entities to satisfy all of the permit obligations, please include as an attachment to this NOI a summary of the permit obligations that will be carried out by another entity. The summary must identify the other entity or entities and must be signed by the other entity or entities.

Part 7 – Public notice

You must publish a public notice in a newspaper of general circulation in the county or city in which the district or entity is located. The following sample public notice contains the required public notice elements.

Sample Public Notice

(Name and address of municipality, district or other public entity) is seeking coverage under (select one of the following):

- **Phase I Permit** – "National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Large and Medium Municipal Separate Storm Sewer Systems"
- **Western Washington Phase II Permit** – "National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Small Municipal Separate Storm Sewers in western Washington"
- **Eastern Washington Phase II Permit** – "National Pollutant Discharge Elimination System and State Waste Discharge General Permit for Discharges from Small Municipal Separate Storm Sewers in eastern Washington"

The proposed permit will authorize stormwater discharges from the municipal separate storm sewer system located in (*city, town, or county*). The permit requires *(Name of municipality, district, or other public entity*) to develop and implement a stormwater management program that:

1. Reduces the discharge of pollutants to the maximum extent practicable.
2. Protects water quality.
3. Satisfies appropriate requirements of the Clean Water Act.

Any person desiring to present views to the Department of Ecology concerning this application may notify Ecology in writing within 30 days from the last date of publication of this notice.
Submit comments to:

Washington Department of Ecology
Water Quality Program
Municipal Stormwater Permits
P.O. Box 47696
Olympia, WA 98504-7696

Fax: 360-407-6426

Part 8 - Certification

An authorized person, such as a principal executive officer or ranking elected official, must sign the certification statement.

OR

A duly authorized representative of the executive officer (or ranking elected official) may sign the certification as long as:

1. The signatory receives written authorization from the executive officer or ranking elected official. This document must be submitted to Ecology at the same time as the completed NOI.
2. The authorization specifies an individual or position that has responsibility for the overall development and implementation of the stormwater management program.

If you need this document in a format for the visually impaired, call the Water Quality Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

APPENDIX 6 – Street Waste Disposal

Street Waste Liquids

General Procedures:
Street waste collection should emphasize retention of solids in preference to liquids. Street waste solids are the principal objective in street waste collection and are substantially easier to store and treat than liquids.

Street waste liquids require treatment before their discharge. Street waste liquids usually contain high amounts of suspended and total solids and adsorbed metals. Treatment requirements depend on the discharge location.

Discharges to sanitary sewer and storm sewer systems must be approved by the entity responsible for operation and maintenance of the system. Ecology will not generally require waste discharge permits for discharge of stormwater decant to sanitary sewers or to stormwater treatment BMPs constructed and maintained in accordance with Ecology's Stormwater Management Manual for Western Washington.

The following order of preference, for disposal of catch basin decant liquid and water removed from stormwater treatment facilities, is required.

1. Discharge of catch basin decant liquids to a municipal sanitary sewer connected to a Public Owned Treatment Works (POTW) is the <u>preferred disposal option</u>.
Discharge to a municipal sanitary sewer requires the approval of the sewer authority. Approvals for discharge to a POTW will likely contain pretreatment, quantity and location conditions to protect the POTW.

2. Discharge of catch basin decant liquids may be allowed into a Basic or Enhanced Stormwater Treatment BMP, if option 1 is not available.
Decant liquid collected from cleaning catch basins and stormwater treatment wet vaults may be discharged back into the storm sewer system under the following conditions:

- The preferred disposal option of discharge to sanitary sewer is not reasonably available, and
- The discharge is to a Basic or Enhanced Stormwater Treatment Facility. If pretreatment does not remove visible sheen from oils, the treatment facility must be able to prevent the discharge of oils causing a visible sheen, and
- The discharge is as near to the treatment facility as is practical, to minimize contamination or recontamination of the collection system, and
- The storm sewer system owner/operator has granted approval and has determined that the stormwater treatment facility will accommodate the increased loading. Pretreatment conditions to protect the stormwater treatment BMP may be issued as part of the approval process. Following local pretreatment conditions is a requirement of this permit.

- Flocculants for the pretreatment of catch basin decant liquids must be non-toxic under the circumstances of use and must be approved in advance by the Department of Ecology.

The reasonable availability of sanitary sewer discharge will be determined by the Permittee, by evaluating such factors as distance, time of travel, load restrictions, and capacity of the stormwater treatment facility.

3. Water removed from stormwater ponds, vaults and oversized catch basins may be returned to the storm sewer system. Stormwater ponds, vaults and oversized catch basins contain substantial amounts of liquid, which hampers the collection of solids and pose problems if the removed waste must be hauled away from the site. Water removed from these facilities may be discharged back into the pond, vault or catch basin provided:

- Clear water removed from a stormwater treatment structure may be discharged directly to a down gradient cell of a treatment pond or into the storm sewer system.
- Turbid water may be discharged back into the structure it was removed from if
  - the removed water has been stored in a clean container (eductor truck, Baker tank or other appropriate container used specifically for handling stormwater or clean water); and
  - there will be no discharge from the treatment structure for at least 24 hours.
- The discharge must be approved by the storm sewer system owner/operator.

Street Waste Solids

Soils generated from maintenance of the MS4 may be reclaimed, recycled or reused when allowed by local codes and ordinances. Soils that are identified as contaminated pursuant to Chapter 173-350 WAC shall be disposed at a qualified solid waste disposal facility.

APPENDIX 7 – Determining Construction Site Sediment Damage Potential

The following rating system allows objective evaluation of a particular development site's potential to discharge sediment. Permittees may use the rating system below or develop alternative process designed to identify site-specific features which indicate that the site must be inspected prior to clearing and construction. Any alternative evaluation process must be documented and provide for equivalent environmental review.

Step one is to determine if there is a sediment/erosion sensitive feature downstream of the development site. If there is such a site downstream complete step two, assessment of hydraulic nearness. If there is a sediment/erosion sensitive feature and it is hydraulically near the site then go to step three to determine the construction site sediment transport potential.

STEP 1 – Sediment/Erosion Sensitive Feature Identification

Sediment/erosion sensitive features are areas subject to significant degradation due to the effect of sediment deposition or erosion. Special protection must be provided to protect them. Sediment/erosion sensitive features include but are not limited to:

i. Salmonid bearing fresh water streams and their tributaries or freshwater streams that would be Salmonid bearing if not for anthropogenic barriers;
ii. Lakes;
iii. Category I, II, and III wetlands;
iv. Marine near-shore habitat;
v. Sites containing contaminated soils where erosion could cause dispersal of contaminants; and
vi. Steep slopes (25% or greater) associated with one of the above features.

Identify any sediment/erosion sensitive features, and proceed to step two. If there are none the assessment is complete.

STEP 2 – Hydraulic Nearness Assessment

Sites are hydraulically near a feature if the pollutant load and peak quantity of runoff from the site will not be naturally attenuated before entering the feature. The conditions that render a site hydraulically near to a feature include, but are not limited to, the following:

i. The feature or a buffer to protect the feature is within 200 feet downstream of the site.
ii. Runoff from the site is tight-lined to the feature or flows to the feature through a channel or ditch.

A site is not hydraulically near a feature if one of the following takes place to provide attenuation before runoff from the site enters the feature:

i. Sheet flow through a vegetated area with dense ground cover
ii. Flow through a wetland not included as a sensitive feature
iii. Flow through a significant shallow or adverse slope, not in a conveyance channel, between the site and the sensitive feature.

Identify any of the sediment/erosion sensitive features from step one that are hydraulically near the site, and proceed to step three. If none of the sediment/erosion sensitive features are hydraulically near the site, the assessment is complete.

STEP 3 – Construction Site Sediment Transport Potential

Using the worksheet below, determine the total points for each development site. Assign points based on the most critical condition that affects 10% or more of the site.

If soil testing has been performed on site, the results should be used to determine the predominant soil type on the site. Otherwise, soil information should be obtained from the county soil survey to determine Hydrologic Soil Group (Table of Engineering Index Properties for step 1.D) and Erosion Potential (Table of Water Features for step 1.E)

When using the county soil survey, the dominant soil type may be in question, particularly when the site falls on a boundary between two soil types or when one of two soil types may be present on a site. In this case, the soil type resulting in the most points on the rating system will be assumed unless site soil tests indicate that another soil type dominates the site.

Use the point score from Step 3 to determine whether the development site has a high potential for sediment transport off of the site.

Total Score	Transport Rating
<100	Low
≥100	High

A high transport rating indicates a higher risk that the site will generate sediment contaminated runoff.

Construction Site Sediment Transport Potential Worksheet

	Points
A. Existing slope of site (average, weighted by aerial extent):	
2% or less	0
>2-5%	5
>5-10%	15
>10-15%	30
>15%	50
B. Site Area to be cleared and/or graded:	
<5,000 sq. ft.	0
5,000 sq. ft. – 1 acre	30
>1 acres	50
C. Quantity of cut and/or fill on site:	
<500 cubic yards	0
500 – 5,000 cubic yards	5
>5,000 – 10,000 cubic yards	10
>10,000 – 20,000 cubic yards	25
>20,000 cubic yards	40
D. Runoff potential of predominant soils (Natural Resources Conservation Service):	
Hydrologic soil group A	0
Hydrologic soil group B	10
Hydrologic soil group C	20
Hydrologic soil group D	40
E. Erosion Potential of predominant soils (Unified Classification System):	
GW, GP, SW, SP soils	0
Dual classifications (GW-GM, GP-GM, GW-GC, GP-GC, SW-SM, SW-SC, SP-SM, SP-SC)	10
GM, GC, SM, SC soils	20
ML, CL, MH, CH soils	40
F. Surface or Groundwater entering site identified and intercepted[1]:	
Yes	0
No	25
G. Depth of cut or height of fill >10 feet:	
Yes	25
No	0
H. Clearing and grading will occur in the wet season (October 1 – May 1):	
Yes	50
No	0

TOTAL POINTS..... _____

[1] If no surface or groundwater enters site, give 0 points.

APPENDIX 8 – Annual Report Questions for New Permittees

New Permittees that are Cities, Towns or Counties are required to submit the following information in an online annual report form, or an alternative format provided by Ecology if requested, pursuant to Special Condition S9.A.

1.	**Attach** updated annual Stormwater Management Program Plan (SWMP Plan). (S5.A.2)
2.	**Attach** a notification of any annexations, incorporations or boundary changes resulting in an increase or decrease in the Permittee's geographic area of permit coverage during the reporting period per S9.D.5.
3.	Implemented an ongoing program to gather, track, and maintain information per S5.A.3, including costs or estimated costs of developing and implementing the SWMP. (*Required* to begin no later than August 1, 2015*)*
4.	Coordinated among departments within the jurisdiction to eliminate barriers to permit compliance? (S5.A.5.b)
4b.	**Attach** a written description of internal coordination mechanisms. (*Required* to be submitted no later than March 31, 2015, S5.A.5.b)
5.	**Attach** description of public education and outreach efforts conducted per S5.C.1.a. i-ii. *(Required* to begin no later than August 1, 2015)
6.	Provided stewardship opportunities (or partnered with others) to encourage resident participation. (*Required* to begin no later than August 1, 2015, S5.C.1.b)
7.	Used results of measuring the understanding and adoption of targeted behaviors among at least one audience in at least one subject area to direct education and outreach resources and evaluate changes in adoption of targeted behaviors. (*Required* no later than August 1, 2017, S5.C.1.c)

7b.	**Attach** description of how this requirement was met.
8.	Describe in *Comments* field the opportunities created for the public to participate in the decision making processes involving the development, implementation and updates of the Permittee's SWMP. *(Required* to begin no later than August 1, 2014, S5.C.2.a)
9.	Posted the updated SWMP Plan and latest annual report on your website no later than May 31. *(Required* to begin posting no later than May 31, 2015, S5.C.2.b)
9b.	List the website address in *Comments* field.
10.	Developed a map of the MS4 that includes the requirements listed in S5.C.3.a.i.-vi. *(Required* no later than August 1, 2017)
11.	Mapped all connections to the MS4 authorized or allowed by the Permittee. *(Required* to begin no later than August 1, 2013, S5.C.3.a.v)
12.	Adopted and implemented an ordinance or other regulatory mechanism to effectively prohibit illicit discharges per the requirements in S5.C.3.b.i.-iv. *(Required* no later than February 2, 2016)
12b.	Cite reference for ordinance or other regulatory mechanism to meet this requirement in *Comments* field.
13.	Developed and implemented a compliance strategy, including informal compliance actions as well as enforcement provisions of the ordinance (S5.C.3.b.v) *(Required* no later than February 2, 2016)
14.	Developed and implemented procedures for conducting illicit discharge investigations in accordance with S5.C.3.c.i. *(Required* no later than February 2, 2018)
14b.	Cite methodology used in the *Comments* sections.

15.	Screened on average 12% of MS4 within coverage area each year in accordance with S5.C.3.c.i. (*Required* to screen 12% no later than December 31, 2017; 20% on average each year thereafter, S5.C.3.c.i)
16.	Publicized a hotline telephone number for public reporting of spills and other illicit discharges. (*Required* to begin no later than August 1, 2015, S5.C.3.c.ii)
16b.	Number of hotline calls received during the reporting period.
16c.	Provide telephone number in the *Comments* field.
17.	Developed and implemented an ongoing illicit discharge training program for all municipal field staff per S5.C.3.c.iii. *(Required* to begin no later than February 2, 2016)
18.	Informed public employees, businesses, and the general public of hazards associated with illicit discharges and improper disposal of waste? (*Required* to begin no later than February 2, 2017, S5.C.3.c.iv)
18b.	Describe activities in *Comments* field.
19.	Developed and implemented a program to characterize, trace, and eliminate illicit discharges into the MS4 found by or reported to the Permittee. (*Required* to begin no later than February 2, 2018, S5.C.3.d.i)
20.	Number of illicit discharges, including illicit connections, eliminated during the reporting year. *(Required* no later than February 2, 2018, S5.C.3.d.iii and iv)
21.	**Attach** a summary of actions taken to characterize, trace and eliminate each illicit discharge found by or reported to the permittee. For each illicit discharge, include a description of actions according to required timeline per S5.C.3.d.iv. *(Required* no later than February 2, 2018)
22.	Trained municipal illicit discharge detection staff to conduct illicit discharge detection and elimination activities referenced in S5.C.3.e. *(Required* no later than February 2, 2016)

23.	Developed and implemented a program to reduce pollutants in stormwater runoff to the MS4 from new public or private development, redevelopment and construction site activities. *(Required* no later than December 31, 2017, S5.C.4)
24.	Adopted and implemented an ordinance or other enforceable mechanism to address runoff from new development, redevelopment and construction sites per the requirements of S5.C.4.a. *(Required* no later than December 31,2017)
24b.	Cite the jurisdiction code reference used to meet this requirement in *Comments* field.
25.	Number of exceptions granted to the minimum requirements in Appendix 1. *(Required* no later than December 31, 2017, S5.C.4.a.i and Section 6 of Appendix 1)
26.	Number of variances granted to the minimum requirements in Appendix 1. *(Required* no later than December 31, 2017, S5.C.4.a.i and Section 6 of Appendix 1)
27.	Reviewed *Stormwater Site Plans* for all proposed development activities that meet the thresholds adopted pursuant to S5.C.4.a.i. *(Required* no later than December 31, 2017, S5.C.4.b.i)
27b.	Number of site plans reviewed during the reporting period.
28.	Inspected, prior to clearing and construction, all permitted development sites that have a high potential for sediment transport as determined through plan review based on definitions and requirements in Appendix 7 *Determining Construction Site Sediment Damage Potential,* or alternatively, inspected all construction sites meeting the minimum thresholds adopted pursuant to S5.C.4.a.i. (*Required* no later than December 31, 2017, S5.C.4.b.ii)
28b.	Number of construction sites inspected per S5.C.4.b.ii.
29.	Inspected all permitted development sites during construction to verify proper installation and maintenance of required erosion and sediment controls. (*Required* no later than December 31, 2017, S5.C.4.b.iii)

29b.	Number of construction sites inspected per S5.C.4.b.iii.
30.	Number of enforcement actions taken during the reporting period based on construction phase inspections at new development and redevelopment projects. (*Required* no later than December 31, 2017, S5.C.4.b.ii, iii and v)
31.	Inspected all permitted development sites that meet the thresholds in S5.C.4.a.i upon completion of construction and prior to final approval or occupancy to ensure proper installation of stormwater facilities. (*Required* no later than December 31, 2017, S5.C.4.b.iv and v)
32.	Verified a maintenance plan is completed and responsibility for maintenance is assigned for projects. (*Required* no later than December 31, 2017, S5.C.4.b.iv)
33	Achieved at least 80% of scheduled construction-related inspections. (*Required* no later than December 31, 2017, S5.C.4.b.ii-iv)
34.	Developed and implemented a program to verify adequate long-term operation and maintenance (O&M) of stormwater flow control and treatment BMPs/facilities that are permitted and constructed pursuant to S5.C.4(b). (*Required* no later than December 31, 2017, S5.C.4.c)
35.	Adopted and implemented an ordinance or other enforceable mechanism that clearly identifies the party responsible for maintenance, requires inspection and establishes enforcement procedures. (*Required* no later than December 31, 2017, S5.C.5.c.i)
36.	Established maintenance standards as described in S5.C.4.c.ii. (*Required* no later than December 31, 2017)
37.	Annually inspected stormwater treatment and flow control BMPs/facilities per S5.C.4.c.iii.*(Required* no later than December 31, 2017)

37b.	If using reduced inspection frequency for the first time during this permit term, **attach** documentation as per S5.C.4.c.iii. *(Required if applicable* no later than December 31, 2017)
38.	Inspected new stormwater treatment and flow control BMPs/facilities and catch basins for new developments every 6 months until 90% of the lots are constructed (or until construction has stopped and the site is fully stabilized) to identify maintenance needs and enforce compliance with maintenance standards as needed? (*Required* no later than December 31, 2017, S5.C4.c.ii)
39.	Achieved at least 80% of scheduled inspections to verify adequate long-term O&M. (*Required* no later than December 31, 2017, S5.C4.c.v)
40.	Verified that maintenance was performed per the schedule in S5.C.4.c.vi when an inspection identified an exceedance of the maintenance standard. *(Required* no later than December 31, 2017)
40b.	**Attach** documentation of any maintenance delays.(S5.C.4.c.vi)
41.	Provided copies of the *Notice of Intent for Construction Activity* and *Notice of Intent for Industrial Activity* to representatives of proposed new development and redevelopment. (*Required* no later than August 1, 2013, S5.C.4.d)
42.	Ensured that all staff responsible for implementing the program to control stormwater runoff from new development, redevelopment, and construction sites are trained to conduct these activities, as per S5.C.4.e. *(Required* to begin no later than December 31, 2017)
43.	Reviewed, revised and made effective the low impact development-related codes, rules, standards and other enforceable documents as per S5.C.4.f.i. (*Required* no later than December 31, 2017)
43b.	**Attach** a summary of the LID review and revision process that includes the requirements listed in S5.C.4.f.ii. (*Required* to be submitted no later than March 31, 2018)

44.	Where applicable, participated and cooperated with the watershed-scale stormwater planning process led by a Phase I county. (S5.C.4.g)
45.	Developed and implemented maintenance standards as protective, or more protective, of facility function as those specified in Chapter 4 of Volume V of the *Stormwater Management Manual for Western Washington.* (*Required* no later than December 31, 2017, S5.C.5.a)
46.	Applied a maintenance standard that is not specified in the *Stormwater Management Manual for Western Washington.* (*Required to report, if applicable,* no later than December 31, 2017, S5.C.5.a)
46b.	Please note in the *Comments* field what kinds of facilities are covered by this alternative maintenance standard.
47.	Performed timely maintenance as per S5.C.5.a.ii. *(Required* no later than December 31, 2017)
47b.	**Attach** documentation of any maintenance delays. *(Required, if applicable,* no later than December 31, 2017, S5.C.5.a.ii)
48.	Annually inspected all municipally owned or operated permanent stormwater treatment and flow control BMPs/facilities. (*Required* no later than December 31, 2017, S5.C.5.b)
48a.	Number of known municipally owned or operated stormwater treatment and flow control BMPs/facilities.
48b.	Number of facilities inspected during the reporting period.
48c.	Number of facilities for which maintenance was performed during the reporting period.
49.	If used a reduced inspection frequency, **attach** documentation as per S5.C.5.b *(Required, if applicable,* no later than December 31, 2017)

50.	Conducted spot checks and inspections (if necessary) of potentially damaged stormwater facilities after major storms. (*Required* no later than December 31, 2017, S5.C.5.c)
51.	Inspected all municipally owned or operated all catch basins and inlets owned or operated by the Permittee at least once during the permit term, or used an alternative approach. (*Required* no later than February 2, 2018, S5.C.5.d)
51b.	Number of known catch basins.
51c.	Number of catch basins inspected.
51d.	Number of catch basins cleaned.
52.	**Attach** documentation of alternative catch basin cleaning approach, if used. (*Required, if applicable,* no later than February 2, 2018, S5.C.5.d.i- iii)
53.	Developed and implemented practices, policies and procedures to reduce stormwater impacts associated with runoff from all lands owned or maintained by the Permittee, and road maintenance activities under the functional control of the Permittee. *(Required* no later than December 31, 2017, S5.C.5.f)
54.	Developed and implemented an ongoing training program for Permittee employees whose primary construction, operations or maintenance job functions may impact stormwater quality. (*Required* no later than December 31, 2017, S5.C.5.g.)
55.	Developed and implemented a Stormwater Pollution Prevention Plan (SWPPP) for all heavy equipment maintenance or storage yards, and material storage facilities owned or operated by the Permittee in areas subject to this Permit as described in S5.C.6.h. *(Required* no later than December 31, 2017, S5.C.6.h)
56.	Complied with the Total Maximum Daily Load (TMDL) specific requirements identified in Appendix 2, if applicable. (S7.A)
57.	If applicable, for TMDLs listed in Appendix 2 **attach** a summary of relevant SWMP and Appendix 2 activities to address the applicable TMDL parameter. (S7.A)

58.	**Attach** a description of any stormwater monitoring or stormwater-related studies as described in S8.A.
59.	Notified Ecology in accordance with G3 of any discharge into or from the Permittee's MS4 which could constitute a threat to human health, welfare or the environment. (G3)
60.	Number of G3 notifications provided to Ecology.
61.	Took appropriate action to correct or minimize the threat to human health, welfare, and/or the environment per G3.A.
62.	Notified Ecology within 30 days of becoming aware that a discharge from the Permittee's MS4 caused or contributed to a known or likely violation of water quality standards in the receiving water. (S4.F.1)
63.	If requested, submitted an Adaptive Management Response report in accordance with S4.F.3.a.
64.	**Attach** a summary of the status of implementation of any actions taken pursuant to S4.F.3 and the status of any monitoring, assessment, or evaluation efforts conducted during the reporting period? (S4.F.3.d)
65.	Notified Ecology of the failure to comply with the permit terms and conditions within 30 days of becoming aware of the non-compliance? (G20)
66.	Number of non-compliance notifications (G20) provided in reporting year.
66b.	List permit conditions described in non-compliance notification(s) in *Comments* field.

APPENDIX 9 – Stormwater Discharge Monitoring

This Appendix applies to Permittees with stormwater discharge monitoring requirements pursuant to Special Condition S8 Monitoring and Assessment, particularly sections S8.B.2, for Clark County, and S8.C.2, if a Permittee chooses not to participate in the Regional Stormwater Monitoring Program (RSMP) by paying into a collective fund to implement RSMP effectiveness studies.

Stormwater discharge monitoring is intended to characterize stormwater runoff quantity and quality at a limited number of locations in a manner that allows analysis of loadings and changes in conditions over time and generalization across the Permittee's jurisdiction.

QAPP Preparation

Permittees shall prepare a Quality Assurance Project Plan (QAPP) in accordance with *Quality Assurance Project Plan Guidance, Special Condition S8.D, Phase I Municipal Stormwater Permit,* December 2010 (Ecology Publication no. 10-10-075 http://www.ecy.wa.gov/pubs/1010075.pdf). The QAPP shall be developed by qualified staff or contractors with experience in applying Ecology or Environmental Protection Agency (EPA) QAPP Guidelines.

A stormwater discharge monitoring QAPP shall be submitted to Ecology in accordance with the deadlines in S8. The QAPP shall describe field collection methods and sample preparation methods appropriate to each group of analytes, reporting limits, and field conditions.

Permittees are responsible for maintaining an up-to-date approved QAPP for stormwater discharge monitoring. Significant changes shall be reviewed by Ecology and reflected in a revised QAPP. Significant changes include, but are not limited to:

- Land disturbing activities over 10 acres in size within the sampled drainage area.
- Relocating a monitoring station.
- Introducing new sampling equipment.
- Unanticipated back water conditions, base flow, or tidal influences.
- Changes in laboratories, analytical methods, or reporting limits.

Discharge Monitoring Location Selection

Stormwater monitoring discharge monitoring locations shall have mapped tributary conveyance systems and drainage areas, and be suitable for permanent installation and operation of flow-weighted composite sampling equipment. Additional monitoring location selection guidance and information about how to estimate a rainfall to runoff relationship is available in *Standard Operating Procedure for Automatic Sampling for Stormwater Monitoring, ECY002* from the Ecology Quality Assurance Page (http://www.ecy.wa.gov/programs/eap/quality.html; specific guidance for automatic sampling is available at http://www.ecy.wa.gov/programs/eap/qa/Agency/ECY_WQ_SOP_AutomatedSampling_v1_0ECY002.pdf).

Permittees may identify a discharge monitoring location upstream in the conveyance system (*i.e.*, upgradient of the outfall) in order to achieve the desired land use, to accommodate the installation of sampling equipment, and/or to avoid or minimize back water or tidal interference.

The QAPP shall describe each stormwater discharge monitoring location and associated drainage basin in detail. The QAPP must describe how each discharge monitoring location was selected, the size of the drainage basin, and the percentage of area in the drainage basin representing the following land uses: high density residential, low density residential, commercial, industrial, agriculture, and transportation right-of-way. Table A9-1 below provides characteristics to consider for some of these land uses. However, density definitions can vary from jurisdiction to jurisdiction and may be defined locally in codes and comprehensive plans. Report the residential density definitions used if they differ from these.

Table A9-1 Land Use Selection Characteristics

Land use category	**Characteristics**
High density residential	4 dwelling units per acre or greater
Medium to high density residential	2 to 4 dwelling units per acre
Low density residential	1 to 2 dwelling units per acre
Commercial	Includes multi-family residential
Industrial	Not predominated by one facility with a few operators

Flow Monitoring

Discharge monitoring locations must be evaluated for a rainfall to runoff relationship in order to ensure that the discharge monitoring location will receive enough runoff for sufficient sample volume. This rainfall to runoff relationship will also assist in programming the automatic sampling equipment. In order to establish the rainfall to runoff relationship, one year of continuous flow recording (including base flow and all storm events) is necessary.

Monitoring Frequency

Permittees shall sample each stormwater discharge monitoring location according to the frequency described below. Documented good faith efforts with good professional practice by the Permittee which do not result in collecting a successful sample for the full number of required storms may be considered as contributing toward compliance with this requirement.

For each location, the Permittee shall sample and analyze a minimum of eleven (11) qualifying storm events per water year. Qualifying storm event sampling must be distributed throughout the year, approximately reflecting the distribution of rainfall between the wet and dry seasons (with a goal of 60-80% of the samples collected during the wet season and a goal of 20-40% of the samples collected in the dry season).

Ecology may approve a reduced sampling frequency if the Permittee provides a statistical analysis demonstrating that monitoring goals can be met with fewer samples.

Qualifying Storm Event Criteria

The wet season is from October 1 through April 30. A qualifying wet season storm event is defined as follows:

- Rainfall volume: 0.20" minimum, no fixed maximum
- Rainfall duration: No fixed minimum or maximum
- Antecedent dry period: Less than or equal to 0.05" rain in the previous 24 hours
- Inter-event dry period: 6 hours

The dry season is from May 1 through September 30. A qualifying dry season storm event is defined as follows:

- Rainfall volume: 0.20" minimum, no fixed maximum
- Rainfall duration: No fixed minimum or maximum
- Antecedent dry period: less than or equal to 0.02" rain in the previous 48 hours
- Inter-event dry period: 6 hours

Types of Sampling

Storm events shall be sampled using flow-weighted composite sampling techniques. Automatic samplers shall be programmed to begin sampling as early in the runoff event as practical and to continue sampling past the longest estimated time of concentration for the tributary area. Refer to *Standard Operating Procedure for Automatic Sampling for Stormwater Monitoring, ECY002* (http://www.ecy.wa.gov/programs/eap/quality.html) for guidance on how to conduct flow weighted composite sampling.

For storm events lasting less than 24 hours, samples shall be collected for at least seventy-five percent (75%) of the storm event hydrograph. For storm events lasting longer than 24 hours, samples shall be collected for at least seventy-five percent 75% of the hydrograph of the first 24 hours of the storm.

Each composite sample shall be targeted to contain at least 10 aliquots. Composite samples with 7 to 9 aliquots are acceptable if they meet the other sampling criteria and help achieve a representative balance of wet season/dry season events and storm sizes.

Continuous flow recording of all storm events (not just sampled storm events) is necessary for at least one complete water year to establish a baseline rainfall/runoff relationship. Ongoing continuous flow monitoring is required for each of the sampled storm events as necessary to properly conduct the flow-weighted composite sampling. Precipitation data shall be collected from the nearest rain gauge reporting at least hourly rainfall amounts.

Grab samples are necessary for some parameters (see below) and shall be collected early in the storm event. Refer to *Standard Operating Procedure for Grab Sampling for Stormwater Monitoring, ECY001* (http://www.ecy.wa.gov/programs/eap/quality.html).

Use of in-line sediment traps or similar collection system is preferred for sediment samples; refer to *Standard Operating Procedure for Collection of Stormwater Sediments using In-Line Sediment Traps, ECY003* (http://www.ecy.wa.gov/programs/eap/quality.html).

Sediment samples shall be collected once per water year at each stormwater discharge monitoring location, or in the vicinity of each stormwater monitoring location, during the month of May or June.

Sampling of receiving water sediment deposits is an alternative where approved by Ecology.

Parameters

Flow-weighted composite samples shall be analyzed for the following parameters utilizing an Ecology- or EPA-accredited laboratory and the methods and reporting limits as provided in table A9-2 at the end of this appendix or otherwise approved by Ecology.

- Conventional parameters: total suspended solids (TSS), turbidity, conductivity, chloride, biochemical oxygen demand (BOD5), hardness, pH, and methylene blue activating substances (MBAS).
- Nutrients: total phosphorus, orthophosphate, total kjeldahl nitrogen, and nitrate plus nitrite
- Metals, total and dissolved: copper, zinc, cadmium, lead, and mercury
- Organics:
    - Polycyclic aromatic hydrocarbon (PAH) compounds: acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene
    - Herbicides: 2,4-D and dichlobenil
    - Insecticides: carbaryl and chlorpyrifos
    - Phthalates: bis(2-Ethylhexyl)phthalate

If the volume of the stormwater sample collected from a qualifying storm is insufficient to allow analysis for all of the parameters listed above, the sample shall be analyzed for as many parameters as possible in the following priority order: (1) metals and hardness; (2) TSS; (3) organics: PAHs, herbicides, insecticides, phthalates; (4) nutrients; (5) conductivity; (6) BOD_5; and (7) remaining conventional parameters. If insufficient sample exists to run the next highest priority pollutant, that analysis may be bypassed and analyses run on lower priority pollutants in accordance with the remaining priority order to the extent possible. Parameters that are below reporting limits after two years of data may be dropped from the analysis.

Grab samples shall be analyzed for the following parameters utilizing an Ecology- or EPA-accredited laboratory and the methods and reporting limits listed in Table A9-2 at the end of this Appendix.

- Fecal coliform bacteria
- Total petroleum hydrocarbons (TPH): NWTPH-Gx and NWTPH-Dx and BTEX (benzene, toluene, ethyl-benzene, and xylenes).

Sediment samples shall be analyzed for the following parameters utilizing an Ecology- or EPA-accredited laboratory and the methods and reporting limits listed in table A9-3 at the end of this Appendix or otherwise approved by Ecology. If the volume of sediment sample is insufficient to analyze for all of the parameters listed below, the sample shall be analyzed for as many parameters as possible in the following priority order:

- Total organic carbon
- Metals: copper, zinc, lead, cadmium, and mercury
- Organics:
    - PAH compounds: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, 2,6-dimethylnaphthalene, 2-methylnaphthalene, fluoranthene, naphthalene, benzo(ghi)perylene, phenanthrene, and pyrene
    - Petroleum hydrocarbons: NWTPH-Dx
    - Pyrethroids: bifenthrin
    - PCBs: aroclors
- Total volatile solids
- Total phosphorus
- Percent solids, grain size

A minimum of one sediment sample per year shall be collected. Additional samples shall be collected if insufficient sample exists from a single sample to run all of the organic pollutants listed above. A visual, qualitative determination of grain size shall be reported for all samples (in addition to the quantitative analysis for all samples with sufficient volume). Parameters that are below reporting limits after two years of data may be dropped from the analysis.

Recordkeeping and Reporting

For each stormwater monitoring location, calculate the following:

- Event Mean Concentrations (EMCs)
- Total annual pollutant load by parameter
- Seasonal pollutant loads by parameter for the wet and dry seasons

The annual pollutant load calculations must be based on a water year and include wet and dry season loads and total annual load (wet plus dry season load). The loadings shall be expressed as total pounds and as pounds per acre, and must take into account potential pollutant load from base flow. Loadings shall be calculated following *Standard Operating Procedure for Calculating Pollutant Loads for Stormwater Discharges, ECY004* (http://www.ecy.wa.gov/programs/eap/quality.html). Pollutant loading information is required for water quality parameters only.

Annual Monitoring Reports shall be submitted with each Annual Report beginning with the first Annual Report following the first full water year of monitoring. Annual Monitoring Reports shall provide all monitoring data collected during the preceding water year (October 1 – September 30). Concentration data shall be provided in the same units that are specified for Reporting Limits in Tables A9-2 and A9-3. Flow data shall be provided in gallons per minute. Loading data for each water year shall be provided in total pounds and in pounds per acre. Annual Monitoring Reports shall consist of a narrative report, an Excel spreadsheet with all data and pollutant

loading calculations, and a submittal to Ecology's Environmental Information Management (EIM) database. For the Annual Monitoring Report to be considered on time, the EIM data submission process must be initiated before April 1 of each relevant year, and completed by June 15 of each relevant year.

Annual Monitoring Reports shall include:

- A brief summary of each monitored drainage basin (full details of the monitoring drainage basin shall be in the QAPP), including any changes within the contributing drainage area or changes to the monitoring station that could affect hydrology and/or pollutant loading.
- A description of each flow-weighted composite and grab sampled storm event, including:
    - General summary about storm event criteria, including:
        - Precipitation data (in inches) including antecedent dry period and rainfall distribution throughout the event.
        - Flow and hydrograph data including sampled and total runoff time periods and volumes.
        - Total number of qualifying storm events captured and analyzed at each monitoring location.
        - Distribution of storms collected between wet and dry seasons (permit goals include 60-80% of storms during the wet season and 20-40% of storms during the dry season).
        - Logistical problems associated with any storm event criterion.
    - A hyetograph and a hydrograph for each sampled storm event. Include properly labeled graphs that display the following:
        - Date of the storm event.
        - Time of day versus precipitation information.
        - Time versus flow rate (in gallons per minute).
        - Time versus aliquot collection.
        - Display the total duration of the storm event, not just the duration when samples were collected (remember your pollutant load calculation must include flow for the entire storm event, not just the water quality sampled portion).
    - A summary of (or in the graph) the total runoff volume in gallons.
    - A rainfall/runoff relationship table used to estimate the un-sampled storm events (when water quality samples were not collected). This is used for future estimations of annual and seasonal loads.
    - Whether or not any chemicals were removed from the list of analysis due to two years of non-detect data.
    - A brief summary with storm event dates where insufficient volumes were collected. Include the parameters analyzed.
- A description of the sediment sampling event, including:
    - Whether or not any chemicals were removed from the list of analysis due to two years of non-detect data.

  - A summary of sediment sampling (including dates) where insufficient volumes were collected. Include the parameters analyzed.

- Event Mean Concentrations (EMCs)
- The wet and dry season pollutant loads and annual pollutant load based on water year for each discharge monitoring location expressed in total pounds, and pounds per acre. Include the following:
  - For storm events where water quality samples were collected, the load in pounds per day for each parameter for each sampled storm event, include date of storm events.
  - An estimated seasonal pollutant load for each parameter at each discharge monitoring location. This is calculated using all storm events (when water quality samples were collected and when samples were not collected).
  - A total annual pollutant load (wet season load + dry season load) for each parameter (include estimated events).
  - The rainfall/runoff relationship including your pollutant load estimates for un-sampled events.
  - Note that if any data is unavailable to effectively estimate your rainfall to runoff relationship due to an incomplete water year, submit this information in the next year's stormwater monitoring report.
- Quality Assurance/Quality Control information for each *successfully sampled qualifying storm event* at each discharge monitoring location and *sediments* sampled at each discharge monitoring location, including:
  - A narrative summary of your field and laboratory verification, validation results and quality control checks performed.
  - A narrative analysis of your field and laboratory quality control sample results and how they compare with your data quality objectives/indicators in your QAPP.
  - Corrective actions reported/taken.
- An explanation and discussion of results from each *successfully sampled qualifying storm event* at each discharge monitoring location and *sediments* collected at each discharge monitoring location, including:
  - A statistical analysis of the event mean concentrations for each parameter and a narrative description of significant findings from this analysis.
  - Any conclusions based on data from this study including analyses of previously collected data from these discharge monitoring locations.
- A description of Stormwater Management Program activities currently taking place or planned within the monitoring station's drainage area that may have affected or may potentially affect future monitoring results.

If the Permittee monitors any pollutant more frequently at the stormwater discharge monitoring locations, then the results of this monitoring shall be included in the annual monitoring report reflecting the water year in which the monitoring occurred.

After three (3) water years of data, the Annual Monitoring Report shall include:

- Trend analyses,
- An evaluation of the data as it applies to the SWMP, and
- Any stormwater management activities the Permittee has identified that can be adjusted to respond to this data.

Laboratory Methods

The Permittee's stormwater discharge monitoring program shall use the following analytical methods or other methods approved by the U.S. Environmental Protection Agency or Ecology with similar reporting limits, unless alternative methods are approved by Ecology. Any alternative method proposed by a Permittee must have a similar reporting limit, or must be justified as adequate for the likely, expected range of concentrations. Permittees are not guaranteed approval of alternative methods or reporting limits.

In cases where smaller volumes of water are expected to be collected, or to save analytical costs, Permittees may propose that some of the analyses be optimized for specific parameters or groups. The Permittee must, in consultation with a qualified chemist, define the exact volumes and optimization steps and include them in the QAPP.

Table A9-2 Analytical Procedures in Stormwater

Analyte	Method in Water	Reporting Limit[a]
Conventional Parameters		
Total suspended solids	SM 2540B[b] or SM 2540D	1.0 mg/L
Turbidity	EPA Method 180.1 or SM2130B	$\pm$ 0.2 NTU
Conductivity	SM 2510 or EPA Method 120.1	$\pm$ 1 umhos/cm
Chloride	EPA Method 300.0, EPA Method 325.2, or SM4110B or SM4500 Cl-E	0.2 mg/L
BOD_5	SM5210B	2.0 mg/L
Particle size distribution[1]	Coulter Counter, Laser diffraction, or comparable method - *see attached method*	NA
pH	EPA Method 150.2 or SM 4500H^+	0.2 units
Hardness as $CaCO_3$	EPA Method 200.7, SM2340B(ICP), SM2340C (titration) or SM 3120B	1.0 mg/L
Methylene blue activated substances (MBAS)	CHEMetrics Colorimetric or SM5540C	0.025 mg/L
Bacteria		
Fecal Coliform	SM 9221E	2 min., 2E6 max.
Nutrients		
Orthophosphate and total phosphorus	EPA Method 365.3, EPA Method 365.4, SM 4500-P E or SM4500-P F	0.01 mg P/L
Total Kjeldahl nitrogen	EPA Method 351.2, EPA Method 351.1, SM 4500 Norg-B, SM 4500 Norg-C, SM 4500 NH3-D, SM 4500 NH3-G, SM 4500 NH3-E or SM4500 NH3-F	0.5 mg/L
Nitrate-Nitrite	EPA Method 353.2 or SM 4500 -$NO3^-$ E	0.01 mg/L

[1] Particle size distribution is required only for monitoring sites that measure discharge from best management practices.

Metals		
Total recoverable zinc	EPA Method 200.8 (ICP/MS), EPA Method 200.7 (ICP) or SM 3125 (ICP/MS)	5.0 µg/L
Dissolved zinc	EPA Method 200.8 (ICP/MS), or SM 3125 (ICP/MS)	1.0 µg/L
Total recoverable lead	EPA Method 200.8 (ICP/MS), or SM 3125 (ICP/MS)	0.1 µg/L
Dissolved lead, copper, and cadmium	EPA Method 200.8 (ICP/MS), or SM 3125 (ICP/MS)	0.1 µg/L
Total recoverable copper	EPA Method 200.8 (ICP/MS), or SM 3125 (ICP/MS)	0.5 µg/L
Total recoverable cadmium	EPA Method 200.8 (ICP/MS), or SM 3125 (ICP/MS)	0.2 µg/L
Total and dissolved mercury	EPA Method 7470 (CVAA), EPA Method 245.7, or EPA Method 1631E	0.1 µg/L
Organics		
PAH compounds	EPA Method 8310 or 8270 D SIM	0.1 µg/L
Herbicides (2,4-D, dichlobenil)	EPA Method 8270 D SIM or 8151 A	0.1 µg/L, 1 µg/L
Carbamate insecticides (carbaryl)	EPA Method 632	0.5 µg/L
Organophosphate insecticides (chlorpyrifos)	EPA Method 625 or EPA Method 614, 8270 D, EPA Method 622, EPA Method 1657	0.5 µg/L
Phthalates (bis(2-ethylhexyl)phthalate)	EPA Method 8270 D	1 µg/L
Petroleum Hydrocarbons		
NWTPH-Dx	Ecology, 1997, (Publication No. 97-602)	0.25-0.5 mg/L
NWTPH-Gx	Ecology, 1997, (Publication No. 97-602)	0.25 mg/L
BTEX	EPA Method 8260 or 602	1 µg/L or 5 µg/L

a. The QAPP shall identify Ecology- or EPA-approved methods with appropriate reporting limits. An individual sample that could not be run at a reporting limit because of matrix interference or other such reasons would not be called into question for compliance purposes. All results shall be reported. For non-detect values below the reporting limit, report results at the method detection limit from the lab and the qualifier of "U" for undetected at that concentration.

b. To ensure accurate results, Ecology recommends modifying these methods to analyze (filter) the entire field sample. Research results indicate that errors may be introduced by decanting a subsample, although using a funnel splitter may help. The analyst may also consider analyzing several premixed subsamples from the same sample container to determine if significant variability occurred due to stratification. Reports shall indicate whether the entire field sample or a subsample was used.

NA – Not applicable

SM – Standard Methods

Table A9-3 Analytical Procedures in Sediments

Analyte	Method in Sediment	Reporting Limit[a]
Conventional Parameters		
Percent solids	SM 2540G	NA
Total organic carbon	Puget Sound Estuary Protocols (PSEP 1997), SM 5310B, SM 5310C, SM 5310D or EPA Method 9060	0.1%
Grain size	Sieve and Pipette (ASTM 1997), ASTM F312-97, ASTMD422 or PSEP 1986/2003	NA
Total phosphorus	EPA Method 365.3, EPA Method 365.4, SM 4500 P E or SM 4500 P F	0.01 mg/kg
Total volatile solids	EPA Method 160.4 or SM 2540G	0.1%
Metals		
Total recoverable zinc	EPA Method 200.8 (ICP/MS), EPA Method 6010, EPA Method 6020 or SM 3125 (ICP/MS), or EPA Method 200.7 (ICP)	5.0 mg/kg
Total recoverable lead	EPA Method 200.8 (ICP/MS), EPA Method 6010, EPA Method 6020 or SM 3125 (ICP/MS)	0.1 mg/kg
Total recoverable copper	EPA Method 200.8 (ICP/MS), EPA Method 6010, EPA Method 6020 or SM 3125 (ICP/MS)	0.1 mg/kg
Total recoverable cadmium	EPA Method 200.8 (ICP/MS), EPA Method 6010, EPA Method 6020 or SM 3125 (ICP/MS)	0.1 mg/kg
Total recoverable mercury	EPA Method 245.5 or EPA Method 7471B	0.005 mg/kg
Organics		
PAH compounds	EPA Method 8270 D	70 µg/kg dry
Pyrethroids (bifenthrin)	EPA Method 8270 D, EPA Method 1660	1.0 µg/kg dry
PCBs (aroclors)	EPA Method 8082	80 µg/kg dry
Petroleum Hydrocarbons		
NWTPH-Dx	Ecology, 1997 (Publication No. 97-602) or EPA SW-846 method 8015B	25.0-100.0 mg/kg

a. The QAPP shall identify Ecology- or EPA-approved methods with appropriate reporting limits. An individual sample that could not be run at a reporting limit because of matrix interference or other such reasons would not be called into question for compliance purposes. All results shall be reported. For non-detected values below the reporting limit, report results at the method detection limit from the lab and the qualifier of "U" for undetected at that concentration.

NA – Not applicable

SM – Standard Methods

WET SIEVING AND MASS MEASUREMENT

FOR LASER DIFFRACTION ANALYSIS

WET SIEVING

Sample Collection/Handling

Samples should be collected in HDPE or Teflon containers and held at 4 degrees C during the collection process. If organic compounds are being collected, the sample containers should be glass or Teflon.

Preservation/Holding Time

Samples should be stored at 4o C and must be analyzed within 7 days (EPA, 1998). Samples may not be frozen or dried prior to analysis, as either process may change the particle size distribution.

Sonication

Do not sonicate samples prior to analysis to preserve particle integrity and representativeness. Laboratories using laser diffraction will have to be notified not to sonicate these samples at any time during the analysis. It is recommended that this request also be written on the chain-of-custody form that the analytical laboratory receives in order to assure that sonication is omitted.

LABORATORY PROCEDURES

Equipment

__ 2 Liters of stormwater sample water (total sample required for analysis (ASTM D 3977))
__ Drying oven (90 degrees C +2 degrees)
__ Analytical balance (0.01 mg accuracy)
__ Desiccator (large enough diameter to accommodate sieve)
__ Standard sieves - larger than 2" diameter may be desirable
__ 500 um (Tyler 32, US Standard 35)
__ 250 um (Tyler 60, US Standard 60)
__ Beakers - plastic (HDPE)
__ Funnel (HDPE - Large enough diameter to accommodate sieve)
__ Wash bottle
__ Pre-measured reagent-grade water

Sample Processing

- Dry 250 um and 500 um mesh sieves in a drying oven to a constant weight at 90 ± 2° C.
- Cool the sieves to room temperature in a desiccator.
- Weigh each sieve to the nearest 0.01 mg.
- Record the initial weight of each dry sieve.
- Measure the volume of sample water and record.
- Pour the sample through a nested sieve stack (the 500 um sieve should be on the top and the sieve stack should be stabilized in a funnel and the funnel should be resting above/inside a collection beaker).
- Use some of the pre-measured reagent-grade water in wash bottle to thoroughly rinse all soil particles from sample container so that all soil particles are rinsed through the sieve.

- Thoroughly rinse the soil particles in the sieve using a pre-measured volume of reagent-grade water.
- The particles that pass through the sieve stack will be analyzed by laser diffraction Particle Size Distribution (PSD) analysis using the manufacturers recommended protocols (with the exception of no sonication).
- Particles retained on the sieve (>250 um) will not be analyzed with the laser diffraction PSD.
- Dry each sieve (500 um and 250 um) with the material it retained in a drying oven to a constant weight at 90 ± 2° C. The drying temperature should be less than 100° C to prevent boiling and potential loss of sample (PSEP, 1986).
- Cool the samples to room temperature in a desiccator.
- Weigh the cooled sample with each sieve to the nearest 0.01 mg.
- Subtract initial dry weight of each sieve from final dry weight of the sample and sieve together.
- Record weight of particles/debris separately for each size fraction (> 500 um and 499 - 250 um).
- Document the dominant types of particles/debris found in this each size fraction.

Laser Diffraction (PSD)

PSD results are reported in ml/L for each particle size range. Particle size gradations should match the Wentworth grade scale (Wentworth, 1922).

Mass Measurement

Equipment

__ Glass filter - 0.45 um (pore size) glass fiber filter disk (Standard Method D 3977) (larger diameter sized filter is preferable)
__ Drying oven (90 degrees C +2 degrees)
__ Analytical balance (0.01 mg accuracy)
__ Wash bottle
__ Reagent-grade water

Procedure

- Dry glass filter in drying oven at 90 ± 2° C to a constant weight.
- Cool the glass filter to room temperature in a desiccator.
- Weigh the 0.45 um glass filter to the nearest 0.01mg.
- Record the initial weight of the glass filter.
- Slowly pour the laser diffraction sample water (after analysis) through the previously weighed 0.45 um glass filter and discard the water.
- Use reagent-grade water in wash bottle to rinse particles adhering to the analysis container onto glass filter
- Dry glass filter with particles in a drying oven at 90 ± 2° C to a constant weight.
- Cool the glass filter and dried particles to room temperature in a desiccator.
- Weigh the glass filter and particles to the nearest 0.01mg.
- Subtract the initial glass filter weight from the final glass filter and particle sample weight.
- Record the final sample weight for particles <250 um in size.

Quality Assurance

Dried samples should be cooled in a desiccator and held there until they are weighed. If a desiccator is not used, the particles will accumulate ambient moisture and the sample weight will be overestimated. A color-indicating desiccant is recommended so that spent desiccant can be detected easily. Also, the seal on the desiccator should be checked periodically, and, if necessary, the ground glass rims should be greased or the "O" rings should be replaced.

Handle sieves with clean gloves to avoid adding oils or other products that could increase the weight. The weighing room should not have fluctuating temperatures or changing humidity. Any conditions that could affect results such as doors opening and closing should be minimized as much as possible.

After the initial weight of the sieve is measured, the sieve should be kept covered and dust free. Duplicate samples should be analyzed on 10% of the samples for both wet sieving and mass measurements.

Reporting

Visual observations should be made on all wet sieved fractions and recorded. For example if the very coarse sand fraction (2,000-1,000 um) is composed primarily of beauty bark, or cigarette butts, or other organic debris this should be noted. An option might also be for a professional geologist to record the geological composition of the sediment as well.

REFERENCES

ASTM. 1997. Standard test methods for determining sediment concentration in water samples. Method D 3977. American Society for Testing and Materials, Philadelphia, PA.

PSEP. 1986. Recommended Protocols for measuring conventional sediment variables in Puget Sound. Prepared by Tetra Tech, Inc. for U.S. Environmental Protection Agency and Puget Sound Water Quality Authority. Tetra Tech Inc., Bellevue, WA.

U. S. EPA. 1998. Analysis of total suspended solids by EPA Method 160.2. Region 9, Revision 1. SOP 462. 12 pp

Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. Journal of Geology. 30:377-392

Appendix B: Phase II NPDES Stormwater Permit Compliance Work Plan

Phase II NPDES Municipal Stormwater Permit Compliance Work Plan

Prepared for the
City of Auburn, Washington
July 2, 2014

Phase II NPDES Municipal Stormwater Permit Compliance Work Plan

Prepared for the
City of Auburn Washington
July 2, 2014

Brown AND Caldwell
701 Pike Street, Suite 1200
Seattle, WA 98101

Table of Contents

List of Tables

List of Abbreviations

ACC	Auburn City Code
BMP	best management practice
City	City of Auburn
CMMS	computerized maintenance management system
Ecology	Washington State Department of Ecology
Ecology Manual	2012 *Stormwater Management Manual for Western Washington*
EPA	U.S. Environmental Protection Agency
GMA	Growth Management Act
HR	Human Resources Department
IDDE	Illicit Discharge Detection and Elimination
IT	Information Technology Department
LID	low-impact development
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
M&O	City of Auburn Maintenance and Operations Division
Permit	NPDES Phase II Municipal Stormwater Permit
RSMP	Regional Stormwater Monitoring Program
SIDIR	Source Identification Information Repository
SOP	standard operating procedure
STORM	Stormwater Outreach for Regional Municipalities
SWMM	City of Auburn Surface Water Management Manual (November 2009)
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
TMDL	total maximum daily load

Executive Summary

On August 1, 2012, the Washington State Department of Ecology (Ecology) reissued the National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Stormwater Permit (Permit) to comply with requirements of the federal Clean Water Act. The new Permit became effective August 1, 2013, through July 31, 2018. The City of Auburn (City) will be required to pursue updates to the Auburn City Code (ACC) and to City stormwater standards based on the requirements of this new NPDES Permit.

Maintaining compliance is important for the City for the following reasons:

- Requirements of the Permit are intended to result in more "fishable, swimmable waters."
- Ecology has the power to levy fines or impose criminal penalties for noncompliance.
- Grant funds may be affected by noncompliance.
- Noncompliance with the Permit and the Clean Water Act can expose the City to third-party litigation.

Some of the most significant changes to the Permit include:

- Requirements to evaluate City codes, standards, and policies and to incorporate low-impact development (LID) principles, making LID the preferred way of managing stormwater runoff from future development and redevelopment
- Revised stormwater facility requirements for new development and redevelopment, which are more intensive and will affect more projects, including single-family dwellings
- Requirements for new and more frequent inspections of permanent stormwater infrastructure, including small LID facilities to be constructed on virtually all private property over time
- Requirement to pay for participation in Ecology water quality monitoring programs, or to conduct equivalent programs independently

The updated Permit requirements may affect the City in a number of ways, including potential impacts to:

- City codes, standards, policies, and requirements, affecting both public and private activities. Potentially impacted codes include ACC 13.48 and other development-related sections. The degree of impact in other areas of the ACC (e.g., development regulation, transportation, zoning, etc.) will be related to the outcome of the City's LID principles review process. Updates to City standards and guidance documents will also be required, including the City Surface Water Management Manual (SWMM) and Public Works Design Standards. The new Permit requirements may also create potential policy and public-relations issues related to access of private property for City-conducted inspections and enforcement actions.
- Staff effort for ongoing Permit compliance activities, including efforts to conduct the required LID evaluation process; develop, adopt, and enforce code, standard, and policy updates; and conduct new and more frequent inspections. Annual effort for City inspectors will increase over time as more facilities are constructed, each of which must then be inspected in perpetuity.
- City expense for potential additional staffing needs, capital improvement projects, and payments for monitoring program participation. Staffing needs may increase as a result of increased compliance efforts and field inspection requirements. Additional capital improvement project funding may be required to incorporate required stormwater facilities into future City capital improvement projects. Stormwater monitoring program participation includes annual payments of approximately $48,000 from the City to Ecology.

- Developers and the general public, which may face additional costs and effort for many development projects, including individual single-family residential projects.

The City is actively planning and preparing to comply with the updated Permit requirements, including development of this Compliance Work Plan for compliance activities. The City will continue this Permit compliance preparation with reviews of codes, policies, and standards, and will begin to implement new requirements, including making the first annual payment to participate in Ecology's monitoring programs.

Over the 5-year term of the Permit, the City will conduct a variety of activities to update City codes, standards, and policies, and to carry out this Compliance Work Plan consistent with regulatory schedule deadlines. Activities involving significant resource allocation will include:

- Conducting a process to review and incorporate LID principles into City codes, standards, and policies
- Developing and adopting updates to codes and other City documents, including the City Comprehensive Plan
- Developing and adopting updates to the Surface Water Management Manual (SWMM), or adopting an alternative manual
- Communicating new development requirements to the building industry and the public, and enforcing new requirements
- Funding construction of new stormwater facilities associated with City capital improvements and providing for long-term maintenance of those facilities and other facilities accepted for maintenance by the City
- Developing and implementing updates to the City's Public Education and Outreach, Illicit Discharge Detection and Elimination (IDDE), and Operations and Maintenance (O&M) programs
- Scheduling and conducting new and more frequent inspections of permanent stormwater infrastructure, or providing Ecology with justification for less frequent inspections
- Making annual payments to participate in the Ecology monitoring program
- Compliance with total maximum daily load (TMDL) requirements

Section 1

Introduction

1.1 Overview and Background

The National Pollutant Discharge Elimination System (NPDES) permit program is a requirement of the federal Clean Water Act that is intended to protect and restore waters for "fishable, swimmable" uses. The City of Auburn (City) is one of more than a hundred jurisdictions in Washington that has obtained, and is currently in compliance with, a municipal stormwater discharge permit for "small" municipalities (i.e., under 100,000 in population according to the 1990 census). This group of permittees is considered to have "Phase II Permits," with larger municipalities regulated by "Phase I Permits."

These permits allow municipalities to discharge stormwater runoff from municipal drainage systems into the state's water bodies (i.e., streams, rivers, lakes, wetlands, etc.) as long as the municipalities have programs that protect or minimize impacts to water quality as required by the Permit conditions. Compliance deadlines for implementation of the Permit conditions are phased in over the 5-year Permit term. The Washington State Department of Ecology (Ecology), as the delegated authority by the U.S. Environmental Protection Agency (EPA), is to revise and reissue these permits every 5 years.

On August 1, 2012, Ecology reissued the NPDES Phase II Municipal Stormwater Permit (Permit), effective August 1, 2013, through July 31, 2018. As a Phase II Permittee, the City will be required to pursue updates to the Auburn City Code (ACC) and stormwater standards based on the requirements of this new NPDES Permit.

The purpose of this Compliance Work Plan is to identify and make recommendations regarding the key changes and activities that should take place over the next 5 years for the City to comply with the updated Permit requirements. This identification includes:

- Required compliance schedule deadlines
- Recommended updates and activities, organized by applicable Permit section
- Interim deadlines and activities for completing groups of similar tasks

Refer to the Phase II Gap Analysis Technical Memorandum, dated February 28, 2014, for details of the Permit requirements and identification of potential Permit compliance gaps in City codes, standards, and policies.

1.2 Schedule for Permit Compliance

A number of due dates for City Stormwater Management Program (SWMP) activities are included in the updated Permit. Key Permit requirement due dates are summarized in Table 1-1.

Table 1-1. Summary Compliance Schedule	
Compliance activity	**Due date**
Continue annual inspections of any onsite stormwater facilities approved by the City for construction under the terms of the 2007–12 Permit or subsequent Permits.	Ongoing
Communicate to Ecology whether the City will participate in the collective fund for Monitoring and Assessment, or conduct stormwater monitoring activities independently.	December 1, 2013 (completed)
Post SWMP documents to Web site annually.	May 31 annually, starting 2014
Review and update interdepartmental coordination mechanisms, if needed.	March 31, 2015
Update public outreach and education materials.	August 1, 2015
Measure effectiveness of public outreach for at least one target audience and subject area (may be as part of a regional effort).	February 2, 2016
Review and update City operations, maintenance, and inspection standards, if needed.	December 31, 2016
Adopt a new stormwater management manual: either the 2012 *Stormwater Management Manual for Western Washington* (Ecology Manual) or an approved equivalent.	December 31, 2016
Review, revise, and adopt local development codes, standards, and policies to require low-impact development (LID) principles and LID best management practices (BMPs), and to reflect deletion of the less than 1-acre onsite stormwater facilities requirement exemption. The Permit requires a specific process to be followed in considering revisions. This revision process may involve revisions to a variety of potentially affected ACC sections.	December 31, 2016
Compile and submit a summary of the LID review and revision process.	March 31, 2017
Complete one inspection of each catch basin, including documentation and reporting.	August 1, 2017, and at least every 2 years thereafter
Complete field screening for 40% of the system by 2018, and 12% annually thereafter.	December 31, 2017, annually thereafter
Revise codes to reflect Illicit Discharge Detection and Elimination (IDDE) changes in the Permit.	February 2, 2018

1.3 Key Policy Issues

Over the 5-year Permit term, Auburn will need to address several significant policy issues affecting multiple departments. The major policy issues associated with the updated Permit generally align with the following categories:

- Low-impact development (LID) principles assessment, policy development, implementation, and reporting
- LID infeasibility criteria and competing needs
- Updates to the City Surface Water Management Manual (SWMM) or adoption of alternative manual
- Code revisions
- LID facility inspections
- Additional City effort and costs

Major policy issues are described in the following sections.

1.3.1 LID Principles

The revised Permit requires that development-related codes, standards, and enforcement be revised to implement LID principles, including minimizing impervious surfaces, native vegetation loss, and stormwater runoff. The requirement to minimize impervious areas poses regulatory challenges and may have significant policy implications for Permittee interests outside of stormwater management. Examples of potential policy conflicts might include preserving areas of existing vegetation and reducing impervious surface areas vs. meeting parking requirements or roadway width standards.

The City will need to complete an assessment of LID principles related to various City codes, develop policies for LID implementation, and report on the process to Ecology. The Puget Sound Partnership's *Integrating LID into Local Codes: A Guidebook for Local Governments* is a reference guidebook intended by Ecology to be used in this policy development process.

1.3.2 LID Infeasibility Criteria and Competing Needs

The revised Permit allows local programs to identify LID infeasibility and competing needs criteria. These could include infeasibility criteria for considerations like critical areas (e.g., steep slopes, slide-prone areas, protected aquifers, and floodplains) or areas otherwise unsuitable for infiltration (e.g., areas with seasonally high groundwater or low soil permeability). They could also include potentially conflicting regulations (e.g., Growth Management Act [GMA] requirements), or local requirements (e.g., transportation or community planning considerations). It may be that infeasibility and competing needs criteria can give local jurisdictions more flexibility; however, the criteria may also require additional updates to the ACC and City policies. This issue may have significant policy implications for Permittee interests outside of stormwater management.

1.3.3 Manual Adoption

Another key policy decision relates to adoption of a new manual for management of stormwater from construction and new development and redevelopment sites. The Permit requires each Permittee to adopt the 2012 *Stormwater Management Manual for Western Washington* (Ecology Manual) or an equivalent manual approved by Ecology.

The City has several options related to adoption of a stormwater manual. During the previous Permit cycle, the City developed the City-specific SWMM, based on the 2008 City of Tacoma manual. In order to comply with updated Permit requirements, the City can choose one of three options:

- Update the Auburn SWMM
- Adopt the Ecology Manual
- Adopt another Phase I jurisdiction's equivalent manual (no local jurisdiction manuals are currently approved as equivalent by Ecology, but achieving equivalency by at least some of the Phase I Permittees is likely)

1.3.4 Code Revisions

City codes will require an update to comply with the new Permit requirements. The following major changes will be required:

- Updates to Chapter 13.48 (Storm Drainage Utility) and related sections to reflect updated definitions and requirements for Illicit Discharge Detection and Elimination (IDDE), development activities, and LID
- Other updates to various City codes as identified during the LID Principles assessment process

1.3.5 LID Facility Inspections

The previous Permit included requirements to conduct annual inspections for all permanent stormwater best management practices (BMPs)/facilities permitted in accordance with the requirements of this Permit. The requirements for inspections now include LID and facilities constructed on private property. With the deletion of the 1-acre threshold exemption, this requirement takes on new significance. With new development and redevelopment, virtually all properties will have the potential to have an inspection requirement over time. The scale of required inspections and the requirement to inspect on private property may pose challenges.

Increased presence of inspectors on private property and increased costs associated with inspections represent policy issues that City officials may want to consider (e.g., options to fund inspections, perceptions of increasing City authority, etc.).

1.3.6 Additional City Effort and Costs

The Permit will require additional activities that will grow over the 5-year Permit term. The City must decide how to staff and fund the required new activities. See Appendix B for a preliminary estimate of City effort and costs to comply with new Permit requirements.

1.4 Document Organization

The remainder of this Compliance Work Plan is organized similarly to the Permit:

- **Section 2** addresses compliance with the Permit requirements for administration of the City's Stormwater Management Program
- **Section 3** presents a compliance work plan for Public Education and Outreach
- **Section 4** presents a compliance work plan for Public Involvement and Participation
- **Section 5** presents a compliance work plan for Illicit Discharge Detection and Elimination
- **Section 6** presents a compliance work plan for Controlling Runoff from New Development, Redevelopment, and Construction Sites
- **Section 7** presents a compliance work plan for Municipal Operations and Maintenance
- **Section 8** presents a compliance work plan for TMDL requirements
- **Section 9** presents a compliance work plan for Monitoring and Assessment
- **Appendix A** includes a schedule of due dates for new requirements
- **Appendix B** includes a compliance effort estimate developed to help the City identify staffing and funding needs related to new Permit requirements
- **Appendix C** includes a gap analysis table developed to assess changes in the Permit and corresponding impacts on City codes, standards, and activities

Each section includes a summary of new Permit requirements, current compliance activities that are applicable to the new requirements, discussion of policy and compliance strategy issues (if applicable), and recommended actions to maintain future compliance. For additional details on requirements and recommended activities, see the Gap Analysis Table in Appendix C.

Section 2

Stormwater Management Program Administration

This section summarizes new Permit requirements for SWMP administration, current compliance activities that are applicable to the new requirements, and recommended actions to maintain future compliance.

2.1 New Permit Requirements

Sections S5.A, S7.A, and S9.A of the Permit include the following new requirements:

- The SWMP shall include coordination mechanisms among departments within each jurisdiction to eliminate barriers to compliance with the terms of this Permit. Permittees shall include a written description of internal coordination mechanisms in the Annual Compliance Report, due no later than March 31, 2015.
- Each Annual Compliance Report shall include a summary of relevant SWMP and Appendix 2 activities conducted in the total maximum daily load (TMDL) area to address the applicable TMDL parameter(s).
- Permittees shall submit Annual Compliance Reports electronically using Ecology's WQWebDMR available on Ecology's Web site at http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html unless otherwise directed by Ecology. The first Annual Compliance Report will be due March 31, 2015, covering activities for 2014.

2.2 Current Compliance Activities Applicable to New Requirements

Current City compliance activities applicable to updated requirements of Sections S5.A, S7.A, and S9.A include:

- The City coordinates and tracks stormwater management activities and compliance across multiple City departments.
- The City completes and submits Annual Compliance Reports by March 31 annually.

2.3 Recommended Actions to Maintain Future Compliance

Auburn is compliant with the Permit requirements that are currently in effect. Additional requirements will take effect during the next 4 years. Table 2-1 lists activities and time frames for the City to comply with new Permit conditions related to SWMP administration.

Table 2-1. Stormwater Management Program Administration				
Task ID	Task description	Lead	Support	Compliance time frame
SWMP-2	Build on existing annual reporting task in 2014 SWMP; use updated electronic template to complete and submit annual reports	Utilities Engineering	None	Annual Compliance Report is due by March 31 of each year beginning in 2015
SWMP-3	Include a written description of internal coordination mechanisms in the 2014 Annual Compliance Report	Utilities Engineering	HR, M&O, Permit Center, Development Engineering	Due March 31, 2015
SWMP-4	Include summary of relevant SWMP and Appendix 2 activities related to applicable TMDLs in Annual Compliance Report	Utilities Engineering	None	Ongoing

Note: Task ID numbering and work items build on tasks currently included in the 2014 SWMP.

Section 3

Public Education and Outreach

This section summarizes new Permit requirements for Public Education and Outreach, current compliance activities that are applicable to the new requirements, discussion of policy and compliance strategy issues, and recommended actions to maintain future compliance.

3.1 New Permit Requirements

Section S5.C.1 of the Permit requires the City to conduct the following activities:

- Educate the general public (including school-age children) and businesses (including home-based and mobile businesses) about several new areas, including:
  - Impacts of illicit discharges and how to report them
  - LID principles and LID BMPs
  - Opportunities to become involved in stewardship activities
  - Equipment maintenance
  - Prevention of illicit discharges
- Educate engineers, contractors, developers, and land use planners about several new areas, including:
  - Technical standards for stormwater construction site and erosion control plans
  - LID principles and LID BMPs
  - Stormwater treatment and flow control BMPs/facilities
- Educate residents, landscapers, and property managers/owners about several new areas, including:
  - Use and storage of household chemicals
  - Vehicle, equipment, and home/building maintenance
  - Pet waste management disposal
  - LID principles and LID BMPs
  - Dumpster and trash compactor maintenance
- Create stewardship opportunities and/or partner with existing organizations to encourage residents to participate in activities such as stream teams, storm drain marking, volunteer monitoring, riparian plantings, and education activities.
- Measure the understanding and adoption of the targeted behaviors for at least one target audience in at least one subject area. No later than February 2, 2016, Permittees shall use the resulting measurements to direct education and outreach resources most effectively, as well as to evaluate changes in adoption of the targeted behaviors. Permittees may meet this requirement individually or as a member of a regional group.

3.2 Current Compliance Activities Applicable to New Requirements

Current City compliance activities applicable to updated requirements include:

- The City conducts numerous education and outreach activities that address stormwater management targeted to the general public, residents/homeowners, and some industries.
- The City is participating in a regional effort to develop effective ways to track and measure the effectiveness of its education and outreach efforts.
- The City tracks its education and outreach efforts.
- The City is providing stewardship opportunities such as planting native plants and removing invasive species at the Auburn Environmental Park.

3.3 Compliance Policy Issues

Measuring changes in understanding or behavior is a challenging objective. City representatives are participating in a cooperative effort with several other NPDES municipalities to explore efficient and effective methods to meet the Permit requirements for its public education and outreach program evaluation.

3.4 Recommended Actions to Maintain Future Compliance

Auburn has a broad public education and outreach program but will need to update the program to maintain compliance as the Permit requirements take effect. Table 3-1 lists activities and time frames for the City to comply with new Permit conditions related to public education and outreach.

Table 3-1. Public Education and Outreach

Task ID	Task description	Lead	Compliance time frame
EDUC-1	Build on collaboration with the Stormwater Outreach for Regional Municipalities (STORM) group and Puget Sound Starts Here efforts to identify and implement programs to measure the understanding and adoption of targeted behaviors for at least one target audience, and adjust programming as needed	Utilities Engineering	February 2, 2016
EDUC-3	Implement new or modify existing education and outreach activities relative to new target audiences/topics identified by the Permit	Utilities Engineering	Ongoing
EDUC-6	Provide stewardship opportunities for the public	Community Development and Public Works, Parks	Ongoing

Note: Task ID numbering and work items build on tasks currently included in the 2014 SWMP.

Section 4

Public Involvement

This section summarizes new Permit requirements for Public Involvement, current compliance activities that are applicable to the new requirements, and recommended actions to maintain future compliance.

4.1 New Permit Requirements

Section S5.C.2 of the Permit requires the City to:

- Post on its Web site its SWMP Plan and the Annual Compliance Report required under S9.A no later than May 31 of each year. All other submittals shall be available to the public upon request.

4.2 Current Compliance Activities Applicable to New Requirements

The City currently has activities and programs relevant to the Public Involvement requirement. These activities are summarized below:

- The City makes the SWMP document and Annual Compliance Report available to the public on the City Web site.

4.3 Recommended Actions to Maintain Future Compliance

Auburn is on track for compliance with new Public Involvement requirements. Table 4-1 lists activities and time frames for the City to comply with new Permit conditions related to Public Involvement.

Table 4-1. Public Involvement

Task ID	Task description	Lead	Compliance time frame
PI-2	Define public involvement opportunities for annual SWMP update and reporting process.	Utilities Engineering	Continue to post to Web site; note the May 31 deadline for annual posting starting in 2014

Note: Task ID numbering and work items build on tasks currently included in the 2014 SWMP.

Section 5

Illicit Discharge Detection and Elimination

This section summarizes new Permit requirements for Illicit Discharge Detection and Elimination, current compliance activities that are applicable to the new requirements, and recommended actions to maintain future compliance.

5.1 New Permit Requirements

The Permit (Section S5.C.3) requires the City to:

- Require thermal control of discharges from swimming pools, spas, and hot tubs.
- Include informal compliance actions as an element of the City's enforcement strategy.
- Revise the City's IDDE ordinance or regulatory mechanisms if necessary to meet the requirements of this section no later than February 2, 2018.
- Implement a field screening methodology appropriate to the characteristics of the municipal separate storm sewer system (MS4) and water quality concerns. Screening for illicit connections may be conducted using *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments,* Center for Watershed Protection, October 2004, or another methodology of comparable or improved effectiveness.
- Document the field screening methodology in the relevant Annual Compliance Report.
- Complete field screening for at least 40 percent of the MS4 no later than December 31, 2017, and on average 12 percent each year thereafter.

5.2 Current Compliance Activities Applicable to New Requirements

The City currently has activities and programs relevant to IDDE requirements. These activities are summarized below:

- City codes and standards address illicit discharges.
- The City conducts annual dry weather screening for illicit discharges and connections.

5.3 Recommended Actions to Maintain Future Compliance

Auburn has an established IDDE program, but will need to make some updates in order to maintain compliance as new Permit requirements take effect. Table 5-1 lists activities and time frames for the City to comply with new Permit conditions related to IDDE.

Table 5-1. Illicit Discharge Detection and Elimination

Task ID	Task description	Lead	Support	Compliance time frame
IDDE-4	Complete updates to IDDE requirements in ACC 13.48 (e.g., updated Permit definitions and allowable discharges).	Utilities Engineering	M&O, City Attorney	February 2, 2018
IDDE-5	Complete updates to City standards and standard operating procedures (SOPs) reflecting any modified policies or activities.	Utilities Engineering	M&O	February 2, 2018
IDDE-6	Update public outreach and/or construction permitting materials related to IDDE updates, if needed.	Utilities Engineering	Permit Center, Development Engineering	February 2, 2018
IDDE-7	Review policies and activities related to IDDE source control (updated Ecology Manual BMPs) for potential update.	Utilities Engineering	None	February 2, 2018
IDDE-8	Update the City's screening methodology if desired (optional). The prior Permit required outfall screening—the 2013 Permit allows greater flexibility, including in-system screening. Permittees may continue to screen outfalls, or begin screening in-system instead. Develop local strategy/definition for 40% screening coverage. Update SWMP with details of screening methodology.	Utilities Engineering	M&O	Establish early enough to meet December 31, 2017 compliance targets
IDDE-9	Complete field screening using selected methodology, including 40% of the City stormwater system by the end of 2017, and 12% of the system annually thereafter.	M&O	Utilities Engineering	December 31, 2017, annually thereafter

Note: Task ID numbering and work items build on tasks currently included in the 2014 SWMP.

Section 6

Controlling Runoff from New Development, Redevelopment, and Construction Sites

This section summarizes new Permit requirements for Controlling Runoff from New Development, Redevelopment, and Construction Sites; current compliance activities that are applicable to the new requirements; discussion of policy and compliance strategy issues; and recommended actions to maintain future compliance.

6.1 New Permit Requirements

The Permit (Section S5.C.4) requires the City to:

- Apply program requirements to construction sites disturbing less than an acre (removed the 1-acre threshold for construction project exemption from many S5.C.4 requirements).
- Update the City's codes, standards, and programs to reduce pollutants in stormwater from new development, redevelopment, and construction site activities, consistent with the updated minimum technical requirements of the Permit, Appendix 1, and the 2012 Ecology Manual, including:
  - Updated definitions
  - Modified project thresholds
  - Updated Minimum Requirements, including incorporation of LID elements
  - Significantly updated Minimum Requirement 5, with new BMP lists and an LID Performance Standard for onsite stormwater management
  - New and updated BMPs and requirements in the 2012 Ecology Manual
- Adopt the 2012 Ecology Manual or an equivalent stormwater manual, or update the Auburn SWMM consistent with the updated minimum technical requirements in Appendix 1 of the Permit.
- Establish the legal authority, through the approval process for new development and redevelopment, to inspect and enforce maintenance standards for private stormwater facilities approved under the provisions of this section that discharge to the Permittee's MS4.
- Ensure that the program includes provisions to verify adequate long-term operations and maintenance (O&M) of stormwater treatment and flow control BMPs/facilities that are permitted and constructed pursuant to the City's permitting process under the Permit.
- Inspect all permanent stormwater treatment and flow control BMPs/facilities and catch basins in new residential developments every 6 months until 90 percent of the lots are constructed (or when construction is stopped and the site is fully stabilized) to identify maintenance needs and enforce compliance with maintenance standards as needed.
- Comply with inspection requirements of this section by achieving at least 80 percent of scheduled inspections.

- Review, revise, and make effective its local development-related codes, rules, standards, or other enforceable documents to incorporate and require LID principles and LID BMPs.
  - The intent of the revisions shall be to make LID the preferred and commonly used approach to site development. The revisions shall be designed to minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations. Permittees shall conduct a similar review and revision process, and consider the range of issues, outlined in the following document: *Integrating LID into Local Codes: A Guidebook for Local Governments* (Puget Sound Partnership, 2012).
- Submit a summary of the results of the review and revision process described above with the Annual Compliance Report due no later than March 31, 2017. This summary shall include, at a minimum, a list of the participants (job title, brief job description, and department represented); the codes, rules, standards, and other enforceable documents reviewed; and the revisions made to those documents that incorporate and require LID principles and LID BMPs. The summary shall include existing requirements for LID principles and LID BMPs in development-related codes. The summary shall be organized as follows:
  a. Measures to minimize impervious surfaces
  b. Measures to minimize loss of native vegetation
  c. Other measures to minimize stormwater runoff
- Participate in watershed-scale stormwater planning if a watershed partially or fully located in Auburn is selected by a Phase I county for watershed-scale stormwater planning under condition S5.C.4.c of the Phase I Municipal Stormwater General Permit. (The City may be required to provide data, mapping, and "monitoring locations," and participate in "development of strategies to prevent future and address existing impacts".)

6.2 Current Compliance Activities Applicable to New Requirements

The City currently has activities and programs that meet many of the Permit requirements summarized above. The current compliance activities associated with the above Permit requirements include:

- The City has existing programs, codes, and standards that address many of the Permit requirements for management of stormwater runoff from development, redevelopment, and construction sites. The City reviews all stormwater site plans for proposed development. The City currently implements the Auburn SWMM as an equivalent manual approved by Ecology.
- The City has a site planning process for BMP selection and design criteria.
- The City inspects all permitted development sites during construction and after construction.
- The City clearly identifies the party responsible for O&M and requires long-term O&M of permitted facilities and BMPs.
- The City records inspections and enforcement actions by staff.

6.3 Compliance Policy Issues

Compliance with Permit Condition S5.C.4 will require the City to address the following key issues:

- See Section 1.3 for discussion of key policy issues related to controlling runoff from new development, redevelopment, and construction sites, including:
  - LID principles assessment, policy development, implementation, and reporting
  - LID infeasibility criteria and competing needs
  - Updates to SWMM or adoption of an alternative manual

- Code revisions
- LID facility inspections

6.4 Recommended Actions to Maintain Future Compliance

Auburn has a well-developed program to help reduce stormwater runoff from new development, redevelopment, and construction sites but significant updates will be necessary to maintain compliance with new Permit requirements. Table 6-1 lists activities and time frames for the City to comply with new Permit conditions related to control of runoff from new development, redevelopment, and construction sites.

Table 6-1. Controlling Runoff from Development, Redevelopment, and Construction Sites

Task ID	Task description	Lead	Support	Compliance time frame
CTRL-3	Begin process to update City codes related to controlling runoff from new development, redevelopment, and construction site projects (e.g., ACC 13.48 and planning-related code sections: see Table 6-2 for potentially affected City codes).	Storm Drainage Utility, Building Division	City Attorney	December 31, 2016
CTRL-4	Begin a process to develop and adopt a stormwater management manual equivalent to the 2012 Ecology Manual.	Utilities Engineering	Community Development and Public Works, City Attorney	December 31, 2016
CTRL-5	Begin process to review, revise, and make effective development-related codes, rules, standards, or other enforceable documents to incorporate and require LID principles and LID BMPs. See Table 6-2 for potentially affected City documents.	Storm Drainage Utility, Planning Division	Permit Center, Development Engineering, City Attorney	December 31, 2016
CTRL-6	Implement updated codes, manual, and standards.	Utilities Engineering, Permit Center, Development Engineering,	M&O	After adoption, no later than January 1, 2017
CTRL-7	Consider updates to public outreach and communications materials for property owners related to increased potential for annual stormwater facility inspections on private property.	Utilities Engineering	Permit Center	Ongoing
CTRL-8	Update inspection requirements for residential developments (inspect every 6 months until 90% buildout).	Construction Inspectors	None	Ongoing
CTRL-9	Complete and document 80% of scheduled O&M and construction inspections to demonstrate compliance.	Utilities Engineering, Construction Inspectors, Building Inspectors, M&O	None	Ongoing
CTRL-10	Compile and submit a summary of the LID review and revision process described in CTRL-5	Utilities Engineering	Planning Division	March 31, 2017

Note: Task ID numbering and work items include and build on tasks currently included in the 2014 SWMP.

Table 6-2 is adapted from the *Phase II Gap Analysis* technical memorandum dated February 28, 2014. It includes assessments of City codes, standards, and other documents that may require update to comply with updated Permit requirements related to control of runoff from new development, redevelopment, and construction sites. In general, the LID principles requirements may affect provisions of Comprehensive Plan goals and policies, land use and development code provisions, and development standards.

Table 6-2. Recommended City Code and Document Updates (Development-Related)

City document	Sections/descriptions	Comments
Auburn City Code (ACC) sections		
Title 1 General Provisions	Chapter 1.20 Right of Entry for Inspection Chapter 1.25 Civil Penalties for Violations	These sections were reviewed because of their relationship to facility inspection and enforcement. 1.20: The language in this section appears to be adequate. The City may wish to review further in the context of a broader strategy/approach for conducting inspections of LID facilities on private property. 1.25: No changes appear necessary.
Title 2 Administration and Personnel	Chapter 2.25 Planning and Development Department Chapter 2.27 Public Works Department	These sections were reviewed because of their potential relationship to stormwater program implementation. No changes appear necessary.
Title 8 Health and Safety	Chapter 8.20 Vegetation	This section was reviewed because of its potential relationship to maintenance of vegetation in private stormwater facilities. The City will likely address O&M requirements for private stormwater facilities elsewhere; no apparent change is required.
Title 12 Streets, Sidewalks and Public Works	Chapter 12.04 Public Works Construction	12.04.010: Update SWMM reference, once the updated manual is developed.

Table 6-2. Recommended City Code and Document Updates (Development-Related)		
City document	**Sections/descriptions**	**Comments**
Title 13 Water, Sewer and Public Utilities	Chapter 13.41 Utility Systems Development Charge Chapter 13.48 Storm Drainage Utility	13.41.010: Consider updating definitions and usage of impervious surfaces and LID. 13.41.050: Consider updating policies regarding and description of credits available for LID. With LID now generally required, credits may no longer be appropriate. Numerous revisions are identified throughout Chapter 13.48. 13.48.010: Permit included updates to definitions of illicit connection, illicit discharge, hard and impervious surfaces, and other terms. Consider matching Permit language. Update SWMM reference. 13.48.100.G: Equivalent service units are currently determined based on impervious surface area. With the Permit now focused on "hard surfaces," consider updating the City's approach for consistency. Could impact rate ordinance. Optional and potentially low priority. 13.48.180.A: Inspection access language appears adequate. 13.48.180.B: Review to confirm that this language is adequate to enforce O&M of private stormwater facilities. 13.48.180.D: Code identifies 50% buildout; the Permit now specifies 90%. Update accordingly. 13.48.210.A: Review and consider matching updated language in Permit related to illicit discharges. 13.48.225: See following: • MR 2: Add new element "Protect Low Impact Development BMPs". • MR 5: Make significant revisions in accordance with Permit LID changes. • MR 6 an 7: Code language is adequate, but changes in SWMM will be required (e.g., thresholds in terms of hard surface area, Basic and Enhanced Treatment requirements). • MR 8: Wetlands guidance in Ecology Manual changed significantly (Guide Sheets 1–3, Appendix I-D). Review further to confirm adequacy of ACC language 13.48.230.B: Update thresholds from impervious to hard surfaces. 13.48.435: Consider whether modified requirements for single-family home/small LID facilities are needed.
Title 14 Project Review	All	This title was reviewed because of its relationship to the project review and approval process. The title generally outlines how projects must be reviewed consistent with specific requirements found in other sections. No changes appear necessary.
Title 15 Buildings and Construction	Chapter 15.07 Construction Administration Code Chapter 15.68 Flood Hazard Areas	These sections were reviewed because of their relationship to development and construction. 15.07.090: No changes appear necessary. 15.68: Permit changes (in particular LID principles) have the potential to impact or be impacted by flood zone-related code. The sections appear to be general enough to avoid revision but their content should be reviewed to ensure that it aligns with the City's desired approach to LID.

Table 6-2. Recommended City Code and Document Updates (Development-Related)		
City document	**Sections/descriptions**	**Comments**
Title 16 Environment	Chapter 16.10 Critical Areas	These sections were reviewed because the Permit changes (in particular LID principles) have the potential to impact code related to critical areas. As part of the process for determining the City's approach to LID implementation, consider how LID policies will relate to critical areas, critical areas mapping, buffers and setbacks, and other considerations.
Title 17 Land Adjustments and Divisions	All	This title was reviewed because of its relationship to land use and development. The title is not impacted by the technical changes to the Permit, but may be impacted in various sections by the LID principles requirement, consistent with the LID approach to be determined by the City. LID principles-related updates could represent a major work effort.
Title 18 Zoning	All	This title was reviewed because of its relationship to land use and development. The title is not impacted by the technical changes to the Permit, but may be impacted in various sections by the LID principles requirement, consistent with the LID approach to be determined by the City. LID principles-related updates could represent a major work effort. Potential issues to consider include: • Landscaping requirements and native vegetation preservation • Impervious surface limitations/standards • Roads and parking standards • Site plan review criteria
City of Auburn documents		
Surface Water Management Manual (SWMM)	The City developed and uses the SWMM as its primary mechanism for implementing state stormwater regulations related to new development and redevelopment	The SWMM was developed as an equivalent to the Ecology Manual during the previous Permit cycle. Updates to the Permit and the Ecology Manual will trigger corresponding updates in the SWMM in order to maintain equivalency. This includes changes to the Minimum Requirements, BMPs (for construction, source control, and facilities), and design guidance and practices documented in the SWMM. Because the SWMM is based on the Tacoma Manual, updates to the SWMM may be able to build on corresponding updates to the Tacoma Manual. Potential updates to the SWMM represent a major effort for City staff.
Public Works Design Standards	Chapter 1 General Information 1.02 Engineering Handouts 1.03 Deviations from Standards	1.02.1.2 Update the referenced guidance and permitting handouts and create new handouts as necessary. Also see related discussion on Permit Application Checklists below. 1.03 Consider whether updates to the deviation from standards section are needed based on the City's implementation approach for LID and the associated identification of infeasibility criteria for LID.
	Chapter 2 Plan Approval Process 2.02 Review and Approval Process	Depending on the City's approach to implementing LID, consider including a submittal requirement related to infiltration testing. This testing may already be adequately covered by existing requirements.

Table 6-2. Recommended City Code and Document Updates (Development-Related)		
City document	**Sections/descriptions**	**Comments**
	Chapter 4 Report Preparation Requirements 4.02 Report Types	Depending on the City's approach to implementing LID, consider expanding on the existing requirement to conduct infiltration testing and report on the results as part of the geotechnical report. An alternative approach for smaller projects needing to implement LID may be desirable (short of a full geotechnical report, perhaps).
	Chapter 5 TESC, Clearing and Grading 5.02 Land Clearing 5.05 Construction Sequence	5.02 Clearing requirements could be affected by City's approach to LID and the Permit requirement to minimize native vegetation loss. 5.05 Consider how LID requirements may affect or need to be included in construction sequence requirements.
	Chapter 6 Storm Drainage	This section has been replaced with a reference to the SWMM. No changes necessary.
	Chapter 10 Streets 10.05 Sidewalks 10.06 Bikeways 10.07 Pavement Design 10.08 Landscaping	10.05–10.07 Consider allowing and including specifications for pervious pavement design if determined to be an acceptable alternative for sidewalk, bikeway, and/or roadway construction. 10.08 Consider how landscaping elements could be integrated with or serve a dual purpose for storm drainage. Updates other than those noted may be needed to align with potential transportation-related strategies as part of the City's broader LID approach.
	Chapter 11 Site Design	Site design requirements (e.g., zoning, land use) refer to more specific requirements in the ACC. No updates appear necessary.
	Definitions	The City may want to consider updating definitions consistent with relevant Permit definitions.
Engineering Construction Standards	Special provisions and standard details for construction.	This document appears unaffected by Permit updates. The City communicated during workshops the intention to address stormwater BMPs through the SWMM, and not through standard specification and details.
Permit Application Checklists and related guidance documents	Checklists and guidance materials for City permit applicants: (see City Forms Web site)	These documents were reviewed because of their relationship to permits and project review. City forms such as the Residential Permit Submittal Checklist and Commercial Building Permit Checklist will require update to align with the new Permit requirements and the City's approach to LID.

Table 6-2. Recommended City Code and Document Updates (Development-Related)		
City document	**Sections/descriptions**	**Comments**
City Comprehensive Plan	The Plan sets future, long-range goals and summarizes major City policies and proposals.	This document was reviewed because of its relationship to policy determination and implementation. While most of the plan will be unaffected by Permit changes, updates may be desirable in the following chapters to better align with the new Permit language and the City's determined LID approach (in particular, potential changes to zoning, land use, or other City policies that may result from requirements to preserve native vegetation and trees and to minimize impervious surfaces): 3. Land Use 5. Capital Facilities 7. Transportation (refers out to a separate Transportation Comprehensive Plan) 9. Environment Broadly, the Permit requires Permittees to minimize impervious surfaces and minimize the loss of native vegetation. The City should consider how those principles can be incorporated into the goals of the Plan. More specifically, several items and sections were flagged during review for additional scrutiny: • Page 3-28: Note indicating elimination of stormwater improvements as incentive for redevelopment may not be consistent with state regulations. • Page 5-10 (CF-42, 43): Review these two policies related to stormwater facilities on private property and regional facilities in light of new focus on LID and distributed stormwater infrastructure. Other policies in this section do not appear to require update, but the City should review to confirm. • Page 9-2 (EN-2): Check whether this reference to the Ecology Manual is intentional, or should be replaced with a reference to the Auburn SWMM. • Page 9-4 (EN-14): Check whether this reference to the Ecology Manual is intentional, or should be replaced with a reference to the Auburn SWMM. • Page 9-22 (EN-124): Consider updating language in light of new LID requirements (no longer only "encouraged"). • Page 15-4: Update the description of the Comprehensive Drainage Plan consistent with the current update in progress. Coordination with the Comprehensive Storm Drainage Plan update is recommended.

Table 6-2. Recommended City Code and Document Updates (Development-Related)		
City document	**Sections/descriptions**	**Comments**
Comprehensive Storm Drainage Plan	The Plan guides the City's Stormwater Drainage utility with respect to future activities and improvements for the stormwater drainage system.	This document was reviewed because of its relationship to policy determination and implementation. While most of the plan will be unaffected by Permit changes, updates may be desirable throughout the Plan to better align with the new Permit language and the City's determined LID approach. The following specific areas were flagged for update: • Figure ES-2: Update timeline for Permit compliance • Section 2.2: Describe future updates to City codes and standards • Section 2.3.2: Review and revise NPDES Permit description • Section 3.2: Review how levels of service will be affected by new LID focus and implementation • Sections 4.1.6/4.1.7: Review how these sections related to geology, soils, and groundwater affect or are affected by LID requirements and feasibility criteria • Section 4.1.8.3: Update section on development regulations and drainage design standards • Section 7.3: Update section on NPDES compliance programs, including Figure 7-2 (matches Figure ES-2) Coordination with the City Comprehensive Plan update is recommended (e.g., policies CF-40, EN-12, and EN-17). The Comprehensive Storm Drainage Plan should indicate coordination of maintenance activities with a schedule developed to comply with Ecology requirements and asset criticality.
Shoreline Master Program	The Program provides policies and regulations to govern development and other activities along the City's shorelines. It includes guidance related to critical areas, buffers, and general stormwater/LID management and goals.	Discussion related to stormwater appears to be general and unaffected by the detailed changes to the Permit. To the extent that the City's LID implementation process (including policies to preserve native vegetation and minimize impervious surfaces) affects critical areas and buffer requirements, updates to those elements could be needed. No immediate changes were identified.
Downtown Urban Center Design Standards	The Design Standards outline architectural guidelines for downtown development. This includes guidelines for elements like parking spaces and lots, driveways, and pedestrian sidewalks.	To the extent that these parking and access elements are affected by potential land use, zoning, and transportation changes made during the City's LID implementation process, the Design Standards may need to be updated.

Section 7

Municipal Operations and Maintenance

This section summarizes new Permit requirements for Municipal Operations and Maintenance, current compliance activities that are applicable to the new requirements, and recommended actions to maintain future compliance.

7.1 New Permit Requirements

Section S5.C.5 of the Permit requires the City to:

- Update maintenance standards as necessary to meet updated Permit requirements
- Inspect all catch basins and inlets owned or operated by the City at least once no later than August 1, 2017, and every 2 years thereafter
- Implement practices, policies, and procedures to reduce stormwater impacts associated with runoff from all lands owned or maintained by the Permittee, and road maintenance activities under the functional control of the Permittee (added buildings, parks, open spaces, road rights-of-way, maintenance yards, and stormwater facilities to Permit list of Permittee lands)

7.2 Current Compliance Activities Applicable to New Requirements

The City currently has activities and programs that meet many of the requirements of Section S5.C.5 of the Permit. Current activities and programs include the following:

- The City operates an O&M program intended to minimize pollutant runoff from municipal operations.
- The City conducts and records the inspections and cleaning of City-owned and -permitted stormwater facilities and elements of the collection system (e.g., catch basins, outfalls).

7.3 Recommended Actions to Maintain Future Compliance

Auburn has a well-developed municipal stormwater system O&M program to minimize water quality impacts from municipal operations. Some updates to programs and activities will be necessary to maintain compliance with the new Permit requirements. Table 7-1 lists activities and time frames for the City to comply with new Permit conditions related to municipal operations and maintenance.

Table 7-1. Municipal Operations and Maintenance

Task ID	Task description	Lead	Support	Compliance time frame
MOM-4	Review City maintenance standards (SWPPPs, SOPs, SWMM BMPs, City inspection schedules/Cartegraph tracking, other) relative to new requirements in S5.C.5, including new inspection and cleaning requirements and additional City lands identified. Update if needed. SWPPPs appear unlikely to require update.	Utilities Engineering	M&O, Parks, Building Maintenance, IT	December 31, 2016
MOM-5	Continue inspection and cleaning of catch basins currently conducted. Meet at a minimum one inspection of each catch basin by August 1, 2017, and at least once every 2 years thereafter, or justify a longer cycle (see below). The City is currently inspecting on a 3-year rotating basis.	M&O	Utilities Engineering	August 1, 2017 Every 2 years thereafter
MOM-6	If desired, use maintenance records to justify an alternative catch basin inspection frequency (e.g., every 3 years). If this approach is selected, compile and submit maintenance records to Ecology.	Utilities Engineering	M&O	Optional

Note: Task ID numbering and work items build on tasks currently included in the 2014 SWMP.

Section 8

TMDL Compliance

This section summarizes new Permit requirements for total maximum daily load (TMDL) compliance, current compliance activities that are applicable to the new requirements, and recommended actions to maintain future compliance.

8.1 New Permit Requirements

The Permit contains two sections that address TMDL requirements: Section S7 and Appendix 2. Section S7 received minor updates, while Appendix 2 was entirely revised from the prior version.

Appendix 2 contains TMDL requirements for specific water bodies and Permittees, including the City of Auburn. The City has required actions identified for the Puyallup Watershed Water Quality Improvement Project, which is a fecal coliform TMDL for portions of the Puyallup River Watershed. The City is specifically required to:

- Beginning no later than October 1, 2013, conduct twice monthly wet weather sampling of stormwater discharges to the White River at Auburn Riverside High School to determine if specific discharges from Auburn's MS4 exceed the water quality criteria for fecal coliform bacteria.
  - Data shall be collected for one wet season.
  - Data shall be collected in accordance with an Ecology-approved QAPP.
  - Data collected since EPA TMDL approval can be used to meet this requirement.
- For any of the outfalls monitored above showing discharges that exceed water quality criteria for primary contact recreation: designate those areas discharging via the MS4 of concern as high priority areas for illicit discharge detection and elimination efforts and implement the schedules and activities identified in S5.C.3 of the Western Washington Phase II permit for response to any illicit discharges found beginning no later than August 1, 2014.
- Install and maintain pet waste education and collection stations at municipal parks and other Permittee owned and operated lands adjacent to streams. Focus on locations where people commonly walk their dogs.

8.2 Current Compliance Activities Applicable to New Requirements

The City has completed required wet weather monitoring of discharges to the White River.

The City maintains pet waste education and collection stations at municipal parks and other public lands adjacent to the White River and its tributaries.

8.3 Recommended Actions to Maintain Future Compliance

Table 8-1 lists activities and time frames for the City to comply with new Permit conditions related to TMDL compliance. The City's 2014 SWMP contains current tasks related to TMDL compliance. The tasks shown in Table 8-1 build on those current tasks identified in the SWMP.

Table 8-1. TMDL Compliance

Task ID	Task description	Lead	Compliance time frame
TMDL-2	Maintain pet waste education and collection stations at municipal parks and other public lands adjacent to the White River and its tributaries.	Parks Department	Ongoing
TMDL-3	If triggered by wet weather monitoring results, designate areas contributing to water quality exceedances as high priority areas for illicit discharge detection and elimination efforts; implement permit-required responses for any illicit discharges found.	Utilities Engineering	August 1, 2014

Note: Task ID numbering and work items build on tasks currently included in the 2014 SWMP.

Section 9

Monitoring and Assessment

This section summarizes new Permit requirements for Monitoring and Assessment, current compliance activities that are applicable to the new requirements, and recommended actions to maintain future compliance.

9.1 New Permit Requirements

The Permit (Section S8) was substantially revised from the prior version. Permittees are required to:

- Conduct Status and Trends Monitoring and Effectiveness Studies, or pay annually into a collective fund to implement monitoring through the Regional Stormwater Monitoring Program (RSMP). Auburn's annual payment will be $45,096.
- Pay into the RSMP to implement the RSMP Source Identification Information Repository (SIDIR). Auburn's annual payment will be $2,614.
- Provide the following monitoring and/or assessment data in each Annual Compliance Report:
  - A description of any stormwater monitoring or studies conducted by the City during the reporting period. If stormwater monitoring was conducted on behalf of the City, or if studies or investigations conducted by other entities were reported to the City, a brief description of the type of information gathered or received shall be included in the Annual Compliance Report.

9.2 Current Compliance Activities Applicable to New Requirements

The City committed in 2013 to make annual payments into the Ecology monitoring programs, in lieu of running an independent monitoring program. Program payments are planned by the City in compliance with annual due dates.

9.3 Recommended Actions to Maintain Future Compliance

Table 9-1 lists activities and time frames for the City to comply with new Permit conditions related to monitoring and assessment. The City's 2014 SWMP contains task MNTR-1, which identifies annual payments into the Ecology monitoring programs. Because the SWMP already captures relevant new activities for monitoring, the work plan mirrors the SWMP.

Table 9-1. Monitoring and Assessment

Task ID	Task description	Lead	Compliance time frame
MNTR-1	Pay $47,710 annually into the RSMP collective fund for implementation of Status and Trends Monitoring, Effectiveness Studies, and the Source Identification Information Repository.	Utilities Engineering	Annual payment due by August 15, starting in 2014

Note: Task ID numbering and work items build on tasks currently included in the 2014 SWMP.

Section 10

Limitations

This document was prepared solely for the City of Auburn in accordance with professional standards at the time the services were performed and in accordance with the contract between the City of Auburn and Brown and Caldwell dated October 17, 2013. This document is governed by the specific scope of work authorized by the City of Auburn; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by the City of Auburn and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Section 11

References

Western Washington Phase II Municipal Stormwater Permit, Washington State Department of Ecology, effective date August 1, 2013.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2012.

Integrating LID Into Local Codes: A Guidebook for Local Governments, AHBL for the Puget Sound Partnership, July 2012.

Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection and Robert Pitt (University of Alabama), October 2004.

Attachment A: Permit Compliance Schedule (Draft)

(Courtesy Cities of Covington and SeaTac)

WESTERN WASHINGTON PHASE II MUNICIPAL STORMWATER PERMIT IMPLEMENTATION SCHEDULE

CHAPTER	SECTION	SUB-SECTION	TASKS
S5	A1		SWMP Develop & Implement
	A2		SWMP Plan Annually Updated
	A3	a.	Track Costs or Estimated Costs
		b.	Track Inspections, Enforcements & Public Educ. Activities
	A4		Continue Implementation of Exising Programs
	A5	a.	Include Coord. Mech. wi Other Entities (If Applicable)
		b.	SWMP Includes Internal Coordination Mechanisms
	C1	a.	Public Education & Outreach (Local or Regional)
		b	Create Stewardshp Opportunities
		c	Measure Understanding & Adoption of Behaviors
	C2	a.	Public Involvement & Participation (Create opport.)
		b.	SWMP & Annual Report Website Posting
	C3		Illicit Discharge Detection and Elimination
		a.	Ongoing Stormwater Mapping - periodically update
		a.v	Map All New Connections Since February 16, 2007
		b.	IDDE Ordinance Update
		c.	Illicit Discharge Detection & Elimination Program
		c.i	Field Screen 40% of MS4 12/31/17- 12% yrs thereafter
		c.i	Document Field Screen Methodology in Annual Report
		c.ii	Publically List Phone #'s for Reporting Spills
		c.iii	Ongoing Training all Muni. Field Staff - Lvl B (Tracked)
		c.iv	IDDE Education
		d	
		e.	Ongoing Training IDDE Staff - Lvl A (Tracked)
	C4		Construction Site Runoff Program
		a.	Update Construction Site Runoff Ordinance
		a.i	Adopt Appendix 1 or Approved Phase I Program
		a.i	Adopt Variance Criteria Equiv. to Appendix 1
		a.ii	Site Plan & BMP Select per Append 1 or Approved Ph I
		a.iii	Ord./ Reg. Mech. Giving Legal Authority to Inspect
		b.	Implement Permit Process / Plan Review & Inspect. wi new thresholds
		b.i	Review All Stormwater Site Plans
		b.ii	Pre-Con Site Inspection
		b.iii	Inspect All Sites for Erosion and Sediment Controls
		b.iii	Enforce ESC as Necessary
		b.iv	Final ESC Inspection
		b.iv	Maintenance Plan for New Facilities (Bond Program)
		b.iv	Enforce Maintenance Plan (Bond Program)
		b.v	Minimum 80% Compliance wi Inspect. Requirements
		b.vi	Enforcement Strategy
		c.	O&M for Private Stormwater Facilities & BMPs
			- Long Term Mnt - Treatment & Flow Control BMPS
		c.i	Enforce. Mech. Identifying Responsibilities for O&M
		c.ii	Est. Maint. Standard = to Ch.4 Vol.V of 12' SMMWW
		c.iii	Annual Inspection of Private Facilities Aprvd after 2/15/10
		c.iv	Inspect Bonded Resid. Facilities Every 6 Months until 90% of lots constructed (or when construction stops and sites are fully stabilized)
		c.vi	Compliance = records + 80% scheduled inspections
		c.vi	Perform Timely Maintenance
		c.vii	Track Inspections, Enforcements etc. (All Notices)
		d.	Make NOI for Const. & Industrial Site Avail. & Enforce Local Regs on NPDES Const. Sites
		e.	Train All Applicable Staff on Above Activities (Track)
		f.	Low Impact Development
		f.i.	Incorporate LID into Codes, Rules Stnds & Enf. Docs Making LID Prefered/Commonly Used Approach
		f.ii	Submit Summary of Results of LID Update Process
		g.	Watershed Scale Stormwater Planning wi Phase Is
	C5		O&M Program (for Municipally Owned or Operated)
		a.	Update Maint. Stnds = to Ch.4 Vol.V of 12' SMMWW
		a.ii	Perform Timely Maintenance
		b.	Annually Inspect All Treatment & Flow Cntrl. Facilities
		c	Spot Check Inspections After Major Storms (10 yr 24 Hour)
		d.	Catch Basin Insp. & Mnt. - All by 8/17 - then every 2 yrs
		e.	Ensure 95% compliance for O&M inspections
		f.	Establish & Implem. Practices to Reduce Impacts
		g.	O&M Training Program (Train to Standards)
		i	SWPPPs for All Heavy Equip. Mnt. & Storage Yards
		j	Track Maint. & Repair Activities Identified Above
S8	A		**Monitoring & Assessment** - Submit Stormwatwer Studies
	B1		Status & Trends Monitoring Notification & Contribution
	C1		Effectiveness Monitoring Notification & Contribution
	D		Source Ident. & Diagnostic Monitoring (Info. Repository)
S9	A1		Annual Compliance Report
G18			Apply for permit renewal

2013: August 1st, September, October, November, **December 1**

2014: January, February 16, March 31, April, May, June, July, **August 15**, September, October, November, December

2015: January 1, February 16, **March 31**, April, **May 31**, June, July, August, September, October, November, December

2016: January, **February 2**, **March 31**, April, **May 31**, June, July, August, September, October, November, **December 31**

2017: **January 1st**, February, **March 31**, April, **May 31**, June, July, August 1st, September, October, November, December

2018: January, **February 2**, **March 31**, April, **May 31st**, June, **July 31st**

Reduced standard frm 95%

Not Applicable - SeaTac Watersheds not selected

Notification to DOE

Annual Payments Start

2 year schedule

LEGEND: Effective & Expiration Dates of Permit | Ongoing Requirement | Permit Deadline

Attachment B: Compliance Effort Estimate

Brown AND Caldwell

701 Pike Street, Suite 1200
Seattle, Washington 98101

T: 206.624.0100
F: 206.749.2200

Memorandum

Prepared for: City of Auburn

Project Title: NPDES Compliance Assistance

Project No.: 145125

Memorandum

Subject: Effort Estimate

Date: July 2, 2014

To: Chris Thorn, Water Quality Program Coordinator

From: Patrick Weber, Project Manager

Copy to: Tim Carlaw, Storm Drainage Engineer

Prepared by: Patrick Weber, P.E.
Kirsten Wood, EIT

Reviewed by: Damon Diessner

Brown AND Caldwell

Memorandum

The Department of Ecology issued an updated National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Stormwater Permit (Permit) on August 1, 2013. As a Phase II Permittee, the City of Auburn (City) must update its codes and policies to comply with the new Permit requirements. The City began this process by completing a gap analysis to identify existing City codes and policies that may be affected by the Permit.

Based on discussions with City staff, Brown and Caldwell (BC) estimated the additional efforts required by the City to address potential gaps identified in the gap analysis.

Estimated resources are listed in terms of full-time employees (FTE), limited-term employees (LTE), materials and equipment, and fees (all changes relative to the 2013 baseline year).

The following additional resource needs have been identified, relative to a 2013 baseline:

- Annual fee to participate in Ecology's monitoring programs is $47,710 USD
- In 2014, 1.05 FTEs, 0.7 LTE, and equipment, including 1 stormwater inspector
- In 2015, 3.05 FTEs, 1.7 LTEs, and equipment, including 1 stormwater inspector and 2 M&O field staff
- In 2016, 3.3 FTEs, 2.55 LTEs, and equipment, including 1 stormwater inspector and 2 M&O field staff
- In 2017, 5.65 FTEs, 0 LTEs, and equipment, including 2 stormwater inspectors, 2 M&O field staff, and 1 LID facility inspector
- In 2018, 5.9 FTEs, 0 LTEs, and equipment, including 2 stormwater inspectors, 2 M&O field staff, and 1 LID facility inspector

Table 1 includes the estimated additional effort, costs, materials and timing for each Permit compliance activity. The numbering in the first column corresponds to the attached schedule table, which includes the estimated additional effort required each year from 2014 to 2018.

Table 1. Estimated Resources Required for Compliance

Schedule table reference number	Description	Duration
1.A	City permit review staff to update public guidance materials and checklists to align with the new City/NPDES Permit requirements.	One-time effort in 2016 once updates to City requirements are clarified, early enough to be able to inform the public in advance of upcoming/new requirements. [0.1 LTE one-time in 2016]
1.B	Additional staff effort to conduct permit application reviews. Additional staff effort will be driven by more complex, iterative permitting processes for LID, including site-specific LID feasibility review and determinations.	Ongoing effort starting in 2017, potentially ramping up with long term growth and an increase in permit applications. [0.25 FTE ongoing starting in 2017]
2.A	Additional staff inspector(s) focused on stormwater elements. The position could require additional and specialized training in stormwater management, water quality, erosion control and LID installation requirements.	Ongoing effort starting in 2014. Includes training and coordinating responsibilities among inspector groups for different project types. Additional inspector added in 2017 as new LID requirements become active, potentially continuing to ramp up over time. [1.0 FTE from 2014 to 2016, increasing to 2.0 FTEs ongoing starting in 2017]

Table 1. Estimated Resources Required for Compliance		
Schedule table reference number	Description	Duration
2.B	Define, coordinate and update procedures and responsibilities among inspector groups.	One-time effort should occur in 2014 before or coinciding with filling additional inspector position to ensure that all required tasks are covered among the roles. [0.1 LTE one-time in 2014]
3.A	Define and organize LID asset classification, and coordinate/update maintenance tracking methods. Additional efforts to track and record maintenance of stormwater assets.	One-time setup of asset management systems and protocols should occur in 2016. Ongoing tracking will continue and potentially ramp up with increase in development with tracked assets. [0.25 FTE in 2016 decreasing to 0.1 FTE ongoing starting in 2017]
3.B	Develop procedures for public LID facility maintenance and oversight of private facilities.	One-time effort should occur in 2016 so procedure is defined before 12/31/2016 deadline. [0.25 LTE one-time in 2016]
3.C	Inspect, clean and maintain catch basins at frequencies as required by the Permit. New hire(s) will require a vehicle and field equipment.	Ongoing effort starting in 2015. [2 FTE ongoing starting in 2015]
3.D	Maintain publicly owned LID facilities and other stormwater assets. Obtain required equipment for facility maintenance.	Ongoing effort starting in 2017, with potential increases over time due to future growth. [0.25 FTE in 2017 increasing to 0.5 FTE ongoing starting in 2018]
4.A	Update public education and outreach materials to include additional target audiences, evaluate program effectiveness, and conduct regional coordination.	Ongoing effort starting in 2014. [0.05 FTE ongoing starting in 2014]
5.A	Update or adopt Stormwater Manual to meet requirements.	One-time effort ramping up in 2015 and completed in 2016. [0.5 LTE in 2015 increasing to 1.0 LTE in 2016]
5.B	Develop City planning methods and update Code to meet new Permit requirements for stormwater, including new runoff control requirement thresholds, BMP performance standards and LID requirements.	One-time effort ramping up in 2014 and completed in 2016. [0.5 LTE in 2014 increasing to 1.0 LTE in 2015 and 2016]
5.C	Inspect new LID facilities regularly and purchase and maintain any associated field instruments required to perform inspections.	Ongoing effort starting in 2017 and potentially increasing with future development. [1.0 FTE ongoing starting in 2017]
6.A	Update City Comprehensive Plan related to implementation of LID principles that could affect elements beyond stormwater management implementation such as levels of service, setbacks, zoning densities, etc.	One-time effort ramping up in 2014 and completed in 2016. [0.1 LTE in 2014 increasing to 0.2 FTE in 2015 and 2016]
7.A	Annual fees to participate in Ecology-run statewide monitoring programs.	Annual fee starting in 2014. [$47,710 annually starting in 2014]

For more details on each item, see attached spreadsheet

City of Auburn NPDES Support
Compliance Effort Estimate
April 1, 2014

FTE Full Time Employee - allocations are for ongoing implementation of new requirements
LTE Limited Term Employee - allocations are for one-time Permit compliance efforts (e.g. Manual updates)
FTE/LTE options include: Temporary staff hires, reallocation of existing staff, or consultant assistance.

			2014				2015				2016				2017				2018			
No.	Work Effort Category	Description	Labor		Equipment	Other	Labor		Equipment	Other	Labor		Equipment	Other	Labor		Equipment	Other	Labor		Equipment	Other
			FTE	LTE			FTE	LTE			FTE	LTE			FTE	LTE			FTE	LTE		
1	Permitting Staff																					
A	1.A	Update permitting project/plan checklists and procedural information to meet new City and Ecology standards.	-	-	-	-	-	-	-	-		0.1	-	-	-	-	-	-	-	-	-	-
B	1.B	Increased permitting staff time to review permits. New effort related to additional LID requirements, more discussion with and guidance for applicants, more required review information for design decisions (slope, infiltration, etc.).	-	-	-	-	-	-	-	-	-	-	-	-	0.25	-	-	-	0.25	-	-	-
2	Construction Inspections																					
A	2.A	Additional inspectors with a stormwater focus added to the Utility or Building inspector groups, or as a new group. Trained in: stormwater management, water quality (NPDES), erosion control (CESCL certified), LID installation.	1		Pickup (1), field instruments, office equip	-	1	-	Pickup (1), field instruments, office equip	-	1	-	Pickup (1), field instruments, office equip	-	2	-	Pickup (2), field instruments, office equip	-	2	-	Pickup (2), field instruments, office equip	-
B	2.B	Develop updated procedures to coordinate inspector responsibilities.		0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Maintenance and Operations																					
A	3.A	Asset management - Defining asset grouping/classification for LID installation, recording all existing assets, update maintenance checklists and mobile units (Cartagraph) record requirements, coordinate with IT.	-	-	-	-	-	-	-	-	0.25	-	-	-	0.1	-	-	-	0.1	-	-	-
B	3.B	Determine updated procedures for LID inspections, public facility maintenance and private facility notifications.	-	-	-	-	-	-	-	-	-	0.25	-	-	-	-	-	-	-	-	-	-
C	3.C	Additional staff to meet increased catch basin inspection and cleaning frequency.					2		Pickup (2), field instruments, office equip		2		Pickup (2), field instruments, office equip		2		Pickup (2), field instruments, office equip		2		Pickup (2), field instruments, office equip	
D	3.D	Additional effort to maintain publicly owned LID facilities													0.25		Pervious pavement equip - purchase/rental/ contract		0.5		Pervious pavement equip -purchase/rental/ contract	
4	Public Outreach and Education																					
A	4.A	Annual compliance activities - extra effort to implement, track, and report on efforts related to new requirements	0.05	-	-	-	0.05	-	-	-	0.05	-	-	-	0.05	-	-	-	0.05	-	-	-
5	Stormwater Staff																					
A	5.A	Adapt/update Stormwater Manual (BMPs) and Design Standards/Specifications (especially to regulate private development).	-	-	-	-	-	0.5	-	-	-	1	-	-	-	-	-	-	-	-	-	-
B	5.B	Planning and Code Modifications - City to strategize approach on how to standardize and implement LID; complete and adopt Code updates.	-	0.5	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-
C	5.C	Conduct inspections of new LID facilities triggered by updated Permit requirements	-	-	-	-	-	-	-	-	-	-	-	-	1	-	field instruments, office equip	-	1	-	field instruments, office equip	-
6	Planning Staff																					
A	6.A	Coordinate updates to City Comprehensive Plan related to LID implementation (e.g., levels of service, zoning densities, etc.).		0.1	-	-	-	0.2	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-
7	Monitoring Program Costs																					
A	7.A	Annual fees to participate in Ecology-run statewide monitoring programs.	-	-	-	$ 47,710	-	-	-	$ 47,710	-	-	-	$ 47,710	-	-	-	$ 47,710	-	-	-	$ 47,710
TOTAL ADDITIONAL EFFORT PER YEAR ABOVE 2013 BASELINE			**1.05**	**0.7**	**0**	**$ 47,710**	**3.05**	**1.7**	**0**	**$ 47,710**	**3.3**	**2.55**	**0**	**$47,710**	**5.65**	**0**	**0**	**$ 47,710**	**5.9**	**0**	**0**	**$ 47,710**
CHANGE IN EFFORT FROM PREVIOUS YEAR			**1.05**	**0.7**	**0**	**$ 47,710**	**2**	**1**	**0**	**$ -**	**0.25**	**0.85**	**0**	**$ -**	**2.35**	**-2.55**	**0**	**$ -**	**0.25**	**0**	**0**	**$ -**

Attachment C: Gap Analysis Table

SWMMWW = Stormwater Management Manual for Western Washington (Ecology)
SWMM = Auburn Stormwater Management Manual adapted from Tacoma manual
*All page numbers are for redlined version of new Permit

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
1	Phase II Permit	15	S4.F.3.e	Compliance with Standards	A TMDL or other enforceable water quality cleanup plan that has been approved and is being implemented to address the MS4's contribution to the Water Quality Standards violation supersedes and terminates the S4.F.3. implementation plan	New Permit language identifies that a TMDL or equivalent plan supersedes the requirements of S4.F.3 (Adaptive Management Response)	TMDL plan	N	None	None	TMDLs are in effect or in development for a number of constituents and water bodies in the Puyallup River Watershed.	N	Monitor Ecology TMDL processes, note relationship between TMDLs and Adaptive Management Response requirements in the event of a violation of Water Quality Standards.	N/A	N/A	N/A
2	Phase II Permit	18	S5.A.5.b	Coordination among Permittees	The SWMP shall include coordination mechanisms among departments within each jurisdiction to eliminate barriers to compliance with the terms of this permit. Permittees shall include a written description of internal coordination mechanisms in the Annual Report due no later than March 31, 2015.	Added the deadline and requirement for written description	Annual Report	N	None	None	Departmental responsibilities for individual tasks are identified in SWMP.	Y	Review and update as needed description of internal coordination mechanisms in SWMP by March 31, 2015.	March 31, 2015	Low	Low
3	Phase II Permit	19	S5.C.1.a.i.a	Public Education and Outreach	General public (including school age children), and businesses (including home-based and mobile businesses) - General impacts of stormwater on surface waters - Impacts from impervious surfaces - Impacts of illicit discharges and how to report them - Low impact development (LID) principles and LID BMPs - Opportunities to become involved in stewardship activities	Added requirements to general public target area. Last three bullet points are new.	Outreach	N	None	None	Public education and outreach activities are included in Section 3 of the SWMP and included as an attachment to the Annual Report. City has a number of ongoing programs and partnerships.	Y	Consider how to further incorporate the following education and outreach elements: - Impacts of IDDE and how to report - Low Impact development (LID) principles and LID BMPs - Opportunities to become involved in stewardship activities Begin implementing by August 1, 2015.	August 1, 2015	Low	Low
4	Phase II Permit	19	S5.C.1.a.i.b	Public Education and Outreach	Engineers, contractors, developers and land use planners - Technical standards for stormwater site and erosion control plans - LID principles and LID BMPs - Stormwater treatment and flow control BMPs/facilities	Revised language for engineers, contractors, developers and land use planners target area about LID and added third bullet point	Outreach	N	None	None		Y	Consider how to incorporate additional awareness elements targeted towards engineers, contractors, developers and land use planners. Begin implementing by August 1, 2015.	August 1, 2015	Low	Low
5	Phase II Permit	20	S5.C.1.a.ii.b	Public Education and Outreach	Residents, landscapers and property managers/owners - Yard care techniques protective of water quality - Use and storage of pesticides and fertilizers and other household chemicals - Carpet cleaning and auto repair and maintenance - Vehicle, equipment and home/building maintenance - Pet waste management disposal - LID principles and LID BMPs - Stormwater facility maintenance - Dumpster and trash compactor maintenance	Added requirement to residents, landscapers and property managers/owners target area about vehicles, pet waste and dumpsters.	Outreach	N	None	None		Y	Consider how to incorporate additional awareness elements targeted towards residents, landscapers and property managers/owners. Begin implementing by August 1, 2015. Leverage opportunities to participate in regional efforts to achieve economies of scale.	August 1, 2015	Low	Low
6	Phase II Permit	20	S5.C.1.b	Public Education and Outreach	Each Permittee shall measure the understanding and adoption of the targeted behaviors for at least one target audience in at least one subject area. No later than February 2, 2016, Permittees shall use the resulting measurements to direct education and outreach resources most effectively, as well as to evaluate changes in adoption of the targeted behaviors. Permittees may meet this requirement individually or as a member of a regional group.	Added a deadline and the flexibility of meeting the requirement individually or regionally	Outreach	N	None	None		Y	Measure understanding and adoption of targeted behaviors for at least one audience and subject area, and use results to adapt education and outreach programming, no later than February 2, 2016. Leverage opportunities to participate in regional efforts to achieve economies of scale.	February 2, 2016	Low/ Medium	Low
7	Phase II Permit	21	S5.C.2.b	Public Involvement and Participation	Each Permittee shall post on their website their SWMP Plan and the annual report required under S9.A no later than May 31 each year. All other submittals shall be available to the public upon request. To comply with the posting requirement, a Permittee that does not maintain a website may submit the updated SWMP in electronic format to Ecology for posting on Ecology's website.	Added requirement to have SWMP on the website no later than May 31, starting 2014.	SWMP Plan	N	None	None	City posts SWMP and Annual Report to website annually.	N	Continue to post to website, note the May 31 deadline for annual posting starting in 2014.	May 31, every year.	Low	N/A
8	Phase II Permit	21	S5.C.3	Illicit Discharge Detection and Elimination	The SWMP shall include an ongoing program designed to prevent, detect, characterize, trace and eliminate illicit connections and illicit discharges into the MS4.	Changed requirement from 'detect and remove' to 'prevent, detect, characterize, trace and eliminate' illicit discharges and connections. Removed requirement of implementing illicit discharge detection/elimination 180 days prior to the expiration date.	IDDE	N	13.48.190 13.48.210	Existing language appears adequate.	Existing activities highlighted in SWMP Section 5 and IDDE SOP	Y	Highlight in SWMP how existing programs and activities under the SWMP meet the broader Permit requirements.	Ongoing Requirement	Low	Low
9	Phase II Permit	23	S5.C.3.a. viii	Illicit Discharge Detection and Elimination	Upon request, and to the extent appropriate, Permittees shall provide mapping information to federally-recognized Indian Tribes, municipalities, and other Permittees. This permit does not preclude Permittees from recovering reasonable costs associated with fulfilling mapping information requests by federally-recognized Indian Tribes, municipalities, and other Permittees.	Added requirement to provide mapping to Indian Tribes. Permittees may recover costs associated with fulfilling mapping information requests by Indian Tribes, municipalities and other Permittees.	Sharing mapping information with other entities	N	None	None		N	If requested, share mapping information with other entities.	N/A	N/A	N/A
10	Phase II Permit	24	S5.C.3.b.ii	Conditionally allowable discharges	The regulatory mechanism may allow the following categories of non-stormwater discharges only if stated conditions are met: Dechlorinated swimming pool, spa and hot tub discharges. The discharges shall be dechlorinated to a total residual chlorine concentration of 0.1 ppm or less, pH-adjusted and reoxygenized if necessary, volumetrically and velocity controlled to prevent re-suspension of sediments in the MS4. Discharges shall be thermally controlled to prevent an increase in temperature of the receiving water. Swimming pool cleaning wastewater and filter backwash shall not be discharged to the MS4.	Added requirement for thermally controlled discharges from swimming pools, spas, and hot tubs.	Control discharges	Y	13.48.210	Update Code to reflect thermal discharge requirements, other minor changes to conditionally allowable discharges.		Y	Consider adding awareness elements for thermal discharge requirements to public outreach program. Assess extent of issue for City relative to potential to elicit a reaction from residents and policy makers.	N/A	Low	Low
11	Phase II Permit	24	S5.C.3.b.ii	Conditionally allowable discharges	The regulatory mechanism may allow the following categories of non-stormwater discharges only if stated conditions are met: Street and sidewalk wash water, water used to control dust, and routine external building washdown that does not use detergents. The Permittee shall reduce these discharges through, at a minimum, public education activities (see section S5.C.1) and/or water conservation efforts. To avoid washing pollutants into the MS4, Permittees shall minimize the amount of street wash and dust control water used.	Removed requirement to sweep the street prior to washing the street at active construction sites.	Construction WQ	N	13.48.210	Optional: update Code to remove the requirement for street sweeping prior to washing the street at active construction sites, if desired.		Y	Update construction permitting materials if needed.	N/A	Low	Low
12	Phase II Permit	25	S5.C.3.b.v	IDDE Compliance Strategy	The Permittee shall implement a compliance strategy that includes informal compliance actions such as public education and technical assistance as well as the enforcement provisions of the ordinance or other regulatory mechanism.	Added informal compliance actions to the compliance strategy requirements.	IDDE	N	1.25 13.48.180	Existing Code language includes enforcement provisions and allows for informal actions prior to enforcement.		Y	Consider policy updates and/or public outreach activities related to informal compliance actions if not already a part of City policy.	Ongoing Requirement	Low	Low

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
13	Phase II Permit	25	S5.C.3.b.v	IDDE Compliance Strategy	To implement an effective compliance strategy, the Permittee's ordinance or other regulatory mechanism may need to include the following tools: The application of operational and/or structural source control BMPs for pollutant generating sources associated with existing land uses and activities where necessary to prevent illicit discharges. The source control BMPs referenced in this subsection are in Volume IV of the 2012 Stormwater Management Manual for Western Washington, or an equivalent manual approved by Ecology under the 2013 Phase I Permit.	Added optional tools to implement an effective compliance strategy, including references to BMPs in the 2012 SWMMWW.	IDDE	N	13.48.225.C	Review whether existing Code language in Chapter 13.48 would benefit from additional requirements related to source control for existing sources/discharges.	IDDE response and enforcement SOP	Y	Review policies and activities related to IDDE source control (updated Ecology Manual BMPs) for potential update.	Ongoing Requirement	Low / Medium	Medium
14	Phase II Permit	25	S5.C.3.b.v	IDDE Compliance Strategy	To implement an effective compliance strategy, the Permittee's ordinance or other regulatory mechanism may need to include the following tools: The maintenance of stormwater facilities which discharge into the Permittee's MS4 in accordance with maintenance standards established under S5.C.4 and/or S5.C.5 where necessary to prevent illicit discharges.	Added optional tools to implement an effective compliance strategy, including references to O&M standards elsewhere in the Permit.	IDDE	N	13.48.180, 225, 435, 440	The City's existing Code language around illicit discharges and private system inspections and maintenance responsibilities appears fairly robust.		N	None	Ongoing Requirement	N/A	N/A
15	Phase II Permit	25	S5.C.3.b.vi	IDDE Ordinance	The Permittee's ordinance or other regulatory mechanism in effect as of the effective date of this permit shall be revised if necessary to meet the requirements of this section no later than February 2, 2018.	Added deadline for ordinance revision, if necessary.	IDDE Ordinance	Y	13.48	Update Code to reflect new Permit requirements in S5.C.3 (if changes are identified as necessary), no later than February 2, 2018.		Y	Implement the updated Code requirements, if applicable, no later than February 2, 2018.	February 2, 2018.	Medium	Medium
16	Phase II Permit	26	S5.C.3.c.i	Procedures for investigating Permittee's MS4	The Permittee shall implement a field screening methodology appropriate to the characteristics of the MS4 and water quality concerns. Screening for illicit connections may be conducted using: Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection, October 2004, or another methodology of comparable or improved effectiveness. The Permittee shall document the field screening methodology in the relevant Annual Report. All Permittees, except for the City of Aberdeen, shall complete field screening for at least 40% of the MS4 no later than December 31, 2017, and on average 12% each year thereafter.	Updated field screening requirements for illicit discharges and connections. Includes annual percentage of stormwater system requirements.	WQ	N		None		Y	Update the City's screening methodology if desired (optional). The prior Permit required outfall screening - the 2013 Permit allows greater flexibility, including in-system screening. Permittees may continue to screen outfalls, or begin screening in-system instead. Develop local strategy/definition for 40% screening coverage. Update SWMP with details of screening methodology. Complete field screening using selected methodology, including 40% of the City stormwater system by the end of 2017, and 12% of the system annually thereafter.	December 31, 2017, annually thereafter	Medium/ High	Low
17	Phase II Permit	28	S5.C.4	Controlling Runoff from New Development, Redevelopment and Construction Sites	[Deleted the following text] This program shall be applied to all sites that disturb a land area 1 acre or greater, including projects less than one acre that are part of a larger common plan of the development or sale.	Removed the one acre threshold for construction project exemption from many S5.C.4 requirements.	Project thresholds	N	13.48.230	The City has not been relying on the 1 acre threshold exemption, so the Code and SWMM appear unaffected by this change.		Y	Confirm suitability of existing guidance documents and materials for construction permit applicants. Enforce Minimum Requirements.	December 31, 2016.	Low	Low
18	Phase II Permit	30	S5.C.4.a	Minimum performance measures	Implement an ordinance or other enforceable mechanism that addresses runoff from new development, redevelopment, and construction site projects. Except for Permittees in Lewis and Cowlitz counties and the City of Aberdeen, the ordinance or other enforceable mechanism to implement (i) through (iii), below, shall be adopted and effective no later than December 31, 2016. The local program adopted to meet the requirements of S5.C.5.a(i) through (iii), below shall apply to all applications submitted on or after January 1, 2017 and shall apply to projects approved prior to January 1, 2017, which have not started construction by January 1, 2022	Updated deadline for implementing an updated runoff control ordinance.	Runoff ordinance	Y	13.48 Various ACC sections	Update Code to reflect new Permit requirements in S5.C.4. before December 31, 2016.		Y	Implement the updated Code requirements starting in 2017.	December 31, 2016.	High	High
19	Phase II Permit	31	S5.C.4.a.ii	Local requirements	The local requirements shall include the following requirements, limitations, and criteria that, when used to implement the minimum requirements in Appendix 1 (or program approved by Ecology under the 2013 Phase I Permit) will protect water quality, reduce the discharge of pollutants to the MEP, and satisfy the State requirement under chapter 90.48 RCW to apply AKART prior to discharge: a. Site planning requirements b. BMP selection criteria c. BMP design criteria d. BMP infeasibility criteria e. LID competing needs criteria f. BMP limitations	Added list of requirements, limitations, and criteria for implementation of Minimum Requirements. Adoption of the 2012 SWMMWW or an approved equivalent program is noted as sufficient to meet these requirements.	Local requirements	Y	13.48 Various ACC sections	Adopt the 2012 SWMMWW or an approved equivalent program (such as an updated version of the Auburn SWMM)	City of Auburn SWMM City Design Standards	Y	Adopt 2012 SWMMWW or equivalent manual prior to December 31, 2016. Update the Auburn SWMM, if electing to continue using it as an equivalent manual. Update City Design Standards consistent with selected manual adoption and other relevant program updates. Implement Permit S5.C.4 and related requirements starting in 2017. Monitor the status and results of ongoing appeals to the Permit. Revisions to the code, standards, manual, and related programs and documents to address the mandatory LID elements will represent a significant effort.	December 31, 2016.	High	High
20	Phase II Permit	32	S5.C.4.a	Local requirements	[Deleted the following text] If the Permittee chooses to allow construction sites to apply the "Erosivity Waiver" in Appendix 1, Minimum Requirement #2, the ordinance or regulatory mechanism shall include appropriate, escalating enforcement sanctions for construction sites that provide notice to the Permittee of their intention to apply the waiver but do not meet the requirements (including timeframe restrictions, limits on activities that result in non-stormwater discharges, and implementation of appropriate BMPs to prevent violations of water quality standards) to qualify for the waiver.	Removed "Erosivity Waiver"	Erosivity Waiver	N		None		N		N/A	N/A	N/A
21	Phase II Permit	32	S5.C.4.a.iii	Maintenance inspection and enforcement	The legal authority, through the approval process for new development and redevelopment, to inspect and enforce maintenance standards for private stormwater facilities approved under the provisions of this section that discharge to the Permittee's MS4.	Added "redevelopment", "enforce maintenance standards", and "approved under the provisions of this section", which would appear to expand the scope and responsibility associated with this section.	Inspection authority	N	1.20 13.48.180,280, 290,435	Existing Code language in 13.48 appears adequate to allow inspections, identify owner responsibility for maintenance, and provide enforcement.		N	The requirement to conduct inspections is included elsewhere in the Permit.	December 31, 2016.	N/A	N/A
22	Phase II Permit	32	S5.C.4.b.ii	Plan review and permitting	As an alternative to evaluating each site according to Appendix 7, Permittees may choose to inspect all construction sites that meet the minimum thresholds adopted pursuant to S5.C.4.a.i, above.	Added alternative to existing Appendix 7 requirements (allows Permittee to inspect all construction sites that meet minimum thresholds instead of evaluating sediment transport potential). Optional.	Plan review	N	13.48.290	None		N	Allow flexibility in plan review and inspection.	N/A	N/A	N/A

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
23	Phase II Permit	33	S5.C.4.c	Long term O&M program	The program shall include provisions to verify adequate long-term operation and maintenance (O&M) of stormwater treatment and flow control BMPs/facilities that are permitted and constructed pursuant to (b) above. Except for Permittees located in Lewis or Cowlitz Counties and the City of Aberdeen, these provisions shall be in place no later than December 31, 2016.	Revised deadline for adequate long term O&M of stormwater treatment and flow control BMPs/facilities.	Facility inspection	N	13.48.180, 225, 435, 440	Existing Code language in 13.48 appears adequate to allow inspections, identify owner responsibility for maintenance, and provide enforcement.		Y	Inform Permit applicants of inspection requirements and maintenance obligations. Continue annual inspections of stormwater facilities approved under the 2007 and 2012 Permits, and incorporate any newly constructed facilities. Because of the revised MR 5 requirements related to LID, this may include a substantial number of future facilities. May be sensitive, City may need to conduct education for property owners regarding potential inspections on private property.	December 31, 2016.	High	High
24	Phase II Permit	34	S5.C.4.c.iv	Site inspection Requirement	Inspections of all permanent stormwater treatment and flow control BMPs/facilities and catch basins in new residential developments every six months until 90% of the lots are constructed (or when construction is stopped and the site is fully stabilized) to identify maintenance needs and enforce compliance with maintenance standards as needed.	Added the requirement of inspections until 90% of lots are constructed (or when construction is stopped and the site is fully stabilized).	Facility inspection	Y	13.48.180.D	Existing Code language allows City inspections for the duration of construction. Code specifies inspections until 50% build-out is achieved; update to match Permit requirement of 90% build-out.		Y	Inspect ongoing residential developments at least every six months. With change in requirements from 50% build-out to 90% build-out, this may result in additional inspections. If needed, add or highlight inspection requirements in construction permitting materials for residential developments.	Ongoing Requirement	Medium	Low
25	Phase II Permit	34	S5.C.4.c.v	Site inspection Requirement	Compliance with the inspection requirements in (iii) and (iv) above shall be determined by the presence and records of an established inspection program designed to inspect all sites. Compliance during this permit term shall be determined by achieving at least 80% of scheduled inspections.	Added the requirement of at least 80% of scheduled inspections for compliance.	Inspection records	N		None		Y	Continue completing annual inspections for O&M purposes, regular inspections of construction sites, maintain records, and document 80% completion rate for compliance.	Ongoing Requirement	Medium	Low
26	Phase II Permit	36	S5.C.4.f.i	LID code requirements	No later than December 31, 2016, Permittees shall review, revise and make effective their local development-related codes, rules, standards, or other enforceable documents to incorporate and require LID principles and LID BMPs. The intent of the revisions shall be to make LID the preferred and commonly-used approach to site development. The revisions shall be designed to minimize impervious surfaces, native vegetation loss, and stormwater runoff in all types of development situations. Permittees shall conduct a similar review and revision process, and consider the range of issues, outlined in the following document: Integrating LID into Local Codes: A Guidebook for Local Governments (Puget Sound Partnership, 2012).	Added deadline for local program updates to require LID Principles and LID BMPs	LID	Y	13.48.225 Various other ACC sections	Conduct a process to review and revise LID-related Codes, policies, and standards. Evaluate LID requirements relative to existing Code and City's historical experience with stormwater management. Developing a holistic strategy for incorporating LID (to the extent feasible) into City Codes, policies, and development standards will likely require a substantial effort with multiple stakeholders.	Existing Code allows LID implementation, subject to approval.	Y	See Code entry at left. This "LID Principle" requirement will affect codes/policies other than those that are strictly stormwater - e.g. land use, zoning, roads, etc. Monitor the status and results of ongoing appeals to the Permit. This requirement, collectively with the following line item, is one of the most substantive changes in the new Permit.	December 31, 2016.	High	High
27	Phase II Permit	36	S5.C.4.f.ii	LID code requirements	Except for Permittees in Lewis and Cowlitz Counties and the City of Aberdeen, each Permittee shall submit a summary of the results of the review and revision process in (i) above with the annual report due no later than March 31, 2017 . Permittees in Lewis and Cowlitz counties shall submit the summary with the annual report due no later than March 31, 2018. The City of Aberdeen shall submit the summary with the Fifth Year annual report. This summary shall include, at a minimum, a list of the participants (job title, brief job description, and department represented), the codes, rules, standards, and other enforceable documents reviewed, and the revisions made to those documents which incorporate and require LID principles and LID BMPs. The summary shall include existing requirements for LID principles and LID BMPs in development related codes. The summary shall be organized as follows: a. Measures to minimize impervious surfaces; b. Measures to minimize loss of native vegetation; and c. Other measures to minimize stormwater runoff	Requires Permittee to submit a summary of results and review and revision process in S5.C.4.f.i. (Code incorporating LID Principles and LID BMP) with the Annual Report due on March 31, 2017.	LID revision process	N		None	Potential for policy debate.	Y	Compile and submit a summary of the LID review and revision process no later than March 31, 2017.	March 31, 2017.	High	High
28	Phase II Permit	37	S5.C.4.g.	Watershed Planning	Watershed-scale stormwater planning Each Permittee that has all or part of its coverage area under this Permit in a watershed selected by a Phase I county for watershed-scale stormwater planning under condition S5.C.4.c of the Phase I Municipal Stormwater General Permit shall participate in the watershed-scale stormwater planning process led by the Phase I county. [Permittee may be required to provide data, mapping, "monitoring locations", and participate in "development of strategies to prevent future and address existing impacts"]	Counties are required to complete watershed planning for a selected watershed.	Watershed planning	N				Y	Monitor King and Pierce County activities related to watershed planning. Watersheds likely to be selected by each County appear to lie outside of Auburn, but that could be subject to change.	N/A	Low	Low
29	Phase II Permit	38	S5.C.5.a	Municipal O&M	Except for Permittees located in Lewis and Cowlitz Counties and the City of Aberdeen, no later than December 31, 2016, Permittees shall update their maintenance standards as necessary to meet the requirements of this section.	Updated deadline for maintenance standard updates.	Maintenance standard update	N		None	City facility SWPPPs Auburn SWMM CarteGraph tracking systems	Y	Review City maintenance standards (SWPPPs, SOPs, SWMM BMPs, City inspection schedules/CarteGraph tracking, other) relative to new requirements in S5.C.5, and update if needed. SWPPPs appear unlikely to require update.	December 31, 2016.	Medium	Medium
30	Phase II Permit	39	S5.C.5.d	Municipal O&M	Except for the City of Aberdeen, inspection of all catch basins and inlets owned or operated by the Permittee at least once no later than August 1, 2017 and every two years thereafter.	Added deadline and frequency for catch basin and inlet inspection.	Catch basins/inlets inspection	N		None	City's 2012 Annual Report indicates there are 10,621 known catch basins. Approximately 41% were inspected and of those, about 13% were cleaned in 2012.	Y	Continue inspection and cleaning of catch basins currently conducted. Meet at a minimum one inspection of each catch basin by August 1, 2017, and at least once every two years thereafter, or justify a longer cycle (see below). The City is currently inspecting on a 3-year rotating basis.	August 1, 2017, then every 2 years ongoing.	Low	Low
31	Phase II Permit	39	S5.C.5.d.i	Municipal O&M	The catch basin inspection schedule of every two years may be changed as appropriate to meet the maintenance standards based on maintenance records of double the length of time of the proposed inspection frequency. In the absence of maintenance records for catch basins, the Permittee may substitute written statements to document a specific, less frequent inspection schedule. Written statements shall be based on actual inspection and maintenance experiences and shall be certified in accordance with G19 Certification and Signature.	Added alternative approach to catch basin inspection.	Catch basins/inlets inspection alternative	N		None		Y	The City indicated in workshops that using past maintenance records to justify continuing on a 3-year rotation is likely the preferred approach. If this approach is selected, compile and submit maintenance records to Ecology.	Ongoing Requirement	Low	Low
32	Phase II Permit	40	S5.C.5.d.ii	Municipal O&M	Inspections at least once by August 1, 2017 and every two years thereafter may be conducted on a "circuit basis" whereby 25% of catch basins and inlets within each circuit are inspected to identify maintenance needs.	Added deadline and 25% threshold.	Catch basins/inlets inspection	N		None		N	Allow flexibility in catch basin inspections if conducted on a "circuit basis".	August 1, 2017, then every 2 years ongoing.	N/A	N/A

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
33	Phase II Permit	40	S5.C.5.d.iii	Municipal O&M	The Permittee may clean all pipes, ditches, catch basins, and inlets within a circuit once during the permit term. Circuits selected for this alternative must drain to a single point.	Added pipes and ditches.	Catch basins/inlets inspection	N		None		N	Allow flexibility in catch basin inspections if conducted on a "circuit basis".	August 1, 2017, then every 2 years ongoing.	N/A	N/A
34	Phase II Permit	40	S5.C.5.f	Municipal O&M	Implement practices, policies and procedures to reduce stormwater impacts associated with runoff from all lands owned or maintained by the Permittee, and road maintenance activities under the functional control of the Permittee. Lands owned or maintained by the Permittee include, but are not limited to, streets, parking lots, roads, highways, buildings, parks, open space, road right-of-ways, maintenance yards, and stormwater treatment and flow control BMPs/facilities.	Updated list of lands owned or maintained by Permittee to include buildings, parks, open spaces, road rights-of-way, maintenance yards, and stormwater facilities.	Runoff control/WQ	N		None		Y	Review potential need for additional policies and procedures to address stormwater impacts from the noted areas.	Ongoing Requirement	Medium	Medium
35	Phase II Permit	52	S7.A.	TMDL requirement	Each annual report shall include a summary of relevant SWMP and Appendix 2 activities conducted in the TMDL area to address the applicable TMDL parameter(s).	Added requirement to be included in Annual Report.	TMDL reporting	N		None	The White River in Auburn has a fecal coliform TMDL. Other TMDLs are possible in the future.	Y	Include summary of relevant SWMP and Appendix 2 activities related to applicable TMDLs in Annual Report.	Ongoing Requirement	Low/ Medium	Low
36	Phase II Permit	53	S8.B	Monitoring and Assessment	[Summary] [By December 1, 2013, notify Ecology which of the following options are to be adopted for status and trends monitoring for each permit cycle for small streams and marine nearshore status and trends monitoring in Puget Sounds: - Option 1: Pay into a collective fund to implement a Regional Stormwater Management Program (RSMP) for small streams and marine nearshore status trends due to Ecology annually beginning August 15, 2014. (Auburn cost per Ecology: $16,914). - Option 2: Beginning July 31, 2014, conduct wadeable stream water quality, benthos, habitat, and sediment chemistry monitoring at the frequencies as specified in the Permit. In addition, beginning October 1, 2015, conduct sediment chemistry, mussel, and bacteria monitoring according to the Permit requirements. All the data and analyses should be reported annually according to the Ecology-approved Quality Assurance Project Plans (QAPPs).]	Section 8 wholly replaced. City must choose between the two options for implementing RSMP for small streams and marine nearshore.	Monitoring and Assessment	N		None		Y	The City has notified Ecology of its intention to participate in the RSMP, in lieu of conducting independent monitoring. The City's annual payment amount to participate in the state program is listed as $16,914. The deadline to notify Ecology of the City's selected approach was December 1, 2013.	August 15, 2014, and annually thereafter.	Low/ Medium	Low
37	Phase II Permit	56	S8.C	Monitoring and Assessment	[Summary] [By December 1, 2013, notify Ecology which of the following options are to be adopted for SWMP effectiveness studies for each permit cycle: - Option 1: Pay into collective fund to implement RSMP effectiveness studies due to Ecology annual beginning August 15, 2014. (Auburn cost per Ecology: $28,182) - Option 2: By February 2, 2014, submit a draft stormwater discharge monitoring QAPP to Ecology describing why selected discharge monitoring locations are of interest for monitoring and evaluations. Monitor at locations chosen and submitted in the annual reports that were due March 31, 2011.]	Section 8 wholly replaced. City must choose between the two options for implementing RSMP effectiveness studies.	Monitoring and Assessment	N		None		Y	Determine City's approach for SWMP effectiveness studies: either pay into the RSMP, or conduct independent studies. The City's annual payment amount to participate in the state program is listed as $28,182. The deadline to notify Ecology of the City's selected approach was December 1, 2013.	August 15, 2014, and annually thereafter.	Low/ Medium	Low
38	Phase II Permit	59	S8.D	Monitoring and Assessment	Source identification and diagnostic monitoring. Each city and county Permittee listed in S1.D.2.a(i) and S1.D.2.a(ii) shall pay into a collective fund to implement the RSMP Source Identification Information Repository (SIDIR). The payments into the collective fund are due to Ecology annually beginning August 15, 2014. (Auburn cost per Ecology: $2,614).	Section 8 wholly replaced. City required to participate in pay-in monitoring program.	Monitoring and Assessment	N		None		Y	Pay into the collective fund annually beginning August 15, 2014. The City's annual payment amount is listed as $2,614.	August 15, 2014, and annually thereafter.	Low	Low
39	Phase II Permit	60	S9.A	Reporting Requirements	Permittees shall submit annual reports electronically using Ecology's WQWebDMR available on Ecology's website at http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html unless otherwise directed by Ecology. Permittees unable to submit electronically through Ecology's WQWebDMR must contact Ecology to request a waiver and obtain instructions on how to submit an annual report in an alternative format.	Added electronic format requirement for Annual Report (first Annual Report will be due March 31, 2015, covering activities for 2014.)	Annual Report	N		None		Y	New Annual Report format to be used.	Ongoing Requirement	Low	Low
40	Phase II Permit	66	G9.F	Lab Accreditation	Quick methods of field detection of pollutants including nutrients, surfactants, salinity, and other parameters are exempted from this [lab accreditation] requirement when the purpose of the sampling is identification and removal of a suspected illicit discharge.	Added instances where labs are exempt from being registered or accredited under Accreditation of Environmental Laboratories, Chapter 173-50 WAC.	Monitoring	N		None		N	Note the change in instances where labs are exempt from being registered or accredited.	N/A	N/A	N/A
41	Phase II Permit	67	G10	Removed Substances	Solids generated from maintenance of the MS4 may be reclaimed, recycled, or reused when allowed by local codes and ordinances. Soils that are identified as contaminated pursuant to chapter 173-350 WAC shall be disposed at a qualified solid waste disposal facility (see Appendix 6).	Added solid disposal requirements.	Monitoring	N		None		N	Ensure proper disposal of solids generated from maintenance of MS4.	N/A	N/A	N/A
42	Phase II Permit	71	Definitions	Definition	[Text added to the definition of AKART] See also State Water Pollution Control Act, chapter 90.48.010 RCW and chapter 90.48.520 RCW.	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
43	Phase II Permit	71	Definitions	Definition	Applicable TMDL means a TMDL which has been approved by EPA on or before the issuance date of this Permit, or prior to the date that Ecology issues coverage under this Permit, whichever is later.	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
44	Phase II Permit	72	Definitions	Definition	Census defined urban area means Urbanized Area	New definition	Definitions	N		None		N		N/A	N/A	N/A
45	Phase II Permit	72	Definitions	Definition	Circuit means a portion of a MS4 discharging to a single point or serving a discrete area determined by traffic volumes, land use, topography or the configuration of the MS4.	New definition	Definitions	N		None		N		N/A	N/A	N/A
46	Phase II Permit	72	Definitions	Definition	Component or Program Component means an element of the Stormwater Management Program listed in S5 Stormwater Management Program for Cities, Towns, and Counties or S6 Stormwater Management Program for Secondary Permittees, S7 Compliance with Total Maximum Daily Load Requirements, or S8 Monitoring of this permit.	Revised definition to include "S7 Compliance with Total Maximum Daily Load Requirements, and S8 Monitoring"	Definitions	N		None		N		N/A	N/A	N/A
47	Phase II Permit	72	Definitions	Definition	Co-Permittee means owner or operator of an MS4 which is in a cooperative agreement with at least one other applicant for coverage under this Permit.	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
48	Phase II Permit	73	Definitions	Definition	Hazardous substance means any liquid, solid, gas, or sludge, including any material, substance, product, commodity, or waste, regardless of quantity, that exhibits any of the physical, chemical, or biological properties described in WAC 173-303-090 or WAC 173-303-100.	New definition	Definitions	Y	18.04.453	Consider adding definition to ACC 13.48.010		N		N/A	Low	Low/ Medium
49	Phase II Permit	73	Definitions	Definition	Highway means a main public road connecting towns and cities.	New definition	Definitions	N		None		N		N/A	N/A	N/A

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50	Phase II Permit	73	Definitions	Definition	Illicit connection means any infrastructure connection to the MS4 that is not intended, permitted or used for collecting and conveying stormwater or non-stormwater discharges allowed as specified in this permit (S5.C.3 and S6.D.3). Examples include sanitary sewer connections, floor drains, channels, pipelines, conduits, inlets, or outlets that are connected directly to the MS4.	Revised definition	Definitions	Y	13.48.010	Consider updating Code definition of "Illicit connection" consistent with updated Permit definition.		N		N/A	Low	Low/ Medium
51	Phase II Permit	73	Definitions	Definition	Illicit discharge means any discharge to a MS4 that is not composed entirely of stormwater or of non-stormwater discharges allowed as specified in this permit (S5.C.3 and S6.D.3).	Revised definition	Definitions	Y	13.48.010	Consider updating Code definition of "Illicit discharge" consistent with updated Permit definition.		N		N/A	Low	Low/ Medium
52	Phase II Permit	73	Definitions	Definition	Impervious surface means a non-vegetated surface area that either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A non-vegetated surface area which causes water to run off the surface in greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or stormwater areas, concrete or asphalt paving, gravel roads, packed earthen materials, and oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater.	New definition	Definitions	Y	13.48.010 13.48.100.G	Consider updating Code definition of "impervious surface" consistent with updated Permit definition.		Y	Note new definition, and how it relates to definition of Hard Surface, Item 84. City currently assesses stormwater ESU's based on total impervious surfaces. As less impervious surface construction and more use of LID is required, the stormwater utility will potentially start seeing a decline in revenue - both from the impact fee collected at the time of site development permit issuance, as well as the bi-monthly utility fee. One approach could be to change the word in code to 'hard surface' instead of impervious, but this issue requires additional City review to confirm.	N/A	Low	Low/ Medium
53	Phase II Permit	74	Definitions	Definition	Land disturbing activity means any activity that results in a change in the existing soil cover (both vegetative and non-vegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to clearing, grading, filling and excavation. Compaction that is associated with stabilization of structures and road construction shall also be considered land disturbing activity. Vegetation maintenance practices, including landscape maintenance and gardening, are not considered land disturbing activity. Stormwater facility maintenance is not considered land disturbing activity if conducted according to established standards and procedures.	New definition	Definitions	Y	13.48.010	Consider updating Code definition of "land disturbing activity" consistent with updated Permit definition.		N		N/A	Low	Low/ Medium
54	Phase II Permit	74	Definitions	Definition	LID means Low Impact Development	New definition	Definitions	N		None		N		N/A	N/A	N/A
55	Phase II Permit	74	Definitions	Definition	LID BMP means low impact development best management practices	New definition	Definitions	N		None		N		N/A	N/A	N/A
56	Phase II Permit	74	Definitions	Definition	Low Impact Development means a stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.	Revised definition	Definitions	Y	13.48.010 18.04.595	Consider updates to the Code definition of LID based on the revised Permit definition.		N		N/A	Low	Low/ Medium
57	Phase II Permit	74	Definitions	Definition	Low impact development best management practices means distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, vegetated roofs, minimum excavation foundations, and water re-use.	New definition	Definitions	N		This new definition may prove useful to add to the City Code, depending on the approach the City identifies for LID.		N	Note the updated definition.	N/A	N/A	N/A
58	Phase II Permit	75	Definitions	Definition	MS4 means municipal separate storm sewer system	New definition	Definitions	N		None		N		N/A	N/A	N/A
59	Phase II Permit	75	Definitions	Definition	[Text added to definition of Municipal Separate Sewer System] (v) Which is defined as "large" or "medium" or "small" or otherwise designated by Ecology pursuant to 40 CFR 122.26	Revised definition- Added clarification of conveyance or a system of conveyances	Definitions	N		Changes don't appear to impact existing City Code language.		N		N/A	N/A	N/A
60	Phase II Permit	76	Definitions	Definition	Native vegetation means vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and which reasonably could have been expected to naturally occur on the site. Examples include trees such as Douglas Fir, western hemlock, western red cedar, alder, big-leaf maple; shrubs such as willow, elderberry, salmonberry, and salal; and herbaceous plants such as sword fern, foam flower, and fireweed	New definition	Definitions	N		None		N	Note the updated definition.	N/A	N/A	N/A
61	Phase II Permit	76	Definitions	Definition	New development means land disturbing activities, including Class IV General Forest Practices that are conversions from timber land to other uses; structural development, including construction or installation of a building or other structure; creation of hard surfaces; and subdivision, short subdivision and binding site plans, as defined and applied in chapter 58.17 RCW. Projects meeting the definition of redevelopment shall not be considered new development. Refer to Appendix 1 for a definition of hard surfaces.	New definition	Definitions	N	13.48.010	Consider updates to the Code definition of new development based on the revised Permit definition.		N		N/A	N/A	N/A
62	Phase II Permit	76	Definitions	Definition	New Permittee means a city, town, or county that is subject to the Western Washington Municipal Stormwater General Permit and was not subject to the permit prior to August 1, 2013.	New definition	Definitions	N		None		N		N/A	N/A	N/A
63	Phase II Permit	76	Definitions	Definition	Outfall means point source as defined by CFR 122.2 at the point where a discharge leaves the MS4 and discharges to waters of the State. Outfall does not include pipes, tunnels, or other conveyances which connect segments of the same stream or other surface waters and are used to convey primarily surface waters (i.e. culverts).	Revised definition - Replaced "waters of the State" with "surface waters" and specified "culverts" and the means to convey primarily surface waters.	Definitions	N		None		N		N/A	N/A	N/A
64	Phase II Permit	77	Definitions	Definition	Project site means that portion of a property, properties, or right-of-ways subject to land disturbing activities, new hard surfaces, or replaced hard surfaces. Refer to Appendix 1 for a definition of hard surfaces.	New definition	Definitions	N		None		N		N/A	N/A	N/A
65	Phase II Permit	77	Definitions	Definition	Quality Assurance Project Plan means a document that describes the objectives of an environmental study and the procedures to be followed to achieve those objectives.	New definition	Definitions	N		None		N		N/A	N/A	N/A
66	Phase II Permit	77	Definitions	Definition	Redevelopment means, on a site that is already substantially developed (i.e., has 35% or more of existing hard surface coverage), the creation or addition of hard surfaces; the expansion of a building footprint or addition or replacement of a structure; structural development including construction, installation or expansion of a building or other structure; replacement of hard surface that is not part of a routine maintenance activity; and land disturbing activities. Refer to Appendix 1 for a definition of hard surfaces.	New definition	Definitions	N	13.48.010	Consider updates to the Code definition of redevelopment based on the revised Permit definition.		N		N/A	N/A	N/A

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67	Phase II Permit	78	Definitions	Definition	Regional Stormwater Monitoring Program means, for all of western Washington, a stormwater-focused monitoring and assessment program consisting of these components: status and trends monitoring in small streams and marine nearshore areas, stormwater management program effectiveness studies, and a source identification information repository (SIDIR). The priorities and scope for the RSMP are set by a formal stakeholder group. For this permit term, RSMP status and trends monitoring will be conducted in the Puget Sound basin only.	New definition	Definitions	N		None		N		N/A	N/A	N/A
68	Phase II Permit	78	Definitions	Definition	Sediment/Erosion-Sensitive Feature means an area subject to significant degradation due to the effect of construction runoff, or areas requiring special protection to prevent erosion. See Appendix 7 Determining Construction Site Sediment Transport Potential for a more detailed definition.	New definition	Definitions	N		None		N		N/A	N/A	N/A
69	Phase II Permit	78	Definitions	Definition	SIDIR means Source Identification Information Repository.	New definition	Definitions	N		None		N		N/A	N/A	N/A
70	Phase II Permit	78	Definitions	Definition	Small Municipal Separate Storm Sewer System means an MS4 that is not defined as "large" or "medium" pursuant to 40 CFR 122.26(b)(4) & (7) or designated under 40 CFR 122.26 (a)(1)(v).	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
71	Phase II Permit	79	Definitions	Definition	Source control BMP means a structure or operation that is intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. The SWMMWW (2012) separates source control BMPs into two types. Structural Source Control BMPs are physical, structural, or mechanical devices, or facilities that are intended to prevent pollutants from entering stormwater. Operational BMPs are non-structural practices that prevent or reduce pollutants from entering stormwater. See Volume IV of the SWMMWW (2012) for details.	New definition	Definitions	Y	13.48.010	Consider referencing updated Auburn SWMM in definition of "Source Control BMP"		N	Note new definition, and how it may relate to operations and maintenance standards.	N/A	Low	Low
72	Phase II Permit	79	Definitions	Definition	Stormwater Management Program means a set of actions and activities designed to reduce the discharge of pollutants from the MS4 to the MEP and to protect water quality, and comprising the components listed in S5 (for cities, towns and counties) or S6 (for Secondary Permittees) of this Permit and any additional actions necessary to meet the requirements of applicable TMDLs pursuant to S7 Compliance with TMDL requirements, and S8 Monitoring and Assessment.	Revised definition to highlight the components listed in S5, S6, S7, and S8.	Definitions	N		None		N		N/A	N/A	N/A
73	Phase II Permit	80	Definitions	Definition	Stormwater Treatment and Flow Control BMPs/Facilities means detention facilities, treatment BMPs/facilities, bioretention, vegetated roofs, and permeable pavements that help meet Appendix 1 Minimum Requirements #6 (treatment), #7 (flow control), or both.	New definition	Definitions	N		None		N		N/A	N/A	N/A
74	Phase II Permit	80	Definitions	Definition	Tributary conveyance means pipes, ditches, catch basins, and inlets owned or operated by the Permittee and designed or used for collecting and conveying stormwater.	New definition	Definitions	N		None		N		N/A	N/A	N/A
75	Phase II Permit	80	Definitions	Definition	Urban Growth Area means those areas designated by a county pursuant to RCW 36.70A.110.	New definition	Definitions	N		None		N		N/A	N/A	N/A
76	Phase II Permit	80	Definitions	Definition	[Text added to the definition of Urbanized Area] Urbanized Areas are designated by the U.S. Census Bureau based on the most recent decennial census.	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
77	Phase II Permit	81	Definitions	Definition	Waters of the United States refers to the definition in 40 CFR 122.2.	New definition	Definitions	N		None		N		N/A	N/A	N/A
78	Phase II Permit Appendix 1	2	2	Definitions	Arterial - A road or street primarily for through traffic. The term generally includes roads or streets considered collectors. It does not include local access roads which are generally limited to providing access to abutting property. See also RCW 35.78.010, RCW 36.86.070, and RCW 47.05.021.	Revised definition to more clearly define an arterial	Definitions	N		None		N		N/A	N/A	N/A
79	Phase II Permit Appendix 1	2	2	Definitions	Bioretention - Engineered facilities that treat stormwater by passing it through a specified soil profile, and either retain or detain the treated stormwater for flow attenuation. Refer to the SWMMWW 2012 Ch. 7 of Vol V for Bioretention BMP types and design specifications.	New definition	Definitions	N		None		N		N/A	N/A	N/A
80	Phase II Permit Appendix 1	3	2	Definitions	Commercial Agriculture means those activities conducted on lands defined in RCW 84.34.020(2) and activities involved in the production of crops or livestock for commercial trade. An activity ceases to be considered commercial agriculture when the area on which it is conducted is proposed for conversion to a nonagricultural use or has lain idle for more than five years, unless the idle land is registered in a federal or state soils conservation program, or unless the activity is maintenance of irrigation ditches, laterals, canals, or drainage ditches related to an existing and ongoing agricultural activity.	New definition	Definitions	N		None		N		N/A	N/A	N/A
81	Phase II Permit Appendix 1	3	2	Definitions	Converted vegetation (areas) - The surfaces on a project site where native vegetation, pasture, scrub/shrub, or unmaintained non-native vegetation (e.g., himalayan blackberry, scotch broom) are converted to lawn or landscaped areas, or where native vegetation is converted to pasture.	New definition	Definitions	N		None		N		N/A	N/A	N/A
82	Phase II Permit Appendix 1	3	2	Definitions	[text added to definition of Effective Impervious Surface] 2) residential roof runoff is infiltrated in accordance with Downspout Full Infiltration Systems in BMP T5.10A in Volume III of the SWMMWW (2012); or 3) approved continuous runoff modeling methods indicate that the entire runoff file is infiltrated.	Revised definition to describe ineffective impervious surfaces	Definitions	N		None		N		N/A	N/A	N/A
83	Phase II Permit Appendix 1	3	2	Definitions	Erodible or leachable materials – Wastes, chemicals, or other substances that measurably alter the physical or chemical characteristics of runoff when exposed to rainfall. Examples include erodible soils that are stockpiled, uncovered process wastes, manure, fertilizers, oily substances, ashes, kiln dust, and garbage dumpster leakage.	New definition - previously contained within definition of PGIS	Definitions	N		None		N		N/A	N/A	N/A
84	Phase II Permit Appendix 1	3	2	Definitions	Hard Surface – An impervious surface, a permeable pavement, or a vegetated roof.	New definition	Definitions	Y	13.48.100 13.48.110 13.48.230	Because the Code determination for stormwater rates and charges is based on impervious square footage, the Permit language substituting “hard surface” for “impervious surface” may be something to consider in future rate structure revisions.		N	Note new definition, and how it relates to definition of Impervious Surface, Item 52. City currently assesses stormwater ESU's based on total impervious surfaces. As less impervious surface construction and more use of LID is required, the stormwater utility will potentially start seeing a decline in revenue - both from the impact fee collected at the time of site development permit issuance, as well as the bi-monthly utility fee. One approach could be to change the word in code to 'hard surface' instead of impervious, but this issue requires additional City review to confirm.	N/A	Low	Low/ Medium
85	Phase II Permit Appendix 1	3	2	Definitions	[Revised definition of impervious surface from "hard surface area" to "non-vegetated surface area"]	Revised definition	Definitions	Y	13.48.100	None		N	Refer to the definition of Hard Surface, Item 84.	N/A	Low	Low/ Medium

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86	Phase II Permit Appendix 1	4	2	Definitions	[Text added to definition of Land Disturbing Activity] Vegetation maintenance practices, including landscaping maintenance and gardening, are not considered land-disturbing activity. Stormwater facility maintenance is not considered land disturbing activity if conducted according to established standards and procedures.	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
87	Phase II Permit Appendix 1	4	2	Definitions	Low Impact Development (LID) – A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.	New definition	Definitions	Y	13.48.101 18.04.595	Consider updating Code definition of "Low Impact Development" consistent with updated Permit definition.		N		N/A	Low	Low/ Medium
88	Phase II Permit Appendix 1	4	2	Definitions	LID Best Management Practices – Distributed stormwater management practices, integrated into a project design, that emphasize pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration. LID BMPs include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs, and water re-use.	New definition	Definitions	N		None		N		N/A	N/A	N/A
89	Phase II Permit Appendix 1	4	2	Definitions	LID Principles – Land use management strategies that emphasize conservation, use of on-site natural features, and site planning to minimize impervious surfaces, native vegetation loss, and stormwater runoff.	New definition	Definitions	N		None		N		N/A	N/A	N/A
90	Phase II Permit Appendix 1	4	2	Definitions	[Added text to the definition of Maintenance:] In regard to stormwater facilities, maintenance includes assessment to ensure ongoing proper operation, removal of built up pollutants (i.e. sediments), replacement of failed or failing treatment media, and other actions taken to correct defects as identified in the maintenance standards of Chapter 4, Volume V of the SMMWW. See also Pavement Maintenance exemptions in Section 1 of this Appendix.	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
91	Phase II Permit Appendix 1	5	2	Definitions	On-site Stormwater Management BMPs: As used in this appendix, a synonym for Low Impact Development BMPs.	New definition	Definitions	N		None		N		N/A	N/A	N/A
92	Phase II Permit Appendix 1	5	2	Definitions	Permeable pavement – Pervious concrete, porous asphalt, permeable pavers or other forms of pervious or porous paving material intended to allow passage of water through the pavement section. It often includes an aggregate base that provides structural support and acts as a stormwater reservoir.	New definition	Definitions	N		None		N		N/A	N/A	N/A
93	Phase II Permit Appendix 1	5	2	Definitions	Pervious Surface – Any surface material that allows stormwater to infiltrate into the ground. Examples include lawn, landscape, pasture, native vegetation areas, and permeable pavements.	New definition	Definitions	N		None		N		N/A	N/A	N/A
94	Phase II Permit Appendix 1	5	2	Definitions	Pollution-generating hard surface (PGHS) – Those hard surfaces considered to be a significant source of pollutants in stormwater runoff. See the listing of surfaces under pollution-generating impervious surface.	New definition	Definitions	N		None		N	Note potential impacts of updated definitions (hard/impervious/pervious).	N/A	N/A	N/A
95	Phase II Permit Appendix 1	5	2	Definitions	Pollution-generating impervious surface (PGIS) – Those impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those which are subject to: vehicular use; industrial activities (as further defined in the glossary of the SWMMWW (2012)); storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall; metal roofs unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating); or roofs that are subject to venting significant amounts of dusts, mists, or fumes from manufacturing, commercial, or other indoor activities.	Revised definition - moved text defining erodible and leachable materials to a separate new definition. Also added the final example of roofs subject to venting.	Definitions	N		None		N	Note potential impacts of updated definitions (hard/impervious/pervious).	N/A	N/A	N/A
96	Phase II Permit Appendix 1	5	2	Definitions	Pollution-generating pervious surfaces (PGPS) – Any non-impervious surface subject to vehicular use, industrial activities (as further defined in the glossary of the SWMMWW (2012)); or storage of erodible or leachable materials, wastes, or chemicals, and that receive direct rainfall or run-on or blow-in of rainfall, use of pesticides and fertilizers, or loss of soil. Typical PGPS include permeable pavement subject to vehicular use, lawns, and landscaped areas including: golf courses, parks, cemeteries, and sports fields (natural and artificial turf).	Revised definition - added text for additional use types and for permeable pavement subject to vehicular use.	Definitions	N		None		N	Note potential impacts of updated definitions (hard/impervious/pervious).	N/A	N/A	N/A
97	Phase II Permit Appendix 1	6	2	Definitions	Rain Garden – A non-engineered shallow landscaped depression, with compost-amended native soils and adapted plants. The depression is designed to pond and temporarily store stormwater runoff from adjacent areas, and to allow stormwater to pass through the amended soil profile. Refer to the Rain Garden Handbook for Western Washington Homeowners (WSU 2007 or as revised) for rain garden specifications and construction guidance.	New definition	Definitions	N		None		N		N/A	N/A	N/A
98	Phase II Permit Appendix 1	6	2	Definitions	[Added the following text to the definition of Receiving waters:] Ground water to which surface runoff is directed by infiltration.	Revised definition	Definitions	N		None		N		N/A	N/A	N/A
99	Phase II Permit Appendix 1	6	2	Definitions	Replaced hard surface: For structures, the removal and replacement of hard surfaces down to the foundation. For other hard surfaces, the removal down to bare soil or base course and replacement.	New definition	Definitions	N		None		N		N/A	N/A	N/A
100	Phase II Permit Appendix 1	8	2	Definitions	Vehicular Use – Regular use of an impervious or pervious surface by motor vehicles. The following are subject to regular vehicular use: roads, un-vegetated road shoulders, bike lanes within the traveled lane of a roadway, driveways, parking lots, unrestricted access fire lanes, vehicular equipment storage yards, and airport runways. The following are not considered subject to regular vehicular use: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles, restricted access fire lanes, and infrequently used maintenance access roads.	New definition, but was included in 2005 SWMMWW, Volume I	Definitions	N		None		N		N/A	N/A	N/A
101	Phase II Permit Appendix 1	9	3.1	Minimum Requirement Thresholds	Use the thresholds in sections 3.2 and 3.3 at the time of application for a subdivision, plat, short plat, building permit, or other construction permit. The plat or short plat approval shall identify all stormwater BMPs that are required for each lot. For projects involving only land disturbing activities, (e.g., clearing or grading), the thresholds apply at the time of application for the permit allowing or authorizing that activity. Note the exemption in Section 1 for forest practices other than Class IV General.	Added clarification to type of project applications requiring application of the minimum requirements.	Thresholds	Y	13.48.230	In most cases, the Code references the Auburn SWMM for applicable MR thresholds. Updates are needed to ACC 13.48.230, which is the exception. If the City updates the SWMM as an equivalent manual, SWMM updates reflecting the updated requirements will be required. If the City adopts a different manual, references throughout the Code will require update.	Auburn SWMM	Y	Auburn SWMM includes thresholds and decision flow charts similar to those in Appendix 1. Both will need to be refreshed with updated requirements. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Medium	High

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102	Phase II Permit Appendix 1	10 11	3.2, 3.3	Minimum Requirement Thresholds	[Replaces instances of "impervious surface area" with "hard surface area" Removes "native" from converted vegetation references.]	New definition adds permeable pavement and vegetated roofs to hard surface threshold assessment.	Definitions	Y	13.48.100 13.48.110 13.48.230	Because the Code determination for stormwater rates and charges is based on impervious square footage, the Permit language substituting “hard surface” for “impervious surface” may be something to consider in future rate structure revisions.		Y	Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. City currently assesses stormwater ESU's based on total impervious surfaces. As less impervious surface construction and more use of LID is required, the stormwater utility will potentially start seeing a decline in revenue - both from the impact fee collected at the time of site development permit issuance, as well as the bi-monthly utility fee. One approach could be to change the word in code to 'hard surface' instead of impervious, but this issue requires additional City review to confirm.	N/A	Low	Low
103	Phase II Permit Appendix 1	13	3.4	Additional Requirements for Re-development Project Sites	[Add converted vegetation areas to surfaces required to meet all MRs if applicable thresholds are triggered.]	Adds "converted vegetation" to Permit language	Language change	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
104	Phase II Permit Appendix 1	14	4.1	Min. Req. #1: Preparation of Stormwater Site Plans	Stormwater Site Plans shall use site-appropriate development principles, as required and encouraged by local development codes, to retain native vegetation and minimize impervious surfaces to the extent feasible.	New language. Adds LID related language to Min Req #1	Site Plans	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
105	Phase II Permit Appendix 1	15	4.2	Min. Req. #2: General Requirements	Each of the thirteen elements listed below must be considered and included in the SWPPP unless site conditions render the element unnecessary and the exemption from the element is clearly justified in the narrative of the SWPPP.	Adds a new Element #13 for SWPPP preparation (Protect LID BMPs)	SWPPP/CSCP elements	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
106	Phase II Permit Appendix 1	15	4.2	Min. Req. #2: General Requirements	The SWPPP shall be implemented beginning with initial land disturbance and until final stabilization. Sediment and Erosion control BMPs shall be consistent with the BMPs contained in Chapter 4 of Volume II of the Stormwater Management Manual for Western Washington (SWMMWW)(2012).	Requires use of BMPs consistent with Vol II Ch. 4 of the SWMMWW	BMPs	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
107	Phase II Permit Appendix 1	17	4.2.4	Min. Req. #2: Install Sediment Control (Element #4)	Design, install, and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants.	New language	General	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
108	Phase II Permit Appendix 1	17	4.2.4	Min. Req. #2: Install Sediment Control (Element #4)	Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls must address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site.	New language regarding design of sediment controls	Sediment design criteria	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
109	Phase II Permit Appendix 1	18	4.2.4	Min. Req. #2: Install Sediment Control (Element #4)	Where feasible, design outlet structures that withdraw impounded stormwater from the surface to avoid discharging sediment that is still suspended lower in the water column.	New guidance language for outlet structures	Sediment outlets	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
110	Phase II Permit Appendix 1	18	4.2.5	Min. Req. #2: Stabilize Soils (Element #5)	Applicable BMPs include, but are not limited to: temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base early on areas to be paved, and dust control.	Adds guidance for BMPs	BMP guidance	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
111	Phase II Permit Appendix 1	18	4.2.5	Min. Req. #2: Stabilize Soils (Element #5)	Control stormwater volume and velocity within the site to minimize soil erosion.	New language	General	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
112	Phase II Permit Appendix 1	18	4.2.5	Min. Req. #2: Stabilize Soils (Element #5)	Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion.	New language	Control discharges	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
113	Phase II Permit Appendix 1	18	4.2.5	Min. Req. #2: Stabilize Soils (Element #5)	Minimize the amount of soil exposed during construction activity.	New language	Protect soils	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
114	Phase II Permit Appendix 1	18	4.2.5	Min. Req. #2: Stabilize Soils (Element #5)	Minimize the disturbance of steep slopes.	New language	Protect soils	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low

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115	Phase II Permit Appendix 1	18	4.2.5	Min. Req. #2: Stabilize Soils (Element #5)	Minimize soil compaction and, unless infeasible, preserve topsoil.	New language	Protect soils	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
116	Phase II Permit Appendix 1	19	4.2.6	Min. Req. #2: Protect Slopes (Element #6)	Applicable practices include, but are not limited to, reducing continuous length of slope with terracing and diversions, reducing slope steepness, and roughening slope surfaces (for example, track walking).	New language, notes practices to minimize erosion on slopes	Slopes	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
117	Phase II Permit Appendix 1	20	4.2.9	Min. Req. #2: Control Pollutants (Element #9)	Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.	New language	General	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
118	Phase II Permit Appendix 1	20	4.2.9	Min. Req. #2: Control Pollutants (Element #9)	Secondary containment means placing tanks or containers within an impervious structure capable of containing 110% of the volume contained in the largest tank within the containment structure. Double-walled tanks do not require additional secondary containment.	Adds secondary containment description	Secondary containment	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
119	Phase II Permit Appendix 1	21	4.2.9	Min. Req. #2: Control Pollutants (Element #9)	Assure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the State is prohibited.	New language prohibiting the ability to wash concrete trucks anywhere on-site.	Concrete washout	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
120	Phase II Permit Appendix 1	21	4.2.10	Min Req. #2: Control De-Watering (Element #10)	[Several changes in section] Note that "surface waters of the State" may exist on a construction site as well as off site; for example, a creek running through a site. Ecology approved on-site chemical treatment or other suitable treatment technologies.	New language Chemical or other treatment technologies change from Permittee-approved to Ecology-approved.	Dewatering	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
121	Phase II Permit Appendix 1	22	4.2.12	Min. Req. #2: Manage the Project (Element #12)	Maintain, update, and implement the SWPPP.	A paragraph with similar language was deleted later in this section, so not a significant change.	General	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
122	Phase II Permit Appendix 1	22	4.2.12	Min. Req. #2: Manage the Project (Element #12)	Project sites disturbing less than one acre may have a CESCL or a person without CESCL certification conduct inspections. By the initiation of construction, the SWPPP must identify the CESCL or inspector, who must be present on-site or on-call at all times.	Adds flexibility for small projects	CESCL requirement	N		None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
123	Phase II Permit Appendix 1	22	4.2.13	Min. Req. #2: Protect LID BMPs (Element #13)	Protect all Bioretention and Rain Garden BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden BMPs. Restore the BMPs to their fully functioning condition if they accumulate sediment during construction. Restoring the BMP must include removal of sediment and any sediment-laden Bioretention/rain garden soils, and replacing the removed soils with soils meeting the design specification.	New language, preserve the function of LID BMPs during construction	LID construction	Y	13.48.225	Add new MR 2 element to list in Code.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
124	Phase II Permit Appendix 1	23	4.2.13	Min. Req. #2: Protect LID BMPs (Element #13)	Prevent compacting Bioretention and Rain Garden BMPs by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment	New language, preserve the function of LID BMPs during construction	LID construction	Y	13.48.225	Add new MR 2 element to list in Code.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
125	Phase II Permit Appendix 1	23	4.2.13	Min. Req. #2: Protect LID BMPs (Element #13)	Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements or base materials.	New language, protect permeable pavement during construction	LID permeable pavement	Y	13.48.225	Add new MR 2 element to list in Code.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
126	Phase II Permit Appendix 1	23	4.2.13	Min. Req. #2: Protect LID BMPs (Element #13)	Pavements fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures from the local stormwater manual or the manufacturer's procedures.	New language, testing/cleaning requirements for permeable pavement	LID permeable pavement	Y	13.48.225	Add new MR 2 element to list in Code.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
127	Phase II Permit Appendix 1	23	4.2.13	Min. Req. #2: Protect LID BMPs (Element #13)	Keep all heavy equipment off existing soils under LID BMPs that have been excavated to final grade to retain the infiltration rate of the soils.	New language, manage heavy equipment	LID construction	Y	13.48.225	Add new MR 2 element to list in Code.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
128	Phase II Permit Appendix 1	23	4.5	Min. Req. #5: Applicability	Except as provided below, the Permittee must require On-site Stormwater Management BMPs in accordance with the following project thresholds, standards, and lists to infiltrate, disperse, and retain stormwater runoff on-site to the extent feasible, without causing flooding or erosion impacts	Add new thresholds, performance standards, and requirements	On-site SW management	Y	13.48.225	Update Code section to reflect changes to MR 5, and results of LID Code revision process to be conducted by City.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. As part of the effort to determine City's approach to LID, consider how local feasibility criteria may be developed (potentially as part of the SWMM) to guide LID implementation in the City.	N/A	High	High
129	Phase II Permit Appendix 1	24	4.5	Min. Req. #5: Applicability	Projects qualifying as flow control exempt in accordance with Section 4.7 of this Appendix do not have to achieve the LID performance standard, nor consider bioretention, rain gardens, permeable pavement, and full dispersion if using List #1 or List #2. However, those projects must implement BMP T5.13; BMPs T5.10A, B, or C; and BMP T5.11or T5.12, if feasible.	Applicability and requirements for flow control exempt projects. Referenced BMPs include: Soil Quality and Depth Downspout Full Infiltration Downspout Dispersion Perforated Stub-out Connections Concentrated Flow Dispersion Sheet Flow Dispersion	Flow control exempt	Y	13.48.225	Update Code section to reflect changes to MR 5, and results of LID Code revision process to be conducted by City.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. As part of the effort to determine City's approach to LID, consider how local feasibility criteria may be developed (potentially as part of the SWMM) to guide LID implementation in the City.	N/A	High	High
130	Phase II Permit Appendix 1	24	4.5	Min. Req. #5: Project Thresholds (Triggering Min. Req. #1-#5)	Projects triggering only Minimum Requirements #1 through #5 shall either: - Use On-site Stormwater Management BMPs from List #1 for all surfaces within each type of surface in List #1; or -Demonstrate compliance with the LID Performance Standard. Projects selecting this option cannot use Rain Gardens. They may choose to use Bioretention BMPs as described in the SWMMWW (2012).	New requirements under existing project thresholds	Project reqs	Y	13.48.225	Update Code section to reflect changes to MR 5, and results of LID Code revision process to be conducted by City.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. As part of the effort to determine City's approach to LID, consider how local feasibility criteria may be developed (potentially as part of the SWMM) to guide LID implementation in the City.	N/A	High	High
131	Phase II Permit Appendix 1	25	4.5	Min. Req. #5: Project Thresholds (Triggering Min. Req. #1-#9)	[New Table 4.1]	New on-site stormwater management requirements for projects triggering Min. Reqs. #1-9. New requirements relative to inside/outside UGA, and greater than/less than 5 acres.	Project reqs	Y	13.48.225	Update Code section to reflect changes to MR 5, and results of LID Code revision process to be conducted by City.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. As part of the effort to determine City's approach to LID, consider how local feasibility criteria may be developed (potentially as part of the SWMM) to guide LID implementation in the City.	N/A	High	High
132	Phase II Permit Appendix 1	25	4.5	Min. Req. #5: Low Impact Development Performance Standard (LIDPS)	Stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. Refer to the Standard Flow Control Requirement section in Minimum Requirement #7 for information about the assignment of the pre-developed condition. Project sites that must also meet minimum requirement #7 shall match flow durations between 8% of the 2-year flow through the full 50-year flow.	New LID Performance Standard	LID performance standard	Y	13.48.225	Update Code section to reflect changes to MR 5, and results of LID Code revision process to be conducted by City.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. As part of the effort to determine City's approach to LID, consider how local feasibility criteria may be developed (potentially as part of the SWMM) to guide LID implementation in the City.	N/A	High	High
133	Phase II Permit Appendix 1	25	4.5	Min. Req. #5: List#1	(See List #1: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #5)	Consider the BMP's that are considered feasible for lawn and landscaped areas, roofs, and other hard surfaces. Feasibility shall be determined by evaluation against design requirements for BMP, feasibility criteria and competing needs criteria listed in the SWMMWW, including Volume I Appendix I-F and Chapter 5 of Volume V respectively.	List #1 BMPs	Y	13.48.225	Update Code section to reflect changes to MR 5, and results of LID Code revision process to be conducted by City.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. As part of the effort to determine City's approach to LID, consider how local feasibility criteria may be developed (potentially as part of the SWMM) to guide LID implementation in the City.	N/A	High	High
134	Phase II Permit Appendix 1	26	4.5	Min. Req. #5: List#2	(See List #2: On-site Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #9)	Consider the BMP's that are considered feasible for lawn and landscaped areas, roofs, and other hard surfaces. Feasibility shall be determined by evaluation against design requirements for BMP, feasibility criteria and competing needs criteria listed in the SWMMWW, including Volume I Appendix I-F and Chapter 5 of Volume V respectively.	List #2 BMPs	Y	13.48.225	Update Code section to reflect changes to MR 5, and results of LID Code revision process to be conducted by City.	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements. As part of the effort to determine City's approach to LID, consider how local feasibility criteria may be developed (potentially as part of the SWMM) to guide LID implementation in the City.	N/A	High	High
135	Phase II Permit Appendix 1	28	4.6	Min. Req. #6: Runoff Treatment Thresholds	[Replaced "impervious surface" references with "hard surface" in this section.] Projects in which the total of pollution-generating pervious surfaces (PGPS) – not including permeable pavements - is three-quarters (3/4) of an acre or more in a threshold discharge area, and from which there will be a surface discharge in a natural or man-made conveyance system from the site.	Language changes based on definition change for hard surfaces	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
136	Phase II Permit Appendix 1	28	4.6	Min. Req. #6: Runoff Treatment Thresholds	[Delete Table 4.1 Treatment Requirements by Threshold Discharge Area.]	Deleted table summarizing treatment thresholds	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
137	Phase II Permit Appendix 1	29	4.6	Min. Req. #6: Runoff Treatment Type Thresholds (3. Enhanced Treatment)	Except where specified below under 4. Basic Treatment, Enhanced treatment for reduction in dissolved metals is required for the following project sites that : 1) discharge directly to fresh waters or conveyance systems tributary to, fresh waters designated for aquatic life use or that have an existing aquatic life use; or 2) use infiltration strictly for flow control – not treatment – and the discharge is within ¼ mile of a fresh water designated for aquatic life use or that has an existing aquatic life use	New thresholds for Enhanced Treatment, related to changes in Basic Treatment section.	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low / Medium	Low
138	Phase II Permit Appendix 1	30	4.6	Min. Req. #6: Runoff Treatment Type Thresholds (4. Basic Treatment)	Basic Treatment is required in the following circumstances: Project sites that discharge to the ground, UNLESS: 1)The soil suitability criteria for infiltration treatment are met (See Chapter 3, Volume III of the SWMMWW), and alternative pretreatment is provided (Chapter 6, Vol. V)	Adds alternative pretreatment language	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
139	Phase II Permit Appendix 1	30	4.6	Min. Req. #6: Runoff Treatment Type Thresholds (4. Basic Treatment)	[Basic treatment required for project sites that discharge to the ground, UNLESS:] 3)The project site is industrial, commercial, multi-family residential, or a high AADT road (consistent with the Enhanced Treatment-type thresholds listed above) and is within ¼ mile of a fresh water designated for aquatic life use or that has an existing aquatic life use	New language	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
140	Phase II Permit Appendix 1	30	4.6	Min. Req. #6: Runoff Treatment Type Thresholds (4. Basic Treatment)	Project sites discharging directly (or indirectly through a municipal separate storm sewer system) to Basic Treatment Receiving Waters (Appendix I-C of the SWMMWW (2012))	Language modification	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
141	Phase II Permit Appendix 1	30	4.6	Min. Req. #6: Runoff Treatment Type Thresholds (4. Basic Treatment)	Project sites that drain to fresh water that is not designated for aquatic life use, and does not have an existing aquatic life use; and project sites that drain to waters not tributary to waters designated for aquatic life use or that have an existing aquatic life use.	New language	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
142	Phase II Permit Appendix 1	31	4.6	Min. Req. #6: Runoff Treatment Facility Sizing (Water Quality Design Storm Volume)	Size stormwater treatment facilities for the entire area that drains to them, even if some of those areas are not pollution-generating, or were not included in the project site threshold decisions (Section 3 of this appendix) or the treatment threshold decisions of this minimum requirement.	New language	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
143	Phase II Permit Appendix 1	31	4.6	Min. Req. #6: Runoff Treatment Facility Sizing (Water Quality Design Storm Volume)	Alternatively, when using an approved continuous runoff model, the water quality design storm volume shall be equal to the simulated daily volume that represents the upper limit of the range of daily volumes that accounts for 91% of the entire runoff volume over a multi-decade period of record.	New language	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
144	Phase II Permit Appendix 1	31	4.6	Min. Req. #6: Runoff Treatment Facility Sizing (Water Quality Design Flow Rate)	The flow rate at or below which 91% of the runoff volume, as estimated by an approved continuous runoff model, will be treated. Design criteria for treatment facilities are assigned to achieve the applicable performance goal (e.g., 80% TSS removal) at the water quality design flow rate, At a minimum, 91% of the total runoff volume, as estimated by an approved continuous runoff model, must pass through the treatment facility(ies) at or below the approved hydraulic loading rate for the facility(ies)	Additional clarification language	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
145	Phase II Permit Appendix 1	32	4.6	Min. Req. #6: Runoff Treatment Facility Sizing (Water Quality Design Flow Rate)	[Delete: "Alternative methods may be used if they identify volumes and flow rates that are at least equivalent"]	Deleted language	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
146	Phase II Permit Appendix 1	32	4.6	Min. Req. #6: Runoff Treatment Facility Selection	Stormwater treatment facilities shall be: • Selected in accordance with the process identified in Chapter 4 of Volume I, and Chapter 2 of Volume V of the SWMMWW (2012). [Existing references to Volume V for treatment facility design and maintenance criteria]	Adds reference to Chapter 2, Volume V of SWMMWW. Volume I now points to the step-by-step selection process contained in Volume V, rather than duplicating it. Only minor revisions in the Volume V selection process text for 2012. Revised and updated criteria and guidance throughout SWMMWW Volume V.	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
147	Phase II Permit Appendix 1	32	4.6	Min. Req. #6: Runoff Treatment Facility Sizing (Additional Reqs)	The discharge of untreated stormwater from pollution-generating hard surfaces to ground water must not be authorized by the Permittee, except for the discharge achieved by infiltration or dispersion of runoff through use of On-site Stormwater Management BMPs in accordance with Chapter 5, Volume V and Chapter 7, Volume V of the SWMMWW (2012); or by infiltration through soils meeting the soil suitability criteria in Chapter 3 of Volume III of the SWMMWW (2012).	Adds references to 2012 SWMMWW	WQ	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low

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148	Phase II Permit Appendix 1	32	4.7	Min. Req. #7: Flow Control Applicability	Replaced references to "impervious surface" with "hard surface".	Definition change	FC	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
149	Phase II Permit Appendix 1	33	4.7	Min. Req. #7: Flow Control Thresholds	When assessing a project against the following thresholds, consider only those impervious, hard, and pervious surfaces that are subject to this minimum requirement as determined in Section 3 of this Appendix.	New language	FC	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
150	Phase II Permit Appendix 1	34	4.7	Min. Req. #7: Flow Control Thresholds	Projects that through a combination of hard surfaces and converted vegetation areas cause a 0.10 cubic feet per second (cfs) increase or greater in the 100-year flow frequency from a threshold discharge area as estimated using the Western Washington Hydrology Model or other approved model and one-hour time steps (or a 0.15 cfs increase or greater using 15-minute time steps)**. **The 0.10 cfs (one-hour time steps) or 0.15 cfs (15-minute time steps) increase should be a comparison of the post-project runoff to the existing condition runoff. For the purpose of applying this threshold, the existing condition is either the pre-project land cover, or the land cover that existed at the site as of a date when the local jurisdiction first adopted flow control requirements into code or rules. [Delete Table 4.2 Flow Control Requirements by Threshold Discharge Area]	Language changes based on definition change for hard surfaces. Adds clarification that 0.10 cfs is associated with one-hour time steps, and add new option for 0.15 cfs at 15-min time steps. Not clear whether the requirement is to evaluate both, or one or the other. Deleted flow control threshold summary table.	FC	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
151	Phase II Permit Appendix 1	34	4.7	Min. Req. #7: Flow Control Standard Flow Control Req.	The drainage area of the immediate stream and all subsequent downstream basins have had at least 40% total impervious area since 1985. In this case, the pre-developed condition to be matched shall be the existing land cover condition. The map in Appendix I-G of the SMMWW (2012) depicts those areas which meet this criterion.	Adds new language referring to map in the SWMMWW. The reference should read "Appendix I-F"; there is no Appendix I-G.	FC	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
152	Phase II Permit Appendix 1	36	4.8	Min. Req. #8: Wetlands Protection Standard Req.	Projects shall comply with Guide Sheets 1 through 3 in Appendix I-D of the SWMMWW (2012). The hydrologic analysis shall use the existing land cover condition to determine the existing hydrologic conditions unless directed otherwise by a regulatory agency with jurisdiction.	Updated language for Guide Sheet references. [For reference, the Guide Sheets have the following titles/purposes: Guide Sheet 1: Criteria that excludes wetlands from serving as a treatment or flow control BMP/facility Guide Sheet 2: Criteria for including wetlands as a treatment or flow control BMP/facility Guide Sheet 3: Wetland protection guidelines	Wetlands	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low/ Medium	Low
153	Phase II Permit Appendix 1	36	4.8	Min. Req. #8: Wetlands Protection Additional Reqs.	[Stormwater treatment and flow control facilities shall not be built within a natural vegetated buffer, except for:] As allowed in wetlands approved for hydrologic modification and/or treatment in accordance with Guide Sheet 2 in Appendix I-D of the SWMMWW (2012).	Updated Guide Sheet reference	Wetlands	N	13.48.225	None	Auburn SWMM	Y	Update SWMM in accordance with Permit changes. Update guidance documents and materials for construction permit applicants. Review permit applications consistent with updated Appendix 1 requirements. Enforce Minimum Requirements.	N/A	Low	Low
154	Phase II Permit Appendix 1	38	7	Basin/ Watershed Planning	[Existing reference to SWMMWW Volume I Appendix I-A]	The reference to Appendix I-A is unchanged from the previous Permit; however, the content of Appendix I-A was revised with additional guidance.	Basin/ Watershed Planning	N		None	Auburn SWMM	Y	Review updates to SWMMWW for corresponding updates to SWMM.	N/A	Low	Low
155	Phase II Permit Appendix 1	38	4.7	Flow Control Applicability	[Existing reference to SWMMWW Volume I Appendix I-E]	The reference to Appendix I-E is unchanged from the previous Permit; however, the listing of exempt waters was revised.	Exempt FC	N		None	Auburn SWMM	Y	Review updates to SWMMWW for corresponding updates to SWMM.	N/A	Low	Low
156	Phase II Permit Appendix 1	35	4.7	Additional Flow Control Reqs	[Existing reference to SWMMWW Volume III]	The reference to Volume III is unchanged from the previous Permit; however, the flow control BMPs referenced by the Permit contained in Volume III have received numerous modifications.	FC	N		None	Auburn SWMM	Y	Review updates to SWMMWW for corresponding updates to SWMM.	N/A	Low	Low
157	Phase II Permit Appendix 1	32	4.6	WQ Design Storm Volume	[Existing reference to SWMMWW Volume III Chapter 2]	The reference to Chapter 2 is unchanged from the previous Permit. While the overall Chapter experienced revisions, there are no apparent changes to the NRCS Curve Number equations, which are the context of the reference.	NRCS CN	N		None	Auburn SWMM	Y	Review updates to SWMMWW for corresponding updates to SWMM.	N/A	Low	Low
158	Phase II Permit Appendix 1	23	4.3	Min Req. #3: Source Control	[Existing reference to SWMMWW Volume IV]	The reference to Volume IV is unchanged from the previous Permit. The source control BMPs referenced in the Permit appear to have experienced minor revision.	Source Control	N		None	Auburn SWMM	Y	Review updates to SWMMWW for corresponding updates to SWMM.	N/A	Low	Low
159	Phase II Permit Appendix 1		2	Definitions	[New reference to SWMMWW Volume V Chapter 4]	The new reference is related to requirements for stormwater facility O&M requirements. Chapter 4 was revised from the 2005 SWMMWW, with changes to O&M standards, and placeholders for LID maintenance standards.	O&M	N		None	Auburn SWMM	Y	Review updates to SWMMWW for corresponding updates to SWMM.	N/A	Low	Low

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160	SWMMWW Vol III and V	Var.	Vol III: 3.1 Vol V: 5.3.1, 7.4	BMPs: T5.10A, T5.10B, T5.11, T5.12, T5.13, T5.14A, T5.14B, T5.15, T7.30	LID infeasibility criteria	The revised Permit/SWMMWW include BMP infeasibility criteria, including site and engineering feasibility considerations.	Feasibility	N	31.48.225	Consider how to implement LID infeasibility criteria identified as part of the City LID process (i.e.,whether to include in Code).	Auburn SWMM	Y	Update SWMM, design standards, and guidance materials to reflect City determination of LID infeasibility criteria.	N/A	Medium	Medium
161	SWMMWW Volume III	3-75	3.3.6	Design Saturated Hydraulic Conductivity	Revised guidance on determining infiltration rates / Saturated Hydraulic Conductivity	The revised SWMMWW refines and limits approaches that are acceptable for determining design infiltration rates.	Infiltration rates	N			Auburn SWMM	Y	Update SWMM, design standards, and guidance materials to reflect updated infiltration rate guidance.	N/A	Low / Medium	Low
162	SWMMWW Volume II	4-6	4.1 BMP C103	Construction BMPs	Modified BMP C103: High Visibility Fence	Added text to allow installation of silt fence in accordance with BMP C233 to act as high visibility fence.	Fencing	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
163	SWMMWW Volume II	N/A	4.1 BMP C104	Construction BMPs	Deleted BMP C104: Stake and Wire Fence	Ecology comment: "Removed this BMP because BMP C103: High Visibility Fence meets the intent of this BMP in a safer and more commonly used manner".	Fencing	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
164	SWMMWW Volume II	4-7	4.1 BMP C105	Construction BMPs	Modified BMP C105: Stabilized Construction Entrance/Exit	Added requirement that each residence in a subdivision project have its own entrance. Added detailed guidance for allowed and prohibited materials and depths. Deleted hog fuel as allowed material. Describe street sweeping reqs.	Construction Entrance	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
165	SWMMWW Volume II	4-9	4.1 BMP C106	Construction BMPs	Modified BMP C106: Wheel Wash	Added requirements for discharge of wastewater from wheel wash (prohibit discharge to surface or ground water).	Wheel Wash	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
166	SWMMWW Volume II	4-13	4.1 BMP C120	Construction BMPs	Modified BMP C120: Temporary and Permanent Seeding	BMP C120 substantially re-written, with revisions to seasonal considerations, application approaches, and other elements.	Seeding	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
167	SWMMWW Volume II	4-19	4.1 BMP C121	Construction BMPs	Modified BMP C121: Mulching	Added minimum mulch thickness of 2 inches.	Mulch	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
168	SWMMWW Volume II	4-22	4.1 BMP C122	Construction BMPs	Modified BMP C122: Nets and Blankets	BMP revised to use simpler and clearer language	Netting	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
169	SWMMWW Volume II	4-25	4.1 BMP C123	Construction BMPs	Modified BMP C123: Plastic Covering	Removed the use of plastic sheeting over seeded areas because other coverings are preferable.	Plastic covering	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
170	SWMMWW Volume II	4-27	4.1 BMP C124	Construction BMPs	Modified BMP C124: Sodding	Provided a link to composting guidance Removed compost specification.	Sodding	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
171	SWMMWW Volume II	4-29	4.1 BMP C125	Construction BMPs	Modified BMP C125: Topsoiling / Composting	Added and removed guidance based on field experience.	Topsoiling	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
172	SWMMWW Volume II	4-42	4.1 BMP C150	Construction BMPs	Modified BMP C150: Materials on Hand	Removed measures and quantities; should be based on size of construction site.	Materials	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
173	SWMMWW Volume II	4-43	4.1 BMP C151 BMP C152	Construction BMPs	Modified BMP C151: Concrete Handling Modified BMP C152: Sawcutting	Additional guidance to clarify that concrete spillage and discard is prohibited from entering surface water.	Concrete handling	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
174	SWMMWW Volume II	4-48	4.1 BMP C154	Construction BMPs	Added BMP C154: Concrete Washout Area	New BMP	Concrete washout	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
175	SWMMWW Volume II	4-54	4.1 BMP C160	Construction BMPs	Modified BMP C160: CESCL	Guidance modified.	CESCL	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
176	SWMMWW Volume II	N/A	4.1 BMP C161	Construction BMPs	Deleted BMP C161: Payment of Erosion Control Work	Ecology comment: "Removed this BMP because it is not applicable to the full range of projects needing to perform ESC work".	Payment	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
177	SWMMWW Volume II	N/A	4.1 BMP C180	Construction BMPs	Deleted BMP C180: Small Project Construction Stormwater Pollution Prevention	Ecology comment: "Removed this BMP because of changes to threshold reqs in both the MSGP and CSGP."	Small Projects	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
178	SWMMWW Volume II	4-74	4.2 BMP C207	Construction BMPs	Modified BMP C207: Check Dams	Added guidance based on field experience.	Check dams	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
179	SWMMWW Volume II	4-78	4.2 BMP C220	Construction BMPs	Modified BMP C220: Storm Drain Inlet Protection	Added guidance based on field experience.	Inlet protection	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
180	SWMMWW Volume II	N/A	4.2 BMP C230	Construction BMPs	Deleted BMP C230: Straw Bale Barrier	Ecology comment: "Removed this BMP because it has proved ineffective."	Straw bales	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
181	SWMMWW Volume II	4-90	4.2 BMP C233	Construction BMPs	Modified BMP C233: Silt Fence	Revised and reorganized for clarity.	Silt fence	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
182	SWMMWW Volume II	4-96	4.2 BMP C235	Construction BMPs	Modified BMP C235: Wattles	Renamed BMP from Straw Wattles.	Wattles	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
183	SWMMWW Volume II	4-100	4.2 BMP C236	Construction BMPs	Added BMP C236: Vegetated Spray Fields	New BMP for dewatering.	Spray fields	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
184	SWMMWW Volume II	4-112	4.2 BMP C250	Construction BMPs	Modified BMP C250: Construction Stormwater Chemical Treatment	Numerous revisions and new guidance.	Chemical treatment	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
185	SWMMWW Volume II	4-120	4.2 BMP C251	Construction BMPs	Modified BMP C251: Construction Stormwater Filtration	Added sizing criteria and additional guidance.	Filtration	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
186	SWMMWW Volume II	4-125	4.2 BMP C252	Construction BMPs	Added BMP C252: High pH Neutralization Using CO2	New BMP for CO2 neutralization of pH.	pH	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
187	SWMMWW Volume II	4-128	4.2 BMP C253	Construction BMPs	Added BMP C253: pH Control for High pH Water	New BMP for neutralization of pH.	pH	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
188	SWMMWW Volume III	3-4	3.1.1 BMP T5.10A	Roof Downspout Controls	Modified BMP T5.10A: Downspout Full Infiltration	Updated to reflect implementation approach described under MR#5. Prior thresholds replaced with List #1 and #2 based approach. Must demonstrate infeasibility if not using. Infeasible if not outwash or loam soil. Conduct soil specific testing if outwash or loam soil, to at least 1 ft below proposed bottom elevation of facility. Min 3 ft from proposed finish grade to seasonal high groundwater elevation. Min 1 ft from proposed facility bottom to seasonal high GW elevation. "Steep slopes" replaced with ">=40% slopes". Identify required gravel content required per 1,000 SF of runoff area served. Increase facility spacing from 4 to 10 ft.	Downspout	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
189	SWMMWW Volume III	3-11	3.1.2 BMP T5.10B	Roof Downspout Controls	Modified BMP T5.10B: Downspout Dispersion Systems	Revised application thresholds consistent with MR#5. Defined steep slopes for this BMP (splash block placement) as >=15%. Added guidance cover vegetated path with dense, well-established vegetation. Added guidance to keep flow paths from adjacent dispersion devices separate.	Downspout	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
190	SWMMWW Volume III	3-17	3.1.3 BMP T5.10C	Roof Downspout Controls	Modified BMP T5.10C: Perforated Stub-Out Connections	Not substantially modified from 2005 SWMMWW, but given new emphasis as part of MR#5 in the updated Permit.	Downspout	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
191	SWMMWW Volume V	5-3	5.3 BMP T5.11	On-Site Stormwater Management BMPs	Modified BMP T5.11: Concentrated Flow Dispersion	Very minor changes to guidance and modeling approach.	Dispersion	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
192	SWMMWW Volume V	5-5	5.3 BMP T5.12	On-Site Stormwater Management BMPs	Modified BMP T5.12: Sheet Flow Dispersion	Deleted guidance for cleared upstream areas, steep slopes (8%) within dispersion area. Increased additional buffer width required for each additional 20 ft of impervious surface width from 5 ft to 10 ft. Updated guidance for modeling approach.	Dispersion	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
193	SWMMWW Volume V	5-7	5.3 BMP T5.13	On-Site Stormwater Management BMPs	Modified BMP T5.13 Post-Construction Soil Quality and Depth	Updated WAC reference for composted material specifications. Changed required organic material content from 35-65% to 40-65%.	Soil amendment	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
194	SWMMWW Volume V	5-11	5.3 BMP T5.14A	On-Site Stormwater Management BMPs	New BMP T5.14A: Rain Gardens	New BMP	Rain Garden	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
195	SWMMWW Volume V	5-12	5.3 BMP T5.14B	On-Site Stormwater Management BMPs	New BMP T5.14B: Bioretention	New BMP	Bioretention	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
196	SWMMWW Volume V	5-13	5.3.1 BMP T5.15	On-Site Stormwater Management BMPs	New BMP T5.15: Permeable Pavements	New BMP	Permeable pavement	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
197	SWMMWW Volume V	5-24	5.3 BMP T5.16	On-Site Stormwater Management BMPs	New BMP T5.16: Tree Retention and Tree Planting	New BMP	Trees	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
198	SWMMWW Volume V	5-27	5.3 BMP T5.17	On-Site Stormwater Management BMPs	New BMP T5.17: Vegetated Roofs	New BMP	Vegetated roofs	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
199	SWMMWW Volume V	5-28	5.3 BMP T5.18	On-Site Stormwater Management BMPs	New BMP T5.18: Reverse Slope Sidewalks	New BMP	Sidewalks	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
200	SWMMWW Volume V	5-28	5.3 BMP T5.19	On-Site Stormwater Management BMPs	New BMP T5.19: Minimal Excavation Foundations	New BMP	Excavation	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
201	SWMMWW Volume V	5-29	5.3 BMP T5.20	On-Site Stormwater Management BMPs	New BMP T5.20: Rainwater Harvesting	New BMP	Rainwater harvesting	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
202	SWMMWW Volume V	5-30	5.3 BMP T5.30	On-Site Stormwater Management BMPs	Modified BMP T5.30: Full Dispersion	Added guidance previously contained in Appendix III-C, and expanded on that guidance. Clarified allowances for timber harvest activities and utilities, and septic prohibitions. Added detailed guidance for Residential projects, Public Road projects, and native vegetation landscape specifications.	Dispersion	N			Auburn SWMM	Y	Review new/modified BMPs related to MR 5 for corresponding updates to SWMM.	N/A	Low/ Medium	Low/ Medium
203	SWMMWW Volume V	7-3	7.4 BMP T7.30	Infiltration and Bioretention BMPs	Replaced prior Bioretention Swale BMP with new BMP T7.30: Bioretention Cells, Swales, and Planter Boxes	Added detailed guidance, design criteria, infeasibility criteria, and figures. Essentially a new BMP.	Bioretention	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low

New Item	Ecology Document	Pg	Section	Section Description	Permit Language	Summary of Requirement Changes	Topic	Code Gap?	Code Ref	Code Gaps/Actions	Notes/Existing Programs	Program Gap?	Programmatic Gaps/Actions (Work needed to eliminate the gap)	Deadline	Level of Effort	Policy
204	SWMMWW Volume V	7-25	7.4 BMP T7.40	Infiltration and Bioretention BMPs	Modified BMP T7.40: Compost-amended Vegetated Filter Strips (CAVFS)	Added guidance and design criteria for CAVFS.	Filter strip	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
205	SWMMWW Volume V	8-2	8.5 BMP T8.10	Filtration BMPs	Modified BMP T8.10: Sand Filter Basin	Renamed and reorganized section. Additional guidance.	Sand filter	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
206	SWMMWW Volume V	8-16	8.5 BMP T8.11	Filtration BMPs	New BMP T8.11: Large Sand Filter Basin	Moved out of BMP T8.10 to create a new, separate BMP	Sand filter	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
207	SWMMWW Volume V	8-17	8.5 BMP T8.20	Filtration BMPs	Modified BMP T8.20: Sand Filter Vault	Revised to reference the construction and maintenance criteria used in BMP T8.10 and Section 4.6.	Sand filter	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
208	SWMMWW Volume V	8-24	8.5 BMP T8.40	Filtration BMPs	New BMP T8.40: Media Filter Drain	Added design criteria for new BMP option (previously referred to as Ecology Embankment). Text matches WSDOT Highway Runoff Manual.	Media Filter	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
209	SWMMWW Volume V	N/A	9.4 BMP T9.50	Biofiltration BMPs	Deleted BMP T9.50: Narrow Area Filter Strip	Ecology comment: "No design criteria exists for this BMP to validate basic treatment". Designers should refer to the Basic Filter Strip.	Filter strip	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low
210	SWMMWW Volume V	10-1	10.3 BMP T10.10	Filtration BMPs	Modified BMP T10.10: Wetpools	Generally very minor text changes for clarity and to update references. One exception: a one-cell pond must have a min 4 ft depth for volume equivalent to the first cell of a two-cell design.	Wetpools	N			Auburn SWMM	Y	Review updated BMPs for corresponding updates to SWMM.	N/A	Low	Low

Appendix C: Hydrologic and Hydraulic Modeling and Evaluation

Brown AND Caldwell

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Draft Technical Memorandum

Prepared for: City of Auburn

Project Title: Comprehensive Storm Drainage Plan

Project No.: 145295

Draft Technical Memorandum

Subject: Auburn Storm Drainage Hydrologic and Hydraulic Modeling and Evaluation

Date: July 6, 2015

To: Tim Carlaw, Storm Drainage Engineer

From: Colleen O. Doten

Copy to: Lisa D. Tobin, Utilities Engineering Manager

Prepared by: Margaret Ales
Colleen O. Doten

Reviewed by: Nathan Foged

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List of Abbreviations

2009 Drainage Plan	2009 Comprehensive Stormwater Drainage Plan
2015 Drainage Plan	2015 Comprehensive Storm Drainage Plan
BC	Brown and Caldwell
BMP	best management practice
cfs	cubic foot/feet per second
CHI	Computational Hydraulics International
CIP	Capital Improvement Program
City	City of Auburn
CMP	corrugated metal pipe
CN	curve number
CPEP	corrugated polyethylene pipe
DEM	digital elevation model
DGM	Digital Ground Model
DHI	Danish Hydraulic Institute
EPA	U.S. Environmental Protection Agency
ft	foot/feet
ft^3	cubic foot/feet
GIS	geographic information system
gpm	gallon(s) per minute
HDPE	high-density polyethylene
HEC-RAS	Hydrologic Engineering Center River Analysis System
H&H	hydrologic and hydraulic
hr	hour(s)
HSPF	Hydrological Simulation Program-Fortran
ID	identifier
in.	inch(es)
L	length
LiDAR	light detection and ranging
LOS	level of service
MG	million gallons
n/a	not applicable
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
PVC	polyvinyl chloride
RCP	reinforced concrete pipe
ROW	right-of-way
RPVC	reinforced polyvinyl chloride
SCADA	supervisory control and data acquisition
SCS	Soil Conservation Service
SRTC	Sensitivity-based Radio Tuning Calibration
TR	Technical Release
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
W	width
WWHM	Western Washington Hydrology Model
yr	year(s)

Section 1: Introduction

As part of the 2015 Comprehensive Storm Drainage Plan (2015 Drainage Plan) update, Brown and Caldwell (BC) performed hydrologic and hydraulic (H&H) analyses for nine problem locations within the City of Auburn's (City) storm drainage system. These analyses included model development and refinement, model calibration (where possible), and desktop evaluations of drainage problems in areas recently annexed from King County.

1.1 Background

The City initiated an extensive drainage system data inventory and H&H modeling effort to support the development of capital improvement projects for the 2009 Comprehensive Stormwater Drainage Plan (2009 Drainage Plan) (Brown and Caldwell, 2009). As a result, 15 storm drainage system models were created for areas throughout the city. Each model is identified by the lettered subbasin drainage area(s) covered within the model extent. For example, the "GHI model" covers three subbasins: G, H, and I.

The City's data inventory effort has continued since 2009, with dedicated field survey staff collecting drainage system data across the city on a quarter-section-by-quarter-section basis. The City updates its geographic information system (GIS) data on an ongoing basis based on the survey data. The City has also continued to develop and refine models when needed to support the design of capital improvement projects. During this process, several of the models were converted from MIKE URBAN[1] software to the PCSWMM[2] (version 5.0.022) software to improve modeling efficiency. Additionally, some of the models were refined based on field survey data, system updates, and monitoring data collected in 2010 and 2011. Leading into the 2015 Drainage Plan update, the City's models were in varying states of development, depending on the status of the system inventory and locations of capital improvement projects.

1.2 Purpose and Objectives

Based on the problems identified during the early stages of the 2015 Drainage Plan update, existing H&H models were refined or new models were developed if there was no existing model. After models were developed, they were calibrated based on available data. The calibrated models were used to perform long-term simulations, and to perform a flow frequency analysis to identify design storms. The models and the identified design storms were used to develop capital improvement projects that addressed the identified problem and met the City's stormwater level of service (LOS) goals. The purpose of this technical memorandum is to document the modeling efforts performed in support of the 2015 Drainage Plan. The objectives achieved are the documentation of:

- model update based on current data sources
- model development and refinement steps

[1] MIKE URBAN is a GIS-integrated, modular software program developed by the Danish Hydraulic Institute (DHI) for modeling water distribution and collection systems. The stormwater module is internally powered by the SWMM5 engine, which is public domain software distributed by the U.S. Environmental Protection Agency (EPA). Information about MIKE URBAN software can be found at http://www.mikepoweredbydhi.com/products/mike-urban.

[2] PCSWMM is a GIS-based H&H modeling platform developed by Computational Hydraulics International (CHI). The software fully supports the EPA SWMM5 hydrology and hydraulics engine, thus providing comparable computation between EPA SWMM and PCSWMM models. Information about PCSWMM software can be found at http://www.chiwater.com/Software/PCSWMM/index.asp.

- model calibration steps and calibration results
- drainage problem evaluation in the annexation areas

The model development and refinement approach and model parameters are described in Section 2. Calibration efforts, data, and results are discussed in Section 3. A summary of the annexation area desktop evaluation, which includes modeling and additional evaluations, is provided in Section 4. Section 5 includes a summary of the H&H modeling and evaluation efforts completed in support of the 2015 Drainage Plan.

Section 2: Model Development and Refinement

The City developed and prioritized a list of nine known drainage problems, along with potential capital improvement projects to address the known problem, for inclusion in the 2015 Drainage Plan. BC performed an H&H analysis of the storm drainage system at each of the nine problem locations. The following sections describe the model development procedures and input parameters used to prepare the models for subsequent evaluations.

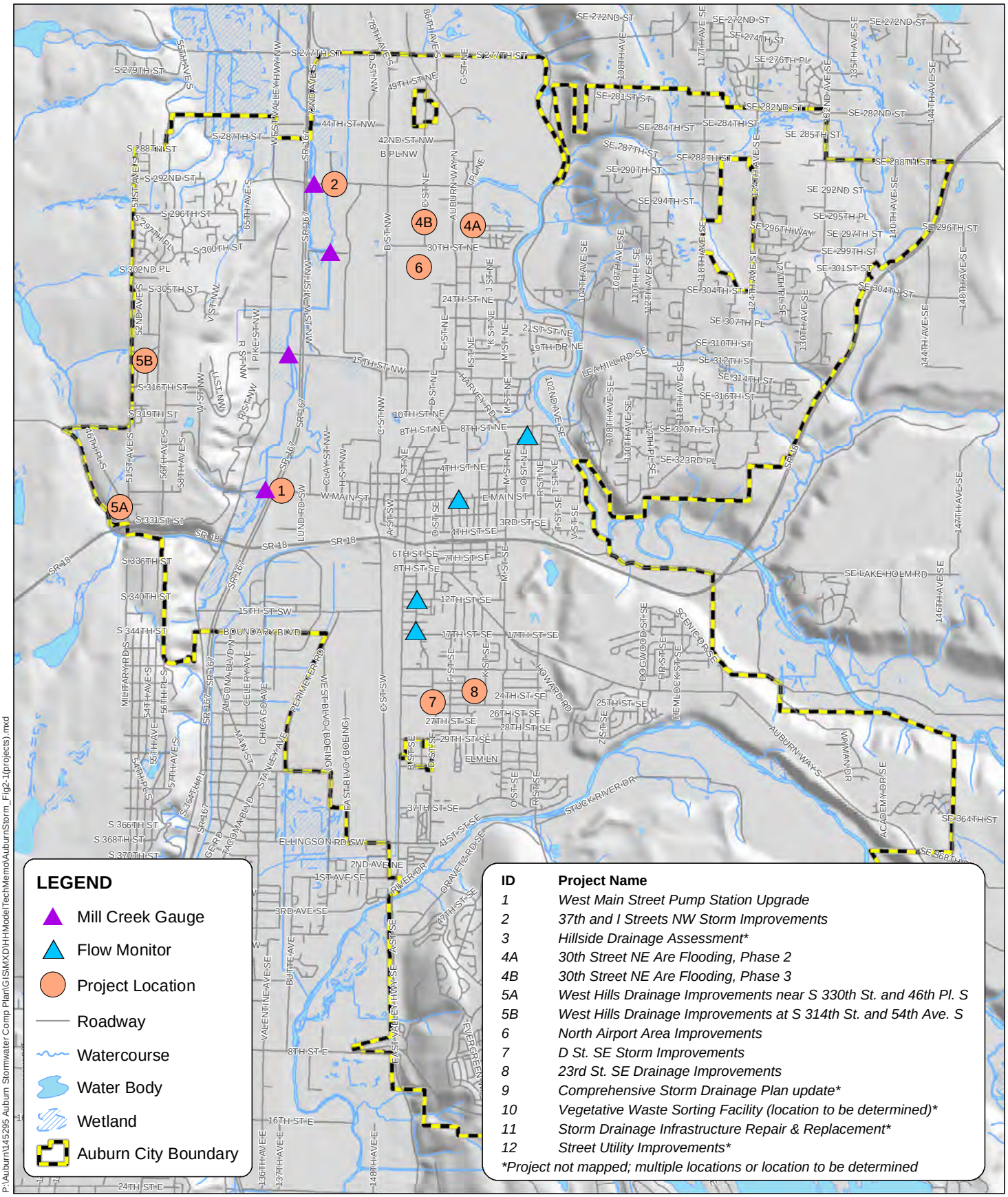
Of the nine prioritized drainage problems, two are located in portions of the city where there is minimal piped conveyance (i.e., ditch and culverts) or complex natural drainage networks. Because PCSWMM is not the best tool for analyzing these systems, other modeling tools (Western Washington Hydrology Model [WWHM] and Hydrologic Engineering Center River Analysis System [HEC-RAS]) were used to perform H&H analyses. The seven remaining problems were analyzed using PCSWMM. Table 2-1 lists the storm drainage subbasins for which models were used to evaluate problems and develop capital improvement projects. The table also presents unique information for each model including the type of model, infiltration method, design storms events, calibration status, and associated capital improvement projects.

Table 2-1. Subbasin Model Summary

Modeled subbasin(s)	Model status	Hydrology model (infiltration method)	Hydraulic model	Design events	Calibration status	Project number and name[a]
BCDF	Updated for 2015 Drainage Plan	PCSWMM (Green-Ampt)	PCSWMM	25-year: 11/4/2006	Calibrated for 2015 Drainage Plan	Project 7: D St. SE Storm Improvements Project 8: 23rd St. SE Drainage Improvements
GHI	Updated for 2015 Drainage Plan	PCSWMM (Green-Ampt)	PCSWMM	25-year: 11/4/2006 50-year: 11/5/2006	Calibrated prior to 2015 Drainage Plan	Projects 4A and 4B: 30th Street NE Area Flooding, Phases 2 and 3 Project 6: North Airport Area Improvements
OO	New for 2015 Drainage Plan	WWHM12 (Hydrological Simulation Program--Fortran [HSPF])	Manning's *n* equations	Storm ranking in WWHM12	Calibration data unavailable	Project 5A: West Hills Drainage Improvements at S 330th St. and 46th Pl. S Project 5B: West Hills Drainage Improvements near S 31th St. and 54th Ave. S
P	Updated for 2015 Drainage Plan	PCSWMM (Soil Conservation Service [SCS] curve number [CN])	PCSWMM	25-year: 1/29/1990 50-year: 11/6/2006	Calibrated for 2015 Drainage Plan	Project 1: West Main Street Pump Station Upgrade
TT	Updated for 2015 Drainage Plan	None, used range of typical flows	HEC-RAS	n/a, used range of typical flows	Uncalibrated due to complexity of Mill Creek	Project 2: 37th and I Streets NW Storm Improvements

a. Projects listed correspond to the nine known drainage problems. Projects 4A, 4B, 5A, and 5B each address a separate problem. Project 3 is not included as it did not require H&H analysis because it is a project to assess pipes that discharge over hillsides.

Figure 2-1 shows the subbasin boundaries highlighting the subbasins modeled for the 2015 Drainage Plan, the location of problem areas for which capital improvement projects have been developed, and monitoring locations where data were collected to calibrate the models.



COMPREHENSIVE STORM DRAINAGE PLAN
October 2015

Brown AND Caldwell

0 2,500 5,000 10,000 Feet

1 inch = 5,000 feet

N

CITY OF AUBURN WASHINGTON

Figure 2-1
Modeled Subbasins, and Monitoring and Project Locations

2.1 Model Development

Existing PCSWMM models were updated with recent data. If there was not an existing model in a problem area, a new model was developed. The steps taken to update existing models or create new models are described below.

2.1.1 Updating Existing PCSWMM Models

GIS data from December 2013 and June 2014 were used to update the PCSWMM files for the BCDF, GHI, and P models. Survey data for quarter-sections 1009 and 1109 collected in November 2014, after the initial data were provided to BC, are included in the BCDF model. The following infrastructure data attributes were checked against the GIS data:

- pipe size
- pipe invert elevations
- pipe material (for estimating pipe roughness)
- node (i.e., catch basin or manhole) rim elevation
- system connectivity

Where the GIS data did not include recent survey information and did not accurately describe the existing system (based on the City's knowledge of the system), technical reports, record drawings, or construction drawings were used to update the model. Detailed pipe information from a stormwater infrastructure survey performed by Reid Middleton in 2011 and 2013 were used to update the GHI model (Reid Middleton, 2011 and 2013).

For model hydrology, subcatchment delineations within problem areas were reviewed and revised based on recent GIS data, topographic data (2-foot contour data), and 2012 aerial photography. Total impervious area was estimated with the City's impervious area coverage included in the December 2013 GIS data. Sub-catchment slope was estimated as the average slope based on a digital elevation model (DEM) or 2-foot contour data. Table 2-2 summarizes the model data sources.

Table 2-2. Model Data Description and Source

Data type	Description and source
Hydrologic model input	
Subbasin and subcatch-ment boundaries	Existing model subbasin boundaries refined based on City GIS topography (2-foot contour data), roads, stormwater infrastructure data, record drawings, and aerial photography.
Land use	Existing City land use GIS data based on adopted land use designations through 2011.
Impervious area	City GIS impervious area coverage from December 2013 and Sutherland equations[a] used to estimate effective impervious area (P subbasin).
Hydrologic soil group	Hydrologic soil group available from Natural Resources Conservation Service (NRCS) soil data (NRCS, 1986).
Slope	Weighted average slope from U.S. Geological Survey (USGS) DEM data sets (PCSWMM models). City 2-foot contour data (all other models and some flat areas in smaller PCSWMM models).

Table 2-2. Model Data Description and Source	
Data type	**Description and source**
Hydraulic model input	
Conduits (stream, creek, and ditch, pipe and culvert)	Primary sources of data were City GIS data, record drawings, construction drawings, or modeling reports. If these sources were not available, conveyance extent was estimated with City 2-foot contour data and aerial photography, and Google aerial and street view photographs.
Nodes (manhole, catch basin, and infall)	Primary sources of data were City GIS data, record drawings, construction drawings, or modeling reports. If these sources were not available, rim elevations were estimated from City 2-foot contour data and invert elevations were estimated based on connected pipe and node data, as noted in the model.
Outfall	Primary sources of data were City GIS data. If these sources were not available, rim elevations were estimated from City 2-foot contour data.
Storage facility (wetland, detention ponds)	City GIS data and 2012 aerial photography, Google street view.
Boundary conditions at outfalls	Modeled as fixed level based on monitoring data (Mill Creek gauge) or modeled water surface elevations (Green River Hydraulic Modeling and Mapping, BCDF model).

a. *Sutherland equations are empirically based formulas to estimate effective impervious area from a mapped impervious area value based on observed or assumed surface water connections (Sutherland, 2000).*

2.1.1.1 Hydrologic Parameters

Subcatchment parameters define the hydrologic component of the PCSWMM model. Table 2-3 lists the subcatchment attributes and the values for each PCSWMM model. Where flow monitoring data were available, calibration was completed by adjusting hydrologic parameters: estimating effective impervious area, reducing subcatchment width, and adjusting soil conductivity parameters (see Section 3 for additional information on calibration procedures).

Table 2-3. PCSWMM Subcatchment Model Attributes			
Model attribute	Description	Value	
Name	Subcatchment name assigned to correlate with the name of the subcatchment outlet node based on City ID (e.g., 909-B1).	Process same for all models	
Rain gauge	Composite precipitation time series.	Same for all models (see Table 2-9)	
Area	Area of the subcatchment in acres.	Varies, based on subbasin dimensions	
Length	Maximum length of overland sheet flow in feet. Estimated in GIS based on the manually drawn longest flow path.	Varies, based on subcatchment and calibration	P
		Varies, based on subcatchment	BCDF, GHI
Width	Width of the overland flow path for sheet flow in feet. Calculated within PCSWMM as area/length. For P subbasin, used as a calibration parameter, by adjusting the length.	Varies, based on subcatchment dimensions and calibration	P
		Varies, based on subcatchment dimensions	BCDF, GHI
Slope	Average percent slope of the subcatchment.	Varies, based on DEM or GIS 2-foot contour data	
Imperv	Percent of land area that is directly connected impervious area.	Varies, based on dimensions and calibration	GHI, P
		Varies based, dimensions	BCDF

Table 2-3. PCSWMM Subcatchment Model Attributes			
Model attribute	Description	Value	
Nimperv	Manning's *n* for overland flow over the impervious portion of the subcatchment.	0.012	
Nperv	Manning's *n* for overland flow over the pervious portion of the subcatchment.	Short grass (0.15)	Same for all models
		Dense grass (0.24)	Same for all models
		Underdeveloped area (0.40)	BCDF
Dstore-Imperv	Depth of depression storage on the impervious portion of the subcatchment.	0.7 inch	P
		0.75 inch	BCDF, GHI
Dstore-Perv	Depth of depression storage on the pervious portion of the subcatchment.	0.15 inch	BCDF, GHI, P
		0.3 inch (underdevelopment area)	BCDF
ZeroImperv	Percent of the impervious area with no depression storage.	0%	GHI
		5%	BCDF, P
Routing	If assigned outlet, runoff from pervious and impervious areas routes to a node within the storm drain system. If assigned pervious, a percent of the impervious area (as specified in PctRouted) is routed to pervious areas and infiltration computations are performed before flow is routed to the outlet. This is representative of the not directly connected (versus the effective) impervious areas.)	Outlet	GHI
		Pervious	BCDF
		Varies by subcatchment	P
PctRouted	Percent of runoff from impervious areas routed to pervious areas before flow is routed to the outlet. Adjusted during calibration.	100%	GHI, P
		Varies, based on calibration	BCDF
Groundwater	Groundwater routing to aquifer.	Not modeled because not observed in flow monitoring data	
CurveNo	SCS CN calculated as an area-weighted average using land use and hydrologic soil group within each subcatchment (see Table 2-6).	Relevant to SCS CN model (P subbasin) only	
DryTime	Time in days for a fully saturated soil to completely dry for SCS CN infiltration method (Table 2-6).	Relevant to SCS CN model (P subbasin) only	
Suction Head	Soil capillary suction head in inches for Green-Ampt infiltration method (see Table 2-4).	Varies by subcatchment	BCDF
		6.57	GHI
Conductivity	Soil saturated hydraulic conductivity in inches/hour for Green-Ampt infiltration method. Adjusted during calibration (BCDF model) (see Table 2-4).	Varies by subcatchment and based on calibration	BCDF
		0.26	GHI
Initial Deficit	Initial soil moisture deficit in fraction of whole for Green-Ampt infiltration method. Calculated as soil porosity minus field capacity (see Table 2-4).	Varies by subcatchment	BCDF
		0.3	GHI

2.1.1.2 Infiltration Methods and Parameters

PCSWMM allows for one of three infiltration methodologies: Green-Ampt, Horton, or Soil Conservation Service (SCS). Where flow monitoring data were available (BCDF and GHI models) infiltration is based on Green-Ampt with infiltration parameters being adjusted during calibration. The P subbasin model uses the SCS method for infiltration.

Green-Ampt. For the Green-Ampt infiltration method, the suction head, conductivity, and initial deficit parameters were derived from the Natural Resources Conservation Service (NRCS) hydrologic soil group (Table 2-4). For the GHI subbasin model, soils are predominantly D and the Green-Ampt parameters are consistent for all subcatchments within the model. For the BCDF subbasin model, soils consist of hydrologic soil groups A, B and D, and the Green-Ampt parameters are an area-weighted average and vary by subcatchment.

Table 2-4. Initial Green Ampt Parameters

Hydrologic soil group	Average conductivity (in./hr)	Suction head (in./hr)	Initial deficit
A	2.6	2.89	0.32
B	0.23	5.10	0.22
C	0.10	8.66	0.15
D	0.025	10.47	0.12

Note: Values are based on soil texture class, as related to hydrologic soil group, and are average (EPA, 2010, Table A.2)

SCS. For the SCS method, curve number (CN), saturated hydraulic conductivity, and drying time parameters were assigned to each subcatchment based on the predominant land use type as shown on soil maps developed by King County and Pierce County. Where there were multiple soil types or land use within a subcatchment, an area-weighted average CN was calculated based on the land use assumptions presented in Table 2-5.

Table 2-5. Curve Number Based on Auburn Land Use and Hydrologic Soil Group

		CN by hydrologic soil group			
Auburn land use	SCS land use	A	B	C	D
Open space	Open spaces, lawns, parks, golf course, cemeteries, etc.; good condition: grass cover on 75% or more of the area	39	61	74	80
Public and quasi-public	Open spaces, lawns, parks, golf course, cemeteries, etc.; fair condition: grass cover on 50%–75% of the area	49	69	79	84
Heavy commercial, heavy industrial, downtown	Commercial and business areas (85% impervious)	89	92	94	95
Light commercial, light industrial, neighborhood commercial	Industrial districts (72% impervious)	81	88	91	93
Office residential	Residential 1/8 acre or less lot (65% impervious)	77	85	90	92
High-density residential, moderate-density residential	Residential 1/4 acre lot (38% impervious)	61	75	83	87
Single-family residential	Residential 1/2 acre lot (25% impervious)	54	70	80	86
Rural residential	Residential 1 acre lot (20% impervious)	51	68	79	84
Street	Streets and roads; paved with curbs and storm sewers	98	98	98	98

Saturated hydraulic conductivity and drying time were assigned based on the NRCS hydrologic soil group definitions. For the saturated hydraulic conductivity, a value in the middle of the range was used. Values near the higher end were assigned for the drying time to simulate conditions representative of winter months, when drainage problems are more likely to occur. Table 2-6 shows the hydraulic conductivity and drying time by hydrologic soil group.

Table 2-6. SCS Model Parameters

Hydrologic soil group	Saturated hydraulic conductivity (in./hr)	Drying time (days)
A	1	8
B	0.22	10
C	0.1	12
D	0.025	14

2.1.2 Creating New WWHM Models

The following is a general description of steps followed to develop new WWHM models for the OO subbasin:

1. Subcatchments within subbasins were delineated with existing GIS data including 2012 aerial photography, roadway extents, 2-foot contour data, and drainage network (catch basins, manholes, pipes, ditches, infalls, and outfalls).
2. Existing GIS data were used to determine hydrologic parameters for WWHM: hydrologic soil group, slope, land cover (i.e., lawn, impervious area). Subbasin slope was estimated from the 2-foot contour data. Total impervious area was estimated with the City's impervious area coverage. 2012 aerial photography was used to estimate vegetation. Table 2-2 summarizes the data types.
3. WWHM uses the Hydrological Simulation Program--Fortran (HSPF) hydrology model. HSPF calculates all individual components of the hydrologic cycle including surface runoff, interflow, groundwater, soil moisture, and evapotranspiration. HSPF simulates infiltration as a function of soil moisture using a set of regionally calibrated parameters included within WWHM.

2.1.3 Drainage Modeling using HEC-RAS

The ditch-and-culvert drainage system along the south side of 37th Street NW was modeled using the HEC-RAS[3] hydraulic modeling software. Basic geometric data inputs for the HEC-RAS model (i.e., cross-sections and ditch lengths) were developed using digital elevation data from a 2003 King County light detection and ranging (LiDAR) survey (King County, 2003). These inputs were modified based on City field observations, including estimated culvert sizes, invert elevations, and roadway embankment heights.

2.2 Hydraulic Parameters

Table 2-7 lists the Manning's roughness coefficients *(n)* used for conveyance analysis in the PCSWMM models, and in the flow calculations for pipe sizing related to the WWHM analysis.

[3] HEC-RAS stands for Hydrologic Engineering Center River Analysis System. This program, which was developed by the U.S. Army Corps of Engineers to perform one-dimensional hydraulic computations, can be used to calculate hydraulic profiles in open channels (USACE, 2010).

Table 2-7. Manning's Roughness Coefficients	
Conveyance material	Model value
Corrugated polyethylene pipe (CPEP) or ADS (manufacturer of CPEP)	0.012
Force main	0.012
Polyvinyl chloride (PVC), reinforced polyvinyl chloride (RPVC), and high-density polyethylene (HDPE)	0.0125
Ductile steel and ductile iron	0.013
Culvert	0.013
Concrete/reinforced concrete pipe (RCP)	0.013
Material unknown	0.013
Corrugated metal pipe (CMP)	0.024
Ditch	0.05

2.3 Monitoring Data

Depth, velocity, and water level monitoring data and pump station supervisory control and data acquisition (SCADA) data were collected subsequent to the 2009 Drainage Plan and used to estimate boundary conditions and calibrate the BCDF, GHI, and P subbasin models. Table 2-8 lists the monitoring locations, model and purpose for which it was used, and period of record.

Table 2-8. Flow Monitoring Summary						
Type	Meter ID	Location	Manhole ID	Modeling purpose	Modeled subbasin	Period of record used in model
Depth, velocity	AUB_B4	8th St. NE and Henry Rd.	710-B4	Calibration	BCDF	12/17/2010–3/19/2011
Depth, velocity	AUB_B86	201 12th St. SE	909-B86	Calibration	BCDF	12/17/2010–3/19/2011
Depth, velocity	AUB_B99	16th St. SE and B St. SE	909-B99	Calibration	BCDF	12/17/2010–3/19/2011
Depth, velocity	AUB_C18	G St. SE	809-C18	Calibration	BCDF	12/17/2010–3/19/2011
Water level	n/a	17th St. Pond	n/a	Calibration	BCDF	11/3/2010–12/31/2010
Water level	n/a	21st St. Pond	n/a	Calibration	BCDF	11/3/2010–12/31/2010
Water level	WL-Mill-01	Mill Creek at 37th St. NW	n/a	Calibration	TT	11/1/2011–12/31/2011
Water level	WL-Mill-02	Mill Creek at 29th St. NW	n/a	Calibration	TT	11/1/2011–12/31/2011
Water level	WL-Mill-03	Mill Creek at 15th St. NW	n/a	Calibration	TT	11/1/2011–12/31/2011
Water level	WL-Mill-04	Mill Creek at W Main St.	n/a	Outfall boundary condition, average winter month level Calibration	P TT	5/23/2011–3/12/2014 11/1/2011–12/31/2011
Flow	ST-18	Old West Main St. & SR 167	807-P156	Calibration	City of Auburn SCADA system	12/28/2012–5/12/2014

2.4 Climatic Data

Precipitation time series data are required to simulate the hydrologic modeling processes in PCSWMM and WWHM. Evaporation data are also required for WWHM and some applications of PCSWMM. The following sections describe the development of these data for use in the models.

2.4.1 Precipitation

The PCSWMM models use a volume-based 15-minute time series rainfall record developed by BC for the City with a period of record from October 1, 1948, to November 1, 2014. The data set is a composite from three rain gauges: City of Auburn, Sea-Tac International Airport, and King County Lakeland Hills (located in Auburn city limits). The City of Auburn gauge data are used when possible. The City's gauge has been collecting rainfall data since 1995. However, based on previous modeling efforts and review of the City's gauge data, it was deemed that data from the Sea-Tac International Airport gauge prior to 2010 should be used. The King County Lakeland Hills data are used when the Sea-Tac gauge data are known not to reflect the rainfall in Auburn (e.g., during a large event in 2007) and when Auburn gauge data are not available. Table 2-9 lists the sources of data for the precipitation time series used in PCSWMM modeling efforts.

The WWHM software contains an embedded precipitation file based on the Sea-Tac gauge from October 1, 1948, to October 1, 2012. These rainfall data were used for the WWHM analysis.

Table 2-9. Auburn Composite Precipitation Record for PCSWMM Models

Rain gauge	Period of record	Notes
Sea-Tac International Airport	10/1/1948–11/30/2007	Data obtained from WWHM
King County Lakeland Hills	12/1/2007–12/6/2007	Sea-Tac rainfall not representative at Auburn
Sea-Tac International Airport	12/7/2007–12/31/2009	Data obtained from WWHM
City of Auburn 15-min rainfall	1/1/2010–12/31/2010	-
City of Auburn aggregated 5-min	1/1/2011–11/14/2012	-
King County Lakeland Hills	11/14/2012–12/4/2012	Auburn gauge inoperable during this period
City of Auburn aggregated 5-min	12/5/2012–11/1/2014	-

2.4.2 Evaporation

Evaporation estimates are used by PCSWMM models that use the SCS CN infiltration method. These models used monthly evaporation values measured in inches per day, which were provided by the City during previous planning efforts. WWHM requires potential evapotranspiration estimates. These values are included with WWHM.

2.5 Horizontal and Vertical Datum

The horizontal and vertical datums of the models are consistent with the City's GIS datums as follows:

- horizontal: NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet (GCS_North_American_1983)
- vertical: North American Vertical Datum of 1988 (NAVD88)

Where necessary, elevations from other sources, such as as-built drawings and reports that are based on National Geodetic Vertical Datum of 1929 (NGVD29), were converted to NAVD88. A value of 3.53 feet was added to the NGVD29 elevation to convert to NAVD88. This conversion value was estimated using the

VERTCON tool provided by the National Oceanic and Atmospheric Administration (NOAA) at the following website: http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html. The conversion was estimated for latitude 35 degrees, 12 minutes, and 59.69 seconds north, and longitude 111 degrees, 40 minutes, and 2.06 seconds west.

Section 3: Model Calibration and Evaluation

BC performed calibration on the BCDF and P subbasin models. The BCDF model was calibrated with flow monitoring data and pond level data, while the P subbasin was calibrated with pump station SCADA data. The calibration for these models is described below.

The GHI model was calibrated with flow monitoring data prior to the 2009 Drainage Plan and the 2015 Drainage Plan update. Therefore, no calibration was conducted for the GHI model as part of the 2015 Drainage Plan update. There were no observed data for the OO subbasin model. The TT subbasin model was not calibrated because of the complexity of the natural Mill Creek system that impacts the problem area.

3.1 BCDF Model Calibration

The BCDF model was calibrated based on flow monitoring data (from end of December 2010 through mid-March 2011) from four locations and pond level data (November and December 2010) from two infiltration ponds. Peak storm events were identified using data from the four flow meters.

The largest six peak flows at each meter occurred during the same storm events. Five of the peak storm events were used in model calibration for comparing observed and simulated flows. The sixth event occurred on January 13, 2011, and the peak flows for this event did not correspond to the precipitation record. According to historical weather data, this event included snowmelt, which is not currently simulated with the model; therefore, calibration was completed with the five remaining events. A summary of the storm events is included in Table 3-2. Model calibration goals were to have modeled peak flows, event volumes, and maximum depths within 15 percent of the observed data.

Peak storm events were also identified for the period when pond level data were available. Seven peak events were identified, based on the maximum pond level. A summary of the storm events is included in Table 3-3. Model calibration goals were to have modeled maximum depths within 15 percent of the observed data.

3.1.1 Methodology

The model was calibrated using the PCSWMM Sensitivity-based Radio Tuning Calibration (SRTC) tool to vary two hydrologic parameters: percent routed and soil hydraulic conductivity. The percent routed parameter is the percent of impervious area that is not directly connected to the drainage system, but is first routed to the subcatchment pervious area. The percent routed was varied, from the original GIS-estimated impervious area, by a fixed amount for all subcatchments upstream of a meter. Subcatchments upstream of a meter (or calibration subbasins) are shown on Figure 3-1. The percent routed was adjusted so the simulated peak flow matched the flow monitoring data.

Hydraulic conductivity was adjusted (increased from the soil-based values) to match the recession (i.e., tail end) of the storm hydrograph, which affected the simulated storm event volumes. For some calibration subbasins, the values were increased by a fixed percentage. In other calibration subbasins, the percent change was varied by soil type, based on a visual comparison of the simulated and observed event hydrographs.

If simulated and observed values were within 15 percent, then the calibration was considered reasonable. Furthermore, visual assessment of the event peak flow, volume, and depth was made to qualify the calibration results.

For unmonitored areas, the lowest percent routed from the calibrated subbasins was applied to all subcatchments. Applying the lowest percent routed value to unmonitored areas is conservative, as the model produces more runoff for lower values. Hydraulic conductivity was not adjusted for unmonitored areas. These unmonitored areas should be considered uncalibrated. The final calibration parameters are summarized in Table 3-1.

Table 3-1. Final Hydrology Parameters Adjusted during Calibration

Parameter	Calibration subbasin					Areas outside monitored areas
	AUB_B4	AUB_B86	AUB_B99	AUB_C18	17th and 21st St. ponds	
Percent impervious routed to pervious	71	70.8	62	56	70.35	56
Hydraulic conductivity (in./hr)	0.32	0.14	0.06–0.48 (increased soil-based values for each subcatchment by 150%)	0.24	D soils increased from 0.025 to 0.236; other soil types increased by 118%	Unadjusted

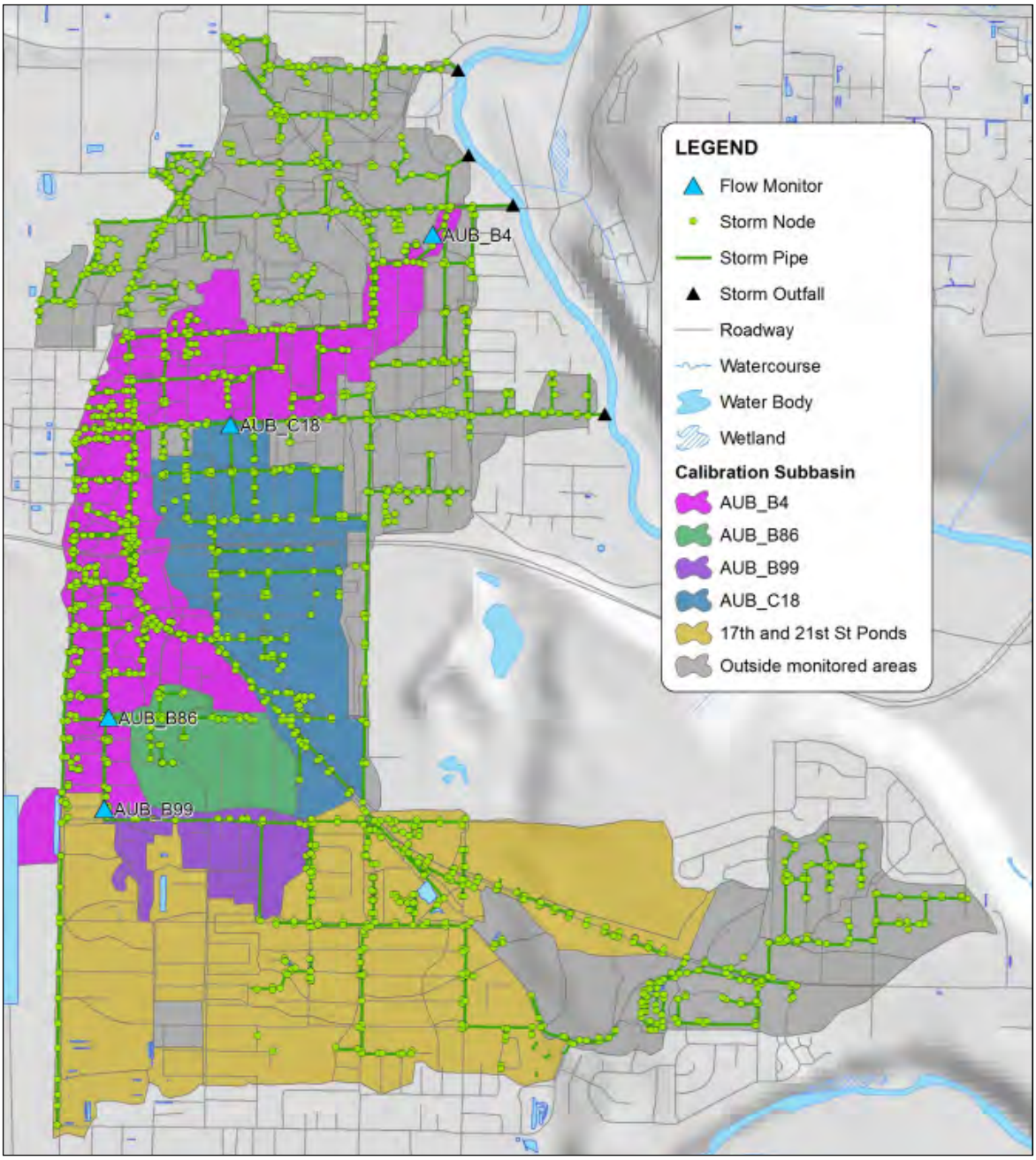


Figure 3-1. BCDF model meter subbasins

3.1.2 Results

The calibration results are summarized in Table 3-2. The calibration improved the model's ability to estimate flow in the City's storm drainage system. The models are considered sufficient tools for capital improvement project development in the areas where problems have been identified, and to increase confidence in project sizing to meet the City's LOS. In general, goals were met for some events at some locations, but were not met for all events at all meters. Calibration results for each meter are summarized below.

AUB_B4. Calibration at this meter did not meet the goals for depth (for all events) and volume and peak flow for some events. This meter has a large tributary area and calibration could not be improved with the available information. For the 2015 Drainage Plan update, there were no problem areas in this calibration subbasin, and the calibration was considered adequate. If future problems or projects area are identified, additional calibration events may be warranted.

AUB_B86. Peak flows were under- and over simulated with simulated peaks flows meeting the calibration criteria for five events. In general, peak volumes were over-simulated, while depths were under-simulated.

AUB_B99. In general, simulated depths matched observed depths. Peak flow were under-simulated while volumes were over- and under-simulated for some events.

AUB_C18. In general, simulated depths matched observed depths. Peak flow and volumes were over- and under-simulated for some events.

Table 3-2. BCDF Flow Monitoring Observed Data Model Calibration Summary

Event	Start date	Duration (hr)	Total rainfall (in.)	Peak 15-min rainfall (in./hr)	Peak 15-minute flow (cfs)			Volume (ft^3)			Maximum depth (ft)		
					Calibrated	Observed	Difference (%)	Calibrated	Observed	Difference (%)	Calibrated	Observed	Difference (%)
AUB_B4													
1	2/12/2011 15:00	12	0.55	0.72	33.1	24.5	35	221,200	168,500	31	1.1	2.2	-49
2	2/27/2011 18:00	13.8	0.63	0.24	14.0	15.2	-8	223,500	206,100	8	0.7	1.6	-54
3	3/9/2011 09:00	24	1.16	0.28	17.2	17.0	1	446,300	343,600	30	0.8	1.8	-57
4	3/13/2011 15:00	9	0.37	0.28	14.7	14.6	0	137,800	126,600	9	0.7	1.7	-56
5	3/15/2011 12:45	7	0.24	0.32	11.9	14.7	-19	83,760	64,330	30	0.7	1.7	-60
AUB_B86													
1	2/12/2011 15:00	12	0.55	0.72	3.2	2.2	43	18,170	14,970	21	3.7	4.3	-15
2	2/27/2011 18:00	13.8	0.63	0.24	1.5	1.6	-5	20,310	13,600	49	0.7	0.9	-22
3	3/9/2011 09:00	24	1.16	0.28	1.9	1.8	6	37,820	36,590	3	0.8	2.1	-60
4	3/13/2011 15:00	9	0.37	0.28	1.6	1.8	-10	11,970	11,370	5	0.7	1.0	-24
5	3/15/2011 12:45	7	0.24	0.32	1.4	1.6	-10	7,533	7,747	-3	0.7	1.0	-33
AUB_B99													
1	2/12/2011 15:00	12	0.55	0.72	3.0	3.2	-5	25,670	21,150	21	1.5	1.8	-15
2	2/27/2011 18:00	13.8	0.63	0.24	1.8	2.1	-16	28,840	28,430	1	0.9	0.8	13
3	3/9/2011 09:00	24	1.16	0.28	2.1	2.5	-18	63,350	66,420	-5	1.0	1.0	6
4	3/13/2011 15:00	9	0.37	0.28	1.8	2.4	-25	17,100	21,420	-20	1.0	0.9	8
5	3/15/2011 12:45	7	0.24	0.32	1.7	2.4	-28	9,895	14,620	-32	0.9	0.9	1
AUB_C18													
1	2/12/2011 15:00	12	0.55	0.72	14.9	13.3	13	96,730	66,090	46	2.1	2.2	-5
2	2/27/2011 18:00	13.8	0.63	0.24	7.2	7.3	0	98,880	79,470	24	1.3	1.4	-4
3	3/9/2011 09:00	24	1.16	0.28	9.3	9.8	-5	192,200	198,400	-3	1.5	1.5	-1
4	3/13/2011 15:00	9	0.37	0.28	7.9	7.6	4	59,840	59,460	1	1.4	1.4	-4
5	3/15/2011 12:45	7	0.24	0.32	6.9	8.6	-20	37,260	42,420	-12	1.2	1.5	-19

The calibration results for the pond depths are summarized in Table 3-3. In general, goals were not met for all events at both ponds. However, they were met for the longest, largest event, December 11, 2010, and therefore, the calibration was deemed acceptable.

Table 3-3. 17th and 21st Street Pond Level Data Model Calibration Summary

Event	Start date	Duration (hr)	Total rainfall (in.)	Peak 15-min rainfall (in./hr)	Maximum depth (ft)		
					Calibrated	Observed	Difference (%)
17th Street Pond							
1	11/6/2010 01:40	49.3	0.89	0.16	1.02	0.99	-3
2	11/17/2010 11:35	26.2	0.41	0.24	n/a	n/a	n/a
3	11/30/2010 03:00	31	0.42	0.12	n/a	n/a	n/a
4	12/7/2010 20:45	77.4	1.28	0.36	0.95	1.30	38
5	12/11/2010 09:15	133.5	3.16	0.28	2.80	2.70	-4
6	12/24/2010 14:25	54.3	0.81	0.12	0.95	1.23	29
7	12/27/2010 11:45	28.8	0.27	0.08	0.45	0.39	-12
21st Street Pond							
1	11/6/2010 01:40	49.3	0.89	0.16	3.00	2.05	-32
2	11/17/2010 11:35	26.2	0.41	0.24	1.38	1.19	-14
3	11/30/2010 03:00	31	0.42	0.12	1.97	1.45	-26
4	12/7/2010 20:45	77.4	1.28	0.36	3.07	3.15	3
5	12/11/2010 09:15	133.5	3.16	0.28	5.06	4.94	-2
6	12/24/2010 14:25	54.3	0.81	0.12	2.68	2.87	7
7	12/27/2010 11:45	28.8	0.27	0.08	1.44	1.60	11

n/a = not applicable as observed pond level data indicated no water in the pond during this event.

3.2 P Subbasin Model Calibration

The P subbasin model was calibrated with anecdotal flooding information and pump run times exported from the SCADA data of the single pump at the West Main Street Pump Station. The anecdotal flooding information includes reports of ponding on private property (because of private conveyance), flooding in the vicinity of the existing pump station prior to its construction, and surcharging in the storm conveyance south of West Main Street.

3.2.1 Methodology

Model calibration goals were set as a maximum 15 percent difference between simulated event volumes and observed volumes. A comparison of peak flows was not a calibration goal as the observed pump station peaks were limited by the pump capacity, which is not a useful measure of simulated peak flows.

The calibration effort focused on adjusting model parameters to match modeled and observed volumes at the pump station, and corroborating observed flooding. A time series representing the observed volume was

developed using pump run times from the SCADA data and assuming a pump capacity of 1,200 gallons per minute (gpm).

Initial comparisons of observed and simulated volumes indicated the presence of base flow in the system. A 0.5-cubic-foot per second (cfs) flow was added to the node immediately upstream of the pump station to represent this base flow contribution from the subbasin. In addition, initial comparisons of model results to anecdotal flooding locations indicated more simulated flooding than observed. The simulated peak flows were adjusted to match the observed flooding by reducing impervious area for the entire subbasin, and adjusting the parameters for subcatchments with detention facilities. The P basin contains several large, privately owned and maintained detention facilities that were not explicitly modeled because the details of their design, construction, and operation/maintenance are unknown. Model parameters for the subcatchments with detention facilities were adjusted in an effort to provide some simulated peak attenuation attributed to the detention facilities. These adjustments included reducing basin width and routing some of the runoff from impervious areas to pervious areas, instead of directly to the outlet. The parameter adjustments made during calibration are described below:

1. **Reduce impervious area for all subcatchments.** The model was calibrated to observed data by adjusting the effective impervious area, which was estimated using the Sutherland equations and GIS-derived total impervious area.
2. **Reduce subcatchment width to account for detention facilities.** The model subcatchment width was reduced by estimating the ratio between width and length as 0.0417. The ratio was derived from model trial runs to produce sufficient peak flow attenuation to reduce simulated flooding in locations with no reported flooding.
3. **Route runoff from impervious areas to pervious areas to account for detention facilities.** For subcatchments with detention, 100 percent of runoff from the impervious surfaces was routed to pervious surfaces prior to being routed to the subcatchment outlet.

Parameter adjustments made during calibration to the area tributary to the pump station, which is about 15 percent of the P subbasin, were applied basin-wide. While land uses are similar for both the area tributary to the pump station and other portions of the basin, these areas not tributary to the pump station should be considered uncalibrated.

3.2.2 Results

The calibration results are summarized in Table 3-4. All events met the calibration goal, which indicates that the calibrated model is effective at matching observations, and is a suitable tool for capital project development. However, the calibrated model constitutes about 15 percent of the P subbasin, and the remaining modeled area is considered uncalibrated. The uncertainty associated with the simulated flows for the uncalibrated portion of the P subbasin should be accounted for when developing capital projects.

Table 3-4. W Main Street Pump Station Observed Data Model Calibration Summary

Event	Start date	Duration (hr)	Total rainfall (in.)	Peak 15-min rainfall (in./hr)	Volume (ft^3)		
					Calibrated	Observed	Difference (%)
1	11/18/2013 00:10	24	1.12	0.2	111,400	103,700	7
2	12/1/2013 03:00	24	0.54	0.2	88,730	82,400	8
3	12/22/2013 00:05	24	0.44	0.08	86,610	81,300	7
4	1/2/2014 15:00	24	0.39	0.16	82,250	77,310	6

Table 3-4. W Main Street Pump Station Observed Data Model Calibration Summary							
Event	Start date	Duration (hr)	Total rainfall (in.)	Peak 15-min rainfall (in./hr)	Volume (ft^3)		
					Calibrated	Observed	Difference (%)
5	1/11/2014 00:00	24	0.95	0.4	101,800	116,400	-13
6	1/29/2014 03:00	24	1.37	0.24	120,700	121,400	-1
7	2/23/2014 21:00	24	0.53	0.12	96,700	100,300	-4
9	3/2/2014 12:05	24	0.88	0.2	99,730	106,100	-6
10	3/16/2014 00:05	24	1.20	0.2	107,700	114,600	-6
11	3/29/2014 15:00	24	0.85	0.36	114,200	112,100	2

Table 3-5 summarizes the parameters adjusted to calibrate the P subbasin model.

Table 3-5. Final Hydrology Parameters Adjusted during Calibration		
Parameter	Subcatchments without detention facility	Subcatchments with detention facility
Percent impervious reduction	-55%	- 55%
Subbasin width	W = area/L where length estimated as longest flow path	W = area/L, where W:L = 1:24
Subarea routing	to outlet	100% of impervious area routed to pervious areas

3.3 Model Evaluations

The models were used to determine appropriate flows or events for developing capital improvement projects to address the identified problems.

3.3.1 Level of Service

The City's stormwater LOS goals were used to evaluate modeled existing conditions and capital improvement project scenarios:

1. The City seeks to manage stormwater runoff within the public right-of-way (ROW) to allow access to and functionality of critical services such as hospitals, fire and police stations, Emergency Operations Center, maintenance and operations, and city hall. The LOS to allow access to and functionality of critical services translates to limiting surface water flooding that will disrupt the function of critical facilities (i.e., with floodwaters reaching the building structure, damaging the structure, and permitting no ingress/egress) with an annual chance of occurrence of no greater than 1 percent (i.e., an average recurrence interval of 100 years).
2. The City seeks to manage stormwater runoff within the public ROW to preserve mobility on major transportation routes (i.e., arterial roads) and residential roads. The LOS for preserving mobility on major transportation routes means limiting flooding disruption that inundates city roadways to an impassable level with an annual chance of occurrence of no greater than 4 percent (i.e., an average recurrence interval of 25 years).

3. The City seeks to manage stormwater runoff from the public ROW to protect real property structures (e.g., residences and businesses). The LOS for protecting real property structures means limiting flooding (surface water from ROW runoff entering premises and damaging building structures) to an annual chance of occurrence of no greater than 2 percent (i.e., an average recurrence interval of 50 years).

3.3.2 Flow Frequency Determination

For the newly calibrated PCSWMM models, a frequency analysis was completed for each model by performing a long-term simulation (from 1948 to 2014) to determine the 2 percent and 4 percent exceedance storms (one-in-50-year and one-in-25-year flows, respectively). These storms were used as design storms to identify ways to alleviate existing drainage problems through capital improvements that meet the LOS.

For the long-term simulations, the hydraulic networks of the models were modified so that there were no restrictions to flow and there was free discharge at outfalls. As a result, all runoff could be conveyed without substantial system storage and attenuation.

The event peak flows from the simulations were selected in PCSWMM with two event-based criteria: minimum inter-event time (time between peak storms) of 12 hours and a flow threshold (varies by subbasin). The peak flows were ranked, and the flow frequencies were established with the Cunnane plotting position estimators. The events associated with the 25- and 50-year peak flows were used to size storm drainage conveyance in order to meet the relevant LOS. The results of the flow frequency analysis for the BCDF and P subbasin models are provided in Table 3-6 and Table 3-7, respectively.

Table 3-6. BCDF Subbasin Frequency Analysis Summary

Peak flow rank	Event start date/time	Peak event flow (cfs)	Return period (yr)
1	10/20/2003 03:50	109.9	110.5
2	11/4/2006 14:45	104.9	41.5
3	11/4/1998 18:55	103.5	25.5
4	1/9/1990 04:10	100.5	18.4
5	11/18/2003 09:55	91.6	14.4
6	11/24/1990 05:00	91.1	11.8
7	10/5/1981 22:50	84.3	10.0

Table 3-7. P Subbasin Model Frequency Analysis Summary					
Event volume rank	Peak flow rank	Event start date/time	Peak event flow (cfs)	Event total volume (MG)	Return period (yr)
1	1	10/20/2003 09:20	21.8	8.1	110.1
4	2	11/5/2006 23:45	18.3	6.8	41.3
42	3	11/4/2006 15:15	17.9	2.0	25.4
16	4	1/9/1990 04:25	17.5	3.9	18.4
10	5	10/5/1981 23:10	16.61	5.4	14.4
13	6	11/24/1990 04:25	16.49	4.4	11.8
14	7	11/18/2003 10:15	14.88	4.3	10.0

For the WWHM models, the 25-year peak flows were estimated within the model using a Bulletin 17B flood frequency method (U.S. Department of the Interior Geological Survey, 1982). These flows were used with Manning's equation of flow to size new and replaced pipe for capital improvement projects in the OO sub-basin.

3.3.3 Drainage System Evaluation in the TT Subbasin

Frequent flooding has occurred in the vicinity of 37th Street NW and I Street NW, including shallow roadway flooding, overtopping of the driveway leading to a power substation, and flooding over the Interurban Trail south of 37th Street NW. Field observations and anecdotal information suggest that at least a portion of the water originates from overbank flooding along Mill Creek near the 29th Street NW bridge. City maintenance crews installed two 8-inch-diameter culverts (in addition to an existing 12-inch-diameter culvert) under the power substation driveway in 2012 to try to reduce flooding, but the City indicates that they have been ineffective.

The complexity of the drainage flow paths in the TT subbasin makes it difficult to quantify discharge frequency for drainage system features within the Mill Creek floodplain. For example, stormwater draining to the ditches along the Interurban Trail and the 37th Street NW road originate not only from upland runoff, but also from Mill Creek overflows near 29th Street NW. Discharges affected by Mill Creek overflows are particularly uncertain because calibration efforts of the existing HEC-RAS model of Mill Creek resulted in simulated water levels that did not match observed water level data. Therefore, hydraulic analyses were not performed for evaluating the existing drainage system capacity in the TT subbasin. Alternatively, ranges of discharges were estimated based on simulated existing system capacity and relative changes due to system improvements.

The HEC-RAS model described in Section 2.1.3 was used to evaluate the capacity of the drainage ditch along 37th Street NW and potential improvements. Two scenarios were developed as described below:

- **Existing conditions:** no culvert under the interurban trail, one 12-inch-diameter reinforced concrete pipe (RCP) culvert plus two 8-inch-diameter ductile iron pipes under the power substation driveway, and a 4-foot minimum ditch bottom width
- **Proposed conditions:** one 1-foot (rise) by 3-foot (span) concrete box culvert under the Interurban Trail, one 2-foot (rise) by 3-foot (span) concrete box culvert under the power substation driveway, and a 4-foot minimum ditch bottom width

Steady-state simulations were run for the two scenarios using discharges ranging from 1 to 10 cfs, where 10 cfs roughly reflects the existing capacity of the ditch system. For the simulated flows, the model indicates that the proposed culvert replacements will decrease water surface elevations along the 37th Street NW ditch system and no driveway or trail overtopping occurs (Figures 3-2 and 3-3).

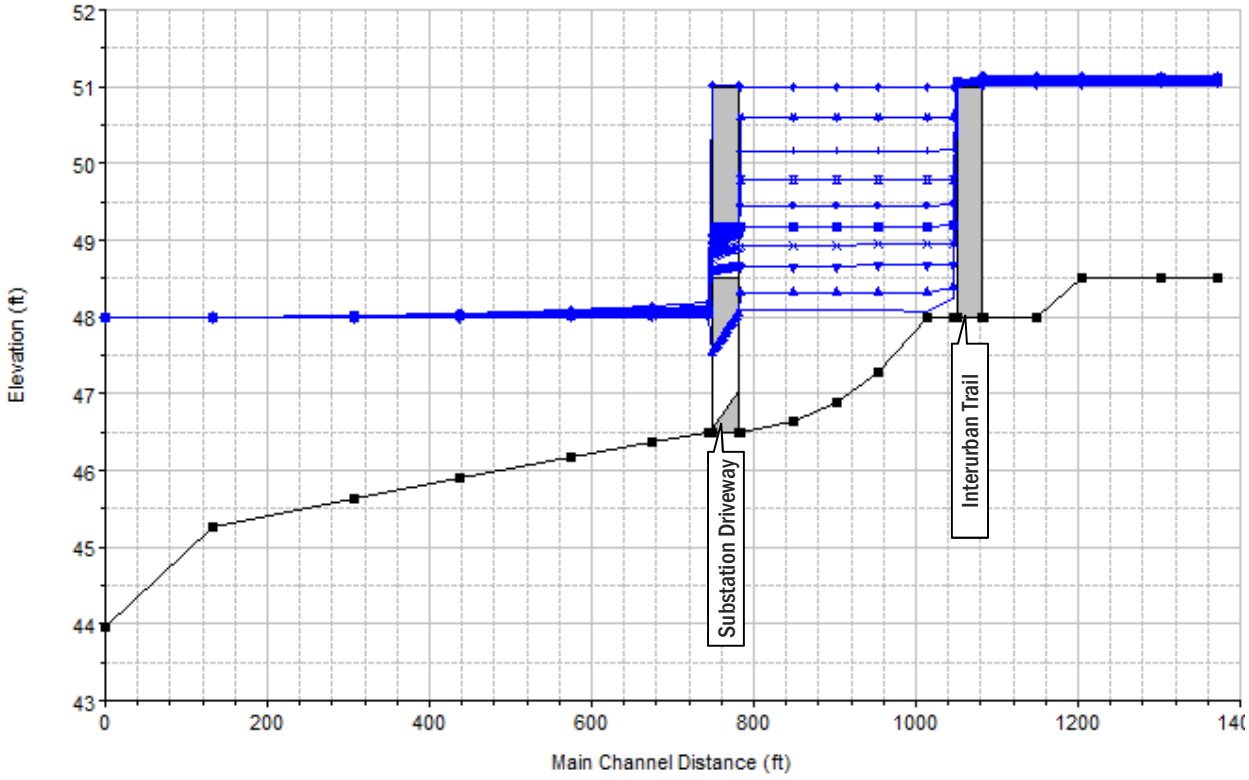


Figure 3-2. Existing-conditions profiles along 37th Street NW ditch for discharges ranging from 1 to 10 cfs

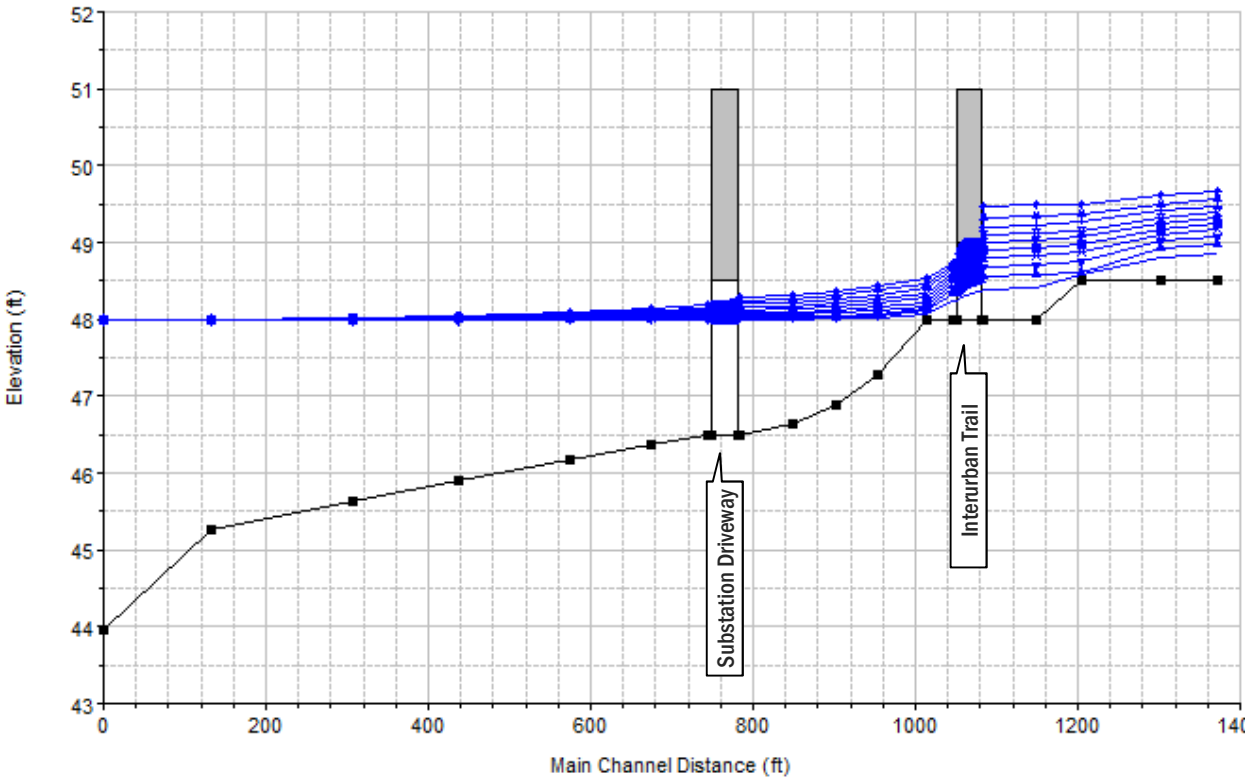


Figure 3-3. Proposed-conditions profiles along 37th Street NW ditch for discharges ranging from 1 to 10 cfs

Section 4: Annexation Area Desktop Evaluation

BC performed a review of the stormwater infrastructure in the City of Auburn's West Hills OO drainage subbasin to identify system easement and infrastructure gaps, and to develop capital improvement projects to address two reported drainage issues. The OO subbasin is 1 of 18 drainage subbasins added to the City of Auburn's storm drainage system with the annexation of the West Hills and Lea Hill areas from King County in 2008. The evaluation was completed in the OO subbasin, and not other annexed subbasins, because the system inventory had been completed and there were two identified drainage problems. The review was based on information collected from site visits to the known problem areas, a desktop analysis using GIS, and anecdotal information from City staff.

4.1 Methodology

Guidelines were developed so that the assessment could be performed consistently across the subbasin, and could be applied across other subbasins in the future. The assessment was completed primarily in GIS to identify potential gaps in the storm drainage system in the OO subbasin.

4.1.1 Assessment Guidelines

Guidelines were developed that reflect the Storm Drainage Utility service and planning expectations and are intended to complement the LOSs identified in the 2015 Drainage Plan:

1. The City will seek to obtain easements for City-owned infrastructure (pipe, culvert, catch basin, or manhole) located on private property.
2. When addressing an identified drainage problem, the City will seek to contain roadway runoff to the ROW to the extent feasible.
3. When addressing an identified drainage problem or reviewing development plans, the City will field-investigate potential infrastructure gaps and evaluate the need for additional drainage facilities.

4.1.2 GIS-Based Methodologies

Using the guidelines, potential easements and infrastructure gaps in the OO subbasin were identified using City GIS data, 2012 aerial photography, and Google Earth software imagery. For potential easement gaps, a spatial analysis was completed in GIS to identify City-owned infrastructure on private property.

To identify potential infrastructure gaps, subbasins were delineated to drainage outfalls. Then major drainage pathways were traced upstream based on topography (2-foot contour data), storm drainage infrastructure, road network, and aerial photos. Ten major pathways were identified. As pathways were traced, gaps were identified. Paved roadways and drainage features (i.e., interior outfalls) not directly contributing to the main drainage pathway were also reviewed. Paved roadways were observed from Google Earth and interior outfalls are outfalls that discharge flows between subbasins and not out of the OO subbasin.

4.2 Results

The assessment revealed three types of gaps:

- easement gaps for public infrastructure on private property
- infrastructure gaps along major drainage pathways
- infrastructure gaps along minor drainage pathways

The gaps and their occurrence in the 00 subbasin are described below. Figure 4-1 shows the locations of the identified gaps within the 00 subbasin, as well as the subbasin delineation and subbasin outfalls, and locations with known problems for which capital improvement projects are planned.

Easements. Of the 11 potential easement gaps identified, 2 are planned to be procured as part of two proposed 6-year capital improvement projects in the 2015 Drainage Plan, Projects 5A and 5B (Figure 4-1).

Major Drainage Pathways. Gaps along major drainage pathways were identified downstream of two interior outfalls. One is the drainage gap downstream of outfall 705-00383. Based on topographic data, the channel appears to be located on private property. However, the channel location is not mapped in GIS, and is not observable from aerial photographs or Google Earth and should be field-confirmed. There are no reported problems with the infall, outfall, or extent of the assumed channel. Another identified gap in a major drainage pathway is the area downstream of outfall 505-00800. This outfall is the downstream end of a daylighted pipe that discharges directly to the surface onto the property to the north. This infrastructure gap is being addressed with Project 5B in the 2015 Drainage Plan.

Minor Drainage Pathways. Gaps in the minor drainage pathways include runoff from paved roadways or where conveyance infrastructure ends and appears to discharge to adjacent parcels. No problems are reported in areas with identify gaps in minor drainage pathways.

505-OO612
505-OO591
505-OO585
605-OO800
704-OO968
704-OO979
705-OO383
705-OO1084
705-OO1036
804-OO459
805-OO396
805-OO343
806-PPP106
806-NNN64
5B
5A
Mill Creek
SR 18
SR-167
PEASLEY CANYON RD S
S 300TH ST
S 300TH PL
S 302ND PL
S 303RD PL
S 305TH ST
S 308TH ST
S 312TH ST
S 314TH ST
S 316TH ST
S 318TH ST
S 319TH ST
S 320TH ST
S 321ST ST
S 322ND PL
S 324TH ST
S 324TH PL
S 325TH ST
S 328TH ST
S 329TH PL
S 331ST ST
S 336TH ST
12TH CT NW
15TH ST NW
51ST AVE S
51ST CT S
52ND PL S
53RD PL S
S 301ST CT
57TH PL S
58TH PL S
59TH PL S
64TH AVE S
52ND AVE S
53RD AVE S
54TH AVE S
55TH AVE S
56TH AVE S
57TH AVE S
58TH AVE S
45TH PL S
W ST NW
V ST NW
U ST NW
T ST NW
R ST NW
9TH CT NW
HI CREST DR
MAY DR NW
MAY PL NW
WEST VALLEY HWY NW

LEGEND

- Storm Node
- Storm Pipe
- Storm Culvert
- Storm Channel
- Subbasin Outfall
- Interior Outfall
- Storm Detention Site
- Project Location and ID
- Potential Easement
- Potential Major Pathway Gap
- Potential Minor Pathway Gap
- Auburn City Boundary
- Basin OO Boundary
- Subcatchment boundary

P:\Auburn\145295 Auburn Stormwater Comp Plan\GIS\MXD\HHModelTechMemo\AuburnStorm_Fig4-1(AA).mxd

COMPREHENSIVE STORM DRAINAGE PLAN
April 2015

Brown AND Caldwell

900 0 900 1,800 Feet
1 inch = 900 feet

N

CITY OF AUBURN WASHINGTON

Figure 4-1
Subbasin OO
Potential Drainage System Gaps
Identified during Desktop Evaluation

4.3 Summary and Recommendations

This desktop evaluation is a high-level review of GIS data and aerial photography to identify potential gaps in the storm drainage system recently annexed to the City of Auburn from King County. The evaluation was completed for the OO subbasin where the storm drainage system was recently inventoried and there are two reported drainage problems. Identified gaps are intended to assist planning efforts associated with development review and investigative efforts should flooding problems arise. The evaluation was also used during the development of two capital improvement projects:

- Project 5A, West Hills Drainage Improvements at S 330th Street and 46th Place S
- Project 5B, West Hills Drainage Improvements near S 314th Street and 54th Avenue S

The approach can be applied to other recently annexed areas when the storm drainage system inventory has been completed or if a drainage problem is reported. If drainage problems are reported in other annexation area subbasins, they could be addressed with one of the general improvements listed in Table 4-1.

Also, as the data inventory for the recently annexed areas is completed, the City may identify more easement gaps. The City may want to develop a program to identify where easements are needed, and work with the property owners to obtain easements.

Table 4-1. Potential Annexation Area Storm Drainage Improvements

Drainage improvement	Benefit	Implementation considerations
Pervious pavement	Proactive for flow reduction Most cost-effective for new projects rather than rehabilitation or as new BMP on existing roads	Low infiltrative soils will require an underdrain. Not appropriate for roads with heavy vegetative debris or moss growth.
ROW bioretention cells	Proactive for flow reduction	Low infiltrative soils will require an underdrain. Higher maintenance requirements.
Pipe and ditch extensions	Connect problem area to the existing system to provide flow conveyance	Consider impact on downstream system and outfall.
Culvert inspection and maintenance	Maintenance may be able to improve the conveyance capacity and address the issue	Inspection may reveal need for culvert replacement. May result in additional downstream flows.
Culvert replacement	Damaged or undersized culvert could be replaced to reduce flooding	May need to increase culvert size based on subbasin land use. May result in changes to connecting infrastructure.
Ditchline grading	Ditch conveyance capacity could be restored	May result in additional downstream flow. Consider impact on downstream system and outfall.
Asphalt berms or curb and gutter	Berms could be used to direct flow to the storm drainage system	May result in additional downstream flow. Consider impact on downstream system and outfall.
Inlet placement or replacement	Capturing flow at additional locations or replacing a damaged inlet could reduce flooding	May result in additional downstream flow. Consider impact on downstream system and outfall.
Move pipe alignment from private property to ROW	Provides City with access to its infrastructure	If pipe is upsized when moved, conveyance capacity may be increased and may result in additional downstream flow. Consider impact on downstream system and outfall.

Section 5: Summary

BC performed H&H modeling for nine known drainage problems within the City of Auburn's stormwater system. The preparatory work included updating existing PCSWMM models and building new models in WWHM and HEC-RAS for smaller-scale analyses. Models were updated or developed with use of several data sources including City GIS data; technical reports; record and construction drawings of stormwater infrastructure; and regional agency climatology, soil, and topographic data.

BC performed calibration on subbasin models with observed data, the BCDF and P subbasin models. The models were used to perform long-term model simulations to estimate peak flow events to perform flow frequency analyses and establish design event flows for each modeled subbasin. The models were used to develop planning-level capital improvement projects to address identified drainage problems that meet the City's LOS goals for storm drainage capacity.

After the City has completed the system inventory, a more comprehensive modeling effort can be completed to evaluate City facilities with regard to the LOS.

BC also performed a review of the stormwater infrastructure in the annexation area West Hills OO drainage subbasin to identify potential easement and infrastructure gaps and to develop capital improvement projects to address two reported drainage issues. The review was based on information collected from site visits to the known problem areas, a desktop analysis using GIS, and anecdotal information from City staff. The evaluation methods can be applied to other recently annexed areas after the storm drainage system inventory has been completed or if a drainage problem has been reported.

References

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Appendix D: SEPA Compliance

CITY OF AUBURN WASHINGTON

Nancy Backus, Mayor

25 West Main Street * Auburn WA 98001-4998 * www.auburnwa.gov * 253-931-3000

DETERMINATION OF NON-SIGNIFICANCE (DNS)
CP1404 – 2015 Comprehensive Storm Drainage Plan
SEP15-0009

The City of Auburn is issuing a Determination of Non-Significance (DNS) for the following described proposal. The permit applications and listed studies may be reviewed at the Auburn Community Development & Public Works Department at 1 E Main ST, 2nd Floor, Customer Service Center, Auburn, WA 98001.

Proposal: City of Auburn 2015 Comprehensive Storm Drainage Plan

Location: City-wide and within potential annexation areas.

File No. SEP15-0009

Applicant: Tim Carlaw, Storm Drainage Utility Engineer
Community Development & Public Works Dept.
City of Auburn
25 W Main ST
Auburn, WA 98001

Studies/Plans Submitted with Application:

- City of Auburn Comprehensive Storm Drainage Plan and Appendices, prepared by Brown and Caldwell, dated April 2015. This information is available on the City's website at www.auburnwa.gov/services/utilities/storm_drainage.htm.

Other Permits, Plans, and Approvals Needed:

- City Council adoption of the 2015 Comprehensive Storm Drainage Plan and Appendices
- WA State Dept. of Ecology approval of the 2015 Comprehensive Storm Drainage Plan and Appendices

Lead Agency: City of Auburn

The lead agency for this proposal has determined that it does not have probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

Public Comment Period: This may be your only opportunity to comment on the environmental impact of the proposal. All persons may comment on this application. This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 15 days from the date issued below. Comments must be in writing and submitted to 25 W Main ST, Auburn, WA 98001 by 5:00 p.m. on **May 22, 2015.**

Any person aggrieved of the City's determination may file an appeal with the Auburn City Clerk within 14 days of the close of the comment period, by 5:00 p.m. on **June 5, 2015**.

For questions regarding this project, please contact Thaniel Gouk, Senior Planner, at tgouk@auburnwa.gov or 253-804-503. Any person wishing to become a party of record, shall include in their comments that they wish to receive notice of and participate in any hearings, if relevant, and request a copy of decisions once made.

RESPONSIBLE OFFICIAL: Jeff Tate
POSITION/TITLE: Assistant Director, Community Dev. & Public Works Dept.
ADDRESS: 25 West Main Street
Auburn, Washington 98001
(253) 931-3090

DATE ISSUED: **May 7, 2015** SIGNATURE:

Note: This determination does not constitute approval of the proposal. Approval of the proposal can only be made by the legislative or administrative body vested with that authority.