



Storm and Surface Water Plan

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City of Olympia

Storm and Surface Water Plan



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This plan was produced by City of Olympia, Water Resources staff

Andy Haub
Eric Christensen
Jake Lund
Jeannine Stewart
Jeremy Graham
Jesse Barham
Joe Roush
Laura Keehan
Marcus Goodman
Steve Thompson
Sue Barclift
Susan Clark

With guidance and review by:

Olympia Utility Advisory Committee
Olympia Land Use and Environment Committee

And assistance from:

Dorothy P. Craig & Associates
FCS Group

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For information or copies of this plan, contact:

Eric Christensen, Engineering and Planning Supervisor
360-570-3741 phone
360-709-2797 fax
echriste@ci.olympia.wa.us

DRAFT Storm and Surface Water Plan

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EXECUTIVE SUMMARY

Every day Olympia's Storm and Surface Water Utility activities help to prevent flooding of homes, businesses, and roads; minimize the amount of contaminants such as sediments and petroleum that enter water bodies; and protect and restore valuable aquatic habitat. The Utility's activities include stormwater system maintenance, public education and outreach, and capital project design and construction.

The Utility's mission is to reduce flooding, improve water quality, and protect and enhance aquatic habitat in Olympia.

The Utility's built stormwater system consists of 160 miles of underground pipe, 7,400 catch basins, 1,400 manholes, 167 flow control structures, and 129 stormwater treatment facilities. This system carries stormwater runoff from roads and hard surfaces to streams and Budd Inlet. An additional 20.7 miles of combined sewer pipe, maintained by the City's Wastewater Utility, conveys stormwater to the LOTT Clean Water Alliance Budd Inlet Treatment Plant. The natural elements of the stormwater system include swales and small drainage courses, streams, rivers, lakes, wetlands, and Puget Sound.

The *Storm and Surface Water Plan* contains policy and financial guidance for the Utility in constructing, operating, maintaining, and improving its built infrastructure and natural elements for the next ten years.

1.1 Overall Vision

The *City of Olympia Comprehensive Plan* contains the vision residents share for Olympia's future. This vision is organized around the following topics:

- Public Participation and Partners
- Natural Environment
- Land Use and Urban Design
- Transportation
- Utilities
- Public Health, Parks, Arts and Recreation
- Economy
- Public Services
- Capital Facilities

The Utility's activities work toward achieving the *Comprehensive Plan* vision, including these statements:

- **Natural Environment.** "Though our population will increase, our air and water will be cleaner and wildlife habitat will be preserved to maintain a biologically healthy diversity of species. Salmon will return and spawn in the streams where they were born. Seals, sea lions, orcas, and otters will roam the waters of southern Puget Sound."
- **Utilities.** "Our improved water treatment and reduced wastewater and storm water discharge will support abundant aquatic life in Budd Inlet and our local streams. A majority of Olympia households will be using urban organic compost on their landscapes. Artificial fertilizers no longer contaminate local water bodies."

1.2 Important Aspects of the Utility

The purpose of Olympia's Storm and Surface Water Utility is to protect public and environmental health by ensuring that surface water runoff is collected and infiltrated or conveyed to streams, rivers, and Puget Sound with the aim of reducing the frequency and severity of flooding, improving water quality, and protecting, enhancing, and restoring aquatic habitat.

The Utility provides storm and surface water services to residents and businesses within Olympia City limits. Properties located in Olympia's Urban Growth Area (UGA) are served by the Thurston County Stormwater Management Utility.

Utility systems and services are designed and managed with the basic understanding that surface water flows through the natural environment. The built infrastructure is designed to channel the water in such a way as to maintain and protect the natural systems, including swales and small drainage courses, streams, rivers, lakes, wetlands, and Puget Sound.

The Utility has a total of 21.6 Full Time Equivalent (FTE) staff in Planning and Engineering, Operations, and Environmental Services. Their work is organized into nine core services:

- Long-Range Planning
- Asset Management
- Technical Review and Support
- Flood Prevention
- Emergency Response
- Pollution Prevention
- Habitat Management
- Capital Facility Program
- Utility Administration and Support

The Utility's success at resolving flooding problems has created an opportunity to focus increasingly on water quality improvement, habitat protection, and scheduled replacement of aging pipe systems.

Community education is essential to accomplishing the Utility's goals. Activities for citizens, landowners, and businesses are aimed at increasing awareness and changing behaviors to prevent flooding, and improve water quality and aquatic habitat. In its educational activities, the Utility collaborates with other utilities, neighboring jurisdictions, and organizations.

1.3 Challenges

The Utility has made considerable progress in its first 30 years. As it embarks on its next phase, the Utility faces numerous challenges. The key challenges are described below.

General Challenges

- **Equitable and Predictable Rates and Fees.** Creating predictability for customers and developers is difficult in a complex and changing regulatory environment.
- **Legacy Development.** Most of Olympia's stormwater infrastructure was constructed prior to the current rigorous storm drainage design regulations. Retrofits of older neighborhoods without modern stormwater control and treatment systems are a logistical and financial challenge, but are often necessary to improve flooding, water quality, and aquatic habitat.
- **Reliance on Choices by Individuals.** The Utility's work is highly influenced by the cumulative impact of individual behaviors.
- **Land Development Pressure.** Increasing population density will both create challenges for water quality and provide opportunities to retrofit and concentrate treatment.

- **Climate Change and Sea Level Rise.** Changing climate in the Pacific Northwest likely will influence aquatic habitats due to warmer temperatures, reduced precipitation in the summer, increased precipitation in other seasons, and a rising sea level. Older stormwater infrastructure will be the most vulnerable to overflows associated with more frequent and intense storm events, which could result in more localized flooding.

Flooding Challenges

- **Asset Management.** Understanding the condition of the Utility’s stormwater infrastructure (both built and natural) informs replacement and maintenance decisions and is referred to as “asset management.” Although significant staff effort has been dedicated to improving the Utility’s understanding of the stormwater infrastructure, additional work is required to fully implement a robust asset management program.
- **Low Impact Development (LID).** The City’s 2016 *Drainage and Erosion Control Manual* requires LID in all new development. The sheer number of such facilities and the intensive maintenance required will likely make LID facilities more complex to manage than more traditional stormwater facilities.

Water Quality Challenges

- **Increasing Permit Requirements.** To discharge stormwater into “waters of the United States,” the City must obtain and keep current a National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Discharge Permit. Permit requirements are continually being revised and expanded.
- **Reliance on the Public for Nonpoint Pollution Prevention.** The Utility is challenged in helping people understand their contribution to nonpoint sources of pollutants and the impact individuals have on water quality.

Aquatic Habitat Challenges

- **Multiple Public/Private Ownership.** Habitat is located within a complex landscape of many large and small parcels under public and private ownership. The Utility has limited authority on private property and must rely on voluntary programs, education and outreach, and incentives to encourage stewardship on private properties.
- **Habitat Fragmentation.** Large intact habitat areas are important for both wildlife and protection of aquatic resources. Maintaining and improving the habitat quality of these areas requires tools and strategies that work across the landscape.
- **Legacy Impacts of Urban Development.** Maintaining functional habitat in an urban landscape is challenging and requires creativity and flexibility to protect remaining habitat areas and maintain their health, while working to enhance and restore key habitats where possible.

1.4 Summary of Goals, Objectives, and Strategies

In this Plan, “goal”, “objective”, and “strategy” have the following meanings:

- **Goal:** Broad, qualitative statement of what the Storm and Surface Water Utility intends to achieve.
- **Objective:** Specific, measurable statement of what will be done to achieve the goals within a particular time period.
- **Strategy:** General approach or method for achieving objectives and resolving specific issues. A strategy speaks to the question: “How will we go about accomplishing our objectives?”

The Utility will focus on achieving the following goals and objectives during the next ten years:

Goal 1 Reduce the frequency and severity of flooding so hazards are eliminated.	
Objective 1A	Improve the stormwater system in areas that are vulnerable to flooding.
Objective 1B	Prepare for emergency response during storm events.
Objective 1C	Mitigate the effects of urban stormwater runoff by implementing low impact development techniques.
Objective 1D	Plan for the anticipated impacts of sea level rise.
Goal 2 Improve surface water quality.	
Objective 2A	Prioritize source control of pollution citywide.
Objective 2B	Retrofit stormwater treatment in areas of the City with little or no water quality treatment.
Objective 2C	Educate the community about water quality with emphasis on how people can be a part of the solution.
Objective 2D	Partner with other agencies, jurisdictions, and organizations in order to leverage water quality planning projects.
Objective 2E	Comply with all federal and state permits and regulations.
Goal 3 Protect, enhance, and restore aquatic habitat functions provided by wetlands, streams, lakes, marine shorelines, and riparian areas.	
Objective 3A	Protect intact aquatic habitat from degradation.
Objective 3B	Enhance aquatic habitat that is already impaired.
Objective 3C	Restore degraded aquatic habitat to increase ecosystem function.
Objective 3D	Participate in and give technical support to City and regional environmental planning efforts and implementation projects.
Objective 3E	Increase community awareness of aquatic habitat function and benefits through outreach, education, and volunteer activities.
Goal 4 Ensure reliable functioning of the built and natural stormwater infrastructure.	
Objective 4A	Develop and implement an asset management program for the built and natural infrastructure.
Objective 4B	Design and construct infrastructure to ensure reliable, cost effective function.
Objective 4C	Further develop and implement the Utility's private and public stormwater system inspection programs.
Objective 4D	Continue to improve maintenance management, including preventive maintenance, repairs, and replacements.
Goal 5 Manage Utility finances responsibly and recover costs equitably.	
Objective 5A	Set rates that reflect financial policies and recover the cost of providing services to customers in each category.
Objective 5B	Manage Utility rates and connection fees consistent with the City's guiding principle of growth paying for growth.
Objective 5C	Use debt financing responsibly to support needed capital facility investments and "smooth" rate impacts.

After analyzing existing conditions (Chapters 6-8) and developing goals and objectives, Utility staff crafted strategies to achieve Plan objectives and meet key challenges. The Utility proposes two types of strategies: those that continue the Utility's existing core services (Chapter 9) and those that enhance existing services. Table ES-1 is an index of Plan strategies, identifying whether they are continuations and/or enhancements of the Utility's nine core services.

Taken together, the goals, objectives and strategies presented here offer a roadmap for the Utility's direction over the next ten years.

Table ES-1 Strategies

Storm and Surface Water Utility Core Services Key					
AM	Asset Management	FP	Flood Prevention	PP	Pollution Prevention
CFP	Capital Facility Program	HM	Habitat Management	TR	Technical Review
ER	Emergency Response	LRP	Long Range Planning	UA	Utility Admin

Strategies		Enhance	Continue
Goal 1 – Reduce the frequency and severity of flooding so hazards are eliminated			
1-1	Identify conveyance capacity problems in the City system. Develop a priority ranking procedure for correcting flooding issues.	CFP	FP
1-2	Evaluate possibilities for regional, City-owned detention facilities and support design and construction where determined feasible through basin planning.	CFP FP	
1-3	Evaluate existing public stormwater detention facilities for effectiveness and potential improvements.	CFP FP	
1-4	Provide information to customers to help investigate and solve drainage issues at their homes or businesses.		TR
1-5	Ensure public and private development complies with the City of Olympia Drainage Design and Erosion Control Manual.		TR
1-6	Provide public education and outreach on how to reduce stormwater runoff.		FP
1-7	Develop post-construction inspection and maintenance capabilities for public stormwater facilities. Focus should be on LID implementation, staffing, and training.	FP	
1-8	Map impervious and pervious surfaces and track implementation of LID stormwater facility installations.		AM
1-9	Encourage use of permeable paving materials and native vegetation in Public Works construction projects.		TR
1-10	Consolidate downtown outfalls to improve manageability.	FP CFP	
1-11	Install tide gates on downtown outfalls to reduce flood risks.	FP CFP	
1-12	Consider separation of storm drainage from combined sewers to protect wastewater treatment plant (LOTT).	FP CFP	
1-13	Develop structural alternatives to mitigate long-term or projected sea level rise impacts.	FP CFP	
1-14	Provide emergency response training to staff.		FP ER
1-15	Respond in a timely manner to emergencies with adequate resources.		FP ER
1-16	Coordinate with other City departments, agencies and local entities to be prepared for emergencies.		FP ER
1-17	Partner with Planning & Engineering, Olympia Fire Department, State and local agencies to develop and implement emergency response plans in the downtown core.		FP ER
1-18	Perform inspections, maintenance, repairs, and installations of Utility infrastructure in anticipation of sea level rise.		PP

Strategies		Enhance	Continue
Goal 2 – Improve surface water quality			
2-1	Provide education and outreach about water quality with emphasis on how to reduce or eliminate behaviors and practices that contribute to negative stormwater impacts.		TR PP
2-2	Support the City’s temporary erosion and sediment control inspection and enforcement program.	TR	PP LRP
2-3	Maintain and improve the program to address illicit discharges, including spills and illicit connections.	PP	
2-4	Adopt regulations that expand and simplify enforcement of illicit discharges.	LRP	
2-5	Develop a street sweeping program focused on improving water quality. (See also Strategy 4-26.)	PP	
2-6	Develop a business pollution prevention program that includes coordination with adjacent jurisdictions.	PP	
2-7	Map and evaluate drainage sub-basins to determine their level of water quality treatment and help prioritize projects that will provide higher levels of water quality treatment.		AM
2-8	Develop a program to evaluate and prioritize retrofits of existing untreated pollution generating infrastructure.	CFP	PP
2-9	Develop a rate structure to incentivize retrofitting private stormwater systems to provide higher levels of water quality treatment.	UA	AM LRP
2-10	Continue to monitor the health and water quality of City streams and lakes.		PP
2-11	Ensure stormwater pollution prevention plans (SWPPPs) are developed and implemented for all heavy equipment and/or material storage facilities owned or operated by the City.	PP	AM LRP
2-12	Develop and implement a plan to identify and evaluate onsite septic systems in priority watersheds (Indian, Moxlie, and Mission).	PP	
2-13	Coordinate with the LOTT Clean Water Alliance to evaluate options for providing higher levels of water quality treatment, particularly in coordination with consolidation of the stormwater conveyance system associated with sea level rise.	LRP	
2-14	Develop and implement an integrated pest management plan in coordination with other City departments.	LRP HM	
2-15	Update annually Olympia's Stormwater Management Program (SWMP) to document the City's plan for ongoing compliance with the Western Washington Phase II Municipal Stormwater Permit.		PP
2-16	Enforce Olympia's Drainage Design and Erosion Control Manual.	TR	
2-17	Provide technical assistance to other City departments to ensure ongoing permit compliance.		TR
2-18	Participate in development of Total Maximum Daily Loading (TMDL) plans and implement resulting required actions.	PP	LRP
2-19	Ensure inspection and maintenance standards for private and public stormwater treatment facilities are being met.	AM PP	TR
2-20	Develop sediment tracking program for management of sources through maintenance activities (street sweeping, ponds, catch basin, ditch maintenance, etc.)	PP	
2-21	Investigate sources of pollutants of concern citywide.		PP
2-22	Respond, document and report spills in a timely manner.		TR PP
2-23	Develop a pollution prevention training and tracking program for field staff with responsibilities in Illicit Discharge Detention and Elimination (IDDE)/Spills, Erosion Control, and O&M.	PP	
Goal 3 – Protect, enhance, and restore aquatic habitat functions provided by wetlands, streams, lakes, marine shorelines, and riparian areas (Chapter 8).			
3-1	Collaborate with other agencies, tribes, and community organizations to support stream, riparian, wetland, and shoreline enhancement and restoration, fish passage, and adaptation to climate change/sea level rise.	HM LRP CFP	

Strategies		Enhance	Continue
3-2	Collaborate with other departments to develop a comprehensive integrated pest management strategy to guide noxious weed control and vegetation management efforts.	HM LRP	
3-3	Develop and implement vegetation and habitat management plans for City-owned properties containing aquatic and associated habitat to improve habitat, protect water quality, and support native species.	HM LRP	
3-4	Identify and acquire important habitat areas or easements (collaborating with internal and external partners).	HM LRP	CFP
3-5	Identify and manage invasive species in aquatic and associated habitats to protect habitat and water quality functions.	HM LRP	AM
3-6	Identify important corridors and support efforts linking important habitats across the City and adjacent jurisdictions.	AM LRP	
3-7	Identify, prioritize, and implement aquatic habitat protection and enhancement opportunities by watershed to enhance and restore ecosystem function (i.e. implement the <i>Habitat Stewardship Strategy</i>).	LRP	HM
3-8	Influence and assess effectiveness of City regulations that protect aquatic resources (e.g. Critical Areas Ordinance and Shoreline Master Program).	LRP	
3-9	Manage beaver activity to provide habitat and water quality benefits while mitigating flooding risk.	LRP FP	HM
3-10	Manage vegetation in riparian areas in order to improve habitat and water quality functions.	HM	AM
3-11	Monitor aquatic habitat quality and quantity based on the best scientific information, methods, and tools available.	LRP HM AM	
3-12	Participate in regional planning to support salmon and Puget Sound recovery (e.g. WRIA 13 and Alliance for a Healthy South Sound).		LRP
3-13	Provide outreach and education to the community around aquatic habitat, wildlife and ecosystem function (wetlands, streams, marine shoreline, lakes, buffers and associated wildlife).	HM	
3-14	Provide focused outreach, technical assistance and incentives to private properties containing aquatic and associated habitats, while promoting voluntary stewardship.	HM LRP TR	
3-15	Provide technical support to City projects with aquatic permitting requirements (e.g. CWA 401/404 and HPA) or that are specifically habitat related.		TR LRP
3-16	Support partners and community efforts to protect, steward, and restore aquatic and associated habitats.	LRP HM TR CFP	
Goal 4 – Ensure reliable functioning of the built and natural stormwater infrastructure.			
4-1	Continue to maintain and improve mapping/geodatabase.		AM
4-2	Continue pipe condition rating program.		AM FP
4-3	Continue catch basin and manhole inspection and cleaning program.		AM PP
4-4	Develop a natural infrastructure asset management program	AM HM	
4-5	Provide operational support and feedback to engineering staff regarding location, function, constructability and maintenance of Utility infrastructure improvements.		CFP

Strategies		Enhance	Continue
4-6	Require development to construct stormwater infrastructure in compliance with the <i>Olympia Drainage Design and Erosion Control Manual</i> and the <i>Engineering Design and Development Standards</i> .		TR
4-7	Design and plan the Utility's capital improvements to complement natural infrastructure.	CFP HM	
4-8	Comply with NPDES permit requirements.		PP
4-9	Develop SOPs for inspections preventive maintenance and correction programs	LRP	
4-10	Enhance public outreach and education for stormwater system functions, operations and maintenance.		PP FP
4-11	Develop enforcement capabilities (facilities to be maintained for the design purpose) in Olympia Municipal Code (OMC).	LRP	
4-12	Develop level of service standards for public stormwater facilities.	AM	
4-13	Monitor resources through work order system and identify any additional needs.	AM	
4-14	Expand inspections beyond NPDES permit requirements.	PP TR	AM
4-15	Keep current with training as new technologies and techniques emerge.		UA
4-16	Update emergency response processes and procedures regularly.		ER
4-17	Develop and implement a sea level rise response plan. Use the best available science and the experiences of other communities in formulating plans for sea level rise. Partner with government entities and key stakeholders. Engage the community in a discussion of various sea level rise scenarios, how the City will respond to lessen the impact and costs.	LRP FP	
4-18	Annually update the Storm and Surface Water component of the City's <i>Capital Facilities Plan</i> .		CFP
4-19	Develop a priority ranking system for proposed capital projects.	CFP	
4-20	Integrate data-based decision making processes into section programs.		AM
4-21	Develop CCTV program to provide long term condition rating, investigation, and emergency response.	AM	
4-22	Continue cleaning and inspection program.		AM FP
4-23	Transition vegetation and LID maintenance programs from Environmental Services to Stormwater Operations.	HM FP	
4-24	Develop and implement field-based data collection tools for public and private stormwater utility infrastructure.	AM	FP PP
4-25	Implement basin approach to utility infrastructure maintenance with an emphasis on sediment management.	AM	FP PP
4-26	Implement a street sweeping program to remove sediment before it enters the stormwater system. (See also Strategy 2-5.)	AM	
4-27	Perform stormwater system repairs and maintenance based on utility wide priorities.		AM FP
4-28	Manage sediment in a manner that complies with applicable regulations and is done in a cost-efficient manner.		PP
4-29	Identify essential training and safety benchmarks by job classification.		UA
4-30	Develop employee training program to meet training and safety benchmarks by job classification.		UA
Goal 5 – Manage Utility finances responsibly and recover costs equitably			
5-1	Continue the capital funding strategy that utilizes existing resources from reserves and general facility charges first before relying on debt financing.		UA
5-2	Pursue grants and state low-interest loans when available.		UA
5-3	Perform operations and maintenance of utility infrastructure in a fiscally thoughtful and strategic manner which reflects positively on the utility.		UA
5-4	Evaluate alternative rate structures and pursue implementation if found beneficial.		UA
5-5	Develop incentives for stormwater retrofit.		UA

Strategies		Enhance	Continue
5-6	Coordinate regular rate studies with the City's other water resources utilities, so that the full impact of rate increases on customers is considered and rates are equitably distributed to customers		UA
5-7	Review general facilities charges regularly to ensure that they accurately and equitably distribute system costs to new development and are adjusted for inflation.		UA

1.5 Summary of Capital Projects

Table ES-2 lists the Capital Projects recommended for construction during the next twenty years.

Table ES-2 20 Year Capital Improvement Program

Storm & Surface Water Utility - Public Works Water Resources															
Project Schedule and Costs (in thousands of dollars) ¹															
Code	Project	Priority	Quadrant	% GFC Funding	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2036
Asphalt Overlay Adjustments															
	Asphalt Overlay Adjustments		Citywide		187	187	187	187	187	187	187	187	187	187	1,865
Aquatic Habitat Improvements															
HAB-1	Habitat Improvement/Stewardship	med	Citywide		266	266	266	266	266	266	266	266	266	266	2,660
HAB-2	Ellis Creek Fish Passage *#	low	NW								375	750	750		
HAB-3	Mission Creek Fish Passage - Feasibility Study and Concept Design	low	NE								100				
HAB-4	Schneider Creek Fish Passage	med	NW							1,000					
HAB-5	West Bay Shoreline Improvements - Garfield Creek/Lagoon Reaches *#	low	Downtown												750
HAB-6	East Bay Shoreline and Salt Marsh*	low	Downtown												1,250
HAB-7	Property Acquisition		Citywide								100	100	100	100	1,000
	# = Funded 50% by Grants														
	* = 25% Design/Engineering, 75% Construction														
	Yearly Program Funding Total				266	266	266	266	266	1,266	841	1,116	1,116	366	5,660
Water Quality Improvements															
WQ-1	Neighborhood LID Design Grant	low	Varies		150										
WQ-2	Harrison Water Quality Retrofit	high	NW		534										
WQ-3	Union Avenue at Plum Water Quality Retrofit	high	Downtown			600									
WQ-4	Brawne Avenue Retrofit (West Bay #5)	med	NW				800								1,000
WQ-5	Capitol Way Water Quality Retrofit	high	Downtown					640							
WQ-6	Martin Way at Mary Elder Water Quality Retrofit	high	NE						550						
WQ-7	Plum Street Water Quality Retrofit	high	Downtown							800					
WQ-8	Evergreen Park Drive Treatment Facility Construction	med	SW								551				
WQ-9	East Bay Drive	med	NE									600			
WQ-10	South Capitol Combined Sewer/Storm Separation w/ LID	med	S									200	200	200	
WQ-11	Downtown Outfall Consolidation	med	Downtown										300	300	300
WQ-12	Arterial Roadway Retrofit	high	Citywide											500	5,000
WQ-13	4th Ave West Water Quality Retrofit	med	SW												1,450
WQ-14	West Bay Drive Retrofit (West Bay #17)	med	NW									46	185		2,850
WQ-15	Madison and Percival NW (West Bay #13)	med	NW											220	900
WQ-16	Madison and Thomas NW (West Bay #14)	med	NW												900
WQ-17	Giles Facility Upgrade (West Bay #18)	med	NW												1,120
	All Water Quality Improvement Projects funded 75% by Grants														
	Yearly Program Funding Total				684	600	800	640	550	800	551	846	685	1,220	13,520

Code	Project	Priority	Quadrant	% GFC Funding	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2036
Flood Mitigation and Collection															
FM-1	Conveyance Spot Repairs (Pipe Replacement)	high	Citywide		79	79	79	79	79	79	79	79	79	79	790
FM-2	Condition Rating Existing Conveyance	high	Citywide		142	142	142	142	142	142	35	35	35	35	350
FM-3	Public Pond Rehabilitation ("City Owned Stormwater Pond Rehab")	high	Citywide		50	50	50	50	50	50	50	50	50	50	500
FM-4	Downtown Flood Mitigation	high	Downtown		123	123	123	123	123	123					
FM-5	Ascension and 4th Avenue Facility	med	NW	25%		277									
FM-6	Cooper Point and Black Lake Conveyance	med	SW	50%			4,700								
FM-7	Ken Lake Flood Conveyance	med	SW	50%					170	490					
FM-8	2900 block 28th Avenue NW - Street and Storm Reconstruction	low	NW	25%											150
FM-9	1300 block Kaiser Road at Green Cove Creek Culvert Replacement	low	NW	25%											50
FM-10	4800 block Harrison Road Closed Depression Emergency Overflow	low	SW	25%											300
FM-11	900 block Poplar St SE/Woodland Trail Swale Closed Depression Analysis	low	SE	25%										60	
FM-12	2300 block of Crestline Blvd - Conveyance and Street Improvements	med	NW	25%											400
FM-13	1400 block Frederick St SE - Culvert Replacement	low	SE	25%									50		
FM-14	Wiggins Road Ditch Reconstruction	high	SE	50%					250	250	250				
FM-15	Pacific Avenue at Chambers - Pipe Replacement	med	NE	25%								120			
FM-16	Indian Creek Culverts at Plum Street	med	SE	25%											
FM-17	Coleman, Bing and Walnut Conveyance	med	NW	25%											
FM-18	Division and Scammel Conveyance	med	NW	25%											
	^ = Not in 2017-2022 CFP														
	Yearly Program Funding Total				394	670	5,094	394	814	1,134	414	284	214	224	2,540
Infrastructure Predesign and Planning															
PL-1	Infrastructure Predesign and Planning		Citywide		50	50	50	50	50	50	50	50	50	50	500
PL-2	Pervious Pavement Contingency Fund		Citywide		25	25	25	25	25	25	25	25	25	25	250
PL-3	Storm and Surface Water Utility Master Plan Update		Citywide								150				300
PL-4	Drainage Design and Erosion Control Manual Updates		Citywide						60					60	120
	Yearly Program Funding Total				75	75	75	75	135	75	225	75	75	135	1,170
Total Funding					1,605	1,798	6,421	1,561	1,951	3,461	2,217	2,508	2,277	2,132	24,755

Code	Project	Priority	Quadrant	% GFC Funding	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2036
Sea Level Rise															
SLR-1	Outfall Consolidation - East Bay	med	Downtown											2,500	
SLR-2	Outfall Consolidation - Capitol Lake	med	Downtown												100
	Outfall Consolidation - West Bay														
SLR-3	North Trunk Line*	med	Downtown												1,599
SLR-4	North Trunk Line Laterals*	med	Downtown												716
SLR-5	South Trunk Line*	med	Downtown												2,489
SLR-6	South Trunk Line Laterals*	med	Downtown												249
SLR-7	Outfall Pipe from Structure to Bay*	med	Downtown												90
	Flood Barrier Construction - Phase I (1 foot SLR)														
SLR-7	Capitol Lake/Heritage Park Area*	med	Downtown												636
SLR-8	West Bay Marina* low	low	Downtown												868
SLR-9	Yacht Club Peninsula*	med	Downtown												1,642
SLR-10	West Side Port Peninsula*	med	Downtown												3,628
SLR-11	North Shoreline Port Peninsula*	med	Downtown												2,205
SLR-12	East Shoreline Port Peninsula*	med	Downtown												915
SLR-13	500 cfs Pump Station*	med	Downtown												37,500
SLR-14	50 cfs Pump Station*	med	Downtown												8,750
SLR-15	Small Pump Station*	med	Downtown												563
SLR-16	Tide Gate Installation	med	Downtown												106
	* = 25% Engineering, 75% Construction														
	Yearly Program Funding Total													2,500	62,053
Total Funding with Sea Level Rise					1,605	1,798	6,421	1,561	1,951	3,461	2,217	2,508	2,277	4,632	86,808

1. In September 2017 dollars. Totals of individual years may not equal subtotals, due to rounding.

Introduction

Chapter 1

Introduction

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CHAPTER 1 – INTRODUCTION

This chapter gives a brief overview of the Storm and Surface Water Utility: its service area, infrastructure, core services, customers, and community involvement. It also describes this Storm and Surface Water Plan: its purpose, key elements, planning process, and how the plan is organized.

1.1 Storm & Surface Water Utility

The purpose of Olympia's Storm and Surface Water Utility is to protect public and environmental health by ensuring that surface water runoff is collected and conveyed to streams, rivers, and Puget Sound with the aim of reducing the frequency and severity of flooding, improving water quality, and protecting, enhancing, and restoring aquatic habitat.

The Utility plans and manages the built and natural storm and surface water system to achieve the Natural Environment and Utilities goals of the Olympia Comprehensive Plan (see Chapter 5).

The Utility operates within the Public Works Department as part of the Water Resources line of business, which includes the Wastewater and Drinking Water utilities (see Chapter 3). It works in cooperation with other City departments, neighboring jurisdictions, state and regional agencies, and the public.

Service Area

The Utility provides storm and surface water services to residents and businesses within Olympia City limits. Properties located in Olympia's Urban Growth Area (UGA) are served by the Thurston County Stormwater Management Utility. When property is annexed into Olympia, Utility staff works with Thurston County Stormwater staff to transfer utility mapping data, maintenance agreements, and system inspection records for the annexed properties.

Infrastructure

Utility systems and services are designed and managed with the basic understanding that surface water flows through the natural environment. The built infrastructure is designed to channel the water in such a way as to supplement and protect the natural systems, including swales and small drainage courses, streams, rivers, lakes, wetlands, and Puget Sound.

The built stormwater system consists of 160 miles of underground pipe, 7,400 catch basins, 1,400 manholes, 166 flow control structures and 126 stormwater treatment facilities that carry stormwater runoff from roads and hard surfaces to streams, lakes, and Budd Inlet. An additional 20.7 miles of combined sewer pipe, maintained by the Wastewater Utility, conveys stormwater runoff from approximately 330 acres to the LOTT Clean Water Alliance Budd Inlet Treatment Plant.

See Chapter 4 for details on the built and natural infrastructure.

Core Services

The Utility has a total of 21.6 Full Time Equivalent (FTE) staff in Planning and Engineering, Operations, and Environmental Services. Their work is organized into nine core services, listed below and described in Chapter 9:

- Long-Range Planning
- Asset Management
- Technical Review and Support
- Flood Prevention
- Emergency Response
- Pollution Prevention

- Habitat Management
- Capital Facility Program
- Utility Administration and Support

Customers

As of March 2016, the Utility served a total of 15,495 customer accounts in four rate categories as shown in Table 1.1. See Chapter 12 for an explanation of the Utility's rate categories.

Table 1.1 Utility Customers

Customer Categories	Number of Customers
Residential	14,057
Commercial - Total	1,438
Category 1 (1990 to present)	323
Category 2 (1980 to 1990)	229
Category 3 (Before 1980)	886

Community Participation

Community education is essential to accomplishing the Utility's goals. Activities for citizens, landowners, and businesses are aimed at increasing awareness and changing behaviors to prevent flooding, and improve water quality and aquatic habitat. In its educational activities, the Utility collaborates with other City departments, utilities, neighboring jurisdictions, and organizations.

Utility customers receive the "Five Things" utility bill insert with each bimonthly utility bill. The City's most recent citizen satisfaction survey found that citizens ranked the bill insert as the primary way they receive information from the City. The bill insert includes such topics as notices of new stormwater construction projects, upcoming habitat stewardship events, seasonal property management reminders, and opportunities to weigh in on planning projects. The Utility also maintains webpages on the City's website, olympiawa.gov, and increasingly uses social media for public outreach.

The Utility relies heavily on the Utility Advisory Committee (UAC) to provide input and feedback on the Utility's planning for capital facility projects, rate adjustments, and storm and surface water policy development. The nine members of the UAC are citizen volunteers appointed by the City Council and serve three year terms, with the possibility of renewal.

1.2 Storm and Surface Water Plan

This Plan is informed by the vision, goals, and policies of Olympia's Comprehensive Plan, particularly those in the Utilities and Natural Environment chapters. See Appendix 1 for a list of these Comprehensive Plan goals and policies.

Plan Purpose

The *Storm and Surface Water Plan* contains the policy and financial guidance to guide the Utility in operating, maintaining, and improving its built infrastructure and natural elements for the next 10 years.

The Plan explains the challenges the Utility faces, programs and capital projects to address those challenges, and presents the financial implications of the Plan's recommended program and capital project enhancements. These recommendations will inform the development of the Utility's annual operating budget and capital facilities program.

Unlike the City's Drinking Water and Wastewater utilities, which are required by regulation to maintain and regularly update their management plans, there is no planning requirement for the Storm and Surface Water Utility. Nevertheless, given the complexity of its mission, the Utility has developed a management plan to guide its work. The first Storm and Surface Water Plan was adopted in 2003, and it was revised in 2010 to update the Utility's water quality and aquatic habitat goals. This is the first complete update of the Plan since 2003.

Plan Goals

The following goals will drive the activities of the Utility for the next 10 years. See Chapter 10 for the Objectives and Strategies recommended to accomplish these goals.

- Goal 1 Reduce the frequency and severity of flooding so hazards are eliminated.
- Goal 2 Improve surface water quality.
- Goal 3 Protect, enhance, and restore aquatic habitat functions provided by wetlands, streams, lakes, marine shorelines, and riparian areas.
- Goal 4 Ensure reliable functioning of the built and natural stormwater infrastructure.
- Goal 5 Manage Utility finances responsibly and recover costs equitably.

Key Elements of Plan

Following an analysis of its current state and the development of goals and objectives, the Utility developed the strategies it intends to implement in order to achieve its objectives and key challenges. The Utility proposes two types of strategies –those that represent a continuation of the Utility's existing core services and those that represent an enhancement.

The Plan recommends enhancements in the following eight of the Utility's nine core services:

- Long-Range Planning
- Asset Management
- Technical Review and Support
- Flood Prevention
- Emergency Response
- Pollution Prevention
- Habitat Management
- Capital Facilities Program

See Chapter 10 for details on "How" each Enhancement Strategy could be implemented, including cost assumptions and level of priority.

The Utility's success at resolving flooding problems during the last 15 years has created an opportunity to focus increasingly on water quality improvement, habitat protection, and scheduled replacement of aging pipe systems.

See Chapter 11 for the Utility's list of capital projects.

Planning Process

This Plan has been prepared by Storm and Surface Water Management Utility staff with financial analysis by Financial Consulting Services Group.

To develop the Plan's recommended programmatic strategies and capital projects, Utility staff analyzed the current state of flooding, water quality and aquatic habitat in Olympia. The data used by staff in its analysis is presented in the Plan.

Official Review

The Utility Advisory Committee serves as the principal public advisor on policy matters for the City's four public utilities: Drinking Water, Wastewater, Storm and Surface Water, and Waste ReSources. Committee members played a key role in reviewing this Plan and making recommendations to clarify and improve it. Throughout the planning process, the Utility provided a total of seven separate Plan briefings to the UAC. In a February 2, 2018 correspondence, the UAC recommended approval of the draft Plan to the City Council.

The Land Use and Environment Committee, a Olympia City Council committee, focuses on the following topics: community development, land use, planning, utilities and environment and sustainability. The draft Plan was reviewed by the Land Use and Environment Committee during two separate committee meetings. On January 18, 2018 the Land Use and Environment Committee recommended forwarding the draft Plan to the full Council for consideration. Following a March 6, 2018 Olympia City Council study session, a public hearing on the draft Plan was held on April 10, 2018.

Public Review

In May 2016, an online survey was conducted to collect feedback about Utility priorities. The survey's information video was reviewed 1,310 times and 196 responses were received. Key responses include:

- In ranking four stated priorities for the Utility, the survey responses reflected the following priority order:
 - Protect groundwater quality
 - Improve surface water quality
 - Maintain or improve aquatic habitat
 - Reduce flooding
- When asked to what extent you would support a monthly rate increase, 19 percent of respondents did not support a rate increase, while 20 percent supported a \$1 a month increase, 17 percent supported a \$2 a month increase, 20 percent supported a \$3 a month increase, and 23 percent supported greater than \$3 a month increase.
- 74 percent of respondents supported giving more emphasis to correcting and preventing water pollution.
- 66 percent of respondents supported giving more emphasis to protecting and enhancing fish and wildlife habitat in local streams.
- 36 percent of respondents supported giving more emphasis to correcting and preventing problems arising from minor flooding.

In July 2016, a focus group consisting of community members and representatives of environmental organizations met with Utility staff to give feedback on the aquatic habitat components of this Plan.

The strategies proposed for incorporation into this Plan were presented for review and comment at a community open house in August 2016.

Plan Organization

The Plan is generally organized in three parts, describing the What, Why, and How of the Plan.

What

The first four chapters describe the Plan, the natural and historical context for planning, the Utility's responsibilities, and the natural and built infrastructure for managing storm and surface water.

- **Chapter 1** gives a brief introduction to the Utility's purpose, service area, infrastructure, core services and customers; and Plan purpose, planning process, and organization.
- **Chapter 2** provides the context for the Plan by describing the physical setting of the service area, and its population and land use; and tracing the history of stormwater management in Olympia and the Utility's evolving priorities.
- **Chapter 3** outlines the Utility's responsibilities, internal organization, and relationships with other agencies and jurisdictions.
- **Chapter 4** is an overview of the built and natural infrastructure that, in combination, form the Utility's stormwater system.

Why

Chapters 5 through 8 describe the reasons motivating the need for this Plan and its direction, including the regulatory environment and the challenges of flood mitigation, improving water quality, and protecting aquatic habitat.

- **Chapter 5** outlines the complex set of laws and regulations which increasingly define the Utility's operations.
- **Chapter 6** reports on the significant reductions in the severity and frequency of flooding, impacts of flooding, the role of the Utility in enforcing requirements of the *Drainage Design and Erosion Control Manual*, and remaining challenges the Utility faces in mitigating flooding impacts.
- **Chapter 7** describes activities that impact water quality, the current quality of Olympia's water bodies, the Utility's role in implementing Clean Water Act regulations, and remaining challenges the Utility faces in improving surface water quality.
- **Chapter 8** details existing conditions of Olympia's aquatic environment and habitat, the Utility's role in implementing and supporting habitat stewardship efforts, and remaining challenges the Utility faces in protecting and enhancing aquatic habitat.

How

The last four chapters describe the Utility's recommended approach, including its funding strategy, to address a changing regulatory environment and the challenges of flood mitigation, improving water quality, and protecting aquatic habitat.

- **Chapter 9** explains in detail how the Utility is addressing challenges of flood mitigation, pollution prevention, and habitat protection through its nine Core Services.
- **Chapter 10** details the strategies proposed, in response to current challenges, to effectively address Utility goals and objectives during the next 10 years.
- **Chapter 11** presents the Utility's capital projects planned for implementation between 2017 and 2036.
- **Chapter 12** describes the Utility's multi-year strategy for ensuring the revenue required to meet total operating and capital costs of providing storm and surface water management services to its customers.

Context & Trends

Chapter 2

Chapter 2 – Context & Trends

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CHAPTER 2 – CONTEXT & TRENDS

This chapter describes the context for storm and surface water planning in Olympia. It starts with an overview of the physical setting: regional characteristics, geography, geology and soils, climate and precipitation, and watersheds. The second section describes land use and population trends, and the third section reviews the history of stormwater management in Olympia from the Utility's origin in 1986, evolving priorities since then, and current challenges.

2.1 Physical Setting

The Puget Sound region and landscape are the physical context for the Utility's work and shape its mission and goals. Understanding the opportunities, challenges, and limitations of regional geography, climate and precipitation, soils and geology is necessary to effectively manage flooding, improve water quality, and protect and enhance aquatic habitat.

Regional Characteristics

The Salish Sea is a large (6,900 square mile), ecologically rich inland sea that includes Puget Sound, the Strait of Juan de Fuca, and the Strait of Georgia in Canada (Map 2.1). The fjord of Puget Sound formed during the Pleistocene period through a number of glacial advances of the Fraser glaciation. The Vashon Stade was the last advance, reaching a maximum around 15,000 years ago extending as far south as Tenino. It retreated between 11,000 and 14,000 years ago. The topography, soils, and character of the Salish Sea ecosystem bear the mark of the region's glacial past.

Southern Budd Inlet was home to Salish villages and families who are the ancestors of the modern Squaxin Island Tribe and other local tribes. The abundance of natural resources – including fish, shellfish, game, and food plants in local streams, marine waters, upland forests, wetlands, and prairies – supported a significant indigenous population.

Geography of South Puget Sound

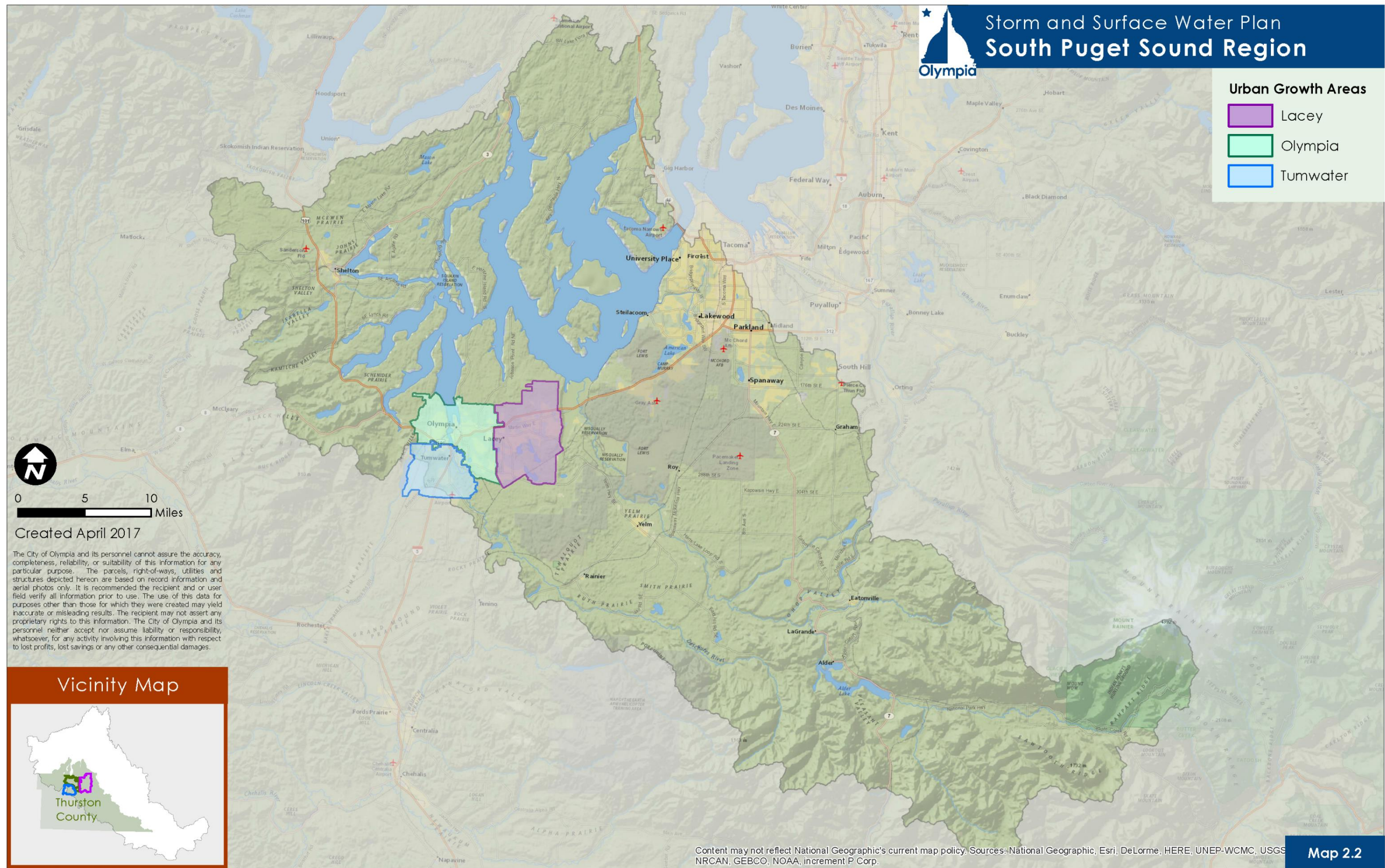
Olympia is located within Thurston County at the southern tip of the Puget Sound along the shores of Budd Inlet and the mouth of the Deschutes River (Map 2.1). Southeast of Olympia, the Black Hills rise to 2,664 feet at Capitol Peak. Most rainfall flows to Budd Inlet or the Deschutes River via eight major streams and many small creeks, which originate in or flow through Olympia, portions of Thurston County, and adjacent cities of Lacey to the east and Tumwater to the south. Part of west Olympia drains to Eld Inlet via Green Cove Creek, and part of east Olympia flows to Henderson Inlet via Woodard Creek and Woodland Creek. In urban areas, much of the rain falling on hard (or impervious) surfaces flows into pipes that lead to streams, wetlands, or Puget Sound.

Tidal range within Puget Sound varies greatly from north to south due to the influence of its bathymetry, length, and configuration of interconnected basins and channels. This large, complex fjord restricts south end flushing and contributes to higher tides in Budd Inlet. Olympia's tidal amplitudes are roughly 75 percent greater than in Port Townsend, near the entrance to Puget Sound. High tides up to 16-17 feet MLLW and low tides down to -4 MLLW occur yearly in Olympia. The maximum tidal range on a yearly basis is over 20 feet with a mean tidal change of 10.5 feet per tidal cycle.

Within the city are over six miles of marine shoreline, four major lakes, eight streams, and many acres of wetlands. A number of closed depressions – remnants of the region's glacial history – exist throughout the area as lakes (e.g. Ward and Hazard) or wetland kettles; there is no surface water outlet to streams in such areas. Upland areas are on a flat glacial plain ranging from 0-380 feet in elevation (North American Vertical Datum of 1988, NAVD88). Between 1893 and 2007, 15 dredge and fill projects added 434 acres and 1.9 miles of shoreline to downtown Olympia, including most of the Port of Olympia peninsula (TRPC 2008).



Map 2.1 Salish Sea & Surrounding Basin, 2009
 Source: Stefan Freelan, Western Washington University.



Map 2.2 South Puget Sound Region
Source: Puget Sound Partnership GIS data

Geology and Soils

The geology of Olympia and Thurston County is largely the result of glacial activity. Materials deposited during many successive glacial periods vary from fine-grained sand and clay to gravel and boulders. These materials are dispersed throughout the area in a complex series of geologic formations created by thousands of years of land, water, and ice movement.

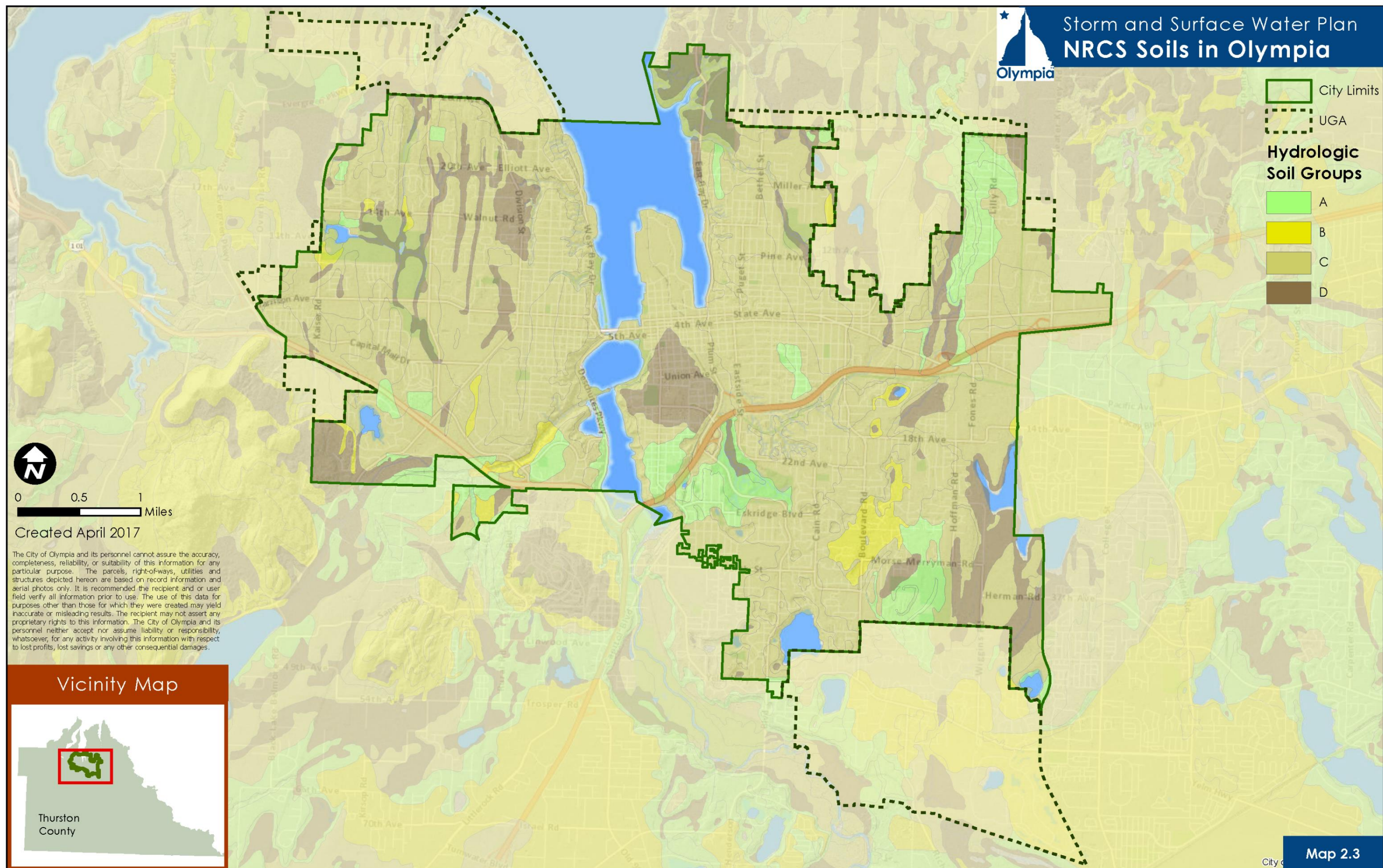
Soils formed as the result of glacial movement and deposition, are primarily glacial outwash, highly compacted glacial till, or lake-derived deposits of clay and silt. Outwash is the loose gravel and sand moved around by glacial meltwaters as the ice receded. Outwash is typically relatively deep and generally well-drained. Till, also known as hardpan, is a compacted and consolidated subsoil (sand, gravel, silt and clay) formed by the weight of glacial ice over 10,000 years ago. Till, clay and silt soils are slow draining.

Soils are grouped into hydrologic soil groups ranging from Group A - high infiltration rates and low runoff potential (outwash) to Group D – low infiltration rates with high runoff potential (e.g. saturated soils). Groups B (e.g. lake deposits) and C (e.g. till) have moderately low infiltration rates and high runoff potential (Map 2.3).

Groundwater

Many geologic formations are permeable and contain Olympia's significant aquifers. Major portions of Olympia are underlain by shallow hardpan (glacial till) with limited infiltration capacity, which often results in perched groundwater. Aquifer recharge areas contain permeable soils that allow rainfall and infiltration to recharge groundwater. These are primarily located in outwash soils and other permeable soils. Groundwater predominately flows from precipitation-driven recharge areas in southern Thurston County north toward Puget Sound. This water discharges to the larger rivers, streams, shallow lakes, natural seeps, and springs (e.g. at Watershed Park), and directly to Puget Sound. The combination of steep glacially formed bluffs, and soil conditions with varying drainage characteristics creates perched water tables and seepage along slope faces. This combination often leads to shallow landslides in the wet winter months. Slope stability along shoreline bluffs is a concern throughout the Puget Sound region.

Olympia relies heavily on groundwater to supply municipal drinking water. Groundwater directly connects with the surface via lakes, streams, wetlands, seeps, and springs. The aquifers under Olympia are both confined and unconfined. Confined aquifers drive the artesian conditions of many wells in low-lying areas along the Deschutes River and Budd Inlet. Additional information on local groundwater conditions can be found in Olympia's 2015-2020 Water System Plan.



Map 2.3 Hydrologic soil groups in Olympia
Source: Natural Resource Conservation Service Soil Survey GIS data

Climate and Precipitation

Olympia's climate is tempered by weather coming from the Pacific Ocean. Summers are warm and dry with infrequent hot days. Winters are cool and wet with abundant precipitation between November and March. Typically, one or two cold periods each winter bring snow and freezing weather. Average January high/low temperatures are 44°/32° F and average August high/low temperatures are 78°/50° F.

Olympia's climate is characterized by wet mild winters with frequent storms arriving from the Pacific Ocean and dry warm summers with little rainfall. The combination of warm dry summers and cool wet winters, glacial history, and underlying geology has shaped the region's landscape, native forests, plant communities, soil characteristics, and water resources.

Olympia's 50-inch average rainfall is significantly greater than Seattle's 38 inches (<http://wrcc.dri.edu>). This is because Olympia is almost directly in the path of Pacific storms coming through the Chehalis Valley from the coast, while Seattle lies partially in the rain shadow of the Olympic Mountains. Pacific storms each fall and winter can bring heavy precipitation events, called atmospheric rivers, which funnel tropical moisture toward the Pacific Northwest. Winter snowfall averages 18 inches at the Olympia Airport (1948-2015), but is highly variable from year to year with significantly less in most recent years. Rainfall varies across the city, in some places higher (typically to the west) and in others lower (typically to the east) than at NOAA's official Olympia Airport weather station.

Climate change may be influencing and likely continue to influence weather in Olympia in the future, with warmer temperatures, drier summers, and wetter winters. See Chapter 6 and 8 for details.

Table 2.1 Olympia Precipitation

Month	Olympia Airport (SE) Monthly Average (2000-2014)¹	South Bay Fire (NE) Monthly Average (2006-2014)¹	County Courthouse (SW) Monthly Average (2001-2014)¹	Green Cove/ Kaiser Rd (NW) Monthly Average (2002-2013)¹	Olympia Airport Average Daily Maximum (Highest) (1948-2015)²
October	4.49	4.17	4.85	5.29	1.23 (4.12)
November	8.34	8.58	8.06	9.46	1.68 (4.33)
December	7.54	6.39	7.30	8.16	1.67 (3.5)
January	7.72	5.52	8.18	8.87	1.53 (4.82)
February	3.97	4.39	3.98	3.50	1.25 (3.64)
March	5.67	5.78	5.96	6.75	1.11 (3.40)
April	3.47	3.11	3.71	3.57	0.82 (3.11)
May	2.74	2.97	2.86	2.84	0.59 (1.54)
June	1.73	1.43	1.40	1.39	0.57 (1.60)
July	0.53	0.51	0.55	0.38	0.34 (1.34)
August	1.13	0.83	1.11	1.01	0.49 (1.38)
September	2.38	2.79	2.32	2.52	0.68 (2.93)
Annual	49.71	46.47	50.28	53.74	2.51 (4.82)

Measurements are in inches.

¹ Source: <http://www.co.thurston.wa.us/monitoring/precip/precip-home.html> (January 2017). Average maximum day per year and extreme maximum day in period of record shown (1948-2015).

² Source: <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa6114> (June 2016).

Watersheds (Basins)

Rain in Olympia runs off hard surfaces, infiltrates into the ground, evaporates, or is used by plants. The area that flows to a given stream, river, or lake is called a watershed. Management of flooding, water quality, and aquatic habitat requires knowledge and watershed-scale evaluation. Most of Olympia's 12,622 acres (19.7 square miles) drain to Puget Sound, primarily to Budd Inlet. Smaller areas flow to Eld and Henderson Inlets. A few watersheds are contained within the City, while others span multiple jurisdictions. See Table 2.2 and Map 2.4.

A watershed's landscape conditions, land uses, and stormwater infrastructure (or lack of) has a large impact on flooding, water quality, and aquatic habitat conditions within and beyond its borders. See Appendix 2 for a detailed description of the various watersheds in Olympia. See also Chapters 4 and 8.

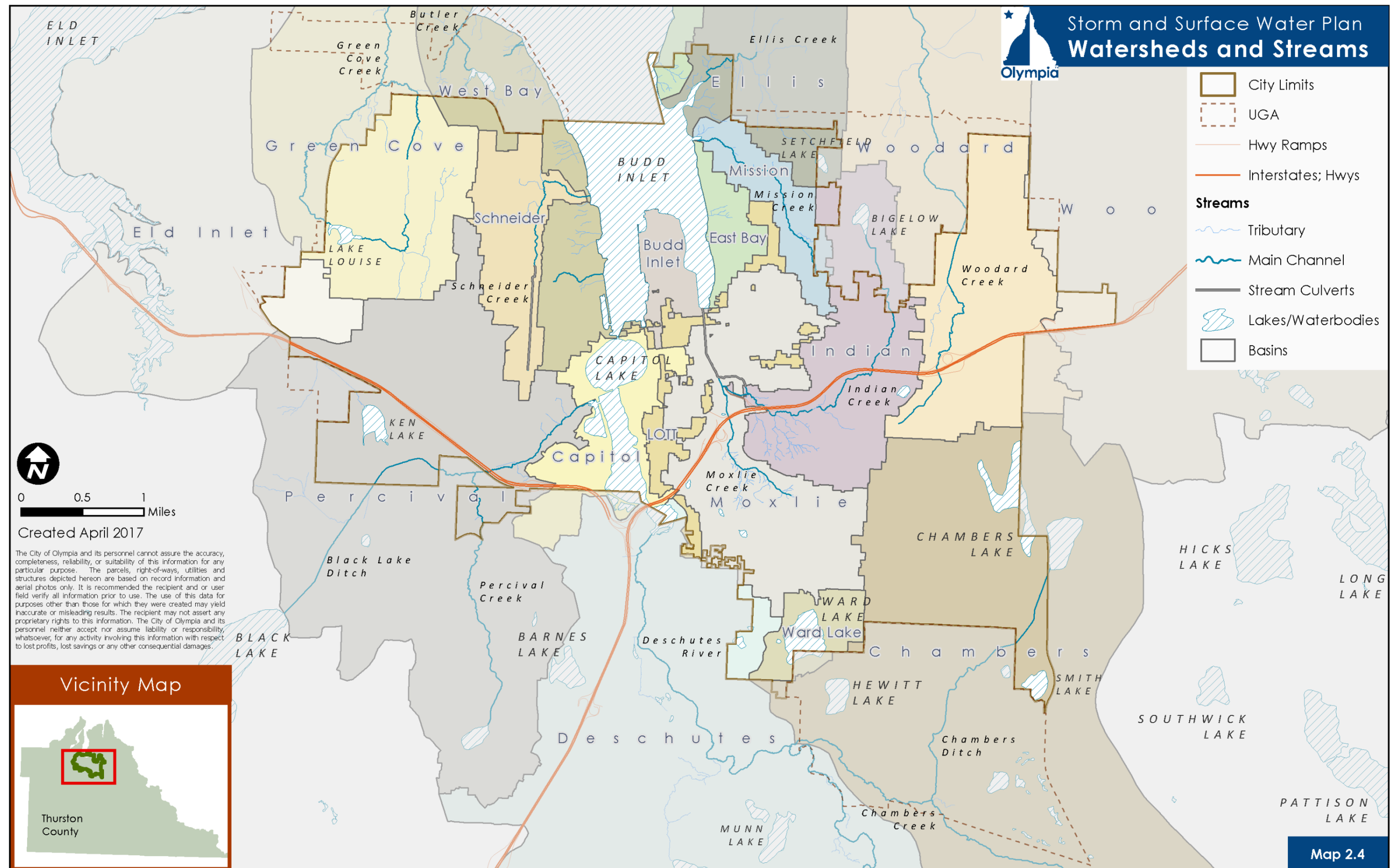
Many smaller drainage basins make up each larger watershed. Rainfall from these smaller basins flows into catch basins and ditches or filters into the ground. Water that filters into the ground recharges shallow aquifers, contributes to stream flow in dry periods, and provides water for seeps and wetlands. In urban areas, these important sources of shallow ground water are often greatly reduced or lost, impacting the health of aquatic habitats. Stormwater that does not infiltrate is conveyed by pipes and ditches to ponds, streams, lakes, or Puget Sound. Managing stormwater often occurs on this smaller basin scale.

Table 2.2 Olympia Watersheds

Name	Total Basin Area (Acres)	Area in City (Acres)	Other Jurisdictions
Budd Inlet*	4,675	1,086 (23%)	Thurston County
Capitol Lake	519	378 (73%)	Tumwater
Chambers Creek	7,559	917 (12%)	Lacey, Thurston County
Deschutes River	81,964	112 (.01 %)	Lacey, Tumwater, Thurston County
Eld Inlet	3,621	243 (7%)	Thurston County
Ellis Creek	1,441	292 (19%)	Thurston County
Green Cove Creek	2,530	1,042 (41%)	Thurston County
Indian Creek	1,322	1,001 (76%)	Thurston County
Mission Creek	406	374 (92%)	Thurston County
Moxlie Creek	1,562	1,541 (99%)	Tumwater
Percival Creek	5,340	1,713 (32%)	Tumwater, Thurston County
Schneider Creek	635	635 (100%)	NA
Ward Lake	226	201 (89%)	Thurston County
Woodard Creek	5,211	1,733 (33%)	Thurston County, Lacey
Woodland Creek	10,462	135 (1%)	Thurston County, Lacey

*Budd Inlet includes East Bay and West Bay

Source: Olympia_Utility.DBO.swBasin, 2010, City of Olympia GIS data



2.2 Population and Land Use

Management of storm and surface water is directly affected by the size and growth of population and current and projected land use.

Population

In 2015, the estimated population of Olympia was 51,020 residents, with another 11,900 living in Olympia's Urban Growth Area (UGA). Forecasters expect the City population will increase to 68,410 by 2035, a rate of approximately 1.5 percent per year. Including Olympia's UGA, population could increase by approximately 2 percent per year to a total of 84,400 by 2035. Most this increase will be due to in-migration. People are attracted to living in Olympia because of the relatively stable economy, beautiful environment, friendly and safe neighborhoods, good schools, and living costs lower than cities to the north.

Demographic data presented here includes total population, number of single-family and multifamily households and total employment within Olympia City limits. Table 2.3 shows the current and projected demographics at specific planning horizons from 2015 to 2035.

Table 2.3 Olympia Population and Employment (2015-2035)

Year	Population	Single-family Households	Multi-family Households	Employment
2015	51,020	12,677	11,497	55,167
2025	60,750	14,903	14,651	62,485
2035	68,410	16,581	17,102	70,793

Note: Numbers do not include Olympia's Urban Growth Area.

Source: Estimates are based on the Thurston Regional Planning Council (TRPC) November 2012 data set.

Land Use

In cooperation with Olympia, Lacey, and Tumwater, Thurston County has established and periodically reviews Urban Growth Area boundaries. In these areas, urban growth is encouraged; outside of them, rural densities and services will be maintained.

Olympia and its Urban Growth Area total about 16,000 acres. This includes about 12,000 acres within City limits and about 4,000 acres in the unincorporated area, which may eventually be annexed into the City.

The growth and development of the City is guided by the Olympia Comprehensive Plan. Since most readily buildable parcels in the City are already developed to some degree, the Comprehensive Plan anticipates that most growth will be accommodated by more infill and redevelopment of already developed areas. Infill and redevelopment provides opportunities to restore degraded environments and invest in improving existing infrastructure and managing it more effectively.

The Comprehensive Plan focuses higher residential densities downtown, along urban corridors, and near neighborhood centers. It encourages commercial development along urban corridors, and directs industrial development along Budd Inlet, Fones Road, and at Mottman Industrial Park.

To ensure that the urban areas within Thurston County are large enough to accommodate 20 years of projected growth, Thurston County Regional Council periodically prepares a land capacity analysis. According to the Buildable Lands Report 2014 for Thurston County, new residential growth within the Olympia city limits reached a density of 6.45 units per acre from 2001-2005, increasing to 8.58 units per acre between 2006-2010. This level of residential density is expected to remain steady or increase slightly into the future as residential development occurs. The Buildable Lands Report concludes that the City of Olympia and its UGA has 20 percent more land available for residential development than required to accommodate the growth expected through 2035.

Since the Utility's inception 30 years ago Olympia has continued to urbanize and the storm and surface water issues facing the Utility have become more urban in nature. The next 30 years will continue to bring additional people and increased density to the City. As the population increases, the likelihood of flooding and water quality and aquatic habitat impacts will also increase. Due to limited land, redevelopment may be more common than new (Greenfield) development. Redevelopment offers opportunities to improve conditions by retrofitting to correct the lack of stormwater management by reducing the impacts of prior development.

2.3 History of Storm and Surface Water Management in Olympia

This section reviews the history of storm and surface water management, from the early days of little or no regulation, to the formation of the Utility, and the impact of federal laws and regulations to protect the health of natural resources and people. It summarizes the evolving priorities of the Utility over the past 30 years.

Creation of the Utility

The Storm and Surface Water Utility was formed in 1986. Prior to the mid-1980s, stormwater management focused on the conveyance of runoff to nearby streams, lakes and wetlands. Stormwater systems were often inadequately constructed to manage high flows and little thought was given to the water quality and aquatic habitat impacts of stormwater. As a result of increased development in Olympia in the 1970s and 1980s, runoff began overwhelming the stormwater system on a frequent basis. Property damage was common. Community concerns highlighted the need for better regulations and designs to minimize flooding. Simultaneously, the scientific community began to better understand the detrimental effects of stormwater on water quality and aquatic habitat. In 1990, Olympia responded to the need for better stormwater management by strengthening the role of the stormwater utility. More rigorous expectations for flood management, water quality improvement, and aquatic habitat protection were established through community dialogue and elected official mandates.

During this period, the Washington Department of Ecology (Ecology) began providing local jurisdictions with better scientific research and regulation for new development. Since 1992, Olympia has adopted and implemented several iterations of increasingly rigorous stormwater management design regulations.

The Utility developed its first *Storm and Surface Water Management Plan* in 2003 that, with minor revisions in 2010, has guided the Utility until today.

2003 Plan and 2010 Update

The 2003 Plan provided an organizational structure and policy direction for the Utility's programs and projects.

The objectives for the 2003 Plan were to:

- Provide a management vision and approach that reflects community expectations for the Storm and Surface Water Utility's future.
- Refine the understanding of current and potential flooding, water quality, and aquatic habitat problems faced by the Utility.
- Propose actions that will comply with regional, State, and federal requirements for storm and surface water management.
- Define services for flooding, water quality, and aquatic habitat management.
- Identify appropriate and cost-effective solutions for accomplishing preferred services.
- Include a process that enables the Plan to be regularly reviewed and revised in order to adapt to emerging information, problems, and regulations.
- Provide a basis to obtain adequate long-term funding for the Utility.
- Provide ongoing opportunities for internal and external customers to learn about stormwater issues, to participate in identifying problems and solutions, and to influence the future of the Utility.

In 2010, the Utility refined the guidance provided by the 2003 Plan by revising the Plan's water quality and aquatic habitat goals.

The 2003 Plan objectives remain relevant. However, the continued increase in State regulatory requirements and ongoing competition for financial and staff resources have created the need to completely update the 2003 Plan.

Evolving Utility Priorities

Early efforts in stormwater management focused on protection of public safety, health, and protection of property from flood damage. This approach often had negative impacts to downstream areas and habitat. Environmental concerns would not become the focal point for managing excess runoff until years later.

The Utility's success at resolving flooding problems during the last 15 years has created an opportunity to focus increasingly on water quality improvement, habitat protection, and scheduled replacement of aging pipe systems. Community expectations and regulations for managing stormwater have increased dramatically, resulting in a more holistic look at stormwater management and aquatic systems.

Flooding: Original Priority

The effectiveness of the City's stormwater system at managing flooding and protecting the natural environment varies depending on location. Private developments and City capital improvements constructed prior to the mid-1980s were required to provide only modest stormwater conveyance capacity, no water quality treatment, and very minimal storage of runoff in constructed ponds.

Since the advent of Ecology stormwater requirements and the implementation of drainage and erosion control standards for new development, the severity and frequency of flooding has been significantly reduced (see Chapter 6).

Water Quality: Increasing Levels of Stormwater Treatment

Stormwater and wastewater in South Puget Sound was not treated prior to the early 1950s when the first wastewater treatment plant went into operation on Budd Inlet. In the 1970s, discharge of pollutants from industrial point sources began to be regulated, following the adoption of the federal Clean Water Act.

Regulation of non-point pollution was minimal until after the 1989 *Puget Sound Water Quality Management Plan* was approved by the Washington legislature. Based on this plan, Ecology adopted its *Stormwater Management Manual for the Puget Sound Basin* in 1992. The Ecology manual established the first requirements for water quality treatment in the form of best management practices for stormwater including infiltration, sedimentation (wet ponds and wet vaults), and filtration by vegetation. Subsequent stormwater management manuals have further honed the levels of required treatment, adopted emerging treatment technologies, and established computer modeling procedures for sizing treatment facilities.

Olympia's current *Drainage Design and Erosion Control Manual*, adopted in 2016, requires new development to incorporate low impact development (LID) techniques. LID techniques encourage infiltration and onsite retention to reduce stormwater runoff. Water quality benefits from LID are associated with the reduced volumes of pollutant-laden runoff that may be transported to surface waters. See Chapter 6 for details about LID and other drainage manual requirements.

Aquatic Habitat

Capital funds were allocated annually for the purchase of aquatic habitat lands from the late 1990s until 2010. In 2012, with support from the Utility Advisory Committee (UAC), the Utility began reviewing potential opportunities for protecting and improving habitat. The 2013 *Habitat and Stewardship Strategy* recommended reorienting the capital funding focus toward habitat stewardship and restoration, in addition to land acquisition. Since then capital funding for land acquisition, as well as stewardship and enhancement has increased. Capital habitat projects have included hiring a Washington Conservation Corps crew to manage riparian and wetland vegetation and improving fish passage in local streams. Stormwater retrofit projects also benefit downstream aquatic habitats.

In 1999, the Puget Sound Chinook salmon and bull trout were listed as threatened under the Endangered Species Act (ESA). In response to a growing awareness that Puget Sound was in serious trouble, the Legislature created the Puget Sound Partnership in 2007. The Puget Sound Partnership is responsible for coordinating and leading the effort to protect and restore Puget Sound. Local municipalities are on the front line for addressing impacts to Puget Sound through actions such as growth management planning and managing surface water runoff. The Utility has an important role in implementing effective stormwater management practices and participating in salmon and ecosystem recovery efforts to meet the expectations of the ESA and to improve the health of Puget Sound.

2.4 Current Challenges

The Utility has made considerable progress in its first 30 years. As it embarks on its next phase, the Utility faces numerous challenges arising from the context and trends described above. The key challenges are listed below. For more details on these challenges and “Why” they are important to address in coming years, see Chapters 5-8 and 12.

General Challenges

- **Equitable and Predictable Rates and Fees.** Creating predictability for customers and developers is difficult in a complex and changing regulatory environment, with fluctuations in the amount of grant money available to fund Utility programs. (See Chapter 12.)
- **Legacy Development.** Most of Olympia’s stormwater infrastructure was constructed prior to current rigorous storm drainage design regulations. In older developed areas, subdivisions and infrastructure were constructed without stormwater treatment or wetland and stream protection and often lack the capacity to handle the increased runoff resulting from growth. Retrofits of older neighborhoods with modern stormwater control and treatment systems are a logistical and financial challenge, but are often necessary to improve flooding, water quality, and aquatic habitat conditions. The worst remaining legacy flooding problems are on Black Lake Boulevard, the Lakemoor subdivision and along Division Street. (See Chapters 6, 7, 8.)
- **Reliance on Choices by Individuals.** The Utility’s work is highly influenced by the cumulative impact of individual behaviors. Decisions about the extent of impervious surfaces on a property and care in keeping storm drains clear of debris can impact flooding. Decisions about yard care practices, onsite sewage system maintenance, car care, and driving habits all can impact water quality. Decisions about landscaping, tree planting or removal, and weed control can impact aquatic habitat. This dynamic adds to the complexity of the Utility’s work. (See Chapter 6, 7, 8.)
- **Land Development Pressure.** To protect agriculture and natural resources, including habitat, Washington’s Growth Management Act (GMA) requires population growth to be focused in urban growth areas like Olympia. Urban development continues to increase impervious surfaces, threatening further loss of forests and wetlands, curtailing the functioning of natural systems and impacting surface water quality. Increasing population densities will both create challenges for water quality and provide opportunities to retrofit and provide flow control and treatment. (See Chapters 7 and 8.)
- **Climate Change and Sea Level Rise.** Changing climate in the Pacific Northwest likely will influence aquatic habitats due to warmer temperatures, reduced precipitation in the summer, increased precipitation in other seasons, and a rising sea level. Older stormwater infrastructure will be the most vulnerable to overflows associated with more frequent and intense storm events, which could result in more localized flooding. Current science indicates that sea levels in Puget Sound may rise between 20 and 55 inches by 2100. The need for community awareness, education, and response regarding sea level rise will increase in the years to come. In order to make timely long-term decisions, City government and the public need to understand the dynamics of climate change and sea level rise. The Utility has a key role in undertaking the necessary research and strategic planning. (See Chapters 6 and 8.)

Flooding Challenges

- **Asset Management.** Properly functioning stormwater treatment and conveyance systems help to mitigate the negative impacts of development by moderating flows and removing sediments and pollutants before the stormwater enters water bodies. As facilities age, their functioning can be impacted. Understanding the condition of the Utility's stormwater infrastructure (both built and natural) informs replacement and maintenance decisions and is referred to as "asset management." Although significant staff effort has been dedicated to improving the Utility's understanding of the stormwater infrastructure, additional work is required to fully implement a robust asset management program. (See Chapter 6.)
- **Limitations of Low Impact Development (LID).** LID is a land planning and engineering design strategy that uses on-site natural features like bioswales and rain gardens to lessen the impact of development on stormwater quality and quantity, thereby mimicking pre-development conditions. LID practices may benefit water quality, but these are secondary to controlling the flow of stormwater. LID facilities are designed to be smaller and more numerous than centralized stormwater ponds to increase infiltration of rainwater over a larger area. The City's 2016 Drainage Manual requires LID in all new development. The sheer number of such facilities and the intensive maintenance required will likely make LID facilities more complex to manage than past stormwater facility designs. (See Chapter 6.)

Water Quality Challenges

- **Increasing Permit Requirements.** Many aspects of the Utility's work are mandated by the federal Clean Water Act. To discharge stormwater into "waters of the United States," the City must obtain and keep current a National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Discharge Permit (Permit). Permit requirements are continually being revised and expanded. Because more and more of the Utility's resources are needed to implement the Permit, significantly less discretionary staff time and budget is available for other aspects of the Utility's work. (See Chapters 5 and 7.)
- **Reliance on Public for Nonpoint Pollution Prevention.** The Utility is challenged in helping people understand their contribution to nonpoint sources of pollutants and the impact individuals have on water quality. The actions of the individual citizen through daily living activities like vehicle maintenance, lawn care, chemical management and pet care can contribute to either improving or degrading water quality. (See Chapter 7.)

Aquatic Habitat Challenges

- **Multiple Public/Private Ownership.** Habitat is located within a complex landscape of many large and small parcels, public and private ownership, and developed and redeveloping neighborhoods, commercial districts, and industrial areas. The Utility has limited authority on private property and must rely on voluntary programs, education and outreach, and incentives to encourage stewardship on private properties. (See Chapter 8.)
- **Habitat Fragmentation.** Large intact habitat areas are important for both wildlife and protection of aquatic resources. These core areas provide nesting/breeding, foraging, and resting habitat for wildlife, and protect water quality and hydrologic functions. Large habitat areas in Olympia are primarily located on public lands. Maintaining and improving the habitat quality of these areas requires tools and strategies that work across the landscape. (See Chapter 8.)

- **Habitat Impacts of Legacy Urban Development.** The changes brought by development of Olympia over the last 100 plus years have had a large impact on aquatic habitat. Budd Inlet was filled and dredged, shoreline armored, sections of streams placed in pipes, wetlands drained, and forests and natural vegetation converted to homes, businesses, roads and other infrastructure. These changes have vastly altered the landscape and hydrology of Olympia. The Growth Management Act encourages development in cities and urban growth areas rather than rural areas of the State. Working to maintain functional habitat in an urban landscape is challenging and requires creativity and flexibility to protect remaining habitat areas and maintain their health, while working to enhance and restore key habitats where possible (See Chapters 5 and 8).



Surface Water Management

Chapter 3

Chapter 3 – Surface Water Management in Olympia

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CHAPTER 3 – SURFACE WATER MANAGEMENT

This chapter gives an overview of the Storm and Surface Water Utility's areas of responsibility, a description of how the Utility is organized and staffed, and its relationships with other agencies and jurisdictions.

3.1 Utility Responsibilities

This section reviews the Utility's primary responsibilities, and limits on those responsibilities.

Primary Responsibilities

The Storm and Surface Water Utility's mission is to reduce flooding, improve water quality, and protect and enhance aquatic habitat in Olympia.

To accomplish this mission, the Olympia City Council mandated the Utility with three basic responsibilities:

- **Flood Management.** Within Olympia's organizational structure, the Utility has primary responsibility for preventing and managing flooding. Duties include monitoring construction standards for new development to prevent flooding, maintaining conveyance systems, constructing minor improvements, and responding to emergencies. The Utility's capital facilities program resolves regional flooding problems through large-scale construction projects.
- **Water Quality Improvement.** Stormwater runoff is a key source of water contamination. Many contaminants from cars and homes reach streams, wetlands, and marine waters via stormwater flows. The Utility plays a key role in managing surface water quality. Duties include monitoring construction of public and private treatment facilities, technical assistance and education, and helping to fund water quality monitoring and reporting.
- **Aquatic Habitat Enhancement.** Many federal, state, tribal, and local management responsibilities and ordinances affect Olympia's natural environment. The Utility's role is to support the protection, restoration, and enhancement of aquatic habitat on both public and private lands. Utility duties include policy guidance, technical assistance, and education to the community as well as within City government.

Limits of Utility Responsibility

The Utility is responsible for managing the stormwater infrastructure located within the public right-of-way and stormwater within dedicated easements and on City-owned property. Property owners are responsible for maintaining stormwater facilities constructed on private property.

The Utility attempts to control stormwater runoff from the street right-of-way that discharges onto or through private property. On new street construction projects, management of this runoff is required for compliance with the City's National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Permit (Permit) and City code. However, much of the City was developed prior to these standards. The primary objective is and has been to maintain historical and natural drainage paths. As a general policy, the Utility does not address or attempt to correct issues caused by groundwater on private property.

The Utility provides stormwater services within Olympia city limits. Outside of Olympia city limits and within its designated Urban Growth Area (UGA), stormwater services are provided by Thurston County consistent with its NPDES permit. When Olympia annexes a part of its UGA, Utility staff work with

Thurston County Stormwater Management Utility staff to transfer mapping data, maintenance agreements and stormwater system inspection records for the annexed properties and the properties become City of Olympia Storm and Surface water Utility customers.

3.2 Utility Organization and Staffing

This section describes where the Utility fits within the organization of the City and Public Works Department.

Public Works Department

The Public Works Department is organized into four lines of business: Water Resources, Waste Resources, Transportation, and Engineering, as shown in Figure 3.1. Water Resources includes the three water-related utilities (Storm and Surface Water, Wastewater, and Drinking Water). Each utility develops its own annual operating budget and capital facilities program.

Engineering supports the other lines of business by providing capital facilities engineering, design, and construction management. The Public Works Director's office provides accounting, strategic communications, and gateway services.

The Storm and Surface Water Utility is also supported by three other City departments:

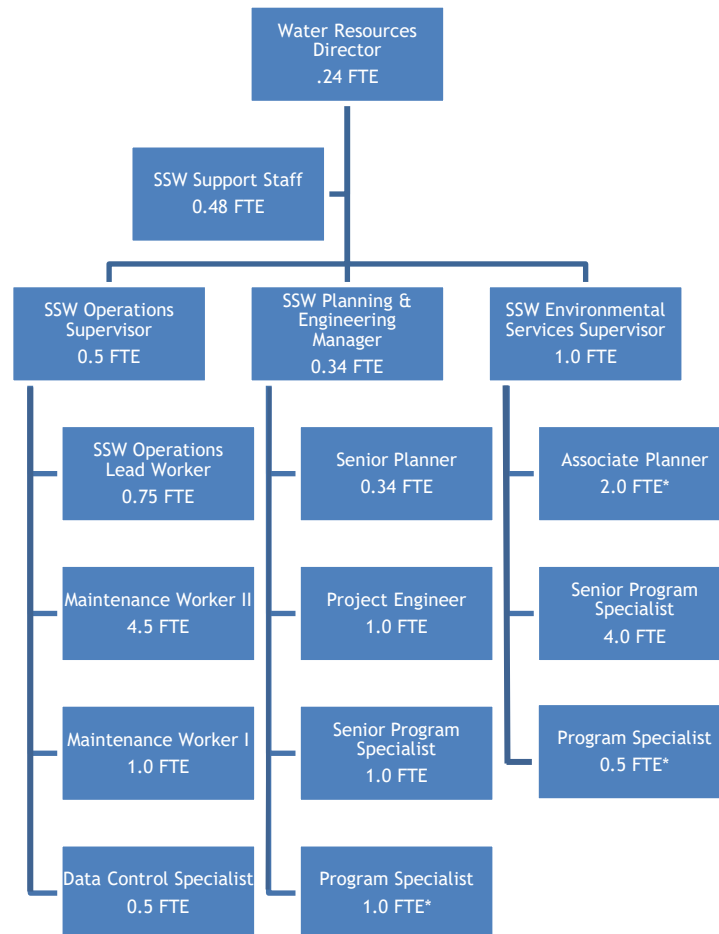
- **General Government.** Oversight of City policies and legal issues as well as coordination of emerging issues.
- **Administrative Services.** Billing, payroll, financial planning and cash management.
- **Community Planning and Development.** Implementation of regulations for private development.



Figure 3.1 Public Works Department Organizational Relationships

Water Resources

The Storm and Surface Water Utility is structured as shown in Figure 3.2, with a staff of 21.6 FTE in Planning and Engineering, Operations, and Environmental Services.



**One Associate Planner and both Program Specialists are currently project funded.*

Figure 3.2 Storm and Surface Water Utility Staffing

On a day-to-day basis, these staff are assigned to one or more of the Utility's nine core services:

- Long Range Planning
- Asset Management
- Technical Review and Support
- Flood Prevention
- Emergency Response
- Pollution Prevention
- Habitat Management
- Capital Facility Program
- Utility Administration and Support Services

See Chapter 9 for a detailed explanation of these core services and current programs and activities. Chapter 10 summarizes the goals, objectives, and strategies recommended for the 2018-2027 planning period.

3.3 Relationships with Other City Departments

To prevent flooding, improve water quality, and protect aquatic habitat the Utility works with other City departments to implement overlapping responsibilities. Coordination related to the Utility's Core Services is described below.

Long Range Planning

The Community Planning and Development (CP&D) department regularly leads citywide, long-range planning efforts, such as the *Comprehensive Plan* update and development of the Action Plan. The Utility participates in helping to shape these plans.

The Utility also interacts with CP&D when aquatic habitat related development regulations, such as the critical areas ordinance and shoreline master program, are being updated.

NPDES Permit Compliance

All stormwater runoff flowing through Olympia's pipes, ponds, and ditches is managed according to the requirements of the Western Washington Phase II Municipal Stormwater Permit (Permit) issued by the Washington State Department of Ecology (Ecology) under the National Pollution Discharge Elimination System (NPDES). To ensure the City remains in compliance with the Permit, the Utility performs a lead role in coordinating Permit and municipal stormwater related activities among City departments.

Development Permit Review

The Utility's stormwater engineer reviews stormwater drainage plans for public and private development proposals that are processed through the Community Planning and Development (CP&D) department for permitting. The stormwater engineer works with CP&D staff and the applicant to make sure that all development proposals comply with the *Olympia Drainage Design and Erosion Control Manual* (DDECM).

Flood Prevention

Impervious surfaces contribute to localized flooding more than any other factor. As a result, the Utility regularly coordinates with the Transportation Line of Business to identify, troubleshoot, and solve flooding threats before incidents occur. This work is done through the Stormwater Operations Problem Solving (STOPS) team.

Emergency Response

In major storm events, the Utility has a primary role as a first responder to prevent harm to life, health, and safety. The Utility coordinates before and during the event with City police and fire departments, as well as other local and state agencies. To minimize the effects of flooding in downtown Olympia, the Utility coordinates with the Washington State Department of Enterprise Services, which is responsible for monitoring Deschutes River levels and tide elevations and managing Capitol Lake levels to reduce flooding.

Spill Response

The Utility has a joint role with the Public Works Transportation Line of Business and the Wastewater Utility as first responders to non-hazardous spills. This requires frequent coordination with other first responders including police, fire, Ecology, and CP&D.

Habitat Management

The Utility and the Olympia Parks, Arts, and Recreation Department (OPARD) often partner on habitat restoration projects on park's properties. Because OPARD is one of the largest property owners in Olympia and many of Olympia's parks have important aquatic habitat areas, OPARD is a natural partner for implementing the Utility's Habitat Stewardship Project.

3.4 Relationships with Other Agencies and Jurisdictions

Because storm, surface water and pollutants cross jurisdictional boundaries, the Utility must work in conjunction with others to prevent flooding, improve water quality, and protect aquatic habitat. The Utility's most important relationships with other agencies and jurisdictions are described below.

Public Education and Outreach

An educated and informed public is one of the Utility's best means of stopping pollution from entering storm and surface water. To make efficient use of public outreach and education dollars, the Utility partners with two organizations.

Thurston Conservation District

Under an Interlocal Agreement, the Utility provides funding support to Thurston Conservation District for the District's South Sound GREEN watershed education program. School-aged children participating in the program conduct stream investigations and learn how human actions impact water quality.

Regional Environmental Education Partnership

Under an Interlocal Agreement, the Utility partners with Thurston County and the Cities of Lacey and Tumwater to implement the Regional Environmental Education Program. Under this program, the four jurisdictions conduct on-site source control training for businesses, coordinate the Stream Team, and implement a Salmon Stewards Program, as well as other educational activities. The Utility supports this partnership by providing staff and sharing financial costs with the other jurisdictions.

Puget Sound Partnership

The Puget Sound Partnership is a Washington State agency charged with leading regional efforts to restore and protect Puget Sound. In 2007, the State legislature created the Partnership and identified the first Puget Sound recovery goals: a healthy human population, vibrant quality of life, thriving species and food web, a protected and restored habitat, abundant water quantity, and healthy water quality. The Puget Sound Action Agenda is a collaboratively developed list of near term actions necessary to stay on track to meet these goals. The first Action Agenda in 2008 listed actions, priorities, and opportunities for improving the health of Puget Sound. This document is updated every two years.

Utility staff engages in this process by participating in the Alliance for a Healthy South Sound (AHSS), the integrating organization responsible for coordinating recovery planning and actions in the South Sound (south of Tacoma Narrows). AHSS recently completed its South Sound Recovery Strategy, which is intended to guide decision making about ecosystem restoration and recovery.

Surface Water Monitoring

The Utility participates in regional and local water quality monitoring programs to assess the health of streams, lakes, and marine waters. Monitoring data and analysis is used to develop policies, programs, and capital facility plans to protect water resources. See Chapter 7 for details.

Regional Stormwater Action Monitoring

The Utility pays into a collective fund to implement a regional Stormwater Action Monitoring program, administered by the Washington Department of Ecology. Western Washington municipal stormwater NPDES Permit holders collaborate in this program.

Local Monitoring Partnership

The Utility participates in a joint storm and surface water monitoring program along with Thurston County, Lacey, and Tumwater stormwater utilities. The program has been administered by Thurston County through an interlocal agreement for over 20 years. The type and frequency of data collected has varied throughout this period.

Salmon Recovery

Thurston Conservation District serves as the Lead Entity for implementing the Salmon Recovery Act (RCW 77.85) for Water Resource Inventory Area 13, the Deschutes watershed. In this role, the District coordinates the selection and ranking of salmon habitat restoration and protection projects for possible funding. Recommendations are based on the input of a technical committee, made up of local experts knowledgeable about the local watershed, habitat, and fish conditions; and a citizens' committee with representatives of local, state, federal, and tribal government, community groups, environmental and fisheries groups, conservation districts, and regional fisheries enhancement groups. Utility staff participates in the technical committee.

Noxious Weed Control

Each year, the Thurston County Noxious Weed Board compiles a list of species required for control in Thurston County. The City is required to control weeds designated by the State and/or Thurston County. Utility staff has taken a lead role in coordinating communication between various City departments and the County Weed Board staff, serving as a single point of contact for the City and tracking weed occurrence and management records.

Government-to-Government Relations

The Utility coordinates with the Nisqually and Squaxin Tribes to ensure that treaty rights are honored. The Utility seeks the expertise of tribal representatives on aquatic habitat and fishery issues.

The Utility also participates in a regional Stormwater Technical Advisory Committee (StormTAC) attended by Thurston County, the City of Lacey, the City of Tumwater, the Washington Department of Transportation, the Washington Department of Enterprise Services, and the Port of Olympia. StormTAC discusses storm and surface water-related issues including Permit regulations, stream and lake monitoring, education and outreach collaboration, and interjurisdictional stormwater outfalls.



Built & Natural Infrastructure

Chapter 4

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CHAPTER 4 – INFRASTRUCTURE

Olympia’s stormwater management system depends upon both natural and built infrastructure to provide basic functions. In natural systems, rain collects in wetlands and lakes, filters into the ground, flows into streams, and eventually makes its way into Puget Sound. The built stormwater infrastructure mimics these functions: channeling rainwater runoff into streams, wetlands, lakes, and finally Puget Sound; storing water after heavy rains so it can infiltrate, evaporate, or release to the conveyance system at a controlled rate; and treating or filtering the water to remove pollutants. The built infrastructure includes:

- **Conveyance.** Gravity storm pipes, ditches and culverts channel surface runoff from structure to structure or into streams, rivers, and other water bodies.
- **Flow Control.** Constructed ponds and vaults and/or wetlands and natural features manage excess runoff volume and flow timing.
- **Treatment.** Stormwater is treated as it passes through a treatment facility or is filtered naturally in the soil, wetlands, and streams.

This chapter describes the natural and built infrastructure and how they function together to manage Olympia’s storm and surface water to prevent flooding, improve water quality, and protect and enhance aquatic habitat. Chapters 6, 7, and 8 describe the current conditions of flooding, water quality, and habitat. Chapter 10 explains how Utility plans to address these conditions over the next 10 years through its Goals, Objectives, and Strategies.

4.1 Natural Infrastructure

Natural systems of water, land, and air are the foundation of all life and provide many tangible and intangible benefits. Natural infrastructure serves surface water management functions by regulating water flows, water quality, nutrient cycling, and sediment transport or retention. Natural aquatic systems also provide fresh water and habitat for many organisms.

A 2010 study placed a monetary value on the hydrologic, water quality, and habitat benefits of natural systems in the Puget Sound Basin. The study valued basin-wide ecosystem services from \$9.5 billion to \$83.4 billion per year for various habitat types (Batker et al 2010). This approach begins to demonstrate the economic value of natural systems in provisioning, regulating, and supporting natural processes and resources and adding to the community’s cultural, recreational, and aesthetic attractions.

This section defines the elements of the natural systems: the landscape of a watershed, streams and riparian areas, wetlands, and marine shorelines. It focuses on how they function as stormwater “infrastructure.” Chapter 8 describes the existing condition of these ecosystems as habitat for aquatic and terrestrial species.

Hydrology

The science of hydrology studies the movement of water in the atmosphere, across the landscape, and beneath the ground surface. In its simplest form, hydrology is an accounting of water resources at various stages in the water cycle as precipitation interacts with vegetation, soils, and urban surfaces such as roofs and pavements, as water flows across the landscape into marine waters. In undisturbed forests of Western Washington and British Columbia, water budget studies report that as much as 40 percent of annual rainfall is intercepted by trees and vegetation, and then evaporated back to the atmosphere. Another 20 to 30 percent is retained the highly organic upper soil surface layers of native soils. Approximately 10 to 40 percent of annual precipitation percolates through the soil to deeper groundwater stores. Shallow subsurface flow through soils occurs slowly, occasionally resurfacing at streams, wetlands, and other surface waters (Bauer and Mastin, 1997). Studies such as this confirm that very little surface runoff – less than 1 percent – occurs in an undisturbed watershed. See Figure 4.1.

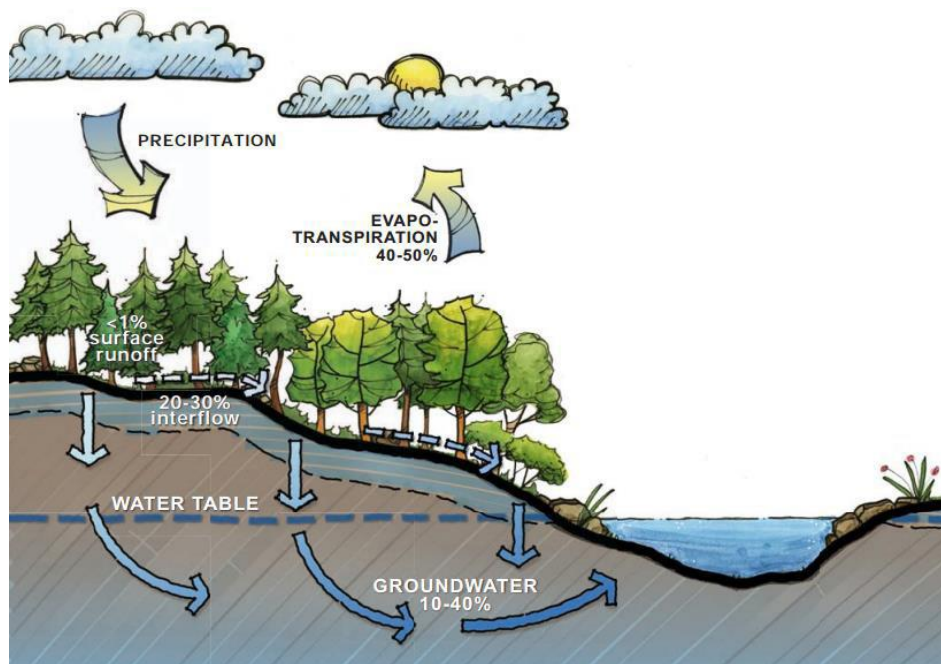


Figure 4.1 Pre-Development Water Cycle
(Source: Puget Sound Partnership, 2012)

Watersheds

A watershed is the land area that drains into a specific creek, lake, or other water body. In undeveloped conditions, the entire landscape – including forests, fields, soils, lakes, streams, ground water, and wetlands – forms the natural infrastructure that influences water transport, storage, and quality. As quantified above, in a natural forested landscape, most rainwater seeps into the ground or is used by plants, and the remaining runoff flows slowly into streams, lakes, and wetlands or directly into Puget Sound.

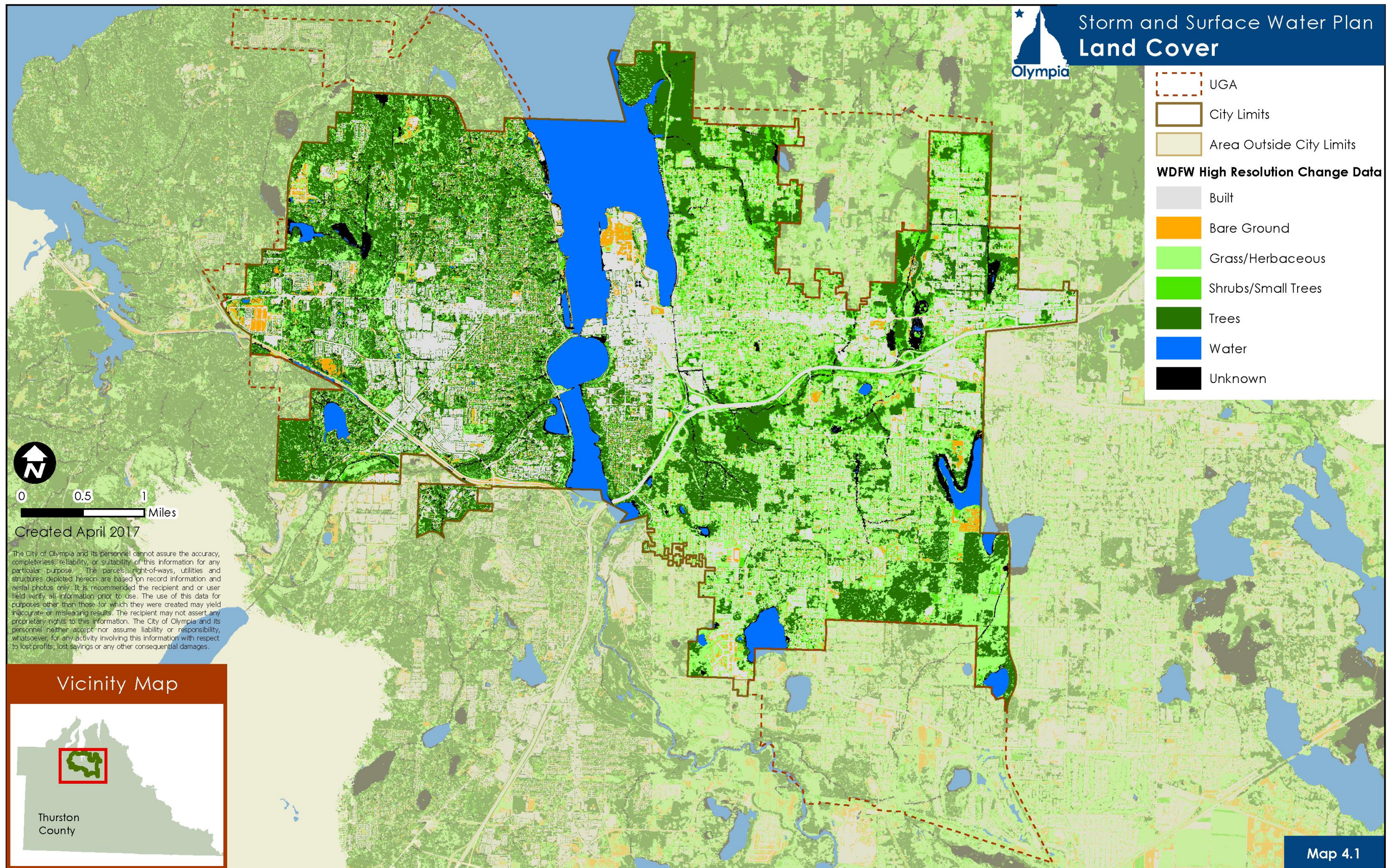
Impact of Urbanization

Urban development interrupts these natural processes: increasing impervious cover (e.g. roofs, parking lots, streets, and sidewalks), compacting the ground during construction, and removing the natural vegetation micro-topography that captures rainfall and aids infiltration. This type of land cover conversion, which is typical of conventional development techniques, dramatically increases surface runoff by approximately 30% (LID Guidance from Ecology/Herrera citation). The result is increased peak flows and duration of flows, increased erosion and sedimentation, and lower summer stream flows. Urban stormwater runoff carries pollutants from vehicles, animal wastes, fertilizers, and other sources into water bodies.

Patterns of development in a watershed – the amount of impervious surfaces, forest cover, and natural vegetation – influence how much rainwater filters into the ground and how much runs off into catch basins, pipes, stormwater ponds, natural wetlands, and streams. Watersheds with more effective impervious surfaces suffer more degradation to the natural system. Map 4.1 shows the various types of land cover in Olympia. Figure 4.2 shows how widely Olympia's watersheds vary in the extent of impervious surface and the type and quality land cover.

Managing Impacts

Past zoning, development practices, and lack of stormwater regulations have contributed to negative impacts on natural systems. In recent years, the City has tried to correct past problems and prevent or mitigate future impacts. Stormwater management focuses on quantifying the amount of rainfall that becomes surface runoff and mitigating the effects – both for quantity and water quality of this runoff. Various federal, State, and local regulations are intended to protect natural systems, and maintain their hydrologic, water quality, and habitat functions. See Chapters 5, 6, 7, and 8 for details about these regulations.



Map 4.1 Types of Land Cover in Olympia (WDFW High Resolution Land Cover 2013)

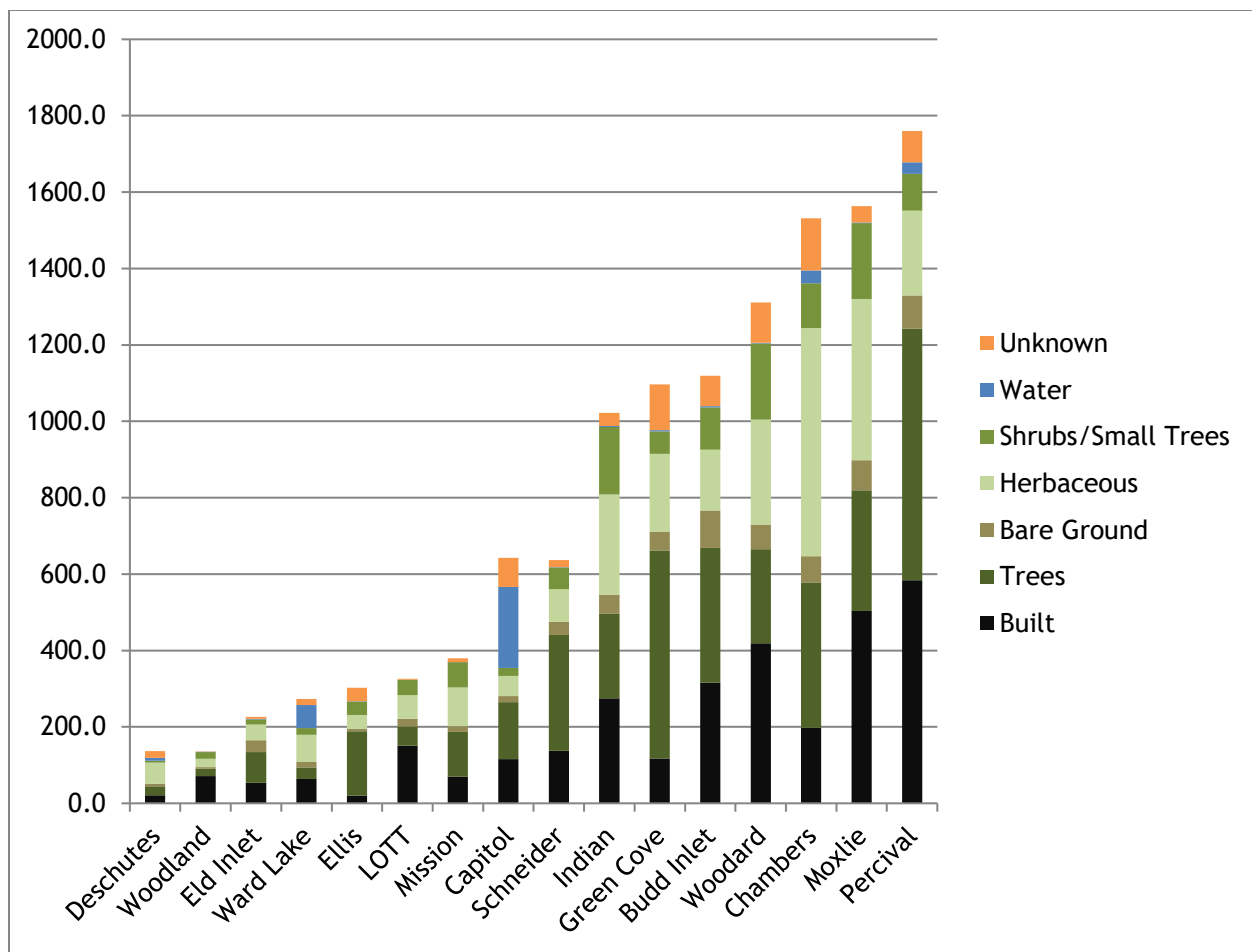


Figure 4.2 Land Cover in Olympia Watersheds, 2013

Source: Preliminary data from 2013 1-meter aerial photos. Washington State Department of Fish and Wildlife High Resolution Change Detection Project at www.pshrcc.com.

Streams and Riparian Areas

Stream channels are pathways for surface water runoff, groundwater from seeps and springs, and outflows from wetlands and lakes flowing into larger waterways. Streams also transport cobbles, gravels, and other sediments to downstream channel reaches and the shoreline, beaches, and mudflats of Puget Sound. Table 4.1 lists streams that flow through Olympia, showing how much of their main channel and tributaries are within the City and how much are piped.

Riparian areas are the forests and plant communities adjacent to streams, wetlands, and lakes that directly influence their water quality and habitat. Forested riparian areas provide the most benefit to aquatic systems. Large trees cool the air and water temperature with their shade. They support aquatic habitat by producing wood, leaf litter, and nutrients that support food webs. Fallen trees become habitat for aquatic life and control the movement of gravel and sediment. Roots of riparian vegetation capture sediment, reducing erosion by holding together stream banks; roots also filter water before it reaches the stream, absorbing large amounts of nitrogen and phosphorus.

By contrast, quickly routing stormwater into pipes and streams reduces infiltration into the soil and prevents groundwater recharge that otherwise would add to dry season stream flow.

Reported monetary values for ecosystem functions provided by riparian forests range from \$1,144 - \$26,844 per acre/year, depending on the age of the forest and other factors (Batker et al 2010).

Table 4.1 Streams in Olympia

Stream	Total Main Stem Length¹	Length in City Main Channel (Tributaries)	Piped Length in City	Other Jurisdictions¹
Black Lake (Ditch)	2.39	0.67 (0.0)	0.02	Thurston Co
Budd Inlet (Small Tribs)	N/A	0 (3.73)	N/A	Thurston Co
Chambers (Ditch)	2.54	0.66 (0.0)	0.02	Thurston Co
Ellis Creek	1.24	0.89 (2.42)	0.13	Thurston Co
Garfield Creek	0.54	0.54 (0.06)	0.08	N/A
Green Cove Creek	5.74	1.56 (3.34)	0.08	Thurston Co
Indian Creek	3.53	2.83 (4.44)	1.16 ³	Thurston Co
Mission Creek	2.13	2.00 (1.00)	0.15	Thurston Co
Moxlie Creek	2.07	2.07 (2.94)	0.87	Tumwater
Percival Creek	4.05	1.87 (0.71)	N/A	Tumwater, Thurston Co
Schneider Creek	2.19	2.19 (0.64)	1.02 ⁴	N/A
Woodard Creek	7.75	2.22 (0.67)	0.32	Thurston Co, Lacey
Woodland Creek	6.17	0 (0.0) ²	N/A	Thurston Co, Lacey

Source: Utility GIS data

¹ Measurements are in miles.

² Some portions of the watershed are within the City but not the stream channel.

³ Includes Indian Creek Bypass, a 0.28-mile long secondary channel.

⁴ Upstream (south) of Giles Avenue is piped.

Wetlands

Wetlands are among the most productive ecosystems in the world. Besides sustaining many plant and animal species, they can improve water quality, reduce erosion and flooding, and even moderate the effects of climate change. Wetlands are areas that are inundated or saturated by surface or groundwater frequent enough to support vegetation adapted for saturated soil conditions.

Wetlands retain surface runoff, slowing peak flows into streams, helping to prevent erosion and impacts to aquatic life. Many wetlands also recharge local aquifers and groundwater, increasing the release of cool, clean water into streams during the dry summer months. Wetlands also provide water quality benefits. Wetlands slow the flow of water, allowing sediments and attached pollutants to settle out of the water column. Plants, growing rapidly in wetlands, filter water by removing nitrogen and other nutrients. The lack of oxygen in wetland soils slows the decomposition of organic matter, preventing the release of carbon captured by vegetation to the atmosphere.

During the past 150 years, an estimated 31% of wetlands in Washington State have been drained and filled. The largest losses (up to 90%) have occurred in the urbanized watersheds around Puget Sound. As shown in Table 4.2, an estimated 3,150 acres of wetland remain in watersheds partially within Olympia, including about 680 acres within City limits. These are only estimates, since detailed wetland mapping must be done on a site-by-site basis and requires confirmation of soil, hydrology, and vegetation criteria.

The loss of wetlands in a watershed reduces their beneficial effects on flooding and surface water quality. Batker et al (2010) report annual ecosystem service values for wetlands ranging from \$14,377 - \$71,103 per acre/year.

Table 4.2 Wetlands in Olympia Watersheds

Watershed Name	Total Acres of Wetland	Acres of Wetland in Olympia City Limits	% of Basin in Wetland¹	% of Basin Unmodified Wetlands²
Chambers	765.5	177.4	10%	8.9%
Ellis Creek	427.5	37.1	30%	17.4%
Green Cove Creek	290.8	88.6	11%	11.6%
Indian Creek	154.9	55.0	12%	10.1%
Mission Creek	30.2	29.4	7%	5.1%
Moxlie Creek	54.9	51.4	4%	5.0%
Percival Creek	367.1	61.2	8%	7.1%
Schneider Creek	2.0	2.0	>1%	0.8%
Woodard Creek	585.1	172.3	12%	13.8%
Woodland Creek	474.7	4.8	5%	9.2%
TOTAL	3152.7	679.2		

Note: All data are estimated.

¹ Source: Thurston Regional Planning Council National Wetlands Inventory mapping. This data is approximate and does not capture all wetlands.

² Source: *Basin Evaluation and Management Strategies – Thurston County*, Table 10 (TRPC 2013).

Lakes

The four lakes in Olympia that are larger than 20 acres are regulated under the State Shoreline Management Act: Capitol Lake, Chambers Lake and Little Chambers Lake, Ken Lake, and Ward Lake (Table 4.3). Smaller lakes and ponds are D'Miller Lake, Lake Louise, Setchfield Lake, Hazard Lake, and Smith Lake. All lakes in Olympia are at least partially privately owned. The Washington Department of Enterprise Services owns and manages Capitol Lake. Each lake is unique and interacts with the surrounding landscape, surface water, and groundwater in different ways. For example, Capitol Lake was created by damming the Deschutes River, and outlets directly to Budd Inlet. Others are the result of glacial activity and/or shallow ground water. In the Olympia area, many ponds, lakes and/or wetlands occur in glacially formed “kettles” or depressions. They typically have no surface water inlets and/or outlets and are often directly connected to the water table. Ward Lake, Ken Lake, and Hazard Lake are examples of this type of system.

Lakes serve the stormwater management functions of storage and flow control. Like wetlands, they collect runoff and release it slowly. Lake water level often directly reflects the local ground water table. They can be highly influenced by nutrients that contribute to algae blooms, low dissolved oxygen, and other problems. Thurston County is the lead agency responsible for the larger lakes in Olympia.

Table 4.3 Larger Lakes in Olympia

Lake Name	Acres	Notes
Capitol Lake	270	• Mouth of Deschutes River, created by 5th Avenue Dam • Managed by State Department of Enterprise Services • Mean depth 9', maximum depth 20'
Chambers Lake (and Little Chambers)	63 and 58	• Shallow lake (maximum depths 5-7') and associated wetlands, flows to Chambers Ditch in Southeast Olympia
Ward Lake	66	• No outlet, maximum depth 67'
Ken Lake	27	• Small lake in Southwest Olympia with manmade outlet

Data from WRIA 13 Watershed Assessment (Accessed at <http://www.thurstoncountywa.gov/sw/Pages/basin-plan-wria13.aspx>)

Marine Shoreline and Budd Inlet

Olympia lies on the shoreline of Budd Inlet, at the southernmost end of Puget Sound. Of the 10.4 miles of shoreline within the City and its Urban Growth Area (UGA), about 73% is modified, primarily by armoring with bulkheads. Fill placed in the late 1800s through the 1980s created most of the Port of Olympia peninsula separating West Bay and East Bay. In 1951, a dam was constructed at 5th Avenue, creating Capitol Lake from mudflats at the mouth of the Deschutes River. These shoreline modifications reduce sediment supply to local beaches and habitat for various fish, shellfish, and their food sources. The east and west sides of Budd Inlet are primarily steep bluffs; the southern shoreline, created over the years by the filling of tideland, is generally flat.

Recently, regional awareness and initiatives have brought attention to how actions and decisions throughout the region affect the health of Puget Sound. Pollutants, nutrients, fine sediment, and bacteria are all transported into the Sound by runoff from streams, rivers, and thousands of pipes. This pollution creates problems for shellfish, juvenile salmon and other life using the Sound and shoreline.

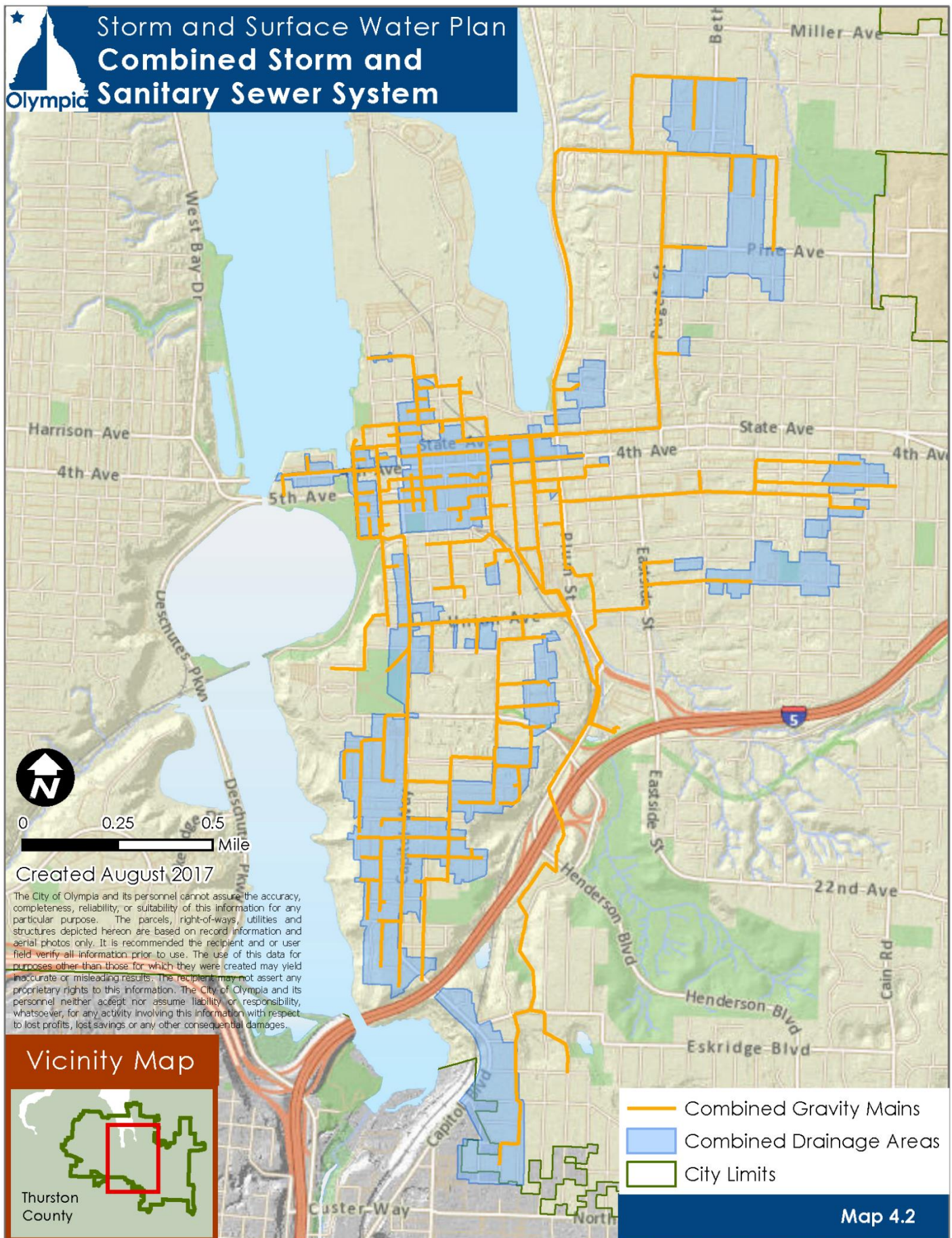
4.2 Built Infrastructure

Stormwater management practices and infrastructure have changed significantly in recent decades. Prior to the 1980s, Olympia's stormwater infrastructure consisted of ditches and pipes, often combined with sanitary sewer. The original infrastructure was designed simply to transport stormwater runoff away from developed land to protect people and property. As developed areas expanded, stormwater runoff increased, causing severe flooding and erosion.

The Utility's early efforts to address these problems aimed to reduce excess flows by requiring detention ponds that capture and detain stormwater runoff from developed areas. With increased understanding of water quality and habitat impacts, stormwater management practices have incrementally improved, aiming to simulate natural systems and mitigate negative impacts.

Currently, most of Olympia's built infrastructure is a storm sewer gravity system, separate from the sanitary sewer. However, an aging combined storm and sanitary sewer system still serves the downtown area and adjacent neighborhoods to the northeast, east, and southeast of downtown (see Map 4.2).

Storm and Surface Water Plan **Combined Storm and Sanitary Sewer System**



Map 4.2 Combined Storm & Sanitary Sewer System

System Overview

Olympia's built infrastructure is a network of public and private systems that work together with gravity to convey, control, and treat stormwater. In general, facility design attempts to supplement or replace natural functions of forests and wetlands by slowing, retaining, and filtering runoff from impervious surfaces. Stormwater facilities include conveyance structures like pipes, swales, ditches, culverts, street gutters; and flow control structures and/or treatment structures like detention ponds, retention ponds, constructed wetlands, infiltration devices, catch basins, oil/water separators, and biofiltration swales. See Map 4.3.

To carry stormwater runoff from roads and other hard surfaces to streams and Budd Inlet, the Utility maintains over 160 miles of underground pipe (separated sewer), more than 7,400 catch basins, approximately 1,400 manholes, 167 flow control structures, and 129 stormwater treatment facilities. Table 4.4 summarizes this infrastructure; see Tables 4.5, 4.6, and 4.7 for inventory detail.

An additional 20.7 miles of combined sewer pipe, maintained by the Wastewater Utility, convey runoff to the LOTT Clean Water Alliance Budd Inlet treatment plant.

Table 4.4 Stormwater Infrastructure Summary

Infrastructure Type	City Owned or Maintained	Privately Owned
Catch Basins and Inlets (number)	7,444	5,760
Conveyance Pipes (miles)	160	143.8
Ditches and Swales (miles)	21.7	9.2
Flow Control Facilities (number)	167	852
Treatment Facilities (number)	129	523

Collection and Conveyance Facilities

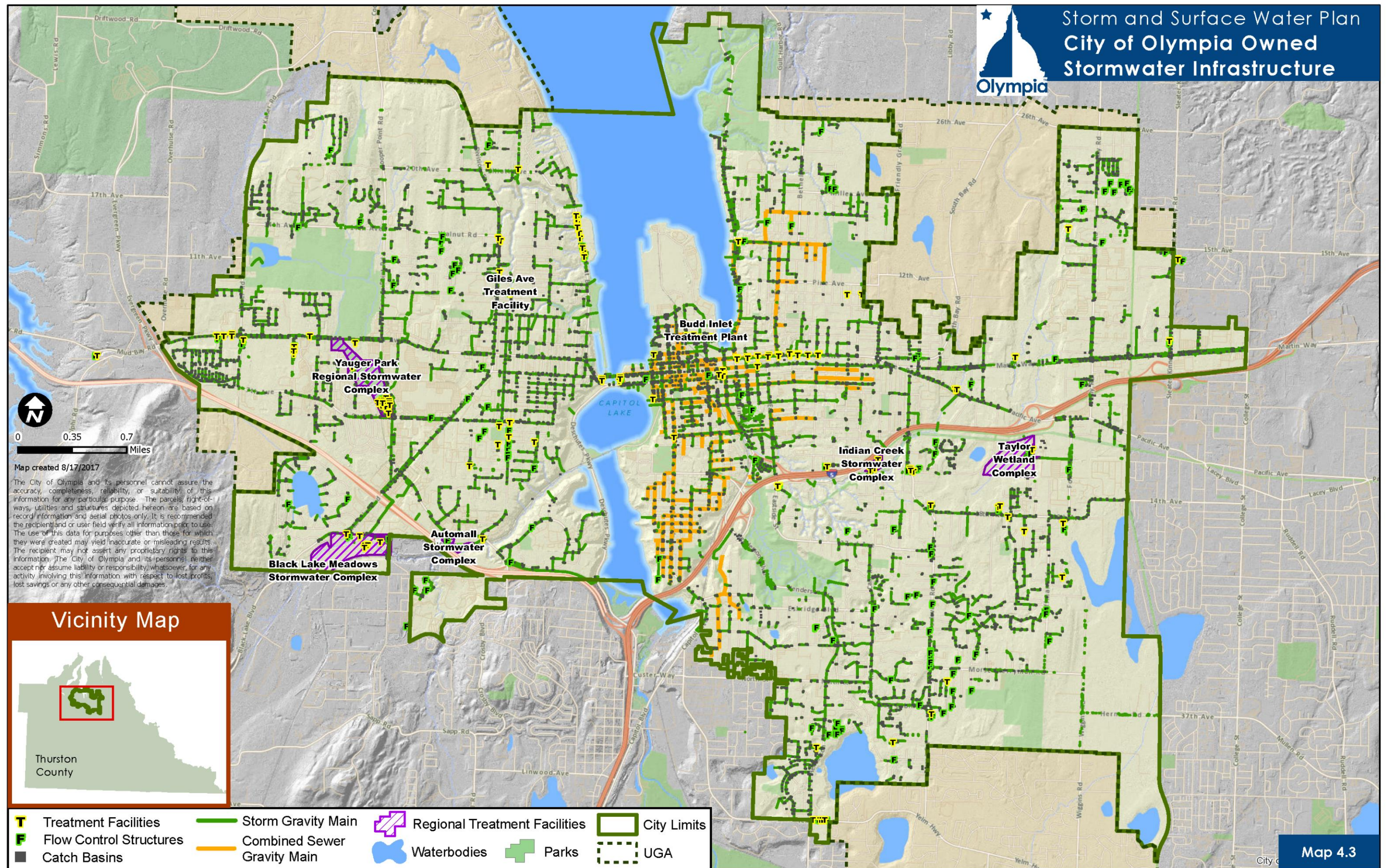
Natural and built drainage facilities collect, contain, and convey the flow of surface and stormwater from the highest points on the land down to a receiving water. Natural elements of conveyance systems include swales and small drainage courses, streams, and rivers. Built conveyance systems include gutters, ditches, pipes, and culverts.

Most of the definitions of system components described below are from Washington State Department of Transportation (WSDOT) Glossary of Terms.

Gravity Storm Pipes

Gravity storm pipes are typically part of a closed pipe network that conveys surface water between inlets, catch basins, manholes, facilities and outfalls. Table 4.5 summarizes Olympia's stormwater gravity collection pipe inventory, showing diameter, length, and materials. The condition of these pipes varies with age, type of materials, and location. Inspection shows the current condition of the storm gravity mains as follows:

- 44% of the pipes are in good condition
- 6% are in fair condition
- 12% are in poor condition
- 38% remain to be inspected



Map 4.3 City of Olympia Storm & Surface Water Infrastructure

Culverts

Culverts are pipes or concrete box structures that drain open channels, swales, or ditches under a roadway or embankment. Typically, there are no catch basins or manholes along their length. The Utility has mapped 5.76 miles of public culverts and 0.83 miles of private culverts within the City.

Table 4.5 Storm Gravity Collection Pipe Inventory

Pipe Diameter (inches)	Cast Iron/Ductile Iron	Concrete	Corrugated Metal	HDPE	PVC	RCP	Steel Trestle	Vitrified Clay	Other or Unknown	TOTAL Pipe Length (feet)
4	615	914	6	549	2,451			1	1,988	6,524
6	2,292	51,073	2,838	1,775	26,305	157		7,070	11,216	102,726
8	7,445	68,404	17,529	6,920	72,056	1,505	29	5,559	14,402	193,849
10	226	22,236	8,964	677	14,364	462		1,726	2,150	50,805
12	12,659	48,071	18,394	90,048	55,239	6,102	307	3,336	12,123	246,279
14	160	90								250
15	139	13,818	6,098	10,611	6,165	5,493		1,996	2,443	46,763
16				177		517				694
18	2,554	7,895	4,982	20,686	6,263	8,051		439	3,169	54,039
20						84				84
21		922	1,481	666	1,375	2,849				7,293
24	281	5,482	7,163	17,971	830	15,659	405	1,257	606	49,654
30		4,118	2,808	5,434	297	5,245		2,133	326	20,361
35			101						62	163
36	34	3,314	4,490	4,172		5,788	426		859	19,083
40	305					146				451
42	313	3,534	1,012	511		922			60	6,352
48			1,025	1,573		850	405			3,853
54			1,412			867				2,279
66			128							128
72			1,034			2,680				3,714
Other			315							315
Unknown	73	183	133		63				26,060	26,512
Total Lengths of Each Pipe Type and Percentage of Total System Length										
Feet	27,096	230,054	79,913	161,770	185,408	57,377	1,572	23,517	75,464	842,171
Miles	5	44	15	31	35	11	< 1	4	14	160
Percentage	3%	27%	9%	19%	22%	7%	< 1%	3%	9%	100%

Catch Basins

Catch basins are chambers or wells, usually built at the curb line of a street, where surface water enters a storm sewer or sub-drain. At the base is a sediment sump designed to retain grit and detritus below the point of overflow.

Ditches

Ditches are long narrow excavations dug in the earth for drainage, with their top width less than 10 feet at design flow. The Utility has mapped 10.86 miles of public ditches and 2.71 miles of private ditches, and has an ongoing effort to map all ditches within the City.

Manholes

Stormwater manholes provide underground access to a vault for inspections and maintenance. Manholes are located at junctions where several pipes meet, pipes change direction, a flow control structure is needed, or sometimes where pipes change size.

Flow Control Structures

Flow control structures are designed to mitigate the impacts of increased surface and stormwater runoff flow generated by development. Flow control facilities are designed to control volume, rate, frequency, and flow duration through evaporation, plant transpiration, and/or infiltration into the ground; or they may be designed to hold runoff for a short period, releasing it to the conveyance system at a controlled rate. Table 4.6 lists the flow control structures in Olympia's stormwater system.

Table 4.6 Flow Control Structures

Flow Control Type	Number of Public Flow Control Structures	Number of Private Flow Control Structures
Combined Detention/Infiltration	5	22
Detention Pond	37	176
Detention Tank	0	2
Detention Under Pavement	2	79
Detention Vault	7	99
Drywell	26	60
Infiltration Basin	14	94
Infiltration Under Pavement	15	42
Infiltration Vault	0	9
Infiltration Trench	61	262
Parking Lot	0	7
Total	167	852

Treatment Facilities

Stormwater treatment facilities are structures or systems designed to reduce or remove pollutants and/or control flow or volume. Natural treatment occurs in streams, wetlands, and lakes. Structures provide varying levels of treatment through settling of particulate pollutants using gravity, centrifugal separation, and/or filtration by biological uptake or media/soil adsorption. Larger facilities such as Black Lake Meadows and Yauger Park are considered regional treatment facilities.

Levels of Treatment

Olympia's Drainage Design and Erosion Control Manual (DDECM), Volume 1 lists the core stormwater management requirements for new development and redevelopment and includes the type(s) and level(s) of stormwater treatment required. The levels of stormwater treatment determined by the DDECM are described below as defined by the Washington State Department of Ecology and shown in Table 4.7.

- **Pretreatment.** Intended to achieve 50% removal of fine (50-micron mean size) and 80% removal of coarse (125-micron mean size) total suspended solids for influent concentrations greater than 100 mg/L, but less than 200 mg/L. For influent concentrations less than 100 mg/L, these facilities are intended to achieve effluent goals of 50 mg/L of fine and 20 mg/L of coarse total suspended solids.

Pretreatment is necessary in areas where the basic treatment facility or the receiving water may be adversely affected by non-targeted pollutants or may be overwhelmed by a heavy load of targeted pollutants. Filtration and infiltration facilities often need protection from clogging, which can be achieved with pretreatment devices such as a pre-settling basin, wet pond or vault, biofilter, constructed wetland, or an oil/water separator.

- **Oil Treatment.** Intended to achieve the goals of no ongoing or recurring visible sheen and a daily average total petroleum hydrocarbon concentration no greater than 10 mg/L with a maximum of 15 mg/L for discrete (grab) samples.

Oil/water separators remove oil floating on the top of the water and are necessary in high-use sites that generate high concentrations of oil due to high traffic turnover or the frequent transfer of oil such as parking lots, vehicle maintenance and repair sites, and fuel stations.

- **Basic Treatment.** Intended to achieve a goal of 80% removal of total suspended solids for an influent concentration range of 100 mg/L to 200 mg/L. For influent concentrations less than 100 mg/L, the effluent goal is 20 mg/L total suspended solids.

Basic treatment is viewed as a minimum technology-based requirement that must be applied regardless of the quality of the receiving waters.

- **Enhanced Treatment.** Intended to achieve a higher level of treatment than basic treatment. Enhanced treatment is targeted at removing dissolved metals and usually involves two or more treatment levels before stormwater is discharged from the treatment facility.

Table 4.7 Treatment Facility Inventory

Treatment Facility Type	Treatment Level	Number of Public Facilities	Number of Private Facilities
Bioretention Pond	Enhanced	17	23
Biofiltration Swale	Basic	12	63
Catch Basin Insert	Pretreatment	0	1
Constructed Wetland	Enhanced	3	4
Filtrerra Unit	Enhanced	17	1
Filter Strip	Enhanced	2	17
Modular Wetland	Basic	8	0
Oil/Water Separator	Oil Control	5	45
Permeable Pavement	Enhanced	1	20
Sand Filter	Enhanced/Oil Control	0	2
Storm Filter Cartridge Vault	Basic	18	202
Vortech/Stormceptor Vault	Pretreatment	9	21
Wet Pool (Wet Pond)	Basic	37	124
	Total	129	523

Regional Treatment Facilities

The Utility has designed and constructed more than a dozen regional infrastructure improvement projects that manage stormwater flow and improve water quality. The larger facilities are described below.

Yauger Park Regional Stormwater Complex

West Olympia's Yauger Park serves the community as both a recreational park and a regional stormwater facility that receives runoff from over 700 acres. The 29-acre stormwater facility was constructed in 1977 when the Capital Mall was built. In 2010, the detention pond was deepened and enlarged to create more stormwater storage capacity and add water treatment. When full, the pond can hold up to 27 million gallons of water. The stored water is gradually released to Black Lake Meadows, then through Percival Creek, and ultimately flows into Budd Inlet. The landscaped wet pond, wetland, rain gardens, and forebays provide stormwater treatment in an attractive natural environment.



West end of Yauger Park Regional Stormwater Complex Pond (May 2016)

Black Lake Meadows Stormwater Complex

Black Lake Drainage Ditch was constructed in 1922 to drain land north of Black Lake. The adjacent 42-acre Black Lake Meadows wetlands was purchased in 1995 for use as storage, infiltration, and treatment of stormwater discharged from many commercial districts in west Olympia, including discharge from the Yauger Park stormwater pond. The complex is a series of ponds on the north side of Black Lake Ditch and a constructed wetland on the south side. This facility protects stream habitat and water quality and provides a home to wildlife. Black Lake Meadows is rich in bird diversity, with a large variety of pond and nesting habitat.



Black Lake Meadows Stormwater Complex (May 2017)

Taylor Wetlands Complex

The Taylor Wetlands Complex is a series of ponds that provide water quality treatment and flow control for runoff from approximately 190 acres of primarily commercial property in the Woodard Creek basin. The facilities receive a portion of the runoff from the South Sound Shopping Center. The City of Olympia owns and maintains the facilities near the Taylor Wetlands, south of the Olympia Woodland Trail and the City of Lacey owns and maintains an upstream water quality facility.



South End of Fones Road Stormwater Facility (May 2017)

Giles Avenue Treatment Facility

The Giles Avenue treatment facility is a two stage treatment train that provides treatment for runoff from approximately 180 acres in the upper Schneider Creek basin. Runoff is pretreated by a Contech CDS swirl concentrator that hydrodynamically separates and traps sediment and debris. Pretreated stormwater is then filtered through an 80 cartridge Contech Storm Filter that further removes sediment and metals.



Giles Ave Treatment Facility (May 2017)

Indian Creek Stormwater Complex

The Indian Creek Stormwater Complex is located at the corner of Frederick Street and Wheeler Avenue on two acres adjacent to the Woodland Trail. The project was originally constructed in 2001 as a joint effort by the City, Washington State Department of Transportation, and the Olympia Arts Commission. The project's innovative use of art, engineering, and the natural environment earned a Federal Environmental Protection and Enhancements Merit Award. Its design integrates treatment function, slope stabilization, and natural elements with public art. The sequence of stormwater facilities slows down and filters out larger items, soils, and sediments in stormwater coming from Interstate-5 as it moves toward Indian Creek. Several native plants were reintroduced to the site, creating a tranquil setting in an urban environment.



Clarification Pond at Indian Creek (May 2016)



Legal and Policy Framework

Chapter 5

Chapter 5 – Legal and Policy Framework

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CHAPTER 5 – LEGAL & POLICY FRAMEWORK

One of the major “Why’s” – the motivations driving the development and management of Olympia’s stormwater system – is the framework of laws, regulations, and policies that the City must adhere to. These laws and regulations became necessary as increasing population and urbanization caused widespread flooding, water quality, and habitat impacts in Washington and across the country. This chapter gives an overview of the major federal, State, and local regulations governing the Utility’s work (Table 5.1).

Table 5.1 Legal and Policy Framework for Storm & Surface Water Management

	Regulations and Statutes	Plans and Policies
Federal	• Clean Water Act • Endangered Species Act • Surface Water Standards • Tribal Treaty Rights	
State	• Phase II Municipal Stormwater Permit (NPDES) • Ecology’s Stormwater Management Manual for Western Washington • Surface Water Quality Standards • Total Maximum Daily Load (TMDL)	• Puget Sound Partnership Action Agenda
City	• Olympia Drainage & Erosion Control Manual • Engineering Development and Design Guidelines • Olympia Municipal Code	• Comprehensive Plan • Storm & Surface Water Plan • Capital Facilities Plan

5.1 Federal

Two federal laws, the Clean Water Act and Endangered Species Act, and the National Flood Insurance Program guide the management of storm and surface water.

Clean Water Act

The Clean Water Act (CWA), or National Pollution Control Act, enacted in 1972, is the primary federal law protecting the nation’s water quality and aquatic resources.

The CWA establishes requirements for preserving, maintaining, and restoring the quality of surface waters for designated beneficial uses, such as fishing and swimming, as well as protecting wetlands. All waters with a “significant nexus” to “navigable waters” are covered under the CWA. “Navigable waters,” also referred to as “waters of the United States” has been interpreted through law to include water features such as intermittent streams, ephemeral lakes, kettles, sloughs, and wetlands.

The US Environmental Protection Agency (EPA) administers the CWA, with authority delegated to the State of Washington and its Department of Ecology (Ecology) and the US Army Corps of Engineers (Corps). See Chapter 5, Section 5.2 for implementation in Washington through the state Pollution Control Act, Section 303 Water Quality Standards and Total Maximum Daily Load (TMDL) requirements, Section 401 Water Quality Certification, Section 402 National Pollutant Discharge Elimination System (NPDES) permits, and Section 404 Dredge and Fill Permits. Details are in Chapter 7.

Endangered Species Act

The Endangered Species Act (ESA) was enacted in 1973 to protect the nation's heritage in fish, wildlife, and plants from extinction. In addition, the Act provides for conservation of habitat upon which endangered and threatened species depend. A species is listed under the ESA when declining populations threaten its existence.

The requirements of the ESA apply to urban stormwater management in Puget Sound because stormwater pollution affects multiple species of salmon and resident killer whales that are listed as threatened or endangered; more listings are likely in the future.

Provisions of the ESA that may apply to stormwater management and aquatic habitat stewardship include the Section 4(d) rules, Section 7 consultations, and Section 10 Habitat Conservation Plans. See Chapter 8 for details.

National Flood Insurance Program

The City participates in the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program, making Olympia property owners eligible for federally subsidized flood insurance. To participate, the City has adopted and enforces a floodplain management ordinance (OMC 16.70) that regulates construction within flood zones established on FEMA flood insurance rate maps. The Community Planning and Development department is responsible for administering the flood plan management regulations. Utility staff provides expertise in interpreting FEMA flood insurance rate maps. FEMA, not the City, develops flood insurance rate maps.

If the City were to undertake NFIP-identified public information and floodplain management activities, the City could participate in the NFIP's Community Rating System, which would likely reduce flood insurance premium rates because of reduced flood risk.

5.2 State of Washington

The state laws and regulations most relevant to the work of the Utility are the Growth Management Act, Shoreline Management Act, Water Pollution Control Act and other water quality regulations pursuant to the Clean Water Act, State Hydraulic Code, and Salmon Recovery Act. Also, the Revised Code of Washington Chapter 35 gives the City authority to operate and charge for its storm and surface water utility.

Growth Management Act

In 1990, the legislature enacted the Growth Management Act (GMA) (36.70A RCW) in response to rapid population growth and concerns about suburban sprawl, environmental protection, quality of life, and related issues. The GMA establishes the primacy of the local comprehensive plan as the starting point for any planning process and the centerpiece of local planning. All development regulations adopted by a jurisdiction, including stormwater regulations, must be consistent with the jurisdiction's comprehensive plan. The GMA also requires adoption of critical area regulations to protect wetlands, critical recharge areas, important fish and wildlife habitat areas, frequently flooded areas, and geologically hazardous areas.

Shoreline Management Act

Established in 1971, the Shoreline Management Act (SMA) (90.58 RCW) requires each city and county adjacent to shorelines of the state to prepare and adopt a Shoreline Master Program (SMP). Although a SMP must be consistent with SMA requirements, a SMP is tailored to the specific geographical, economic, and environmental needs of the community. The local SMP is essentially a shoreline-specific

combination of comprehensive plan, zoning ordinance, and development permit system. SMPs are subject to review and approved by Ecology.

Clean Water Act Implementation

Responsibility for implementing requirements of the federal Clean Water Act in Washington is delegated to the Washington Department of Ecology (Ecology). The Water Pollution Control Act (90.48 RCW) is the principal law governing water quality in Washington State. Water quality standards and implementation of other provisions of the CWA are described below. See Chapter 7, Section 7.4 for the Utility's role in enforcing these regulations.

Water Pollution Control Act

The Act establishes a comprehensive program to protect water quality and beneficial uses of water and applies to surface waters, wetlands, and groundwater. Under the Act, Ecology is given the authority to control and prevent the pollution of waters of the state, including the ability to issue enforcement orders and civil penalties for causing pollution.

Water Quality Standards

Consistent with the Water Pollution Control Act, Washington Administrative Code (WAC 173-201A) establishes surface water quality standards to sustain public health and public enjoyment of state waters, and for the propagation and protection of fish. Under WAC 173-201A all surface waters are protected by numeric and narrative water quality criteria, a designated use, and an antidegradation policy.

NPDES Municipal Stormwater Permit

To protect water quality, the Clean Water Act establishes a permitting system that regulates the discharge of wastewater and stormwater into "waters of the United States." This system is called the National Pollutant Discharge Elimination System (NPDES). In western Washington, Ecology administers this system through the Western Washington Phase II Municipal Stormwater Permit (Permit), consistent with WAC 173-226.

The City is subject to the requirements of the Permit. The Permit allows discharges from the City's municipal separate storm sewer system (MS4) into surface water and groundwater provided certain actions are taken to prevent stormwater pollution. The City has held a Permit since 2007 and reapplies for the revised permit every five years.

The Permit requires the City to create and implement an annual Stormwater Management Program (SWMP), which outlines the City's plan to develop and implement the following programs and processes:

- Public Education and Outreach
- Public Involvement and Participation
- Illicit Discharge Detection and Elimination
- Controlling Runoff from New Development, Redevelopment and Construction Sites
- Municipal Operations and Maintenance
- Control of stormwater runoff from construction sites
- Operations and maintenance of stormwater facilities after construction

The Permit also includes compliance standards with Total Maximum Daily Load (TMDL), monitoring and assessment, and annual reporting requirements.

Total Maximum Daily Load

The CWA requires states to maintain a list of water bodies that fail to meet water quality standards. In Washington, that list is called the 303(d) List. If a water body is out of compliance with standards for a particular pollutant, the CWA requires that a total maximum daily load (TMDL) of the pollutant be calculated. The TMDL is the maximum amount of the pollutant that can be imposed on the water body without violating the water quality standard for that pollutant.

TMDLs have been established for the Henderson Inlet and Deschutes River watersheds, and are being developed for Budd Inlet and Capitol Lake. See Chapter 7 for Olympia creeks and lakes that are on the state's 303(d) list, TMDL planning for watersheds in Olympia, and City actions required to ensure TMDL allocations are met.

Section 401 Water Quality Certification

Section 401 of the CWA allows states to approve, condition, or deny projects proposed in waters of the United States, including wetlands. In Washington, Ecology administers this process by issuing 401 Water Quality Certification to projects that can ensure compliance with state water quality standards and other aquatic resource protection requirements.

Section 404 Dredge and Fill Permit

Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill materials into waters of the United States, including wetlands. The US Army Corps of Engineers administers this program. It requires showing that steps have been taken to avoid impacts to wetlands, streams, and other aquatic resources; minimize potential impacts; rectify temporary impacts after the project is completed; and provide compensation for all remaining unavoidable impacts.

Hydraulic Project Approval

To implement a construction activity or other work that uses, diverts, obstructs, or changes the natural flow or bed of state waters requires a Hydraulic Project Approval (HPA). Activities ranging from work on bulkheads, piers, and docks to culvert cleaning, repair and replacement all require a HPA. The Washington State Department of Fish and Wildlife administers the HPA program under the state Hydraulic Code (77.55 RCW).

Salmon Recovery Act

In 1998, the Washington State Legislature enacted the Salmon Recovery Act (RCW 77.85) to empower citizens at the community level to engage in salmon recovery through locally driven habitat protection and restoration programs. The Act calls for the designation of lead entities to coordinate local efforts by soliciting, developing, prioritizing, and submitting salmon habitat and restoration projects within specified Water Resource Inventory Areas (WRIAs).

In Washington, the Department of Fish and Wildlife administers grants to the lead entities with funds provided by the Salmon Recovery Funding Board. Locally based citizen and technical advisory committees identify projects that are both scientifically sound and in alignment with the needs of the community. Thurston Conservation District is the lead entity for WRIA 13, Deschutes watershed, which includes Olympia. Utility staff participate on the technical committee (see Chapter 8).

Authority to Fix Utility Rates

RCW Chapter 35 (RCW 35.67.20) authorizes cities to “fix, alter, regulate, and control the rates and charges for their” systems of sewerage, defined in RCW 35.67.010 to also include stormwater management. Further, RCW 35.67.20 requires rates to be reduced by “a minimum of ten percent for any new or remodeled commercial building that utilizes a permissive rainwater harvesting system.”

RCW 35.67.20 specifies that all public property “shall be subject to rates and charges for storm water control facilities to the same extent private persons and private property are subject to such rates and charges.” Finally, capital, or general, facilities charges are authorized for cities under RCW 35.92.025. See Chapter 12 for a discussion of Utility rates.

5.3 City of Olympia and Thurston County

The City is required to manage storm and surface water to protect public and environmental health and property, and to maintain compliance with the federal and State regulations described above. Many of these require the City to adopt specific local regulations. The local policies and regulations that impact the Utility are the *Comprehensive Plan* and development regulations, *Shoreline Master Program*, and stormwater regulations, and Thurston County Noxious Weed Board regulations.

Comprehensive Plan

The *City of Olympia Comprehensive Plan* underwent a major update in 2014, with over 1,500 community members participating. It conveys the community’s values and vision for the future, particularly for the next 20 years. Its goals and policies give high-level direction for actions the City and other community members may take to realize the values and vision. The goals and policies also guide City budgets, development regulations, and utility management plans.

Comprehensive Plan goals and policies that have helped guide the direction of this Storm and Surface Water Plan are those in the Natural Environment and Utilities chapters. Goals are listed below, and the complete set of related goals and policies are in Appendix 1.

Natural Environment

- GN2 Land is preserved and sustainably managed.
- GN4 The waters and natural processes of Budd inlet and other marine waters are protected from degrading impacts and significantly improved through upland and shoreline preservation and restoration.
- GN5 Ground and surface waters are protected from land uses and activities that harm water quality and quantity. Healthy aquatic habitat is protected and restored.
- GN11 All members of the community can experience the natural environment through meaningful volunteer experiences, active recreation, and interactive learning opportunities.

Utilities

- GU1 Utility and land use plans are coordinated so that utility services can be provided and maintained for proposed future land uses.
- GU2 Reliable utility service is provided at the lowest reasonable cost, consistent with the City’s aims of environmental stewardship, social equity, economic development and the protection of public health.
- GU3 Utilities are developed and managed efficiently and effectively.
- GU10 The frequency and severity of flooding are reduced and hazards are eliminated, except during major storm events.
- GU11 The City uses best available information to implement a sea level rise management plan that will protect Olympia’s downtown.

Shoreline Master Program

The 2015 *Shoreline Master Program* (SMP) regulates the management and protection of Olympia's shorelines and ensures compliance with the Washington State Shoreline Management Act (90.58 RCW). The Olympia shorelines falling under the program include Grass Lake, Capitol Lake, Ward Lake, Ken Lake, Percival Creek, and marine shorelines.

The State implementing code (WAC 173-26) gives preference to shoreline uses that: depend on proximity to the shoreline; protect biological and ecological resources, water quality, and the natural environment; and preserve and enhance public access or increase recreational opportunities for the public along shorelines.

The Olympia SMP protects and encourages enhancement and restoration of shoreline ecological functions, values, and ecology, paralleling the mission of the Utility to improve and protect aquatic habitats.

Critical Areas Ordinance

The State GMA requires every jurisdiction to adopt a critical areas ordinance (CAO) to protect critical areas and their function. Critical areas include many aquatic habitats (streams, wetlands, lakes, and their buffers). These areas provide many natural flood control and water quality functions, habitats for fish and wildlife, and buffer functions around these habitats.

In response to GMA requirements, Olympia's environmental protection regulations were overhauled as Olympia's first CAO in 1992 and most recently updated in July 2016. The primary set of regulations on development to protect critical areas is codified as OMC 18.32. There are specific regulations for frequently flooded areas (OMC 16.70), marine and freshwater shorelines (OMC 18.20), and erosion hazards (OMC 13.16).

Olympia Stormwater Regulations

The City is required by its NPDES Phase II Municipal Stormwater Permit to implement an ordinance or other enforceable mechanism that addresses management of stormwater runoff from new development, redevelopment, and construction projects (2013 Permit, S5.C.4.a). The City meets this requirement by enforcing applicable sections of the Olympia Municipal Code (OMC), which include other stormwater standards and manuals by reference, as described below.

Utility Minimum Standards and Rates

The Storm and Surface Water Utility section of Olympia Municipal Code (OMC 13.16) identifies the minimum standards for connection, permitted usage, and charges for using the utility. Storm and Surface Water utility rates are discussed in further detail in the Olympia Municipal Code *Title 4 – Fees and Fines*.

Drainage Design and Erosion Control Manual

The 2016 *Olympia Drainage Design and Erosion Control Manual* (DDECM) was adopted by City Council and made effective on December 1, 2016 (Ordinance 7027); it was adopted by reference in OMC 13.16.017. The DDECM is the primary mechanism for ensuring project compliance with the Permit. All new development, redevelopment, and construction projects must conform to the requirements of the DDECM. See details in Chapter 6.

The City's core requirements and standards for design, construction, and management of stormwater facilities meet or exceed the requirements listed in Appendix 1 of the NPDES Permit and Ecology's 2012 *Stormwater Management Manual for Western Washington*. The DDECM is divided

into five volumes and defines numerous best management practices (BMPs) for development projects:

- Volume I – Core Technical Requirements and Site Planning
- Volume II – Construction Stormwater Pollution Prevention (Sediment and Erosion Control BMPs)
- Volume III – Hydrologic Analysis and Flow Control BMPs
- Volume IV – Permanent Stormwater Site Management
- Volume V – Stormwater Treatment BMPs (including Low Impact Development practices)

Engineering Design and Development Standards

The most recent *City of Olympia Engineering Design and Development Standards* (EDDS) were adopted by City Council, and made effective December 13, 2016 (Ordinance 7045); it was adopted by reference in OMC 12.02.020. All public and private development projects must be designed to these standards. Chapter 5 of the EDDS gives specific guidance for the design and installation of stormwater infrastructure constructed in the right-of-way.

Thurston County Noxious Weed Board

Washington State Noxious Weed laws and regulations (RCW 17.10, WAC 16-750, and WAC 16-752) establish that all property owners are responsible for helping to prevent and control the spread of noxious weeds. The Utility is responsible for controlling noxious weeds on City-owned property managed by the Utility.

In Thurston County, the Thurston County Noxious Weed Board (Weed Board) is authorized to adopt rules and regulations as necessary for an effective county weed control or eradication program. The County employs a weed coordinator to inspect property for noxious weeds. If a landowner does not control noxious weeds after receiving several notices, the Weed Board may come and control the weeds and bill the landowner for its work, or it may issue a civil penalty.



Flooding

Chapter 6

Chapter 6 – Flooding

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CHAPTER 6 – FLOODING

One of the main “Why’s” determining the strategies recommended in the Plan for the next ten years (Chapter 10) is the continued challenge of flooding, both from seasonal storms and tidal influences.

Frequent and severe flooding in the mid- to late 20th century was the main impetus for creating the Storm and Surface Water Utility in 1986. Since then, development standards, improved infrastructure, and better infrastructure management have greatly reduced the frequency and extent of flooding, but challenges remain.

The Utility has the City’s primary responsibility for flood mitigation through several of the Core Services described in Chapter 9. These include:

- Reviewing and approving Drainage Control Plans and engineered stormwater facilities for public and private development (see Section 6.3).
- Monitoring incidents of flooding and proposing improvements.
- Tracking “hot spots” where plugged drains cause localized flooding.
- Inspecting and maintaining stormwater facilities.
- Responding to flooding emergencies.
- Planning and managing construction of flood prevention and control facilities.

This chapter reviews the causes and impacts of flooding, the Utility’s role in implementing drainage design standards for new development, and remaining challenges.

6.1 Existing Conditions

Urban development has covered the land with impervious surfaces, greatly increasing the runoff of stormwater and preventing it from soaking into the ground and flowing slowly into streams, wetlands, lakes, and marine waters. Without effective stormwater management, the result is flooding, along with other impacts on water quality and habitat.

Strain on the System

Initial efforts to manage stormwater in the early 20th century focused on rerouting stormwater flows to constructed systems of channels and pipes – all intended to solve localized stormwater issues. While effective in the short term, these systems many times did not account for the capacity of downstream conveyance systems or future buildout of the area. Urbanization that came without effective methods of controlling peak stormwater flows (typically development before 1990) frequently pushed the downstream conveyance system beyond capacity or changed existing drainage patterns completely. Increased flows in City-maintained pipes and ditches overloaded undersized or poorly designed systems.

Approximately 330 acres of the City – mostly located downtown and in the South Capitol Neighborhood – are served by combined sewer conveyance pipes. These pipes drain wastewater from homes and businesses, while also draining surface streets of stormwater. All flows from these portions of the system flow to the LOTT Clean Water Alliance Budd Inlet Treatment Plant. While instances of combined sewer overflow (CSO) are extremely rare in Olympia, any increase in stormwater to these combined systems can be cause for concern. For more information about the combined sewer network and the dedicated stormwater conveyance system, see Chapter 4.

Causes of Flooding

Primary causes of flooding are:

- **Runoff from Impervious Surfaces.** A significant portion of rainfall in forested watersheds is absorbed into soils (infiltration), stored as groundwater, and slowly discharged to streams. As watersheds are urbanized, vegetation is replaced by impervious surfaces, reducing the area where infiltration to ground water can occur. Simply put, in a developed watershed, much more water arrives into a stream much more quickly, resulting in an increased likelihood of more frequent and more severe flooding.

- **Deteriorating or Inadequate Public and Private Conveyance Systems.** In an urban environment, runoff must be collected in extensive drainage systems that combine curbs, storm drains, sewer pipes, and ditches to carry stormwater to streams. Most of the stormwater infrastructure in Olympia was constructed prior to 1990, before there were well-established storm drainage design regulations. It is aging, often undersized, and lacking flow control facilities.
- **Inadequate Maintenance of Conveyance Systems and Inlets.** Public and private stormwater infrastructure requires regular maintenance to properly function. Sediment must be removed from storm drains and sewer pipes to maintain capacity. Leaves, vegetation and debris must be removed from storm drain grates and pipe ends to prevent clogging. Operations staff removes sediment from all storm drains at least every two years (arterial roadways are cleaned annually). Operation staff has established routes (“hot spots”) for clearing troublesome storm drain grates and pipe ends prior to and during major storms. This is particularly important during intense late summer storms and early fall storms when leaves are falling from the trees.
- **Tidal Influence and Sea Level Rise.** During high tides, marine water flows backward up stormwater conveyances, which can cause flooding in low-lying downtown streets and parking lots. These conditions typically resolve within hours as tides recede. As sea level rises, installation and maintenance of tide gates will help reduce this type of flooding.
- **Areas of High Groundwater.** Much of Olympia is underlain by shallow groundwater. In years when groundwater is high, flooding can be observed in closed depressions and seepage can increase or appear on sloped properties.

History of Flooding in Olympia

Urban development has steadily increased the volume and rate of stormwater runoff, and has resulted in flooding and damage to streams and wetlands where none had existed previously. Current stormwater regulations were created to prevent flooding and erosion, but the majority of stormwater infrastructure pre-dates these regulations.

Since the creation of the Storm and Surface Water Utility, the magnitude and frequency of flooding in Olympia has decreased significantly. Most major flooding issues have been corrected and localized flooding has been reduced to sporadic incidents. Roadway closures and property damage reports now only occur in extreme storm events. Nuisance flooding still occurs, but the extent is limited to ponding that generally resolves within hours or a day without incurring structural damage. Claims against the City for flooding incidences have been significantly reduced.

Major flood infrastructure projects and actions to reduce flooding have included:

- New or improved ponds to control the release of flows, thus reducing flooding and erosion. Key pond facilities include Black Lake Meadows, Yauger Park, Taylor Wetlands, Cooper Point Auto Mall and Mud Bay Road.
- New or improved stormwater conveyances to provide capacity and reduce flooding. Key projects have included daylighting Indian Creek and construction of culverts to reduce flooding at Union Avenue and Plum Street, major piping system upgrades to reduce flooding at Cooper Point Road and Black Lake Boulevard, a new pipe system to convey runoff from Crosby Boulevard and Courthouse Hill to Capitol Lake to eliminate closure of Deschutes Parkway, a new culvert under Black Lake Boulevard, a new culvert under RW Johnson Boulevard, and new piping in Van Epps Street to prevent flooding of Royal Gardens.
- Several ponds have been built with roadway reconstruction projects resulting in retrofits that brought legacy roadways up to current standards. Key projects of this type have included 18th Avenue, Division Street, Harrison Avenue, Sleater-Kinney Avenue, Fones Road roundabout, Log Cabin Road roundabout, 22nd Avenue roundabout, and Morse-Merryman Road roundabout.

- Additional retrofits have occurred with redeveloped properties that have made substantial improvements (cumulatively greater than 50% of the property value).
- Staff has identified and mapped areas requiring increased attention (“hot spots”) and routes for inspecting them during storm events.
- A new valve and bypass pumping system installed at 7th Avenue and Water Street has significantly reduced flooding in the vicinity associated with high tides and/or high Deschutes River flows.
- Staff has worked with the Washington State Department of Enterprise Services to better understand, prepare for and coordinate emergency response for Capitol Lake flooding.

Extreme storm events, such as the multi-day storm in December 2007, still cause flood conditions in the Cooper Point Road/Black Lake Boulevard intersection, Chambers Basin, Ken Lake, and Capitol Lake areas. The 2007 event exceeded the “100-year storm,” an event defined as having a 1% probability of occurrence during any given year.



Black Lake Boulevard at Cooper Point Road, December 2007



Schneider Creek Overtops West Bay Drive, December 2007



Flooding at State Avenue and Chestnut Street during High tide Following a Storm, March 2016.

6.2 Impacts of Flooding

The major impacts of flooding are property damage and risk to public safety, habitat degradation, and strain on infrastructure.

Property Damage and Public Safety

Early stormwater management focused on protecting public safety and health and preventing flood damage to property. The effects of flooding are most commonly measured by damage to property and threat to public health and safety. Stormwater runoff that is allowed to run off developed properties unmitigated can flood properties downstream. Typical flooding problems include localized surface ponding and damage to buildings and structures. Larger scale flooding has the potential to close entire streets and limit access to parts of the City. A primary concern with localized ponding of stormwater is along streets where water is allowed to pool in a vehicle lane and inhibits safe traffic movements. Also, when streets are flooded full width during extreme events, emergency service access can be limited.

Habitat Degradation

In recent decades, environmental impacts of increased stormwater runoff have become a priority. Poorly managed seasonally high and low stream flows cause erosion, channel widening, streambed alteration, loss of streamside habitat, degradation of water quality, and barriers to fish migration and spawning. Rapidly changing water levels and increased nutrients alter the natural character and function of remaining wetlands. For details on the impact of urbanization on natural systems, see Chapter 4 Section 4.1. Chapter 8 discusses the existing condition of the City's streams, wetlands, and other aquatic habitats.

6.3 Regulatory Requirements

The most important tool the Utility has to manage flooding is the implementation and enforcement of State and local drainage regulations. All new development and redevelopment projects within the City are subject to the requirements of the *Drainage Design and Erosion Control Manual* (DDECM) and *Engineering Design and Development Standards* (EDDS). While development that occurred before 1980 made little attempt to control the volume, rate, and timing of stormwater runoff, current codes and standards provide specific requirements for managing increased stormwater runoff from impervious surfaces in the City.

Pursuant to the federal Clean Water Act, the Washington State Department of Ecology (Ecology) manages the National Pollutant Discharge Elimination System (NPDES) in Washington through a permit issued to anyone discharging stormwater into waters of the state. Under Olympia’s Phase II Municipal Stormwater Permit (the Permit) the City must adopt stormwater management regulations functionally equivalent to the 2012 *Stormwater Management Manual for Western Washington* with 2014 amendments. A key component for compliance with the Permit is the application of the thresholds and minimum requirements for stormwater management on new and redevelopment projects as identified in Appendix 1 of the Permit.

To comply with the Permit, the Olympia City Council adopted the new *Drainage Design and Erosion Control Manual* (DDECM) by passing Ordinance 7027. The new DDECM became effective on December 1, 2016; it complies with the Permit requirement to provide a manual equivalent to the Ecology stormwater design manual. Notable changes and updates with the new DDECM are:

- Introduction of low impact development requirements for managing stormwater runoff.
- Revisions to the thresholds and requirements for retrofitting redevelopment sites for treatment and flow control.
- Significant revisions to the long-term inspection and maintenance of stormwater management sites (i.e., designated areas containing stormwater facilities).

Key components of the current DDECM and EDDS are described in this section.

Design Storms

Frequent references are made in the DDECM and EDDS to specific storm events as “25-year storm” or the “100-year flood”. Many times these terms are used without proper understanding of the implication. While rare, it is possible for 100-year floods to occur two years in a row or even twice in one year.

Design storms are characterized by exceedance probability, or the percent chance that a storm or flood of a certain magnitude can occur in any given year. The magnitude of storms with these recurrence intervals in the City are defined within the DDECM.

Historical Precipitation Data

The precipitation amounts for these storms are determined based on historic precipitation records, and generally are limited in practical application for system design. Precipitation records in Olympia date back to 1955.

Table 6.1 Rainfall Recurrence Intervals, Probabilities of Occurrence and Amounts

Recurrence Interval (Years)	Chance of Occurrence in Any Given Year	24-Hour Rainfall (Inches)
100	1%	6.34
50	2%	5.81
25	4%	5.23
10	10%	4.55
5	20%	3.97
2	50%	3.27
0.5 (6 month)	200%	1.79

Source: Developed from the 1973 National Oceanic and Atmospheric Administration Atlas 2, *Precipitation-Frequency Atlas of the Western United States, Volume IX-Washington*.

As required by the 2016 DDECM, all flow control facilities – such as detention ponds, infiltration ponds, underground storage vaults or trenches – must be designed using actual precipitation data collected over the last 60 years in Thurston County. The Utility maintains an interlocal agreement with Thurston County for collection of the [rainfall data from various locations throughout the County](#).

Watershed Precipitation Data

Analysis of this historical data typically shows the highest precipitation to be in the western watersheds with diminishing precipitation in eastern watersheds. The obvious effect of differing rainfall trends across the City is the size and design of stormwater facilities, especially those for flow control. However, this recorded data set provides a significant advantage over synthetic design storms. Stormwater systems are now designed with accurate storm data that reflects not only peak rainfall intensities, duration of storm flows, which is an important consideration to protect streams and other aquatic habitats. The effect of very high, sustained flows in streams has been cited as a cause for stream bed scouring and destruction of habitat. Flow control design standards for different system elements are discussed in more detail below.

Modeling Challenge: Predicting Effects of Climate Change

Predicting the precipitation effects of climate change poses a challenge for hydrologic modeling for stormwater system design. Utility staff is engaged in regional discussions and workshops discussing the influence of climate change and suitable methods for incorporating those predictions into stormwater facility design. As confidence in climate change modeling increases, the Utility will consider requiring the inflation of precipitation data in anticipation of increased intensity storm events.

Collection and Conveyance

A well-designed stormwater conveyance system is crucial to effective stormwater management and flood prevention. Conveyance systems include a combination of pipes, ditches, swales (e.g., flat bottom ditches that provide water quality treatment), storm drain inlets, catch basins, and manholes. (See Chapter 4, Section 4.2 for definitions.) When any new conveyance system is designed or older systems are retrofitted, the standards described below are applied.

- All newly constructed conveyance systems are required to accept and pass a minimum of the 25-year, 24-hour peak storm flow. A storm event with this magnitude has a 4% chance of occurring during any given year. This level of design has been accepted as civil engineering standard practice for decades, and is not exclusive to Olympia. Conveyance in key arterial roadways and areas susceptible to structural flooding are required to be designed to capture and pass the 100-year, 24-hour peak storm (1% annual).
- The City's *Engineering Design and Development Standards* (EDDS), include requirements for pipe materials, minimum sizes, and stormwater structure type. Where not explicitly mentioned in the EDDS, stormwater components are required to meet [Washington State Department of Transportation standard specifications](#) and plans.
- A portion of the City's stormwater runoff is collected by combined stormwater and wastewater pipes. By code, new stormwater runoff from new development and redevelopment cannot be added to the combined sewer. As described in Olympia Municipal Code section 13.20.050 – *Prohibited Discharge Standards*, new connections to the combined system and increases in stormwater flows are prohibited. The Utility attempts to separate the two system flows where possible, especially if capacity is limited, thereby reducing combined sewer overflows and the influent load on the LOTT wastewater treatment plant.

Detention and Flow Control

Flow control facilities are designed to mitigate the excess surface runoff resulting from a development project. The excess stormwater must be stored and then released at the rate and duration that existed prior to development in order to protect downstream properties and resources. The requirement is to mitigate storm flows equal to half of the 2-year flow up to the full 50-year storm.

Detention ponds, infiltration or retention ponds, underground vaults or infiltration galleries are all classified as flow control facilities and are designed to completely drain between design storms. Some, but not all, facilities in this category have a combined water quality treatment function. Flow control facilities, as well as wetponds and other runoff treatment practices, are defined in Chapter 4.

Routine operation and maintenance of the City-owned stormwater management sites and ponds are discussed in Chapter 9. Structural maintenance and rehabilitation and vegetation management is done by Utility staff on City-owned facilities; the same requirements apply to privately owned flow control facilities. Most properties developed after approximately 1992 have maintenance agreements binding the owners to perform maintenance.

Low Impact Development

Ecology included provisions in the [2013-2018 Western Washington Phase II Municipal Stormwater Permit](#) (Permit) requiring the City to revise its codes and standards to make low impact development the “preferred and commonly-used approach to site development.” Passed by City Council on July 13, 2016 and made effective December 1, 2016, the low impact development code changes comply with the Permit. Likewise, the City’s 2016 *Drainage Design and Erosion Control Manual* requires Low Impact Development techniques for new development when feasible.

Definition of LID

Low impact development (LID) is an approach to land development that seeks to mimic the natural hydrologic processes of a site and manage rainwater as close to where it falls as possible. Implementation of LID principles and practices manages stormwater to reduce the impact of built areas and promote the natural movement of water within an ecosystem. LID employs principles such as preserving and re-creating natural landscape features, preserving native vegetation, and minimizing impervious surfaces to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. The primary goal of LID is to reduce surface runoff, thereby reducing common problems associated with urbanization such as flooding and pollution of receiving waters. While some LID approaches may actually provide some level of pollutant removal, this is secondary to the reduction or elimination of surface runoff from a project site.

Examples of Low Impact Development Techniques

Low impact development techniques include various structural best management practices (BMPs) such as permeable pavements, green roofs, bioretention and rain gardens, as well as site development principles like reducing impervious surface coverage and retaining native vegetation. Any combination of these BMPs or practices can be employed on a project to achieve the objective of minimizing the effects of urban stormwater runoff.



A Bioretention Cell Surrounded by Permeable Pavement, Yauger Park, 2016

Implementing LID Codes and Standards

Within the context of fostering urban land use, the City has always sought to promote environmentally sensitive development. Over the years, the City's zoning code and development standards have been updated to increasingly incorporate low impact development-friendly regulations. For example, Olympia reduced street lane widths in 2006 to some of the narrowest in the state. The City has long required single-family residential development to add soil amendment in disturbed, landscaped areas, as well as requiring full infiltration of roof runoff from downspouts. In 2000, the City adopted a unique zoning district and associated set of mandatory LID regulations within the highly sensitive Green Cove Creek watershed. The changes were intended to prevent further damage to aquatic habitat resulting from urban development. A comprehensive set of policy revisions covering development density, impervious surface coverage, lot size, open space/tree retention, street design, block sizes, parking, sidewalks, and stormwater management requirements are included in [Chapter 9 of the *Engineering Design and Development Standards*](#).

Implementing Structural LID Techniques

The Public Works Department started implementing structural LID techniques more than 15 years ago. For example in 1999, City Council authorized the Utility to pursue the use of permeable pavements. One of the City's first LID projects and the most commonly utilized installation since then has been pervious concrete sidewalks. Currently, more than five miles of pervious concrete or pervious asphalt sidewalk are scattered throughout the City.

With adoption of the 2016 *Drainage Design and Erosion Control Manual*, LID techniques will be used in nearly all site development and redevelopment and is expected to increase greatly in the in the next decade.

6.4 Challenges

Despite the progress made in the past several decades in reducing the frequency and severity of flooding, several major challenges remain:

Legacy Development

Most stormwater infrastructure in Olympia is a legacy of development constructed prior to 1980 without the rigorous storm drainage design regulations imposed since then. Older infrastructure often lacks the capacity to handle increased runoff resulting from growth and lacks flow control facilities to prevent downstream flooding. The Utility has corrected most of the worst problems, but many smaller issues persist. The worst remaining problems are on Black Lake Boulevard south of Cooper Point Road, the Lakemoor subdivision around Ken Lake, and along Division Street south of Conger Avenue. As roadways are reconstructed and properties are redeveloped, existing onsite and in some cases downstream infrastructure are being retrofitted to meet current regulations.

Asset Management

The Utility will continue to develop its asset management program, described in Chapter 9. Significant staff effort has been dedicated to improving the Utility's understanding of the stormwater infrastructure. It is estimated that over 95% of the public infrastructure has been inventoried and mapped, and mapping of private infrastructure is extended daily.

The Utility began a condition rating program in 2011, using robotic cameras to televise the condition of stormwater pipes. Structural and operational defects are documented and rated using industry standardized methods. To date, the Utility has inspected 62 percent of the public pipe system. Figure 6.1 depicts the results.

The Utility has found most of the pipe system to be in good condition and repairs are currently manageable through spot repairs by Operations staff and current capital funding. Because the Utility prioritized inspection of older and larger pipes first, recent inspections are finding fewer defects requiring attention.

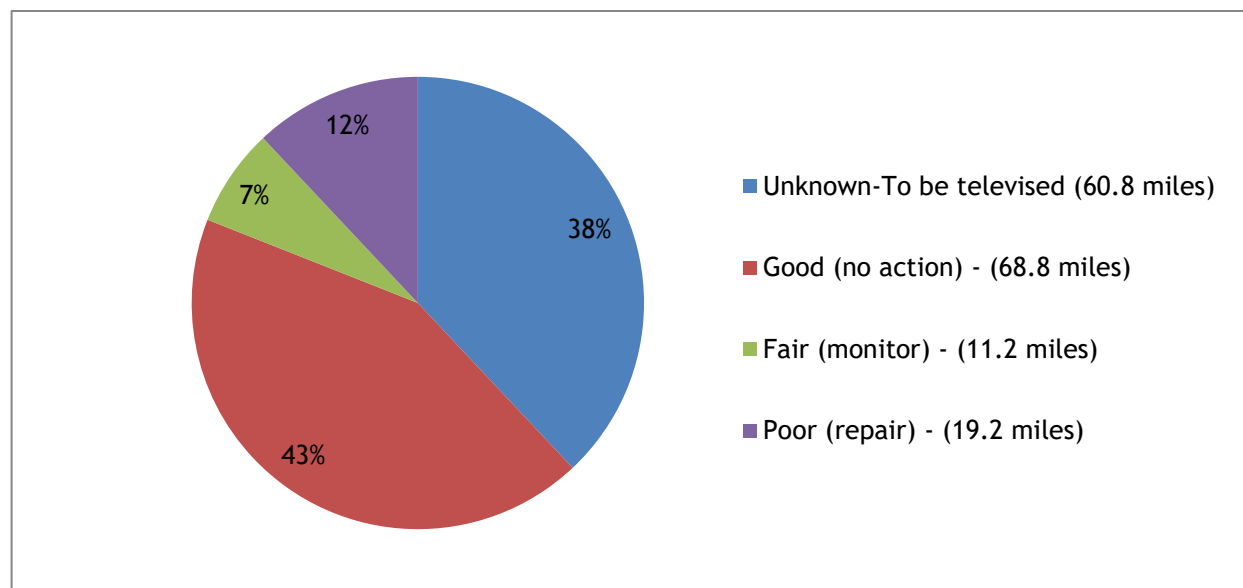


Figure 6.1 Pipe Condition Rating Program Results

Limitations of Low Impact Development

While the advent of LID stormwater management provides additional tools for minimizing runoff, the methodology will have challenges, particularly education of designers and long-term maintenance.

Design

Although LID has been around for decades, it was only made a requirement for site design in December 2016 with adoption of the new *Drainage Design and Erosion Control Manual* (DDECM). Despite public outreach by the City and Ecology, most designers are not very familiar with the new regulations. LID stormwater best management practices used on a site are aimed at mitigating storms that are smaller and more frequent than a six-month storm (less than 1.5 inches of rainfall in 24-hours). In most cases LID will result in an increased number of smaller, decentralized stormwater facilities. In some cases, depending on soil conditions, LID may either replace or reduce the size of centralized pond facilities.

Maintenance

As opposed to centralized stormwater ponds where there is a single facility for an entire development, LID facilities are designed to be smaller, more numerous and effectively spread out over the development area to increase infiltration of rainwater over a larger area. The number of these facilities and the intensive maintenance regimen required is expected to make LID facilities more complex to manage than past stormwater facility designs. Additionally, with adoption of LID, the Utility agreed to perform maintenance of bioretention facilities permitted within the right-of-way. An evaluation of new roadway construction concluded that maintenance of new bioretention facilities within the right-of-way could require up to one half of a new FTE staff each year.

Climate Change and Sea Level Rise

Climate change has the potential to significantly impact stormwater management in Olympia primarily because of expected changes in precipitation timing and quantity, and sea level rise.

Changes in Precipitation

Although annual precipitation is not expected to change significantly, summer precipitation is projected to decrease by up to 10 percent and winter precipitation is projected to increase by up to 12 percent by the 2080s. Additionally, the maximum 24-hour precipitation event is expected to increase by up to 27% by 2080 and by even more in the upper Deschutes River basin.

Older stormwater infrastructure, the network of ponds and pipes that capture and channel runoff from streets and other impervious surfaces, will be most vulnerable to overflows associated with more frequent and intense storm events. As climate modeling improves, the Utility will consider requiring the use of inflated precipitation data for the design of flow control facilities.

Sea Level Rise

Sea level rise poses even greater challenges for stormwater management. Sea level rise is caused primarily by two factors related to global warming: the added water from melting land ice and the expansion of sea water as it warms. Sea levels are rising and the rate of sea level rise is expected to accelerate. The National Research Council's *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*, published in 2012, estimated that sea levels will rise 20 to 55 inches by the year 2100.

Between 1893 and 2007, 15 dredge and fill projects added 434 acres and 1.9 miles of shoreline to downtown Olympia, including most of the Port of Olympia peninsula (TRPC 2008) (see Map 6.1). Not surprisingly, the filled areas are the most vulnerable to sea level rise. Map 6.1 depicts the Downtown Olympia Historic District and the extent of Olympia's shoreline at various dates, and shows the expected extent of inundation during a 100-year tide event with one foot of sea level rise which could happen by 2038.

Given Olympia's location near sea level, protecting the land and conveying water from the land surface to marine waters via piped systems will become more difficult as sea level rises. Higher sea levels will result in less hydraulic pressure to drive stormwater out of pipes. During high tides, marine water flows back up (backflow) into conveyance piping, in some cases causing flooding inland. In most cases, backflow flooding can be prevented by installing tide gates. However, eventually sea levels will rise to elevations that will require reconfiguring the storm drainage system and installing pump stations to get stormwater out of low-lying areas.

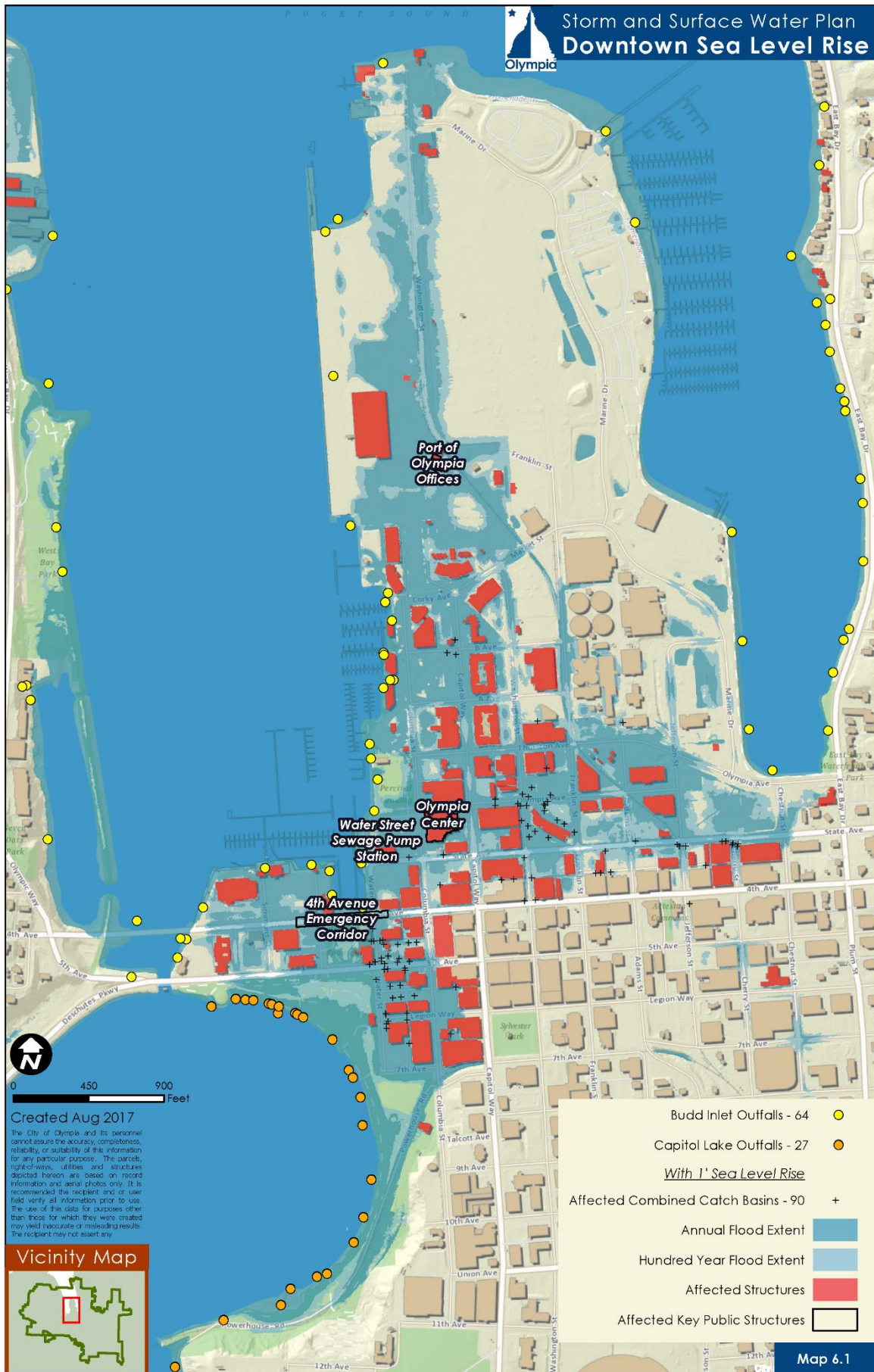
Additionally, stormwater from much of the low-lying areas of downtown are conveyed to the LOTT Clean Water Alliance Budd Inlet treatment plant via the combined sewer system. The combined sewer system will need to be reconfigured or separated to prevent inundating the treatment plant with marine water.

To date, with modest investments and no clearly assigned staff time, the Utility has taken the lead on studying sea level rise and developing response plans for the City. Moving forward, the scope of the work and scale of investments necessary to address sea level rise will require a separate interdepartmental program and funding mechanisms.



Figure 6.2 Extent of Major Fill Projects in Downtown Olympia

Source: Sea-Level Rise: Re-imagining the Urban Edge, a thesis by Brenda Lorene Snyder, [2010]



Map 6.1 Extents of Inundation from One Foot of Sea Level Rise



Street Flooding Due to Tidal Backflow. Thurston Avenue at Adams Street, March 2016



Percival Landing at High Tide, 2012



Water Quality

Chapter 7

Chapter 7 – Water Quality

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CHAPTER 7 – WATER QUALITY

The need to prevent pollution due to stormwater runoff is one of the major “Why’s” determining the strategies recommended in the Plan for the next ten years (Chapter 10).

This chapter describes what is known about water quality in South Sound waters, based on data derived from many studies done over the past several decades. The findings of these studies are briefly summarized below and an analysis of data is presented in Appendix 3. The chapter also presents the results of an analysis showing that the water quality of runoff from watersheds is correlated with the level of water quality treatment.

In addition to monitoring water quality, the Utility’s role in pollution prevention includes education and outreach, illicit discharge prevention and investigation, spill response, stormwater facility inspection and maintenance, street sweeping, and sediment management. These activities are described in Chapter 9.

The main sources of pollutants are stormwater runoff from basins developed before current pollution control standards and onsite sewage systems. The Utility’s pollution prevention efforts are focused by the requirements of two sets of regulations imposed under the federal Clean Water Act:

- The 303(d) listing of many local water bodies as having water quality not meeting State surface water quality standards. The listings have driven Total Maximum Daily Load (TMDL) studies which have identified actions to improve impaired water quality.
- The City’s Municipal Stormwater Permit (Permit) issued as part of the National Pollutant Discharge Elimination System (NPDES).

Meeting these requirements, summarized in Section 7.5, is one of the major challenges facing the City in the years ahead.

7.1 Sources of Pollutants

Most of Olympia was developed prior to the Clean Water Act or any regulations requiring water quality treatment. All developed land uses from pasture and agriculture to industrial have water quality implications. In urban environments, the main source of surface water contamination is stormwater runoff from impervious (hard) surfaces. Other sources of concern are inadequate onsite sewage systems, contamination from cross-connections with the wastewater system, illegal discharges, and spills.

Impervious Surfaces

When rain falls on pavement and other hard surfaces in an urban setting, it runs off and is often conveyed by pipes and ditches directly to lakes, wetlands, streams, and Puget Sound. This stormwater runoff has been declared the most severe pollution problem in the region because it carries oil and grease from paved surfaces, fertilizers and pesticides from lawns, heavy metals from wear and tear on brakes and tires, and animal waste (Weis et al. 2009).

Any substance found on the ground and especially on paved surfaces can wind up in stormwater runoff. Development standards in place since 1991 are designed to filter pollutants and prevent stormwater from leaving the property. However, runoff from more than 60 percent of Olympia’s land surface receives no treatment. For the most part, when oil, antifreeze, detergents, and other materials are deposited in the roadway or into the storm drainage system, it is the same as dumping directly into a lake or stream. Even well-maintained motor vehicles are significant contributors to runoff pollution through normal wear of brakes (copper) and tires (zinc).

Extensive research has demonstrated how reducing tree cover and increasing impervious surfaces can negatively affect water quality and aquatic habitat (Chapter 4, Section 4.2). Utility analysis of local data has confirmed this relationship, showing a correlation between water quality and the land area subject to stormwater controls on new development.

Figure 7.1 and Map 7.1 demonstrate that older parts of the City, which drain to Budd Inlet, Moxlie Creek, and Indian Creek basins, have the largest areas (percentages and acres) of impervious surface that do not receive water quality treatment. These areas thus have the greatest potential for pollution loading. Figure 7.1 quantifies the level of water quality treatment for runoff from arterial and collector roadways in each basin. Map 7.1 depicts impervious surfaces by basin and the portion of the impervious surface that does not receive water quality treatment. For more on the relationship between impervious surfaces and water quality, see Chapter 8, Figure 8.3 and 8.4. A detailed analysis is in Appendix 3.

Onsite Sewage Systems

Within Olympia there are approximately 1,900 onsite sewage systems (OSS), also called septic systems. Even well-functioning OSS discharge only partially treated effluent to the environment. The level of treatment thereafter is highly dependent upon loading and soil properties within the OSS drain field. Failing OSS can be significant sources of such pollutants as fecal coliform and nitrates. The risk to water quality from OSS increase with density (dwelling units per acre), proximity to surface water bodies, and inadequate maintenance.

Illicit Discharges

Illicit discharges are any discharges to the City’s municipal separate storm sewer system (MS4) that are not composed entirely of stormwater. The Permit allows for a few exceptions, including irrigation runoff, firefighting activities, and street and sidewalk wash water. Common illicit discharges include dumping in storm drains, leaking vehicles, sediment runoff from construction sites, carwash wastewater, carpet cleaning wastewater, recreational vehicle dumping, concrete washout water, paint washout water, and failing OSS.

Cross-Connection with Wastewater System

Cross-connections, also referred to as Illicit connections, are any connections to the MS4 that were not intended, permitted, or used for collecting and conveying stormwater or specifically allowed non-stormwater discharges. Examples include sanitary sewer connections, floor drains, channels, pipelines, conduits, inlets, or outlets that are connected directly to the MS4.

Spills

Spills are unintentional, transitory illicit discharges. Very common examples are oil, gas, or antifreeze spills from vehicular accidents that are washed across the road and into the storm drain system.

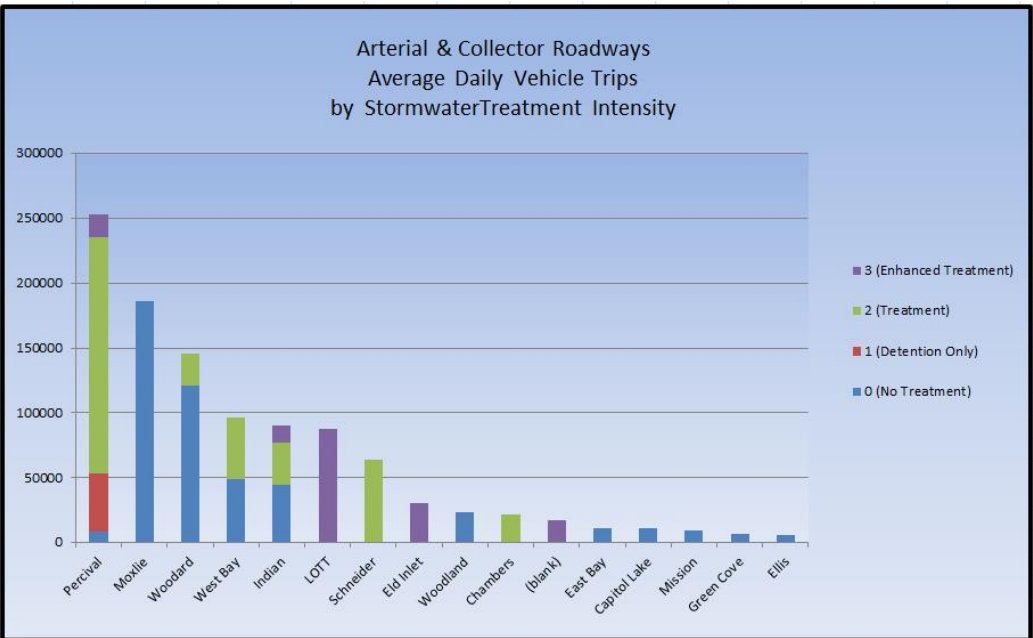
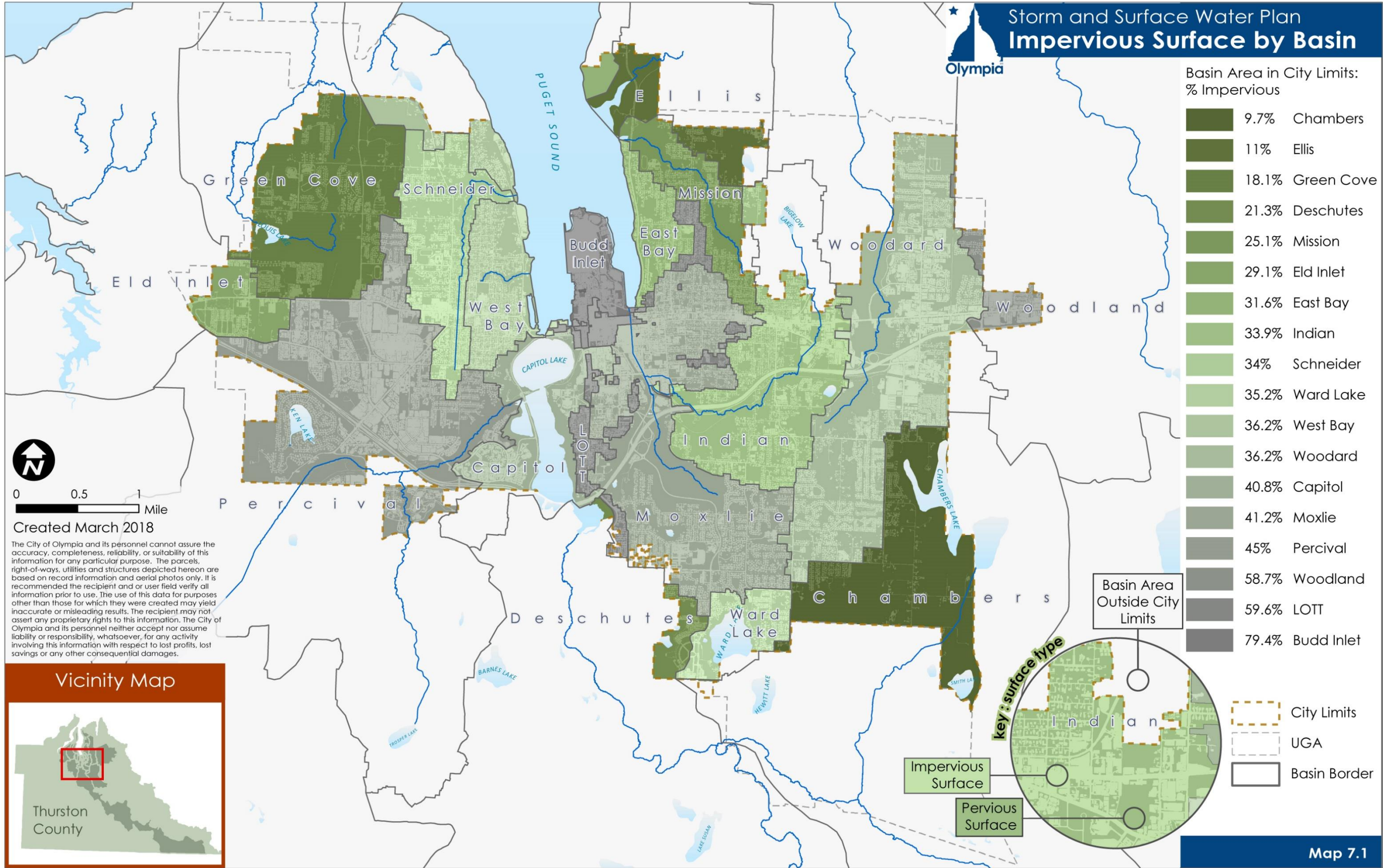
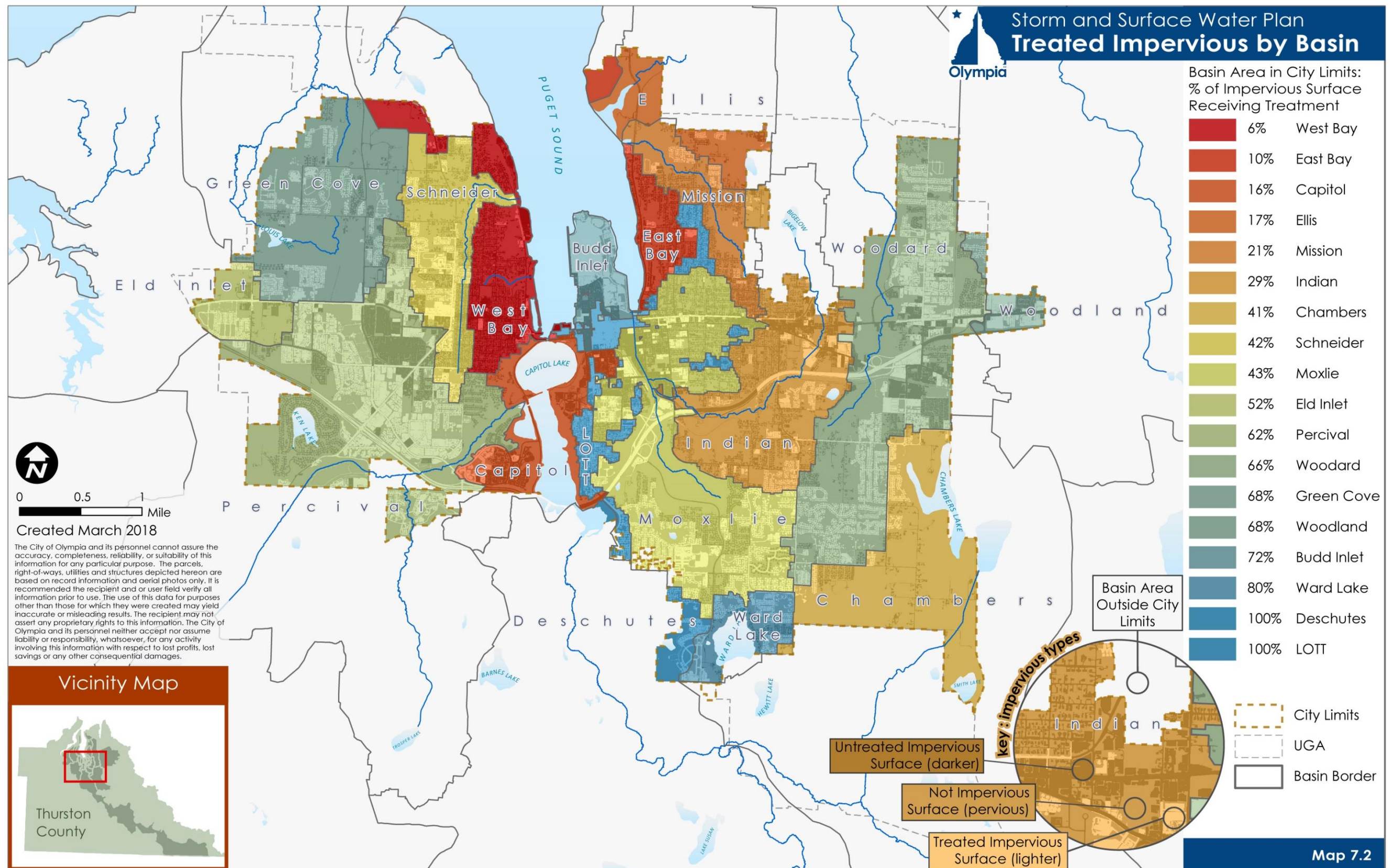


Figure 7.1 Runoff from Arterial and Collector Roadways



Map 7.1 Impervious Surfaces by Basin with Untreated Acreage and Percentages



Map 7.2 Impervious Surfaces by Basin with Treated Percentages

7.2 Regulatory Requirements

Ecology's analysis of water quality problems has resulted in specific regulatory requirements placed upon the City in the form of NPDES Permits (the Municipal Stormwater Permit as well as permits for wastewater treatment plants, industrial stormwater, and construction stormwater), and implementation of Total Maximum Daily Loads (TMDLs) for the Henderson and Deschutes watersheds. The following discussion summarizes these requirements.

Municipal Stormwater Permit

The Clean Water Act established the NPDES permitting system to regulate the discharge of wastewater and stormwater into "waters of the United States." In Washington, Ecology is the regulatory authority for issuing NPDES permits. The City of Olympia is subject to the *2013-2018 Western Washington Phase II Municipal Stormwater Permit* (Permit). The Permit covers discharges from the City's MS4 into surface water and groundwater.

The Permit guides much of the Utility's work efforts. The Utility is responsible for meeting the requirements listed below. These requirements are likely to be revised in the future permit cycles (every five years). The Utility's actions to meet these requirements are discussed throughout this Plan, primarily in Chapters 6, 7, 8, and 9.

Education and Outreach

- Maintain an education and outreach program for source control. The program is 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.

Illicit Discharge Detection and Elimination

- Implement an Illicit Discharge Detection and Elimination (IDDE) program to characterize, trace, and eliminate illicit discharges of pollutants.
- Implement an IDDE training program for all municipal field staff.
- Maintain a hotline telephone number for public reporting of spills.

Controlling Runoff from New Development and Redevelopment Construction Sites

- Implement and enforce the City's *Drainage Design and Erosion Control Manual* (DDECM). This involves ensuring that the design of all new development and redevelopment complies with stormwater quality and quantity control requirements intended to maintain water quality standards in downstream receiving waters. The DDECM establishes when and what level of water quality treatment is required with development.
- 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.
- Inspect all permitted development sites after construction to verify proper installation of permanent stormwater management facilities.
- Revise regulations to make low impact development the preferred and commonly used approach to land development.

Municipal Operations and Maintenance

- Annually inspect and maintain City-owned or City-maintained stormwater facilities.
- Inspect all City-owned catch basins on a two-year cycle and clean as necessary.
- Annually inspect and enforce maintenance of private stormwater facilities constructed after 2007.

TMDL Requirements

- Comply with the specific TMDL requirements identified in the sections below.

Monitoring and Assessment

- Contribute to the regional Stormwater Action Monitoring Program.
- Annually update the City's Stormwater Management Program, a set of actions and activities documenting how the City meets Permit requirements.
- Maintain a map of the Municipal Stormwater System (MS4).
- Notify Ecology of any discharge into or from the MS4 which could constitute a threat to human health, welfare, or the environment.
- Submit an annual report to Ecology documenting compliance with permit requirements.

Total Maximum Daily Load (TMDL) Studies

TMDL studies are performed for polluted water bodies identified by Washington State's Water Quality Assessment (refer to Section 7.4) as requiring actions to improve water quality. TMDL studies describe the type, amount, and sources of water pollution in each water body. TMDL studies also establish a plan of required actions (targets and strategies) to control the pollution and restore water quality.

The four TMDLs affecting Olympia are described below for:

- Henderson Inlet Watershed Area
- Deschutes River Basin (Deschutes River, Percival Creek, and Budd Inlet Tributaries)
- Budd Inlet and Capitol Lake
- Totten, Eld, and Little Skookum Inlets

Henderson Inlet TMDL

In 2008, Ecology completed a technical study on the Henderson Inlet watershed including the Woodard and Woodland Creek watersheds. Portions of Woodard and Woodland Creek watersheds are located within the City of Olympia's jurisdiction and its Urban Growth Area (UGA.) The findings indicated violations of Washington State surface water quality standards for temperature, fecal coliform bacteria, dissolved oxygen, pH, and fine sediment levels. Complete documentation of water quality improvement reports and implementation plans are available at the Ecology's [Henderson Inlet Watershed Area Water Quality Improvement Project website](#). The Henderson Inlet TMDL is complete and required actions from the implementation plan are in Section 7.4, the fecal coliform and phosphorus discussions.

Deschutes River TMDL

In 2003, Ecology began the Deschutes TMDL study to find solutions for water pollution problems in the Deschutes River, Percival Creek, and Budd Inlet watersheds. In 2015, Ecology finalized an improvement plan for water quality in the Deschutes River, Capitol Lake, and Budd Inlet tributaries and submitted it to the EPA for approval. The findings indicated violations of Washington State surface water quality standards for temperature, fecal coliform bacteria, dissolved oxygen, pH, and fine sediment levels. Complete documents associated with the *Deschutes River TMDL* are available at the Ecology [website](#). Recommended actions for pollutants in the Deschutes basin are in Section 7.4.

Budd Inlet and Capitol Lake TMDL

The marine waters of Budd Inlet currently do not meet water quality standards for dissolved oxygen, and Capitol Lake does not meet standards for bacteria and total phosphorus. High levels of phosphorus can cause algae blooms. The nature of the dissolved oxygen impairments in Budd Inlet is complex, but human sources of nitrogen from north of Budd Inlet are recognized as major contributors to water pollution in Budd Inlet. Ecology therefore separated the Budd Inlet and Capitol Lake TMDL from the Deschutes TMDL. Additional computer modeling work was published in a supplemental report in 2015. More computer modeling is underway and a project timeline for the TMDL is being developed. Documents associated with the Budd Inlet and Capitol Lake TMDL are available at the Ecology website.

Totten, Eld, and Little Skookum Inlet TMDL

In 2006, Ecology completed a technical study on the Totten, Eld, and Little Skookum Inlet watersheds. The findings indicate fecal coliform bacteria violated Washington State surface water quality standards. Green Cove Creek in Olympia is tributary to Eld Inlet. However, the study did not identify water quality problems in Green Cove Creek and the City is not required to take any actions. Complete documents associated with the Totten, Eld, and Little Skookum Inlets TMDL are available at the Ecology [website](#).

7.3 Water Quality Monitoring

The Utility staff participates in water quality monitoring as part of several State, regional and local monitoring programs: the Washington Water Quality Assessment, the regional Stormwater Action Monitoring (SAM) Program, and the Thurston County Interlocal Monitoring Program. The Utility occasionally performs specific monitoring on its own. Monitoring results are used to assess the health of streams, wetlands, lakes, and marine waters and develop programs, policies, and capital facility plans to protect these resources.

Washington Water Quality Assessment

The federal Clean Water Act requires states to maintain a list of water bodies that fail to meet water quality standards. Washington State's Water Quality Assessment lists the status of water quality at particular locations in one of five categories recommended by the US Environmental Protection Agency:

- Category 1. Meets tested standards for clean waters:
- Category 2. Waters of concern: waters where there is some evidence of a water quality problem.
- Category 3. Insufficient data: water where there is insufficient data to meet minimum requirements according to Policy 1-11.
- Category 4. Polluted waters that do not require a TMDL.
- Category 5. Polluted waters that require a TMDL or other Water Quality Improvement ([WQI project](#)).

The list of Category 5 “impaired” water bodies is known as the 303(d) list. The Clean Water Act requires states to ensure that these water bodies are restored to healthy water quality. The Total Maximum Daily Load (TMDL) process is typically used to do this.

The cleanup process begins with a water quality study to identify and evaluate sources of pollution. It includes analysis to determine how much pollution from those sources needs to be reduced to meet the TMDL requirement. Study findings are then used as a guide to help develop and implement a cleanup. Table 7.1 shows the Category 5 (303(d)) listings and results of assessment for Olympia water bodies.

Stormwater Action Monitoring Program

Olympia pays into a collective fund to implement the Stormwater Action Monitoring (SAM) Program, an Ecology-administered, collaborative program with western Washington jurisdictions having NPDES Municipal Stormwater Permits. This program samples small streams and marine nearshore waters to monitor water quality status and trends in Puget Sound. Participating in the SAM program is the most cost-effective means

for Olympia to fulfill the Permit requirement for water quality status and trends monitoring. The SAM program collects monthly samples from 60 locations throughout the Puget Sound region; none of the sample locations are within Olympia or its Urban Growth Area.

The monthly monitoring includes sampling or measuring the following:

- Conventional parameters: dissolved oxygen, pH, conductivity, temperature, dissolved organic carbon, chloride, fecal coliform, hardness; nitrogen as ammonia (NH₃), nitrite (NO₂), nitrate (NO₃), and total nitrogen; total phosphorus, orthophosphate, total suspended solids (TSS), and turbidity.
- Metals: totals and dissolved (arsenic, cadmium, chromium copper, lead silver, and zinc).
- Organics: polycyclic aromatic hydrocarbons (PAHs).
- Stage and stream discharge.

All SAM contracts, scopes of work, deliverables, quarterly budget reports, and annual reports are posted at Ecology's SAM [website](#).

Interlocal Monitoring Program

Through an Interlocal agreement, Olympia participates in a storm and surface water monitoring program administered by Thurston County. This program has been continuously active since 1991, but the type of data collected and the frequency of collection has varied. The program currently monitors Capitol Lake, Ward Lake, and Moxlie, Indian, Chambers, and Percival Creeks monthly for conventional water quality parameters including temperature, pH, fecal coliform bacteria, dissolved oxygen, turbidity, total phosphorus, and total nitrogen. The streams are also monitored for flow rates. The local program does not test for organic compounds or metals. Mission, Ellis, and Schneider Creeks had previously been sampled, but have been cut from the local stream monitoring program because funding was diverted to Ecology's SAM program. Appendix 3 provides water quality and flow data collected for each water body and key findings are summarized below. Complete results of the surface water monitoring program can be viewed at <http://www.co.thurston.wa.us/health/ehswat/swater.html>

7.4 Results of Water Quality Monitoring

Understanding water quality in Olympia's surface water bodies requires an evaluation of monitoring data and a review of agency reports and scientific literature. These are combined with an understanding of land cover, land use, and the infrastructure that has been built to mitigate the negative impacts associated with stormwater.

This section reports on the results of the Washington Water Quality Assessment's 303(d) listing of Olympia's water bodies that require a TMDL; local findings on monitored pollutants; non-monitored stormwater pollution from roadways; and special studies conducted by the Utility.

Surface Water Listings and Total Maximum Daily Loads (TMDLs)

Most surface water bodies in Olympia are on Ecology's 303(d) list of polluted waters requiring actions to achieve surface water quality standards (Table 7.1). Note that in 2016, based on more current monitoring data, Ecology lowered the bacteria ranking for Black Lake Ditch and Percival Creek from Category 5 (highest significance requiring action) to Category 1 (meets water quality standards).

Table 7.1 303(d) List of Impaired Water Bodies

Impaired Stream/ Stream Reach	Listing ID	Parameter (Cause of Concern)	WQ Category	Jurisdictional Boundary	Likely Cause of Concern
Black Lake Ditch ¹	50989	pH	5	Confluence of Percival Creek to City Border (Tumwater)	The Black Lake Ditch is a manmade channel that was constructed to allow agricultural activities on the nearby land. The temperature, DO, and pH issues associated with this water body are a likely caused by this legacy activity as well as the water quality issues associated with Black Lake that drains into Black Lake Ditch.
	47761	Dissolved Oxygen	5		
	48733	Temperature	5		
Ellis Creek	45480	Bacteria	5	Priest Point Park	Unknown
Indian Creek	3758	Bacteria	5	Bigelow Lake to Wheeler Street	Past source tracing indicates bacteria likely is coming from within Urban Growth Area
	74218	Bacteria	5	West of Frederick Street along Wheeler to North of I-5	
Mission Creek	45212	Bacteria	5	Mission Creek Park Boundary to the mouth	Likely human source of bacteria.
Moxlie Creek	3759	Bacteria	5	North of I-5 along Chestnut Street to Budd Inlet	Likely human source of bacteria.
	3761	Bacteria	5	Watershed Park up to Union Avenue	
Percival Creek ¹	48085	Dissolved Oxygen	5	From headwaters in Tumwater downstream to the mouth – roughly half in Olympia	Percival Creek’s forested buffer is for the most part adequate in terms of shading for stream temperature. Water quality concerns are likely caused by human sources and the creek’s surface water connection to Black Lake.
	42321	Temperature	5		
Schneider Creek	45559	Bacteria	5	Lower reach of Schneider Creek	A brief analysis of the stream basin indicates a moderate number of homes connected to onsite sewage systems.
Woodland Creek	36184 36185 48066 48067	Temperature	5	Upper Reaches of Woodland Creek within Lacey	A very small part of the Woodland Creek drainage basin is within the Utility’s service area. Only Listing 48066 is downstream of Olympia.
		DO	5	Middle Reaches of Woodland Creek	
Tributary of Woodard Creek	47741	DO	5	Un-named Tributary of Woodard Creek between Pacific Avenue and Martin Way	
Green Cove Creek	74252	Bacteria	5	In UGA from just south of Kaiser Road to mouth	Green Cove Creek was evaluated with the Eld, Totten, and Skookum Inlets TMDL. No actions were required.
Ward Lake	7022	Polychlorinated Biphenyls (PCBs) ²	5	Ward Lake – 90% of the Northern and Eastern Portions are in Olympia	PCBs are assumed to be associated with discontinued land uses.
Capitol Lake	22718	Total Phosphorus	5	Capitol Lake Approximately North of Interstate 5	Deschutes River is the largest contributor to Capitol Lake. The Capitol Lake TMDL is ongoing.
	40588	Bacteria	5		
Budd Inlet	5852 5853 5862 5863 5864	DO	5	Inner and outer Budd Inlet within Olympia city limits	The Budd Inlet TMDL is ongoing.
	4000 64011 64012 64013 64711	2,3,7,8-TCDD (Dioxin) ²	5		
	8685 64004 64017	Benzo(b)fluoranthene ²	5	Inner Budd Inlet within Olympia city limits	
	8686	Benzo(k)fluoranthene ²	5		
	8688 64002 64015	Benzo(a)anthracene ²	5		
	8689 64005 64018	Chrysene ¹	5		
	64003 64016 64712	Benzo(a)pyrene ²	5		
	64006 64009 64019	Dibenzo(a,h)anthracene ²	5		
	64003 64713 64009 64022	Indeno(1,2,3-c,d)pyrene ²	5		
	8690	Polychlorinated Biphenyls (PCBs) ²	5		
	61005	Bacteria	5		

¹ In 2016, based on more current monitoring data, Ecology lowered Black Lake Ditch and Percival Creek from Category 5 (highest significance requiring action) to Category 1 (meets water quality standards) ranking for bacteria.

² Tissue sample medium

Monitored Water Quality Parameters

Thurston County Environmental Health collects monthly samples from many Olympia's streams and lakes on behalf of the Utility. This monitoring is limited to specific water quality parameters that are known to play a role and/or serve as indicators of water quality and biological health. These include nitrogen, phosphorus, fecal coliform, dissolved oxygen, pH, temperature, and turbidity. Diversity of benthic macroinvertebrates in streams, discussed in Chapter 8, is measured annually and is also considered an indicator of surface water quality.

Following is a summary of the findings from the analyses of water quality monitoring data local, regional and TMDL water quality monitoring efforts.

Fecal Coliform

Fecal coliform indicator bacteria (referred to as "bacteria") are ubiquitous in Olympia's surface water bodies. Bacteria can get into surface waters from pets, domestic livestock, wildlife, and untreated or partially treated discharges from improperly functioning onsite sewage systems, cross-connections, and failing sewer lines, as well as improperly managed excrement from homeless encampments. Following are related findings:

- Fecal coliform pollution has been identified within many of Olympia's water bodies. The Utility's ambient monitoring indicates that some streams (Indian, Mission, and Moxlie) have had chronic problems since monitoring began in the early 1990s. The Utility's testing has indicated that other streams had little or only limited problems with fecal coliform pollution.
- Specific sections (reaches) of most Olympia streams (except for the Black Lake Ditch) have been placed on the 303(d) list of impaired waters for failure of fecal coliform tests (see Table 7.1). The 303(d) list is based on data collected over a limited time.
- Over the past 20-plus years, numerous illicit connections between the City's wastewater system and the stormwater system have been identified and eliminated. This has resulted in fewer failures of fecal coliform tests.
- The Utility performed dry weather outfall monitoring on several streams (Mission, Indian, Ellis, Percival, and Moxlie) in 2010 - 2012. This monitoring was performed specifically to identify possible illicit connections with the wastewater system. No dry weather flows were identified, indicating that continued fecal coliform problems in these streams are most likely not caused by illicit connections to the wastewater system.
- Earlier correlation analysis (2010 GIS Basin Analysis) failed to demonstrate a correlation between onsite sewage system density and the water quality problems indicated by a low Water Quality Index. The lack of correlation does not necessarily indicate that failing onsite systems aren't causing problems, since it may only take one failing onsite system nearby to cause a stream to fail fecal coliform monitoring tests.
- The Henderson TMDL requires that Olympia:
 - Monitor fecal coliform levels from stormwater discharging from the Taylor Wetlands stormwater treatment facility just south of Interstate 5.
 - Maintain a Stop and Scoop station on Woodard Creek, to include signs, pet waste collection baggies, and an information rack.
- The Deschutes TMDL recommends that Olympia:
 - Develop a plan to reduce bacteria and sediment loading with a schedule of prioritized projects.
 - Conduct source identification of potential bacteria pollutants and fix potential bacteria pollutant sources such as cross-connected infrastructure, recreational users, and homeless

populations. These actions apply in the Black Lake Ditch, Ellis, Indian, Mission, Moxlie, Percival, Schneider, and Woodard basins.

- Continue to develop and implement pet waste reduction programs through existing education and outreach efforts. These actions apply in Ellis, Indian, Mission, Moxlie, and Schneider Creek basins.
- In coordination with regional partners, develop and implement a strategy for converting onsite sewage systems in high priority/high density neighborhoods within the urban area to sewer. Chambers Lake and Chambers Creek are sensitive areas that are high priority for this action. This action is being led by the Olympia Wastewater Utility.

Nutrients (Nitrogen and Phosphorous)

Nitrogen and phosphorus are common constituents of fertilizers, animal waste, and sewage. Both are essential for plant life. Excess nitrogen can cause eutrophication (a reduction in dissolved oxygen) in marine water bodies. Excess phosphorus can cause eutrophication in fresh water bodies. The following findings are related to nutrients in Olympia's water bodies:

- Nitrogen concentrations in many Olympia streams are high enough to indicate that they are caused by human sources, such as onsite sewage systems, lawn fertilizers, and agriculture operations.
- Nitrogen concentrations above water quality standards do not contribute to surface water quality problems in freshwater systems (lakes, streams, wetlands), since nitrogen is not the limiting nutrient.
- Nitrogen can contribute to water quality problems in saltwater systems such as Puget Sound. Excess nitrogen in saltwater systems causes algae blooms, which then can lead to low dissolved oxygen levels.
- Nitrogen from numerous sources have contributed to low dissolved oxygen levels in portions of Budd Inlet. Modeling has indicated the worst problems are found in East Bay, where low dissolved oxygen levels are exacerbated by poor circulation.
- Ecology's modeling demonstrates that loading from outside the South Sound (1,500 kg/day), the Deschutes River (672 kg/day), and the LOTT Clean Water Alliance wastewater management service area (167 kg/day) each have a greater impact than the total nitrogen loads from all of Olympia's streams combined (145 kg/day).
- The cost effectiveness of identifying and eliminating appreciable sources of nitrogen from the smaller streams in Olympia suggests that eliminating comparable amounts of nitrogen from the other known sources would be a more effective strategy.
- Phosphorus concentrations have at times been identified as a cause of localized water quality problems primarily in freshwater lake systems in Olympia. Phosphorus has also been a limiting factor to water quality in Moxlie and Mission Creeks. Recent regulations that have reduced or eliminated phosphorus from household detergents and lawn fertilizers throughout Puget Sound are expected to greatly reduce water quality problems associated with excess phosphorus.
- The Henderson TMDL required that Olympia control phosphorus sources to protect or improve dissolved oxygen levels in Woodard Creek.
- The Deschutes TMDL recommends that Olympia:
 - Work with commercial businesses to identify pollution sources and best management practices needed to prevent discharge of TMDL pollutants of concern (including nutrients) to the municipal stormwater system (MS4).

- Quantify nutrient sources in Chambers Creek, a tributary to the Deschutes River with elevated nitrogen.
- In appropriate areas, require low impact development (LID) for future development, with particular attention to reducing nutrient contributions below current levels.

Acidity/Alkalinity (pH)

The acidity or alkalinity of a water body is measured by pH. The range goes from 0-14, with 7 being neutral. The pH of water determines the solubility (amount that can be dissolved in the water) and biological availability (amount that can be utilized by aquatic life) of chemical constituents such as nutrients (phosphorus, nitrogen, and carbon) and heavy metals (lead, copper, cadmium, etc.). Fish and other aquatic species thrive in water with pH values between 6.5 and 8.5. When pH values are outside this range, other contaminants in the water may become more harmful to aquatic life.

- Monitoring results indicate only Black Lake Ditch requires actions be taken to address pH. Ellis, Indian, Moxlie and Woodard Creeks have also been listed as waters where there is some evidence of a pH water quality problem.

Total Suspended Solids

High levels of total suspended solids are a common, but typically short-term problem associated with land disturbing activities. Particles in stormwater runoff can carry harmful chemicals such as nutrients, pesticides, heavy metal precipitates, biological solids, and other toxins into surface water bodies. Cloudy or muddy water can keep fish from finding food; the tiny particles in the water irritates their gills, limiting their ability to absorb oxygen.

- No water bodies are listed for total suspended solids. Problems with total suspended solids are addressed through enforcement of Olympia's erosion and sediment control program, street sweeping, and removal of sediment from catch basins, ponds, and treatment facilities.
- The Deschutes TMDL recommends that the City work with commercial businesses to identify pollution sources and best management practices needed to prevent discharge of TMDL pollutants of concern (including total suspended solids) to the municipal stormwater system (MS4).

Dissolved Oxygen

Dissolved oxygen (DO) is a measure of how much oxygen is dissolved in water. Like terrestrial animals, fish and other aquatic species need oxygen to live. A certain minimum amount of oxygen must be present in water for aquatic life to survive. When the amount of dissolved oxygen drops below normal levels in water bodies, water quality is harmed and creatures begin to die off, in a process called eutrophication. Dissolved oxygen issues in freshwater are typically related to elevated water temperatures, since cold water can hold more dissolved oxygen than warm water. In winter and early spring, when the water temperature is low, the dissolved oxygen concentration is high. In summer and fall, when the water temperature is high, the concentration is low.

- Black Lake Ditch, Percival Creek, Woodard Creek, Woodland Creek, and Budd Inlet have all been listed for DO.
- DO problems in Black Lake Ditch and Percival Creek are assumed to be associated with temperature. Refer to the following section regarding temperature for actions to be taken.
- To correct DO in Woodard Creek, the Henderson TMDL requires Olympia to:
 - Monitor, and if necessary source trace, fecal coliform discharging from Taylor Wetlands.
 - Maintain a Stop and Scoop station to include signs, pet waste collection baggies, and an information rack.
 - Require phosphorus control water quality treatment for development within the Woodard Creek basin.

Temperature

Fish of the salmon family (salmonids) depend on cool, oxygenated water to survive. If a stream is too warm it cannot hold as much dissolved oxygen, and low dissolved oxygen can stress or kill juvenile and adult fish. Ecology is required to protect salmonids listed as threatened or endangered under the Endangered Species Act (ESA) or identified as a beneficial use in State water quality standards.

- Monitoring results indicate actions need to be taken to reduce temperatures in Black Lake Ditch and Percival Creek. Fully established riparian vegetation could possibly lower the water temperature in these water bodies. Riparian vegetation currently provides good shade along Percival Creek within the City, and the Utility has made significant efforts to establish riparian vegetation along Black Lake Ditch. The temperature in Black Lake Ditch and to some extent Percival Creek is also highly affected by temperatures upstream in Black Lake.
- The Deschutes TMDL recommends that Olympia:
 - Condition future shoreline development permits to maintain or enhance riparian conditions along Percival Creek.
 - Prioritize and implement riparian and channel restoration projects on City-owned properties as funding is available.
 - Preserve existing riparian vegetation, and restore areas with young or no vegetation.
 - Reduce anthropogenic sources of heat through implementation of the City's Drainage Design and Erosion Control Manual. Where feasible, actions include: retaining runoff and encouraging infiltration, and increasing native vegetative cover in sensitive areas.

Non-Monitored Stormwater Pollutants from Roadways

Many pollutants found in stormwater are not monitored, for example petroleum, metals, and PAHs (poly-aromatic hydrocarbons). Given the complexity and expense of monitoring for these substances, Ecology conducted a series of in-depth studies that measured these and other substances. The resulting data was then correlated to land use practices, such as road classification and traffic intensity. With this information, the Utility can target new infrastructure and programs to best manage for these pollutants. See Figure 7.2.

Key findings are:

- Greater loading of stormwater pollutants are closely correlated with higher traffic counts (average daily trips or ADTs), area of "pollution generating impervious surfaces," and lack of stormwater controls.
- The greatest pollutant potential is from the high traffic routes (arterials and collectors) in the Moxlie, Woodard, West Bay, and Indian Creek Basins.
- The Deschutes TMDL recommends that Olympia work with commercial businesses to identify pollution sources and best management practices needed to prevent discharge of TMDL pollutants of concern to the municipal stormwater system (MS4).

Special Studies

The Utility occasionally conducts short-term studies to explore a specific problem, such as potential pollution from stormwater outfalls, macroinvertebrates in freshwater, and phytoplankton in marine waters. These studies are described below, and in Appendix 3.

Outfall Reconnaissance

Between 2010 and 2013, Utility staff inspected all known outfalls from the City's stormwater drainage system into Percival, Mission, Indian, Moxlie, and Ellis Creeks.

The intent of this monitoring work was to identify areas of obvious pollution or non-stormwater discharges. By performing dry weather outfall inspections in late summer, staff can identify potential "non-

stormwater” discharges without the need for laboratory analysis, under the assumption that flows from outfalls during dry weather are potentially from illicit connections.

No “non-stormwater” discharges were discovered in Percival, Mission, Indian, nor Ellis. This finding confirms the results of previous outfall reconnaissance.

Since large portions of Moxlie Creek are within a pipe, the reconnaissance was largely performed with televising equipment. During this assessment staff did identify dry-weather discharges. Follow up source tracing in suspect upstream manholes and sampling did not result in the discovery of evidence of illicit connections. It is assumed the flow was associated with artesian flows.

Aquatic Species Studies

The Utility also uses biological indicators to assess water quality. Stream Team volunteers often participate in these studies. For details, see Chapter 8, Section 8.1.

- **Benthic Macroinvertebrates in Streams.** One indicator of stream health is the quantity and diversity of benthic macroinvertebrates like insects, crustaceans, worms, snails and clams, found in or near the stream bed. Macroinvertebrate samples are collected and sent to a laboratory where they are identified and counted, and the resulting data is converted into an index score called a Benthic Index of Biotic Integrity (B-IBI).
- **Phytoplankton in Budd Inlet.** The microscopic plants that form the base of the aquatic food web are also important indicators of water quality. The Utility has worked with the Pacific Shellfish Institute to monitor phytoplankton in Budd Inlet since 2013. Each year, approximately 15 sampling events have been conducted from mid-June through September. The resulting data is compiled and shared with the NOAA/Sea Grant’s Sound Toxins volunteer monitoring program.

7.5 Challenges

The Utility faces many challenges when it comes to maintaining and improving water quality. The greatest challenges include a legacy of development without adequate water quality treatment, increasing urbanization, increasing regulatory requirements, a society built around motor vehicles, widespread use of chemicals, and a public with limited knowledge of water quality.

Legacy Developments

Most of Olympia’s stormwater infrastructure was constructed prior to the current rigorous storm drainage design regulations. Before 1991, both public and private land was typically constructed with little or no water quality treatment. As a result, infrastructure serving much of the City will eventually need to be retrofitted to meet current standards. This will be a slow and expensive endeavor.

The Utility is slowly retrofitting drainage facilities along high-traffic corridors, and private property owners are required to meet current standards during re-development. Providing water quality treatment through a retrofit is more difficult than with original construction. The Utility projects that providing enhanced water quality treatment will cost over \$50,000 per acre and approximately \$500 per acre per year to maintain. Low Impact Development (LID) holds promise for retrofitting, but poorly drained soils like glacial till and shallow groundwater underlying much of the City will pose challenges.

Land Development Pressure

To protect agriculture and natural resources, including habitat, Washington’s Growth Management Act (GMA) requires population growth to be focused in urban growth areas like Olympia. In addition to conserving rural areas, the GMA requires cities to protect critical areas within their boundaries. Increasing population density creates challenges for water quality; it also provides opportunities for additional water quality treatment, since new development and redevelopment are required to meet current standards.

Increasing Permit Requirements

Management of stormwater is a relatively new concept. As further scientific research and TMDL studies are performed, the Utility can expect ever-tightening regulations and oversight intended to solve water quality problems. Currently, approximately half of what the Utility does and spends is driven by the City's NPDES Municipal Stormwater Permit. This can only be expected to increase. It is difficult to know what new ideas will compel changes to permit requirements. To prepare for and embrace change as it comes, the Utility closely monitors and participates in the development of water quality regulations.

Reliance on Individual Choices

Modern society is dependent on motor vehicles and chemicals, which are major sources of nonpoint pollution. Whether water quality improves or declines depends largely on how individual citizens manage daily activities like driving habits, vehicle maintenance, lawn care, pet care, onsite sewage system maintenance, and use and handling of toxic chemicals. The Utility's ability to influence such individual choices is limited, although education and outreach efforts can to help citizens understand the implications of their actions and make proper decisions.

Aquatic Habitat

Chapter 8

Chapter 8 – Aquatic Habitat

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CHAPTER 8 – AQUATIC HABITAT

The need to protect aquatic habitat from damage caused by stormwater runoff and other results of urban development is one of the major “Why’s” determining the strategies recommended for the Utility’s next ten years, as described in Chapter 10.

In undeveloped areas, mature forests generate very little runoff directly to streams and other aquatic habitats. In urban areas, stormwater runoff generally travels from impervious surfaces (streets, sidewalks, roofs, and parking lots) to creeks and wetlands via pipes and ditches instead of slowly filtering into the ground. These increased flood flows carry pollutants directly into streams, wetlands, lakes, and Puget Sound (see Chapter 7).

Chapter 4 describes how streams, wetlands, lakes, and marine waters function as “natural infrastructure” for stormwater management. This chapter focuses on how land development – increasing impervious surfaces, filling and altering wetlands, removing forests, and altering shorelines – has impacted the health and extent of aquatic habitat.

In addition to identifying and evaluating aquatic habitat, the Utility’s role in habitat management includes education and outreach, stewardship planning, and restoration and enhancement projects. These activities are described in Chapter 9.

8.1 Existing Conditions

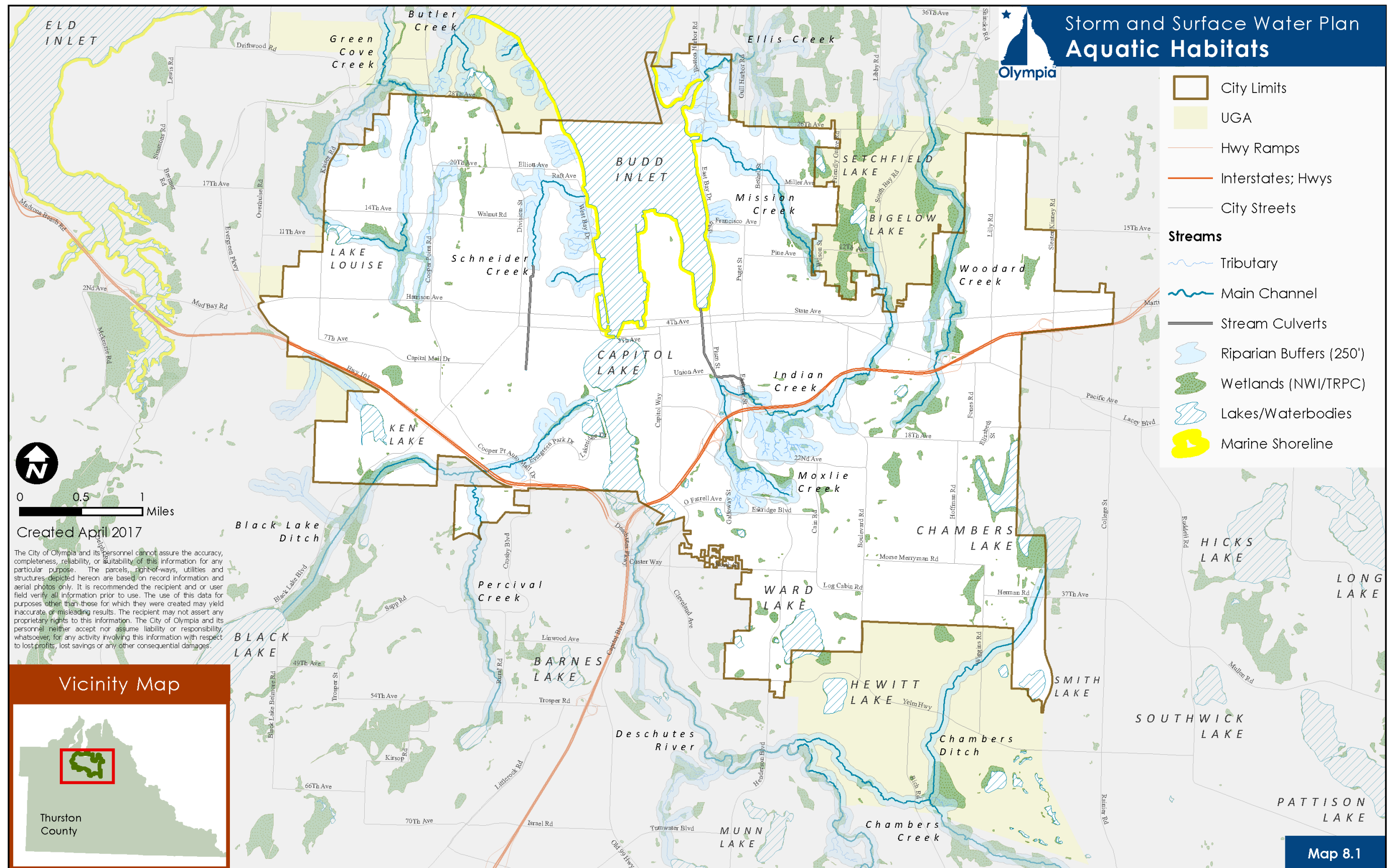
The condition and extent of Olympia’s aquatic and associated habitats underlies the Utility’s focus on protecting, enhancing, and restoring habitat.

A variety of aquatic habitats exist within Olympia, shown in Map 8.1, including streams, wetlands, lakes, and the marine waters of Budd Inlet:

- Eight named streams and smaller unnamed streams spanning almost 39 miles and with approximately 3,250 acres of riparian areas within 250 feet of a stream
- An estimated 680 acres of wetlands
- 16 freshwater lakes and ponds covering over 370 acres
- 10.4 miles of marine shoreline and over 750 acres of Budd Inlet (includes Urban Growth Area)

Chapter 4 contains an inventory of these resources in Tables 4.1, 4.2, and 4.3.

This section describes the aquatic habitat functions and species dependent on these habitats, and then reviews available data and specific functions of the various habitat types: riparian vegetation and upland forest, streams, wetlands, lakes, and Budd Inlet.



Importance of Aquatic Habitat

Aquatic habitat areas provide functions and benefits that are critical to maintaining water quality, natural hydrology, and habitat for fish and wildlife. These functions and some of the species dependent on these habitats are summarized below.

Aquatic Habitat Functions

Aquatic habitats in Olympia vary in habitat quality and function. Streams provide cool clean water for fish and other wildlife, wetlands and ponds accommodate breeding amphibians, riparian forests offer corridors for birds and other wildlife. They also manage stormwater by conveying water and sediment downstream, regulating flood flows, and filtering water to remove fine sediment, nutrients, and pollutants.

Factors that influence these functions include past and present land uses, extent of impervious surfaces, effectiveness of stormwater management, connectivity between riparian vegetation and upland forests, vegetation species diversity, canopy layering and spatial diversity, and hydrologic alterations (e.g. culverts, fill, and ditches). An often-neglected factor is how conscientious neighboring residents are in maintaining buffers of native plants, managing vegetation on their property, properly using pesticides and other toxic substances, and maintaining drains and onsite sewage systems. Hydrologic changes due to development and increased impervious surface are often the largest stressor on aquatic systems. Urbanization impacts five critical stream attributes: flow regime, physical structure, water quality, energy sources, and biotic interactions (Booth (2001).

Aquatic Dependent Species

Migratory fish use stream and rivers for a portion of their life cycle coming into freshwater from the ocean to breed (e.g. salmon and lamprey). Resident fish spend all their lives in freshwater (e.g. trout and stickleback). Aquatic insects feed on microorganisms and provide source of food for many fish and wildlife. Freshwater mussels and crawfish are present in many local streams and rivers in the region. The marine waters of Budd Inlet and Puget Sound provide a home and migration pathway for diverse of marine organisms from salmon, orca whales, and harbor seals to shore crabs, barnacles, and anemones.

Many species depend on aquatic habitats for a portion of their life cycle, but do not rely or reside in the water all the time. These species include a variety of birds (e.g. great blue heron) that may rely on marine or wetland habitats as a food source to support raising their young. Proximity of nesting habitat in forested uplands to healthy wetland and tidal foraging area is critical to successful breeding. Many amphibians (e.g. frogs and salamanders) and insects (e.g. dragonflies) also rely on wetlands, ponds and lake edges for breeding and larval stages, but leave the water as adults and disperse into adjacent uplands. Amphibians particularly rely on undisturbed buffers and uplands with forest cover for feeding, migration and dispersal corridors. Many mammals also rely on aquatic habitat for all or part of their life history (e.g. river otter and beaver) Migratory birds and other wildlife also heavily use upland habitats near aquatic areas for food, cover, breeding locations and migration pathways (Hruby et al 2005).

Some of the typical species in Olympia closely associated with or dependent on aquatic resources are listed in Table 8.1.

Table 8.1 Typical Aquatic and Terrestrial Species in Olympia (*=nonnative)

Fish	Birds	Mammals
Chinook salmon	American bittern	American Beaver
Chum salmon	American coot	Deer mouse
Cutthroat trout	American wigeon	Long-tailed vole
Coho salmon	Barn swallow	Mink
Rainbow trout/Steelhead	Blue-winged teal	Muskrat
Kokanee	Bufflehead	Northern river otter
Sculpin	Canada goose	Nutria*
Three-spine stickleback	Caspian Tern	Raccoon
Dace	Cinnamon teal	Townsend's vole
Olympic Mud minnow	Common snipe	Yuma myosotis
Pacific sand lance	Common yellowthroat	
Surf smelt	Dunlin	Amphibians
Western brook lamprey	Gadwall	Northwest salamander
Bluegill	Great blue heron	Long-toed salamander
Yellow perch*	Greater yellowlegs	Rough-skinned newt
Largemouth bass*	Green heron	Western toad
Brown bullhead*	Green-winged teal	Chorus frog
Large-scale sucker	Least sandpiper	Red-legged frog
	Lesser yellowlegs	Bullfrog*
	Long-billed dowitcher	
	Mallard	Reptiles
	Marsh wren	Common Garter Snake
	Northern pintail	
	Northern rough-winged swallow	Crustaceans
	Northern shoveler	Signal crawfish
	Pied-billed grebe	
	Red-winged blackbird	Mollusk
	Sora	Olympia oyster
	Tree swallow	
	Virginia rail	

Riparian and Forest Ecosystems

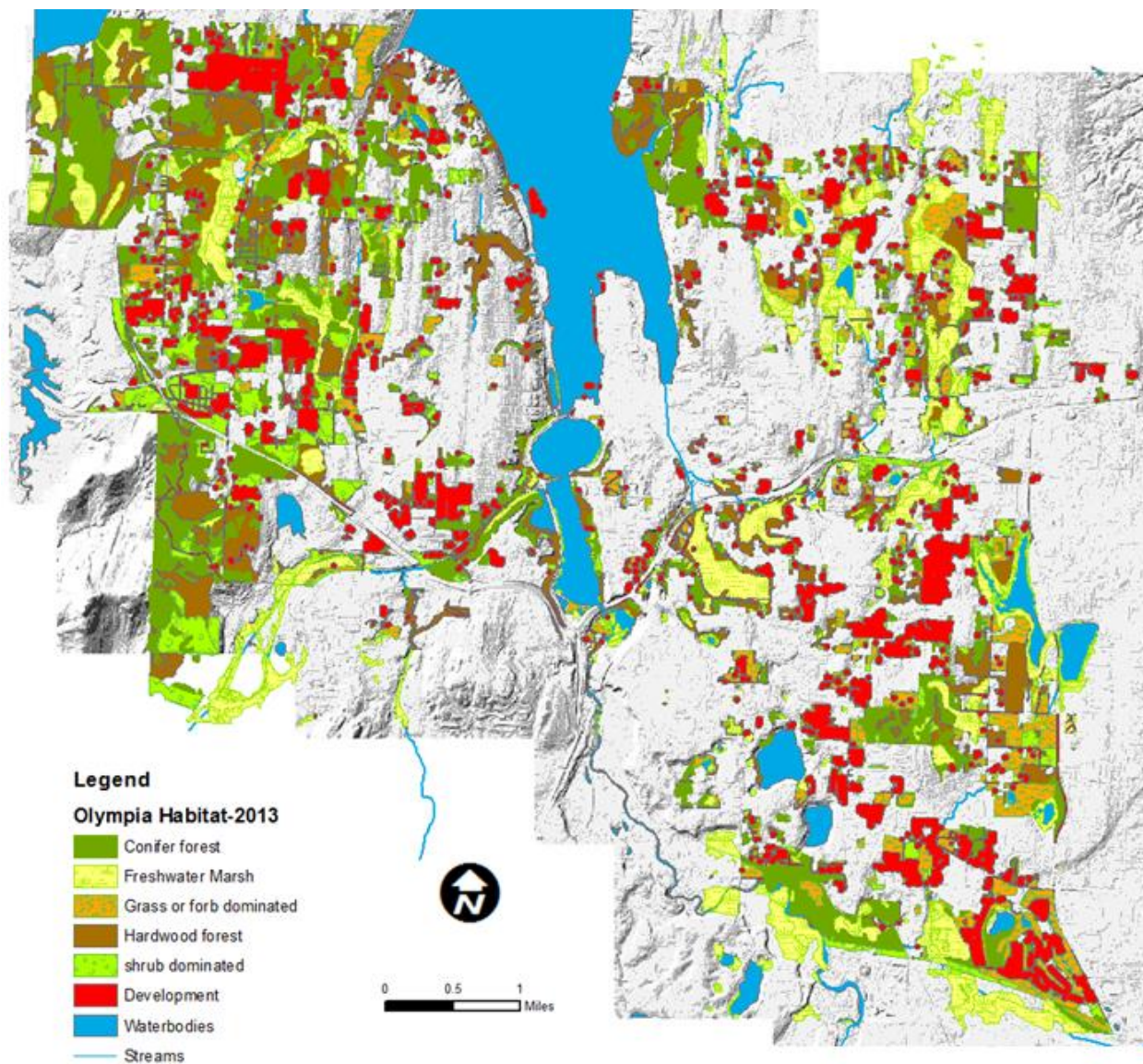
Riparius is a Latin word meaning “of or belonging to the bank of a river.” The term “riparian” describes the areas along streams, rivers, wetlands, and marine systems where aquatic systems transition to uplands.

Basin Land Cover

Basin land cover is directly associated with the health of streams and other aquatic areas (Booth 2005). The conversion of forest to development degrades streams by changing their hydrology and water quality. Maintaining forest cover is critical to protecting water quality and natural hydrologic patterns in streams, wetlands, and watersheds.

In Chapter 4, Map 4.1 shows types of land cover and Figure 4.2 shows land cover by basin.

Map 8.2 shows aquatic and terrestrial habitat in Olympia, Figure 8.1 illustrates habitat loss since 1994, and Table 8.1 shows riparian vegetation cover by basin.



Map 8.2 Types of Aquatic and Terrestrial Habitat in Olympia and Its Urban Growth Area, 2013

Source: City of Olympia Habitat and Stewardship Strategy

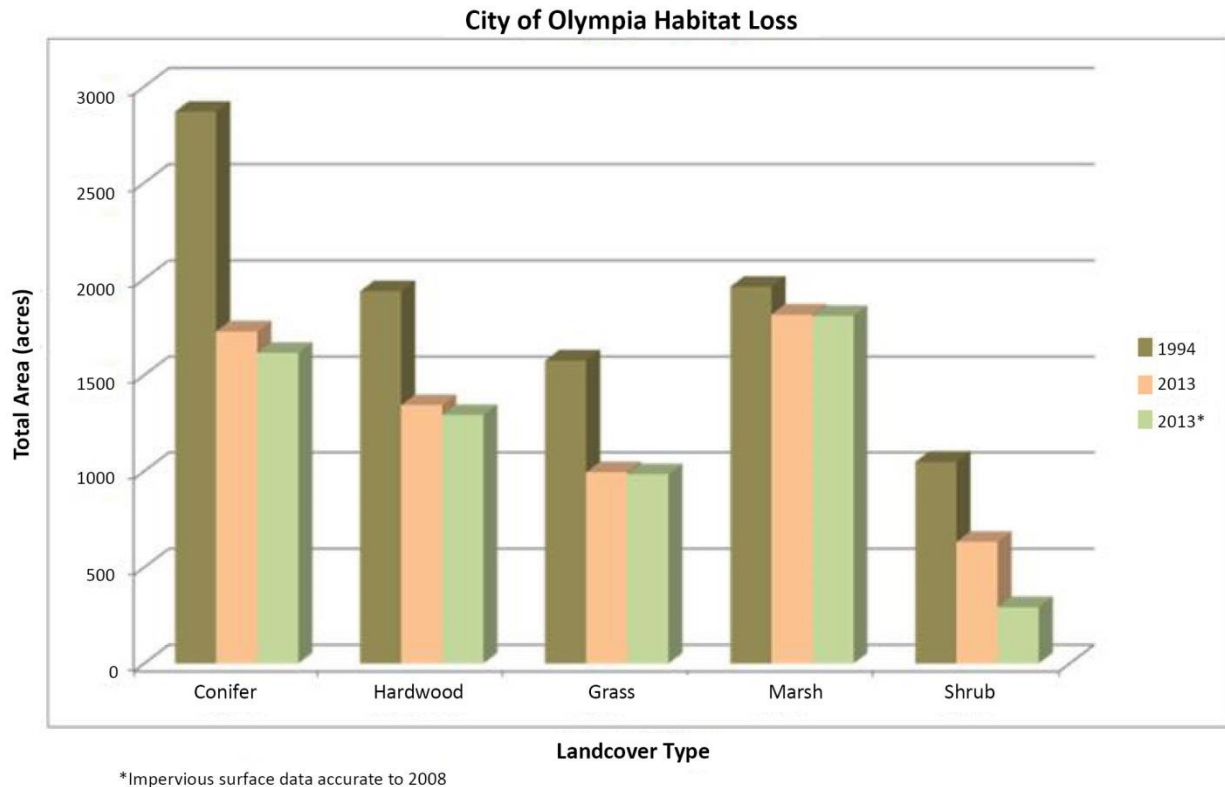


Figure 8.1 Habitat Loss in Olympia

Source: Habitat and Stewardship Strategy (City of Olympia Water Resources 2013)

Table 8.2 Riparian Cover by Basin

Stream	Forest, Scrub/Shrub, and Unmodified Wetland in 250' Buffer*	Riparian Vegetation**	Trees or Shrubs in 250' Buffer***
Green Cove Creek	84.7%	89%	62%
Ellis Creek	70.7%	74%	84%
Woodard Creek	69.8%	78%	43%
Percival Creek	61.3%	67%	57%
Mission Creek	54.6%	66%	73%
Moxlie Creek	52.3%	50%	57%
Schneider Creek	55.5%	78%	70%
Indian Creek	43.8%	55%	57%

*Data from TRPC 2013 based on NOAA C-CAP data and County Wetlands.

**Data from TRPC 2015 based on National Land Cover Dataset.

***Data from WDFW High Resolution Change Detection 2013.



Percival Creek and Healthy Riparian Area (2017)



Percival Creek and Degraded Riparian Area - Under SR 101

Habitat Functions

Riparian and forest ecosystems contribute to the health of aquatic habitats by moderating stream flows and temperature, and contributing nutrients and insects to food webs and large wood to provide structure in streams and wetlands.

Elevated temperature reduces dissolved oxygen in the water and limits the health and diversity of stream life. Rapid changes in temperature, as when stormwater drains from hot pavement in summer, also stresses aquatic life. Riparian vegetation filters water from the surrounding landscape, stabilizes soils, and slows erosion.

Riparian corridors also provide continuous pathways for migration by birds and other wildlife through developed areas, and some aquatic dependent species depend on upland habitats to complete a portion of their lifecycle.

Available Data

Information on the extent and health of riparian and forest ecosystems are derived from the following sources:

- **Citywide Riparian Forest Cover.** Total percent canopy cover in combination with percent conifer are well accepted measures of riparian health and surrogate measures for aquatic health, given the relationships between forest cover/shade and dissolved oxygen, as well as the potential for coarse wood recruitment from the riparian zone. The Utility intends to continue measuring changes in riparian forest cover as a performance metric.
- **Citywide Land Cover Analysis.** The *Habitat and Stewardship Strategy* completed in 2013, included a comprehensive analysis of the remaining habitat by land cover type and by distribution across a complex landscape of ownership types. The Utility intends to continue measuring citywide land cover over time as an environmental indicator.
- **Property Specific Riparian Forest Metrics.** Utility staff members collect habitat-specific data for each property they work with. These data include species diversity, forest structure, coarse woody debris, snags, and presence and dominance of invasive species. Presence and health of wetlands, stream attributes shoreline condition, and other special habitat areas are considered. Staff identified these attributes as important standards to characterize remaining habitat in Olympia.

Streams

Eight significant streams run through at least a portion of Olympia: Ellis, Green Cove, Indian, Mission, Moxlie, Percival, Schneider, and Woodard (see Table 4.1). The condition of these streams varies depending primarily on land use, level of stormwater treatment and flow control, and intact riparian vegetation and wetlands in the basin. Some basins are in relatively good condition while others are more impacted.

Two constructed stream channels flow to natural streams in Olympia. Chambers Ditch flows from Chambers Lake through the southeast corner of Olympia into Chambers Creek in the Thurston County. Black Lake Ditch flows from Black Lake in Thurston County, crosses through a small section of Tumwater into Percival Creek in Olympia, and eventually flows into Capitol Lake.

Smaller year-round or perennial streams (e.g. Garfield Creek) drain directly to East Bay or West Bay. Other streams and rivers (e.g. Woodland Creek and the Deschutes River) are in Lacey, Tumwater, and/or Thurston County, but portions of their watersheds are in Olympia. For example, Woodland Creek runs through Lacey and Thurston County and Chamber Creek runs through the County and Tumwater.

Habitat Functions

Olympia's streams all provide habitat for resident fish and aquatic invertebrates, and migration corridors and fresh water access for other wildlife. Fish and other organisms live directly in the water and are dependent on adequate dissolved oxygen, temperatures, water quality, food sources, and substrate and habitat structure (e.g. pools, wood, gravel) to survive and reproduce. Only Green Cove, Percival Creek, Ellis, and Woodard Creeks contain significant salmon spawning and/or rearing habitat. Black Lake Ditch also provides salmon habitat and functions as a stream for much of its length. Some of the other streams have records of salmon returning in the last few decades, but fish passage is blocked or reduced due to previous development and stormwater inputs. Resident cutthroat trout are also found in many local streams. Many wildlife species (e.g. birds, deer, and river otter) rely on the access to water, cover, habitat features (e.g. snags and downed logs), and migration corridors to feed, raise young, and travel across urban landscapes.

All streams provide hydrologic, chemical, biologic, and physical functions regardless of the degree of degradation. Even when impacted by development, streams continue to convey water and sediment, recharge and accept groundwater, transport nutrients and organic matter, and provide habitat for pollution-tolerant organisms. Streams routed into pipes continue to convey water and sometimes sediment, but lose most of their functions for fish and other wildlife (e.g. upper Schneider and lower Moxlie Creeks).

Biological Health of Olympia Streams

The biological health of Olympia's streams is measured by sampling and evaluating the quantity and diversity of benthic macroinvertebrates. Benthic macroinvertebrates live in the stream benthos, in or near the stream bed and include insects, crustaceans, worms, snails, and clams. Benthic macroinvertebrates play a crucial role in the stream ecosystem and are good indicators of the biological health of streams. Macroinvertebrate samples are collected and sent to a laboratory where they are identified and counted, and the resulting data is converted into an index score called a Benthic Index of Biotic Integrity (B-IBI).

B-IBI is composed of ten metrics that measure different aspects of stream biology, including taxonomic richness and composition, tolerance and intolerance, habit, reproductive strategy, feeding ecology, and population structure. The ten metric scores are added to produce the overall B-IBI score ranging from 10 to 100. Benthic macroinvertebrate data has been collected annually on Green Cove and Ellis Creeks since 2000 and on most of the other streams since 2003. Land cover of a basin, measured by increased impervious surface and decreased tree cover, strongly correlates to the biological health of receiving water bodies as measured by B-IBI.

B-IBI is often a good indicator of stream health. Some streams, like Moxlie Creek, have fine-grained substrates due to the underlying soils or geology that limit the diversity of stream biology. Maintaining high biologic integrity is difficult in an urban setting. Riparian tree cover is often lacking and runoff from pavement, even when treated, still has elevated temperatures. Macroinvertebrate populations are influenced by low frequency extremes as well as ongoing chronic conditions better representing conditions over the entire year than spot sampling.

Table 8.3 summarizes the results of B-IBI monitoring in Olympia streams since 1999. Streams with good/fair B-IBI scores include Indian Creek, Mission Creek, Green Cove Creek, Percival Creek, and Woodland Creek, although in the most recent sampling, Mission and Green Cove have higher scores than their 2013 average. Streams with recent fair/poor or poor/very poor average B-IBI scores include Moxlie Creek, Black Lake Ditch, and Schneider Creek.

Table 8.3 Benthic Index of Biotic Integrity (B-IBI) Data for Olympia's Streams

Stream	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
Ellis Creek (at Priest Point Park)	NA	NA	NA	82.3	79.2	80.1	70.5	76.6	69	62.9	80.7	NA	73	75.9	NA	75
Woodard Creek (near 31st Court)	61	82	65.7	76.7	68.8	69.9	81.9	68.2	70.5	82.9	56.1	53.1	65.7	NA	62.2	68.9
Chambers Creek (near 58th Avenue)	48.2	75.2	66.8	72.7	65.6	71.8	70.8	72.4	NA	71.1	60	64.6	57.3	NA	69.7	66.6
Mission Creek (at Bethel Street)	NA	NA	NA	NA	64.6	54.3	48.8	61.9	52.8	65.7	63.3	NA	NA	67.9	NA	59.9
Green Cove Creek (at 36th Avenue)	NA	NA	NA	54.2	71.9	74.6	49.9	49	49.3	54	48.2	NA	69.6	71.1	NA	59.2
Percival Creek (at SPSCC)	NA	NA	NA	46.6	62.7	55.8	41.3	55.9	57.9	52.2	47.9	NA	42.1	38	NA	50
Indian Creek (Lower Deschutes)	NA	NA	NA	NA	49	51.6	40.2	50.1	55.5	27.9	40.9	NA	47.8	52.9	NA	46.2
Woodland Creek (at Draham Road)	NA	NA	NA	64	60	44.1	37	20.3	49	45.9	39.7	NA	45.6	50.1	NA	45.6
Percival Creek (at foot bridge)	19.3	29.5	36.3	34.7	37.6	47.3	46.7	39.6	NA	70.6	52	39.9	45.4	NA	40	41.5
Schneider Creek (at West Bay Drive)	NA	NA	NA	NA	33.6	41.4	38.4	33.2	41.1	46.9	38.6	NA	28.5	35.6	NA	38.4
Moxlie Creek (at Watershed Park)	NA	NA	NA	NA	34.4	16.9	25.3	19.9	39.3	41.4	51	NA	36.1	37.2	NA	33.5
Black Lake Ditch (at RW Johnson Boulevard)	NA	NA	NA	NA	NA	13.6	19.9	12.3	18.4	13.3	23.4	NA	25.1	28.6	NA	19.3
Olympia Average	42.8	62.2	56.3	61.6	57.0	51.8	47.5	46.6	50.3	52.9	50.2	52.5	48.7	50.8	57.3	50.3
Thurston County Average	54.3	69.9	65.1	65.1	60.5	55.3	52.0	51.0	53.2	56.1	56.2	63.4	54.9	55.5	65.3	58.5
Puget Sound Streams Average	35.5	49.8	45.2	43.7	43.9	48.2	45.1	47.5	48.4	45.1	48.9	46.0	43.5	44.6	48.7	45.6
Legend (from Puget Sound Benthos)	Excellent				Excellent/Good - Good			Good/Fair - Fair			Fair/Poor - Poor			Poor/Very Poor - Very Poor		
Source: Samples - Thurston County Public Health and Social Services Department and Water & Waste Management-Stream Team																
Data from Puget Sound Benthos website: http://pugetsoundstreambenthos.org																
Benthic Index of Biotic Integrity (B-IBI) Scores for Olympia Streams: Methodology - Fore, Wisseman 2012																

Figure 8.2 compares the B-IBI average for all streams in Olympia, Thurston County, and the Puget Sound region. Predictably, the data shows that Olympia's average is between the relatively more rural Thurston County streams and the relatively more urban Puget Sound streams. The slight downward trend of Olympia's stream health is likely due to normal fluctuations or other anomalies prevalent in a relatively small sample set.

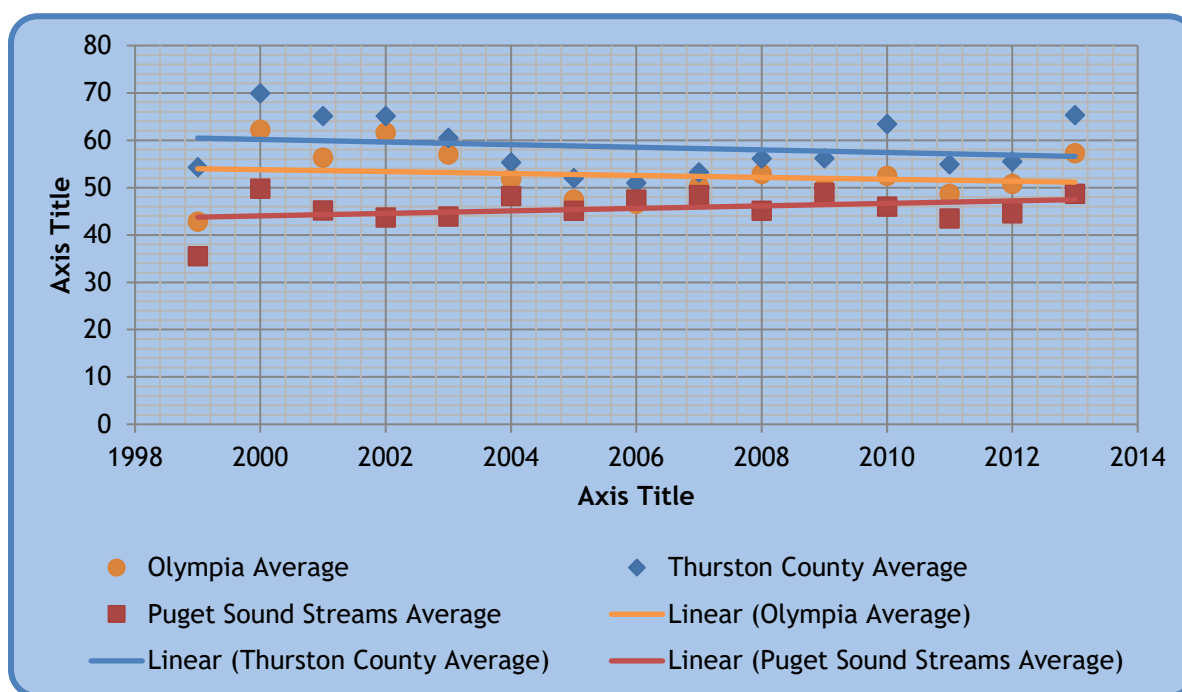


Figure 8.2 Olympia B-IBI Scores Compared to Thurston County and Puget Sound Averages.

Impact of Land Development

The health of biological communities in streams is affected by several factors related to land development:

- Extent of healthy riparian vegetation communities
- Length of the natural channel routed into pipes or culverts
- Number of road crossings or fish passage barriers
- Degree of stormwater treatment in areas draining directly to the stream

Excessive scour and erosion has affected streams such as Schneider Creek that drain older developed areas that lack flow control. Higher more frequent peak flows impact fish habitat and insect communities, and often increase erosion, degrading the stream channel and downstream areas.

Urban development prior to 1991 lacked the stormwater facilities now required by the Olympia *Drainage Design and Erosion Control Manual*; over 60% of Olympia land surfaces lack the treatment or flow control required in newer development.

In Chapter 7, Figures 7.1, and 7.2 demonstrate that older parts of Olympia, tributary to Budd Inlet, Moxlie Creek, and Indian Creek basins, have the largest areas of impervious surfaces without water quality treatment. These areas thus have the greatest potential for pollutant loading. Figure 7.1 illustrates the area of impervious surface by basin and the portion of the impervious surface that does not receive water quality treatment. Figure 7.2 quantifies the level of water quality treatment for runoff from arterial and collector roadways in each basin.

Land cover analysis shows that the percentage of impervious surface with untreated runoff is correlated with basin health as shown in Table 8.3 and Figures 8.2 and 8.3.

Table 8.3 shows that basins with more acres of untreated runoff have poorer water quality. For example, in Moxlie, Indian, and Schneider Creek basins, the relatively high acreage of impervious and untreated impervious surfaces, and low percentage remaining wetlands corresponds to lower water quality and B-IBI scores.

By contrast, Green Cove and Ellis Creeks both have lower amounts of impervious cover, high levels of intact wetlands, relatively intact riparian areas, and reasonable water quality; they also support salmonid use (1999 Aquatic Habitat Study). These streams are now mid-range among Olympia watersheds for impervious surface coverage.

Since 2001, the Green Cove watershed has been uniquely zoned for low impact development, intended to protect the stream and reduce the impact of urbanization on this watershed. Ellis Creek flows through rural areas of Thurston County just north of Olympia and then through intact riparian forests in Priest Point Park.

The correlation between untreated impervious surface and stream health is further illustrated in Figures 8.3 and 8.4. As untreated impervious surface increases, water quality decreases as measured by overall water quality (measured by the Water Quality Index) and biological health (measured by the B-IBI).

Table 8.4 Basin Impervious Surface and Water Quality Parameters

Basin ¹	Total Acres	Total Impervious ²	% Wetland	Acres in City	Untreated Impervious in City ³	WQI (avg)	B-IBI (avg)
Chambers	7,559	19%	10%	917	0.9%	86	66.6
Ellis	1,441	7%	30%	292	1.7%	80	75
Green Cove	2,530	12%	11%	1,042	2.4%	NA	59.2
Indian	1,322	29%	12%	1,001	18.2%	67	46.2
Mission	406	24%	7%	374	18.2%	61	59.9
Moxlie	1,562	40%	4%	1,541	23.0%	47	33.5
Percival	5,340	26%	8%	1,713	6.2%	84	41.5
Schneider	635	22%	0.8%	635	19.7%	82	38.4
Woodard	5,211	15%	12%	1,733	4.0%	80	68.9

Source: Utility GIS data, - Thurston County National Wetlands Inventory data and Thurston County Water quality and B-IBI data from Puget Sound Benthos. WQI = Water Quality Index, B-IBI = measure of biological health. ¹ Not all basins in the City have water quality and/or B-IBI monitoring. ² Data based on NOAA C-CAP land cover from TRPC 2015 Basin Evaluation and Management Strategies Update. ³ Data from City of Olympia hard surfaces GIS layer based on 2015 Lidar data.

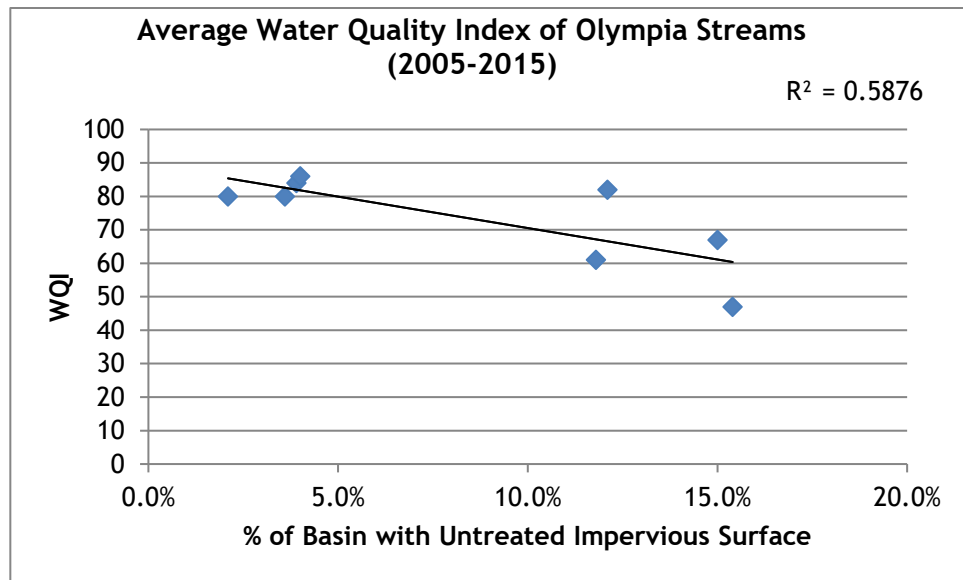


Figure 8.3 Relationship of Water Quality Index to Percentage of Basin without Treatment.

Each blue diamond represents an Olympia stream.
 R^2 is the proportion of the variance explained by the model (In this case 59%).

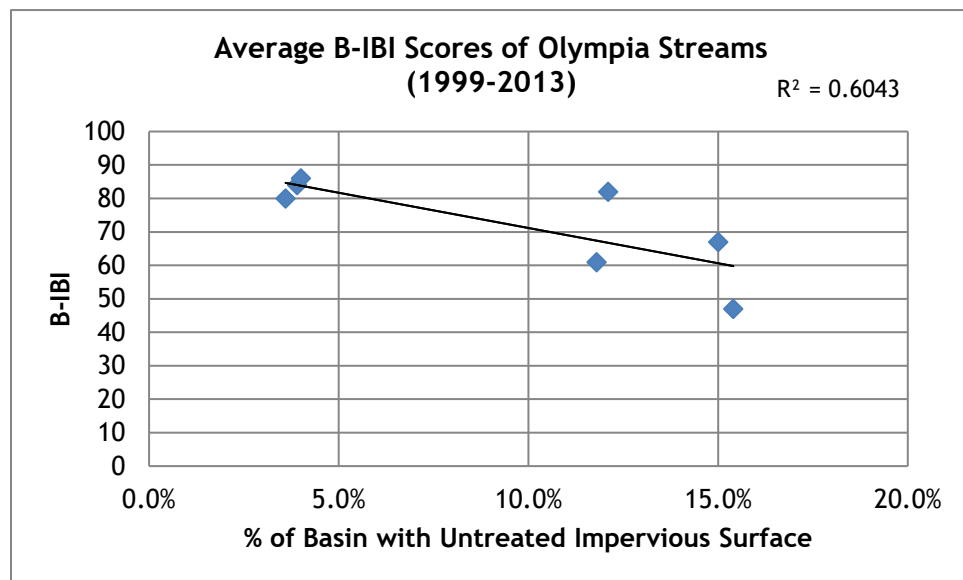


Figure 8.4 Relationship of B-IBI Score to Percentage of Basin without Treatment.

Each blue diamond represents an Olympia stream.

Fish Passage Barriers and Road Crossings

Road crossings, culverts, and other structures can be barriers to fish passage. These features are inventoried and assessed by the Washington State Department of Fish and Wildlife (WDFW). Passage is important for resident fish and other aquatic life, but particularly for migratory fish like salmon.

Within Olympia are 30 partial and complete passage barriers, listed in Table 8.5. Some passage issues are on streams that do not have significant salmonid use and/or would be costly to remedy due to depth of fill over the culverts. The Utility has taken a lead role in planning and design to fix the most problematic culverts despite these challenges.

Table 8.5 Fish Barriers in Olympia Watersheds

Stream	Tributary To	Barrier Type	Number of Barriers
Black Lake Ditch	Capitol Lake	Partial	1
Ellis Cr	Budd Inlet	Partial	1
Green Cove Cr	Green Cove	Total	2
Indian Cr	Moxlie	Total	1
Indian Cr	Moxlie	Partial	6
Mission Cr	Budd Inlet	Total	1
Mission Cr	Budd Inlet	Partial	1
Moxlie Cr	Budd Inlet	Partial	1
Percival Cr	Capitol Lk	Partial	1
Schneider Cr	Budd Inlet	Total	1
unnamed	Black Lake Ditch	Partial	3
unnamed	Budd Inlet	Total	3
unnamed	Budd Inlet	Partial	1
unnamed	Ellis	Partial	1
unnamed	Green Cove	Partial	2
unnamed	Indian	Partial	1
unnamed	Moxlie	Total	1
unnamed	Percival	Total	1
unnamed	Unnamed Butler Cove Tributary	Partial	1

Source: WDFW data. Most of these barriers do not affect anadromous fish.

Wetlands

Wetlands subject to environmental regulation are defined as: “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” (USACE 1987).

Approximately 680 acres of wetlands remain within the City; there are a total of about 3,150 acres in all watersheds that are completely or partially in Olympia. (See Table 4.2 and Map 8.1.)

Wetlands perform important water quantity, water quality and habitat functions. They filter surface and groundwater, retain and store floodwaters, and provide habitat for wetland-dependent wildlife such as amphibians.

Urbanization significantly affects wetland hydrology, biology, and adjacent buffer habitats. Major impacts affecting plant communities and wildlife are:

- Increased volume and duration of flow that alters the degree and duration of water level changes
- Reduced groundwater recharge that affects water level
- Large amounts of sediment transported to wetlands by high flows
- Increased nutrients and pollutant carried by stormwater runoff
- Fragmentation of migration corridors

Wetlands in Olympia

An estimated 31% of wetlands in Washington has been lost between the 1780s and 1990s (Dahl 1990), with much greater losses in the urban areas around Puget Sound. In the late 1800s and early 1900s a large wetland complex at the headwaters of Schneider Creek was drained and filled and the creek placed into a pipe. During the development of Olympia's downtown, many wetlands and mudflats were filled along the shores of Budd Inlet, as illustrated in Chapter 6, Figure 6.2. These and other historical impacts create many challenges to improving and restoring aquatic habitat.

Major wetland complexes still play a critical role in many Olympia watersheds. Intact wetlands in the headwaters and along many tributaries to Green Cove Creek are likely a key factor in the high quality of the stream. Significant wetlands also lie in the headwaters of Indian, Woodard, Percival, Moxlie, and Mission Creeks.

Loss of wetlands due to urban development makes protecting the remaining wetlands more important. Surrounding land uses continue to generate excess runoff and pollutants, and reduce the protected natural habitats and lack of connections between various habitats.

Wetland Types and Habitat Functions

Wetlands are of many types. When seasonal lakes dry up in the summer, they expose **emergent wetlands** with sedges and rushes (e.g. Lake Louise at Grass Lake Nature Park) or persist year-round as herbaceous plant communities. Willows and other water loving shrubs along the edges of lakes, ponds, and in the headwaters of streams dominate in **scrub-shrub wetlands**. Trees and shrubs tolerant of saturated soils dominate **forested wetlands** and often occur along streams, high groundwater areas and in seepage areas on slopes. Salt marsh and mudflats along the Budd Inlet shoreline, and often in the estuaries of creeks or rivers, form **tidal wetlands**. In southeast Olympia depressions or "kettles," formed by blocks of ice left as the glaciers receded, sometimes contain small ponds or wetlands of various types.

Major wetland types and the habitat they provide are described below in order roughly from more to less wet.

- **Emergent Wetlands.** Perennial herbaceous plants like cattail, sedges, rushes, and wetland grasses (e.g. reed canary grass) dominate emergent wetlands. These types of wetlands often occur at the edge of open water or have open water areas that provide food, cover, and breeding habitat for native amphibians, waterfowl, and fish. The Olympia Mud Minnow, listed as a "[sensitive species](#)" by the Washington Department of Fish and Wildlife, is found in some local wetlands. Emergent wetlands are sensitive to fluctuating water level changes, sediment loading, and excess nutrients. These stressors increase due to stormwater inputs, facilitating invasion by reed canary grass and lowered habitat value.
- **Scrub-Shrub Wetlands.** Woody shrubs (e.g. willow and *spirea*) dominate the vegetation of scrub-shrub wetlands. These wetlands are habitat for many songbirds, pollinators, and other wildlife while also serving many hydrologic and water quality functions. Many herbaceous plants also exist in shrub-shrub wetlands.

- **Forested Wetlands.** Trees that can tolerate a high water table into the growing season dominate forested wetlands; shrubs and herbaceous plants are present in the understory. These wetlands often occur on the floodplains of creeks or rivers, on slopes at seeps and springs, and along the fringes of other wetland types. Some common species found in forested wetlands are Oregon ash, red alder, and western red cedar, with salmon berry and skunk cabbage or slough sedge in the understory. They are used heavily by migratory birds for nesting, food, and cover.
- **Tidal Wetlands.** Salt marshes exist along many shorelines of southern Budd Inlet, primarily as a narrow fringe in the upper part of the tidal range or in small pocket estuaries (e.g. Mission and Ellis Creek). Salt-tolerant plants (e.g. pickleweed and salt grass) are dominant. These habitats, and the tidal channels that run through them, are an important nursery ground for many species of fish and marine species. Since the mid- to late 1800s, urban development and fill in southern Budd Inlet has significantly reduced the prevalence of salt marsh.



Emergent Wetland at Grass Lake Nature Park in Northwest Olympia

Lakes

Olympia's lakes range from Capitol Lake, which was created by impounding the Deschutes estuary, to large and small glacially formed kettles (e.g. Ward Lake) and shallow lakes with many wetlands and shallow water habitats (e.g. Chambers Lake). Larger lakes are listed in Table 4.3. These lakes provide a diverse array of habitats from deep water to lake-fringe wetlands. Fish, amphibians, waterfowl, other water birds, and mammals like river otter and beaver utilize lakes for all or a portion of their lifecycle. For example, Capitol Lake provides large quantities of midges and other insects that feed a colony of bats that roosts at Woodard Bay Natural Resource Conservation Area.

Puget Sound

Olympia lies on the shoreline of Budd Inlet, at the southernmost end of Puget Sound. Its land area drains primarily to Budd Inlet with smaller areas of Olympia and its Urban Growth Area (UGA) draining to Eld and Henderson Inlets. The health of Puget Sound has been a regional focus for almost three decades. It is widely understood that one of the largest stressors on the overall ecosystem is unmanaged stormwater runoff into Puget Sound.

Condition of Shoreline

Fill placement beginning in the late 1800s through the 1980s created most of the Port of Olympia peninsula separating Budd Inlet's West Bay and East Bay. The east and west sides of Budd Inlet are primarily steep bluffs and the southern shoreline is generally flat. Within Olympia and its UGA are 10.4 miles of Puget Sound shoreline, of which 73% is modified in some way (ESA 2008). Budd Inlet's shoreline has been heavily altered over the last 150 years with many acres of fill (Chapter 6, Figure 6.2), creating blocks of commercial and industrial development on historic mud flats and salt marsh habitats. In the most urban portion of the shoreline in downtown and the Port Peninsula, 94% of the shoreline is armored (2005 TRPC/ESA). Although portions of Olympia drain to Eld and Henderson Inlets, none of the shoreline lies within the City or its Urban Growth Area (UGA).

Habitat Functions

Puget Sound contains habitat for many important resident bottom fish, forage fish, and crabs. It is a migration pathway for outgoing juvenile salmon and returning adults. It provides migration, overwintering, and year-round habitat for many species of birds including American wigeon, northern pintails, and great blue heron. A few beaches along East and West Bay of Budd Inlet do provide forage fish spawning habitat, which has been documented by the Washington Department of Fish and Wildlife and local Stream Team volunteers.

See Section 3.4 for a description of regional efforts to improve the water quality of Puget Sound and plan for salmon recovery.



Shoreline of Budd Inlet: Salt marsh at the mouth of Mission Creek (Priest Point Park)

Phytoplankton Monitoring

Phytoplankton are small microscopic plants that capture carbon and chemical energy from sunlight often in large blooms during spring and summer when nutrients and light are abundant. They form the base of the food web in marine systems. Many small fish, larval forms of marine species (e.g. Dungeness crab and shellfish), and invertebrates (e.g. clams and oysters) rely on these microscopic plants as a source of food. Certain species of phytoplankton produce toxins creating harmful algal blooms that can harm or kill fish, birds, and/or humans. Decaying algae that sink to the bottom after large blooms can also deplete oxygen harming or killing marine life.

As part of its Stream Team program, the Utility has worked with the Pacific Shellfish Institute to monitor phytoplankton in Budd Inlet since 2013. Each year, approximately 15 sampling events have been conducted from mid-June through September. The resulting data is compiled and shared with the NOAA/Sea Grant's Sound Toxins volunteer monitoring program.

Pacific Shellfish Institute staff and the citizen scientists measure water temperature, salinity, water clarity, and the species of phytoplankton that are present and at what extent. Interpreting marine water quality data is a complex process influenced by many factors, including climatic and pollutant sources far removed from the South Sound. Utility staff will continue to support phytoplankton monitoring, report the findings and rely on State and federal agencies to interpret the data. This information has documented species responsible for both diarrhetic and amnesic shellfish poisoning at various times, mostly at low levels, as well as improving the understanding of the plankton community that drives marine food webs.

8.2 Regulatory Requirements

A web of overlapping federal, State, and local laws and regulations are critical to protecting Olympia's aquatic habitats and their function. The Utility's Environmental Services staff supports the Engineering and Planning staff of the Utility and other City departments in meeting the City's obligations under these regulations.

Utility staff also participates in the Alliance for a Healthy South Sound (AHSS), the local/regional integrating organization responsible for coordinating Puget Sound recovery planning and actions in South Sound.

Chapter 5 gives an overview of the legal and policy framework affecting the Utility's work in flood mitigation, pollution prevention, and habitat management. The regulations most important for protecting aquatic habitat are described briefly here.

Clean Water Act

Regulations under the federal Clean Water Act (CWA) are to protect "waters of the United States" from pollution. In Washington, the Department of Ecology (Ecology) implements the National Pollution Discharge Elimination System (NPDES) and the 303(d) List of Impaired Water Bodies and Total Maximum Daily Load (TMDL) requirements. The Utility is responsible for meeting the requirements of its NPDES Municipal Stormwater Permit and the TMDL plan requirements for Henderson Inlet and Deschutes River watersheds (see Chapter 7). Habitat improvements (e.g. riparian shade) can be required under TMDL and NPDES requirements. The Utility also assists other City departments in complying with State and federal wetland regulations, for example documenting regulated resources and assisting with mitigation planning and implementation.

Endangered Species Act

The federal Endangered Species Act (ESA) is also the basis for regulations to protect threatened and/or endangered species like Chinook salmon, orca whales, steelhead trout, or certain prairie species.

- Under Section 4(d) of the statute, the federal government issues regulations to provide for the conservation of the species. A 4(d) rule may require new development and redevelopment to comply with specific requirements. Compliance with this process may be required for development projects in Olympia that have the potential to affect listed species.

- Section 7(a)(2) of the statute requires the US Environmental Protection Agency (EPA) to consult with either the Fish and Wildlife Service or the National Marine Fisheries Service when approving state or tribal water quality standards and NPDES permitting programs under the CWA. This process incorporates requirements protecting listed species into the City's Ecology issued Phase II NPDES permit, but does not otherwise directly relate to local jurisdictions.
- Section 10 allows entities to create a Habitat Conservation Plan to minimize and mitigate the effects of any permitted incidental take of listed species. There are no known ESA-listed species in the City of Olympia so this process has not been necessary to date.

Salmon Recovery Act

Thurston Conservation District is the lead entity for implementing the Salmon Recovery Act in the Deschutes watershed (Water Resource Inventory Area 13). Utility staff participates in local technical committees. The Utility sometimes takes a lead or supporting role in implementing priority projects within the City limits (e.g. fish passage or shoreline restoration).

Shoreline Master Program

The State Shoreline Management Act requires the City to have and periodically update a Shoreline Master Program (SMP) to guide the management of Olympia shorelines. This document and associated ordinances ensure that shoreline uses protect and maintain ecological function. A planning and permitting process aims to balance water dependent and associated uses, aesthetics, public access, and natural resource value of shorelines. The SMP is approved by Ecology and includes a restoration plan that details shoreline restoration and enhancement opportunities. Protecting and improving the ecological functions of shoreline is consistent with Utility aquatic habitat goals and strategies.

Critical Areas Ordinance

The City's Critical Areas Ordinance (CAO) protects streams, wetlands, steep slopes, important habitats and species, adjacent buffer habitats, and wellhead protection areas. Washington State Growth Management Act requires jurisdictions to have and update CAO every six years. The CAO requires review of any development within 250 feet of a wetland or stream and sets buffers of various widths depending on the attributes of the aquatic resource to be left undisturbed or restored to native vegetation. If impacts are deemed unavoidable minimization and mitigation actions will be required. Utility staff has been actively involved in updates to the ordinance, as it is a key component of protecting aquatic habitat areas and their functions across the City. Staff has also acted as a source of technical expertise for the Community Planning and Development Department about natural resources and aquatic habitat.

Drainage Design and Erosion Control Manual

The Utility's *Drainage Design and Erosion Control Manual* regulates runoff from new development to prevent discharge of excess runoff and pollutants into streams, wetlands, lakes, and marine waters (see Chapter 6).

Low Impact Development

Implementing this aspect of the Permit and Design Manual includes working with public and private developers to incorporate habitat improvements, maintain native vegetation and forests, and avoid impacts to stream and wetlands.

Thurston County Noxious Weed Board

Washington State requires the control of specific noxious weeds on public and private properties (RCW 17.10). Species are sorted into lists of Class A, B, and C species depending on the threat to natural resources and/or agriculture and how widespread each species is. Landowners are required to eradicate Class A species. Landowners may be required to control Class B noxious weeds, depending on how widespread the species is and/or whether the species is a local priority.

In Thurston County, the Noxious Weed Board is authorized to adopt rules and regulations needed for weed control or eradication. The County employs a weed coordinator to inspect property for noxious weeds. If a landowner does not control the weeds after receiving several notices, the Weed Board may control the weeds and bill the landowner for its work, or may issue a civil penalty.

Utility staff works with the Weed Board on behalf of all City departments and coordinates internal communication, data management, and control efforts. Utility crews control weeds on Public Works properties and supports control efforts by Parks maintenance staff.

8.3 Habitat Studies and Land Cover Analyses

Over the past two decades, the Utility has performed several habitat studies and land cover analyses that evaluated the remaining habitat in Olympia. Following is a summary of this body of work.

City of Olympia Wildlife Habitat Study (1994)

Beginning in 1994, the Public Works Department commissioned Shapiro & Associates, Inc. to analyze land cover types in order to identify remaining habitat in Olympia and its UGA. This study, using the best available science, focused on mapping and classifying land cover types and creating criteria that could help managers further protect critical wildlife habitat.

Aquatic Habitat Evaluation & Management Report (1999)

In 1999, the Utility's Water Resources staff conducted an aquatic habitat evaluation focused on the nine major basins within Olympia and its UGA. Based on research findings on the impacts of urbanization on streams and wetlands within the Puget Sound Basin, this report provided the framework for implementing a management approach with basin-specific goals and objectives.

The report found that the most important factors affecting aquatic habitat are changes in basin hydrology and loss of riparian corridor vegetation. This analysis provided evaluation and rating methodology, and recommended management goals and strategies at the basin scale. It gave managers a basis for implementing effective habitat management and protection measures.

GIS Basin Analysis (2012)

With the availability of new Geographic Information System (GIS) technology and staff with the experience to use these tools, basins were characterized in 2010 and updated in 2012. This analysis yielded a comprehensive technical evaluation of all basins in Olympia and its UGA. It incorporated almost a decade of data on water quality, biology, land cover (including tree canopy, impervious surface, and building coverage), stormwater control effectiveness, and onsite sewage system impacts.

Major findings confirmed previous research regarding basin land cover (particularly loss of tree canopy) and the correlation to water quality degradation, as measured by B-IBI. The 2012 Basin Analysis conclusions about riparian land cover include:

- The evaluation of riparian land cover composition did not indicate correlations with either aquatic health or water quality. However, the lack of correlation between riparian forest cover and aquatic health/water quality may be due to the overwhelming influence of basin wide land cover composition and the lack of variability between the riparian forest cover of the different basins.
- On the other hand, the literature strongly supports the value of riparian forest cover in maintaining aquatic health. (National Academies of Sciences 2009, Walsh et al., 2005, Alberti et al. 2006, Mayer et al. 2010, Dosskey, et al. 2010.)
- The *Deschutes TMDL: Water Quality Study Findings* specifically recommends riparian shade targets of 84% for Black Lake Ditch and 98% for Percival Creek. See Chapter 7 for details on the TMDL.
- Olympia streams with tree cover ranging from 54% to 69% would benefit from full riparian shade (>80%).

- In addition to the habitat-specific values of improved riparian conditions, research has demonstrated that streams with intact riparian habitat and greater channel complexity do a better job at nitrogen uptake (Johnson 2009).

City of Olympia Habitat and Stewardship Strategy (2013)

The *City of Olympia Habitat and Stewardship Strategy* identified and quantified the remaining habitat in the study area (Olympia and its UGA) and recommended a strategy to protect and enhance this habitat. Although the relationships between the wildlife habitat and an urbanizing city can be very complex, the City's response as a steward of this resource can be straightforward and targeted. Since acquisition can be an expensive way to steward these resources, the report recommendations included:

- Acquire only the most important properties that are at the greatest risk of being lost to development.
- Leverage limited resources by collaborating with other departments, agencies, and organizations, such as Olympia's Parks, Arts and Recreation Department and Capitol Land Trust.
- Pursue grant funding to leverage limited funds.
- Investigate other protection tools such as regulations or conservation easements before pursuing outright purchase).
- Without active management, habitat in an urban setting will degrade over time due to invasive plants and other stresses imposed by surrounding land uses surrounding.
- The highest priority is to focus habitat enhancement on properties currently under Utility management and collaborate with other public agencies and organizations that have comparable habitat goals, such as the Capitol Land Trust.
- Technical assistance (stewardship planning) and incentives (trees, labor, etc.) for private property owners are other cost-effective ways of improving wildlife habitat.

West Bay Environmental Restoration Assessment (2016)

This project was a collaboration between the Utility, Port of Olympia, Squaxin Island Tribe, and Olympia Parks, Arts and Recreation Department to assess potential habitat restoration and water quality improvement opportunities along the western shore of Budd Inlet. In addition to shoreline restoration concepts, the report included an analysis of potential water quality treatment projects for all areas of Olympia discharging directly to West Bay. This partnership may lead to implementing one or more conceptual projects to improve the condition of the Budd Inlet shoreline in West Bay.

8.4 Challenges

The ability of the Utility to enhance, restore, protect, and steward aquatic habitat is limited by the many pressures that operate at a landscape scale, reliance on individual actions on private property, a complex array of regulations, invasive species, and the dynamic nature of natural systems themselves. The major challenges are summarized here.

Multiple Public/Private Ownership

Habitat is located within a complex landscape of many large and small parcels, public and private ownership, developed and redeveloping neighborhoods, business districts, and industrial uses. The Utility has limited authority and must rely on voluntary programs, education and outreach, and incentives to encourage stewardship on private properties. Habitat quality often relies on the independent choices of many individuals.

Habitat Fragmentation

Habitat fragmentation is a significant problem in urban areas. Large intact habitat areas are important for both wildlife and protection of aquatic resources. These core areas provide nesting/breeding, foraging, and resting habitat for wildlife, and protect water quality and hydrologic functions. The size and relative isolation of

a habitat patch influences what wildlife will use an area and how they use it. Equally important are movement corridors connecting these core habitat areas. Animals need to move to find food, mates, and security from predators. Protected areas around steep slopes, stream corridors, and wetlands often serve as wildlife corridors.

Large habitat areas in Olympia are primarily located on public lands including Priest Point Park, Grass Lake Nature Park, and Watershed Park. The connections between these core areas are located on a mix of private and public property. Maintaining and improving the habitat quality of these areas requires tools and strategies that work across the landscape. See the *Comprehensive Plan* Natural Environment chapter for a map of critical areas and potential wildlife corridors.

Legacy Development and Land Development Pressure

Much habitat has already been destroyed or compromised. Urban development continues to increase impervious surfaces, threatening further loss of forests and wetlands, and curtailing the functions of natural systems. The state Growth Management Act specifically encourages growth and development in already urbanized areas, adding to the challenge of maintaining functional natural systems within the City.

In older developed areas, subdivisions and infrastructure were constructed without stormwater treatment or wetland and stream protection, and without an understanding of how development affects the health and function of wetlands, streams, marine shorelines, and Puget Sound. Retrofits of older neighborhoods with modern stormwater control and treatment systems are a logistical and financial challenge, but are necessary to improve aquatic habitat conditions.

Climate Change

Changing climate in the Pacific Northwest likely will influence aquatic habitats due to warmer temperatures, reduced precipitation in the summer, increased precipitation in other seasons, and a rising sea level. Evolution will continue to guide species and ecosystems toward the most successful strategies, but changes may be occurring faster than their ability to adapt. See Chapter 6, Section 6.4 for details.

Temperatures

Temperatures in the region are expected to continue warming over the coming decades, affecting the range and habitat conditions for many plant and animal species. Increased water temperatures may be affecting the suitability of streams and rivers for cold-water fish. The timing of many biologic processes is being altered. Examples include plant flowering and insect life cycles, availability of food resources, reproductive cycles, and migration of birds and other species. These changes are allowing new invasive plants and animals to become established, further disrupting existing ecosystems.

Hydrology/Precipitation Patterns

Predictions regarding seasonal precipitation patterns include drier summers, less snow in the mountains in the wet season, and increased heavy rain events. These changes would increase wet season flood flows, landslides, and erosion in streams and rivers. Summer stream flows are predicted to be lower with a potential loss of wetlands. All these changes will affect the life cycle of species that depend on aquatic environments.

Sea Level Rise

Increased shoreline erosion and marine bluff landslides caused by sea level rise could have both positive effects (e.g. increased sediment and large wood contributions to nearshore habitats and beaches) and negative effects (e.g. threatening structures and infrastructure). Another likely impact is loss of nearshore saltmarsh and beach habitats in areas where existing infrastructure or other factors prevent the upslope migration of these habitats and/or sufficient sediment supply is not available to allow habitat to adjust.

Ocean Acidification

Much of the carbon dioxide added to the atmosphere is being absorbed into the ocean, increasing its acidity, especially in deep ocean waters. This deeper, more acidic water surfaces in areas of upwelling off the coast of Washington and Oregon and can be brought into Puget Sound with the tides.

More acidic water can affect the ability of shellfish and other marine animals to grow shells. This is already a problem for shellfish farms on the Washington coast and has the potential to affect marine food webs in the ocean and Puget Sound by influencing phytoplankton and zooplankton at the base of marine food webs.



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CHAPTER 9 – CORE SERVICES

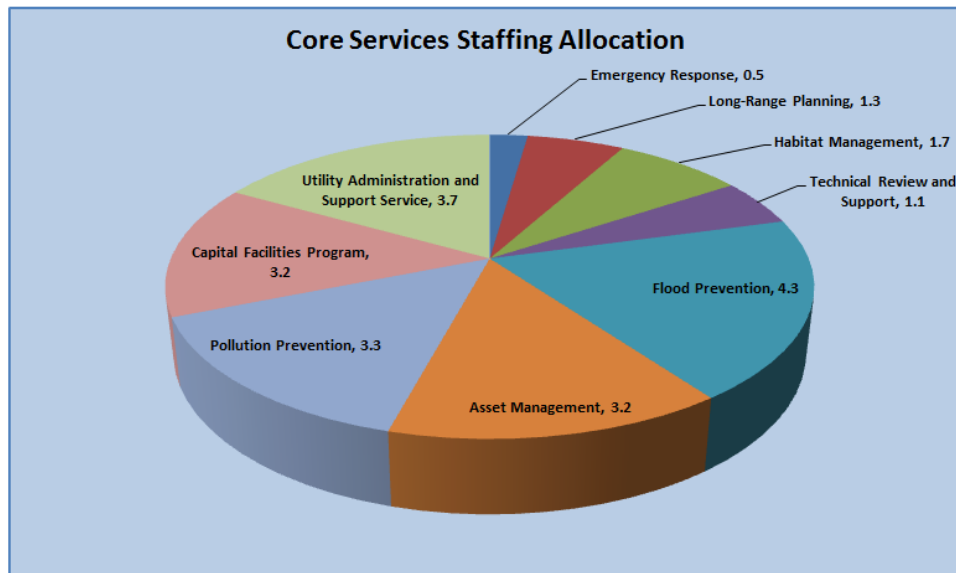
The Storm and Surface Water Utility staff is tasked with the stewardship of the Utility's built and natural environment, with the primary responsibility of reducing the frequency and severity of flooding; improving water quality; and protecting, enhancing, and restoring aquatic habitat. Because of the broad nature of their work, some staff work from the maintenance center, some from City Hall, and some activities are performed by conservation crews throughout the City, the Urban Growth Area and beyond. This chapter describes the core services provided by the Utility. Proposed new and expanded services are described in Chapter 10.

9.1 Overview

In response to new demands on the Utility and organizational changes, the original core services defined in the 2003 Storm and Surface Water Plan have been revised. The nine Utility core services currently are:

- Long-Range Planning
- Asset Management
- Technical Review and Support
- Flood Prevention
- Emergency Response
- Pollution Prevention
- Habitat Management
- Capital Improvements Program
- Utility Administration and Support Service

Figure 9.1 Core Services Staffing Allocation



9.2 Long-Range Planning

The Utility currently dedicates approximately 1.48 FTE to Long Range Planning.

The Long-Range Planning core service is comprised of five primary programs: Storm and Surface Water Plan, Citywide Planning, Water Quality Coordination, Habitat Coordination, and Standard Operating Procedures. These programs are described in the following sections.

Potential changes to these programs, based on strategies to improve the Utility's ability to achieve its goals, are discussed in Chapter 10.

Storm and Surface Water Plan

The *Storm and Surface Water Plan* provides policy, program, and financial guidance to the Utility in planning, managing, operating, maintaining, and improving the built and natural infrastructure. The planning process used to develop an updated Plan brings together staff from throughout the Utility, with input and feedback from the public. The Plan was last updated in 2003, with minor revisions in 2010. See Chapter 1 for more on the planning process.

Citywide Planning

Storm and Surface Water planning staff participates in many citywide planning efforts, including revisions to the Comprehensive Plan and Shoreline Management Plan and county-wide efforts such as revisions to the Urban Growth Area and associated policies. A specific work effort is devoted to the implications of expected sea level rise and tidal flooding in downtown that occurs during extreme high tides. See Chapter 6 for more on sea level rise.

Utility staff also participates in updating the Olympia Municipal Code to ensure stormwater regulations, shoreline master program, and critical area ordinance effectively protect aquatic habitat by remaining consistent with the Storm and Surface Water Plan and any new state or federal stormwater regulations. All new development and redevelopment projects within the City of Olympia are subject to the requirements of the Drainage Design and Erosion Control Manual (DDECM) and the Engineering Design and Development Standards. See Section 9.4 for the Utility's role in review and approval of permits for new and redevelopment projects.

Water Quality Coordination (NPDES/TMDL)

Utility staff is responsible for coordinating the City's compliance with its National Pollution Discharge Elimination System (NPDES) permit and Total Maximum Daily Load (TMDL) requirements.

Coordination of the NPDES permit includes monitoring program development requirements; annually updating the City's Stormwater Management Program (SWMP); coordinating ongoing training requirements and needs; and ensuring that procedures and protocols for specific programs (i.e., Illicit Discharge Detection and Elimination, Education and Outreach, Operations and Maintenance, and construction) are developed and implemented.

TMDL coordination includes participating in the Deschutes TMDL Advisory Group (DAG), coordinating the City's response to TMDL actions, monitoring compliance with conditions related to Henderson Inlet TMDL, and coordinating future compliance requirements for the Deschutes and Budd Inlet TMDLs.

See Chapter 7 for more on these permits.

Habitat Coordination

Collaborating with internal and external partners is critical to effective efforts to restore and enhance aquatic habitat and adapt to climate change. For example, Utility participates in regional work groups like the Alliance for a Healthy South Sound and the WRIA 13 Salmon Recovery process.

Key habitat-related long-range planning tasks are: assessing priorities for restoring and enhancing habitat; assessing potential acquisition and other capital projects; integrating programs among ownership and habitat types; overseeing assessment and monitoring of habitat quality and quantity; planning restoration projects; and targeting outreach programs to make the most efficient use of Utility resources.

Other tasks include overseeing the City's noxious weed control efforts, assisting with other City habitat-related plans and studies; and tracking habitat related code updates.

See Chapter 8 for more detail regarding habitat coordination.

Standard Operating Procedures

The Utility is developing Standard Operating Procedures (SOPs) to enable Operations and Maintenance (O&M) staff to perform their tasks properly and safely. These SOPs will be updated and then reviewed annually for necessary updates. So far, SOPs have been adopted for:

- Capitol Lake Flooding
- Yauger Park Flooding
- Giles Avenue Flooding
- Vactor™ Operations
- Underground Televising and Inspections
- Residential STEP Maintenance
- Wet Well Cleaning
- Sewer Lift Station Checks
- Utility Locate Procedures
- Utility Installations

9.3 Asset Management

The Utility currently dedicates approximately 3.15 FTE to Asset Management.

For several years, Water Resources has been developing an asset management system for the Wastewater, Drinking Water, and Storm and Surface Water utilities. Current asset management practices for the Storm and Surface Water Utility are described below. They include mapping, condition rating and assessment, public and private infrastructure management, water quality and habitat monitoring and evaluation, and data management.

Potential changes to these programs, based on strategies to improve the Utility's ability to achieve its goals, are discussed in Chapter 10.

Mapping

Mapping the stormwater system is fundamental to the Utility's asset management program. Mapping is used to make decisions about infrastructure repairs and upgrades, and planning operations and maintenance activities and schedules. Mapping includes developing an accurate asset inventory that documents the size, age, material type, and other characteristics of each asset. Mapping also maintains a record of impervious surfaces throughout the Utility's service area. Monthly billing of non-residential utility accounts is based on impervious surface coverage. Initial mapping of impervious surfaces was performed in 2015 by a consultant using Light Detection and Ranging (LiDAR), a remote sensing method collected by airplane.

Geographical Information System (GIS)

The Utility uses Geographic Information System (GIS) software from the Environmental Systems Research Institute (ESRI) to document and map the current and future stormwater infrastructure. The GIS platform is used to understand relationships, patterns, and trends, and provides a robust framework for obtaining and storing detailed asset records. It allows the Utility to record several types of data in one place, and to visualize the data geographically for more accurate and complex analyses. Connectivity between stormwater assets (e.g., manholes, catch basins, pipes, outfalls, treatment facilities) allows for analysis of network capabilities. A complete network can identify service areas from a point of reference (e.g. system connections to a catch basin or outfall) or pinpoint capacity problem locations.

Record Drawings and Utility Updates

New Utility infrastructure is mapped using information from construction project record drawings. Utility and topographic mapping updates are performed by Public Works Survey/Mapping. Other updates are performed by Utility engineering and planning staff as field notes and inspections identify changes to Utility infrastructure. As new porous surfaces and LID stormwater facilities are installed, these facilities are mapped and added to the Utility's inventory for ongoing inspection and maintenance.

The Utility's mapping is improving as asset inspections become more detailed and information is recorded in the GIS database. Many GIS layers are connected, but some attributes within these layers are missing (e.g., pipe inverts, catch basin and manhole inverts and sizes). Some layers lack location integrity (e.g., basins and sub-basins). As mapping improves, the stormwater network connections necessary for complex analyses get closer to completion.

This work enables Utility managers to evaluate drainage sub-basins within the City to determine strategic areas where retrofitting Utility infrastructure will result in improved flow capacity or higher water quality treatment. This information can also be used to develop Utility rate structures based on treatment levels.

Permit Requirements

The City is subject to the *2013-2018 Western Washington Phase II Municipal Stormwater Permit*, (Permit) issued by the Washington Department of Ecology (Ecology) under the National Pollutant Discharge Elimination System (NPDES) created under the Clean Water Act. The Permit regulates discharges from the City's municipal separate storm sewer system (MS4). Among other requirements under the Permit, the Utility is charged with mapping several components of its storm infrastructure. At a minimum, the Utility must map and update the following:

- All known City-owned outfalls and discharge points.
- Treatment and flow control facilities operated by the City.
- Tributaries to outfalls and discharge points with 24-inch diameter or larger pipes, or an equivalent cross-sectional area for non-pipe systems.
 - Tributary conveyance type, material, and size where known.
 - Associated drainage areas.
- Land use.
- Receiving waters other than groundwater.
- All connections to the MS4 authorized or allowed by the City after February 16, 2007
- Connections between the MS4 owned or operated by the City and other municipalities or public entities.
- Geographic areas served by the City's MS4 that do not discharge stormwater to surface waters.

All MS4 requirements must be completed by February 2, 2018. Each requirement is included in the Utility's mapping program and is complete to the extent of current electronic records.

The Utility continues to identify stormwater components through historical records and field reconnaissance. As the Utility updates and refines its GIS data, decision makers, program managers, and maintenance crews will continually make more effective and efficient choices regarding asset management.

Condition Rating & Assessment

Assessing the condition of the built infrastructure is necessary to effective asset management and capital planning. The Utility uses condition rating and assessment tools to identify needed maintenance, repair, or replacement of deteriorating infrastructure to minimize flood risks and unanticipated construction costs; and

to mitigate the water quality impacts of stormwater. Proactive asset management allows for maintenance, repairs and replacements at manageable costs before costly emergencies surface.

Analyzing condition assessment data allows the Utility to make accurate life cycle estimates and improve cost efficiency, and reveals system failures that can assist with future infrastructure design.

The Utility's stormwater pipe condition rating program, implemented in 2011, was modeled after the Wastewater Utility condition rating program. It is guided by the Pipeline Assessment and Certification Program (PACP) developed by the National Association of Sewer Service Companies (NASSCO) and accepted as an industry standard.

Methodology

For stormwater gravity mains, the Utility uses closed circuit television (CCTV) technology. Remote tractor-mounted cameras travel inside pipes and send video images to above-ground personnel using Granite XP software. Structural and operational defects and observations are recorded using PACP condition and rating terms in the software. The videos and descriptive data are evaluated and electronically stored.

The Storm and Surface Water Utility contracts televising and conditioning field work, Water Resources televising staff is currently dedicated to condition rating for the Wastewater Utility, but occasionally televise storm pipes as part of a repair, cross-connection or emergency investigation.

Utility crews perform the condition rating and assessment for other facilities, like catch basins, manholes, and treatment and flow control facilities. They use Environmental Systems Research Institute's (ESRI) Collector app and store the data in the GIS for post-inspection processing into work orders as required.

Program Components

Below are the primary components of the Utility's condition rating and assessment program:

- **Inspection.** Locate, identify, and inspect Utility sites, facilities and structures.
- **Investigation.** Respond to internal and external requests to investigate, troubleshoot and problem solve utility location, condition, and illicit connections.
- **Construction Support.** Provide televising support for the construction and repair program.
- **Condition Rating and Assessment.** Condition rate and assess underground infrastructure to determine system condition as well as identify Utility needs and priorities. (Currently performed under contract.)

Criteria Used to Prioritize Televising Activity

To prioritize televising activities, the Utility started with categorizing pipes by size, material, and location. As the program progressed, repair work order and re-televising prioritization procedures were developed. It also became apparent that the most cost-effective approach for televising is by condition rating all pipes within a drainage system. The pipes selected for televising now focus on a drainage basin-wide approach. The following criteria are used to locate priority pipes for televising:

- High consequence/high risk pipes.
- Quantity flow – large pipes.
- Material – ranked by known vulnerability.
- Age – older pipes may be reaching their effective life.
- Location – impact if pipe is compromised, access difficulty, steep slopes, and number of other pipes ranked high in the same drainage system.
- Potential for illicit cross-connections (sanitary sewer discharges to stormwater pipes and surface water).

Pipes that score high for all criteria receive the highest criticality rating. Other assets that score high for one or more criteria are ranked accordingly. The highest ranked pipes are put on the televising list. The drainage basin with the most high-criticality rated pipes becomes a priority televising project and includes all pipes within that drainage system.

Progress to Date

The televising and condition rating objective is 60,000 feet (11.3 miles) per year. Condition rating of all pipes should be complete in 2021.

Over half of the gravity storm system has been televised and conditioned. Early data reveal a significant number of pipes in poor condition. This was expected since high criticality pipes were prioritized for televising first. As the program has matured, the percentage of pipes in poor condition has declined.

Public Infrastructure Management

Operation and maintenance (O&M) of the many stormwater pipes, storage and treatment structures, ditches, ponds, and natural systems is necessary to minimize flooding, improve water quality, and improve aquatic habitat function. Once a Utility asset has been condition rated and/or assessed, a work order is generated to address any needs. This work is done by O&M crews performing one or more of the following activities:

- **Spot Repair and Replacement.** Perform spot repairs and replacement of utility infrastructure as determined by a prioritized condition rating schedule or as assigned by the STOPS Team.
- **Downtown Outfalls.** Consolidate downtown outfalls to improve manageability.
- **Tide Gates.** Install tide gates on downtown outfalls to reduce flood risk.
- **Structure Rehabilitation.** Perform prioritized rehabilitation of stormwater structures to maintain utility function.
- **Habitat Restoration.** Implement restoration activities on sites owned or managed by the Utility.
- **Habitat Management.** Develop and implement habitat management plans on sites owned or managed by the Utility (e.g. riparian area vegetation) to improve habitat and water quality.
- **Integrated Pest Management.** Implement integrated pest management on sites owned or managed by the Utility to manage noxious and invasive species.

Private Infrastructure Management

When private stormwater facilities are built, the infrastructure is incorporated into the Stormwater Geodatabase as part of the record drawing mapping process. The Utility is developing a comprehensive database of all private stormwater facilities. This database will be used to enhance the maintenance inspection program, which is currently limited to facilities that have been built since 2005 (per NPDES permit obligations). An emerging perspective of a core Utility service is to view the natural environment in a manner similar to traditional infrastructure. This work begins with identifying what “assets” exist, and is followed by “condition rating” those assets. Then Utility managers can prioritize these key activities:

- **Facility Inspection.** Inspect residential, commercial, and multi-family stormwater sites, flow control facilities, treatment facilities, and stormwater structures in accordance with NPDES permit requirements.
- **Habitat Stewardship.** Assist landowners with stewardship of private land to improve habitat quality. The idea of working with streams, wetlands and adjacent forests as “natural infrastructure management” is an evolving concept.

Water Quality Monitoring and Evaluation

Intermittent and scheduled monitoring allows the Utility to track the water quality of local stream and contribute to understanding the impacts of stormwater pollution on Budd Inlet and South Puget Sound. The Utility collaborates with Thurston County to sample local streams and contributes funds to a regional monitoring collective that tracks water quality throughout Puget Sound.

See Chapter 7 and Chapter 8 for more information on water quality monitoring and evaluation.

Habitat Monitoring and Evaluation

Streams, wetlands, and riparian areas are habitat for many aquatic and terrestrial species, as well as being part of the “natural infrastructure” that conveys, stores, and treats stormwater runoff. The Utility designs stormwater infrastructure to take advantage of these natural features, while protecting, enhancing, and restoring their habitat functions.

Utility staff can determine priorities for aquatic habitat strategies and capital projects by monitoring habitat conditions and evaluating the data. Monitoring tools include mapping, remote sensing, and sampling of aquatic macroinvertebrates like insects, crustaceans, worm, and clams (Benthic Index of Biologic Integrity or B-IBI, see Chapter 8).

Data Management

As detailed in the previous sections, asset management relies heavily on fieldwork and observation. Fieldwork involves scheduled asset inspections and maintenance, emergency responses, and field investigations to verify location, structures, and condition. The data collected is used to guide and direct the Utility’s maintenance priorities. The Utility’s main operations data is housed in VUEWorks software and used to track work orders.

In 2014 the Utility’s stormwater Operations crew started using ESRI’s Collector app to keep track of inspections, collect field data, signal work orders, and organize emergency responses. Crews retrieve comprehensive information about infrastructure in the field, capture detailed information, note map corrections as they work, and share information in real time between the field and the office.

Currently, the Utility uses Collector apps for catch basin and manhole inspections, public infrastructure inspections, spill response, and emergency hotspot inspections. The data collected is used for analyzing trends, NPDES permit reporting, generating work orders, keeping inspections on schedule, organizing emergency responses, and making map corrections.

The Utility is collaborating with the Drinking Water Utility and Wastewater Utility in searching for new asset management software that can incorporate work orders and field inspections, as well as integrate asset management concepts within the software.

9.4 Technical Review and Support

The Utility currently dedicates approximately 1.15 FTE to Technical Review and Support.

The Technical Review and Support core service is comprised of three programs: Development Review, Internal/External Technical Support, and the Stormwater Operations Problem Solving Team (STOPS). These programs are described in the following sections.

Potential changes to these programs, based on strategies to improve the Utility’s ability to achieve its goals, are discussed in Chapter 10.

Development Review

The Development Review program focuses on stormwater facilities and best management practices for new private development. Staff develops local stormwater regulations for new and modified developments, and works with public and private development to ensure compliance with these regulations. Staff also supports

Olympia's Community Planning and Development Department (CP&D), which is responsible for issuing permits and inspecting developments. The Utility's Stormwater Engineer dedicates approximately 0.4 FTE to Development Review.

Review of Development Plans

New and redevelopment projects applying for land use, engineering, and building permits with CP&D are subject to stormwater design review and must submit a Drainage Control Plan as required by the City's Drainage Design and Erosion Control Manual. The Utility's stormwater engineer is responsible for review and approval of Drainage Control Plans and engineered stormwater facilities for public and private development. The Manual requires development to:

- Establish best management practices for onsite construction and post construction operations to prevent water pollution.
- Remove pollutants from stormwater.
- Reduce the environmental impacts of increased runoff due to urbanization.
- Maintain natural drainage patterns.
- Make low impact development the preferred and most commonly used technique for land development by maximizing infiltration on and minimizing runoff from developed property.
- Encourage groundwater recharge so stream/wetland flows can be adequately maintained year-round.
- Protect wetlands.
- Establish maintenance requirements and responsibilities for stormwater facilities.
- Ensure that stormwater facilities have adequate capacity.

Utility staff also reviews engineering and building applications for single-family residences, and building inspections that address drainage issues on individual lots.

The review of development plans prior to construction helps prevent environmental harm through education and technical assistance to encourage the use of LID techniques, permeable paving, and native vegetation.

Stormwater Manual

Utility staff develops and updates the City's *Drainage Design and Erosion Control Manual*, which is technically equivalent to the Department of Ecology's (Ecology) *Stormwater Management Manual for Washington* (2012 with 2014 revisions). A key change in 2014 was to include requirements for low impact development intended to maximize infiltration on and minimize runoff from developed property. In 2016, Olympia updated its manual to reflect Ecology's new regulations, applying stricter and more complex standards and requiring low impact development.

Engineering Design and Development Standards

Staff also develops and updates the additional design guidelines in Olympia's *Engineering Design and Development Standards*. The standards provide specific guidance for the design and installation of stormwater infrastructure constructed in the right-of-way.

Internal/External Technical Support

In addition to permit review for private development discussed above, Utility staff frequently provides technical expertise for permitting and regulatory support and design of public development. The Public Works Engineering Line of Business often calls upon the Utility's Stormwater Engineer to provide expertise related to stormwater infrastructure design, stormwater modeling, and temporary erosion and sediment control.

Likewise, staff biologists often provide Engineering (and at times CP&D) with expertise related to environmental permitting including:

- Hydraulic Project Approvals administered by the Washington Department of Fish and Wildlife for conducting certain types of work activities in or near the water.
- Clean Water Act 401 water quality certifications administered by Ecology for construction or operation of facilities that discharge to waters of the United States.
- Clean Water Act 404 permits administered by the US Army Corps of Engineers for placement of dredged materials or fill into waters of the United States including wetlands.
- Shoreline substantial development permits administered by Olympia's CP&D for all proposed use and development of land within 200 feet of designated shorelines.
- Olympia's Critical Areas Ordinance for streams and wetlands.

Stormwater Operations Problem Solving Team (STOPS)

The STOPS team investigates, evaluates, and prioritizes storm and surface water related problems – typically involving flooding, water quality, and/or habitat – which are identified by City staff or citizens. The STOPS team maintains an active database of all investigations and recommendations, spanning more than a decade.

Facilitated by the Utility's Stormwater Engineer, the STOPS team is collaboration between Utility Engineering & Planning, Operations, and Environmental Services staff (see Chapter 3, Figure 3.2). The STOPS team also includes Streets Operations staff, since many stormwater issues are associated with runoff from streets. The STOPS team is instrumental in fostering and maintaining working relations among these groups.

Problems often cross public and private properties. Based on its evaluation of the problem, the team assigns staff to either perform needed maintenance and repairs on public property or enforce maintenance and repairs on private property. The Utility's ability to perform work on private property is limited by easements, State laws restricting the gifting of public funds, and liability. In cases where drainage issues occur on private property, Utility staff provides information and assistance to help the property owner solve the problem, first by identifying ways to reduce stormwater runoff, and then by advising them on how to redirect or manage the runoff.

When addressing issues, the Utility strives for timely response to flooding and water quality problems. Response time for relatively minor problems may range from a week to a year, while more complex, regional problems are addressed within three years.

9.5 Flood Prevention

The Utility currently dedicates approximately 4.25 FTE to Flood Prevention. This core service is key to meeting the Utility's goal of reducing the frequency and severity of flooding so hazards are eliminated. This section describes the Utility's efforts to prevent flooding by enlisting public participation, maintaining infrastructure to prevent backups, and preparing for storms.

Potential changes to these programs, based on strategies to improve the Utility's ability to achieve its goals, are discussed in Chapter 10.

Education and Outreach

City ordinance 12.24.040 prohibits raking or blowing leaves from private property into streets. Minor local flooding often results from clogging of drainage systems by leaves and other debris. The "Rake a Drain" program encourages residents to keep grates and catch basins clear of leaves and debris. This effort has proven to be very successful at reducing flood calls and claims during the storm season.

Other efforts include training owners of private stormwater facilities on the proper maintenance and repairs needed to ensure their stormwater system operates as designed.

Stormwater Facility Maintenance

Maintenance of the Utility's infrastructure is important to prevent both flooding and pollution. This effort includes maintenance and repair of pipes, structures, ponds and treatment facilities. The bulk of this work is sediment management and flood prevention. Sediment contains many contaminants and it plugs pipes and catch basins, affecting the ability of ponds and treatment facilities to function as designed. The Utility has a long track record of proactive flood prevention, which has significantly reduced flooding throughout the City. Utility programs aimed at maintaining that track record are:

- **Pipeline Cleaning.** Preventive maintenance that includes routine cleaning of gravity stormwater pipes and support of the construction and repair program.
- **Construction and Repair Program.** Repair and replacement of utility infrastructure as determined by a prioritized condition rating schedule, or as assigned by the STOPS Team.
- **Structure Cleaning.** Preventive maintenance that includes routine cleaning of catch basins, stormwater manholes, treatment and flow control structures, as well as other Utility infrastructure.
- **Pond Maintenance and Rehabilitation.** Pond and facility maintenance as needed to maintain water quality and flow control design function.
- **Ditch Maintenance and Rehabilitation.** Ditch maintenance as needed to maintain water quality and flow design function.
- **Flow Control Facility Maintenance.** Preventive maintenance of flow control facilities including detention/retention ponds, low impact development facilities, and porous surfaces in accordance with NPDES requirements.
- **Treatment Facility Maintenance.** Preventive maintenance of treatment facilities including treatment systems and ponds in accordance with NPDES requirements.

Storm Event Preparation

Standard operating procedures (SOPs) are in place to respond to storm events in flood-prone areas such as Capitol Lake, Yauger Park, and the Giles Avenue Treatment Facility. These SOPs are reviewed and updated frequently.

The Utility also maintains a "Hot Spot" list of areas where localized flooding routinely occurs during storm events. The Utility actively manages these locations and is constantly seeking opportunities to improve the conditions that can cause flooding. Using the ESRI Collector app, stormwater crews document inspections and maintenance performed in these areas.

Unfortunately, engineered or operational solutions can't always prevent natural processes such as beaver activity and seasonal leaf drop. Critical areas prone to flooding can also have human-caused influences such as vandalism and trash dumping. Therefore, during the rainy months it is critical for O&M staff to actively monitor sites most susceptible to flooding.

To ensure their readiness to respond to any emergency, O&M staff routinely maintains the equipment, materials, and skills needed when called upon. Staff is always on the lookout for ways to be better prepared for increased flooding during high tide/rain events, which are expected to become more frequent with climate change and sea level rise. O&M staff have begun addressing maintenance issues, repairs, and small construction projects to proactively respond to anticipated threats to the downtown core. O&M staff anticipates providing the highest level of support to sea level rise mitigation efforts.

When rain events are anticipated the Utility commonly alerts the public using the newspaper, radio, and social media.

9.6. Emergency Response

The Utility currently dedicates approximately 0.5 FTE to Emergency Response. Once a major storm or other emergency occurs, Stormwater Utility staff are among the first responders. This perspective is ingrained in the culture of the Utility. High tides and rain events causing localized flooding happen regularly. Regional emergencies such as snow and ice storms, wind storms, and earthquakes can severely impact essential services citywide. Stormwater Utility planning, engineering, and O&M staff all play a role in Utility-specific as well as overall Public Works emergency response.

Potential changes to these programs, based on strategies to improve the Utility's ability to achieve its goals, are discussed in Chapter 10.

Storm Event Response

During storm events in October and November, it is common for the entire storm/sewer operations crew, as well as the entire streets operations section, to be deployed around town using every available resource to remove leaf litter and debris. These activities include bypass pumping and sandbagging, as well as road closures.

In the downtown core, much of the Utility's infrastructure is combined with the sanitary sewer. During periods of intense runoff or flooding, the combined flow can exceed the capacity of the LOTT Clean Water Alliance Budd Inlet Treatment Plant, resulting in sewage discharge or combined sewer overflow. Preventing this is a very high priority, so the Utility prepares by temporarily sealing catch basin and manhole lids to reduce stormwater runoff access to the combined sewer.

Rain events, high tides, low barometric pressure, and other environmental factors all contribute to flooding in the downtown core. When downtown areas are at risk of flooding, operations staff routinely coordinates with State Department of Enterprise Services staff responsible for monitoring and controlling Capitol Lake water levels.

Whenever possible, Utility staff notify property owners in advance, either in person or by phone. During the event, the Utility uses every resource available to minimize property damage. During storm events, City crews routinely use Twitter to provide up-to-the-minute updates of flood conditions, as well as traditional communication methods such as knocking on doors.

Emergency Response Plan

Stormwater Utility staff provides key organizational support of the Public Works All Hazards Plan. This plan gives an overview of Public Works' approach to emergency operations. It details emergency response policies, describes the response organization, and assigns tasks. Its goal is to provide for public life, health, and safety and to restore essential services to the community.

9.7 Pollution Prevention

The Utility currently dedicates approximately 3.25 FTE to Pollution Prevention. This core service is key to meeting the Utility's goal of improving surface water quality. Programs include Education and Outreach, Illicit Discharge Prevention and Investigation, Spill Response, Street Sweeping, and Solids Management.

Potential changes to these programs, based on strategies to improve the Utility's ability to achieve its goals, are discussed in Chapter 10.

Education and Outreach

Education and outreach activities include those related to non-point pollution, spills, and illicit discharges into the municipal stormwater system (MS4). The City's municipal sewer permit prohibits non-stormwater discharges into the MS4.

Non-Point Pollution – General Education

The top five toxic chemicals in Puget Sound are petroleum, zinc, lead, total Polycyclic Aromatic Hydrocarbons (PAH), and copper (ranked by total releases in tons/year). The sources for most of these can be linked to residential non-point sources such as motor vehicle use and maintenance, wood stoves and fireplaces, roofing materials, and some pesticides.

Residential non-point pollutant loads are difficult to reduce because they are created by large numbers of people, across large areas, whom may or may not be using Best Management Practices (BMPs) that could intercept or mitigate the downstream release of these toxins.

Focused Education

As required by the City's municipal stormwater permit, the Utility's education and outreach program recommends specific actions to minimize pollution problems. Once a pollution source has been identified, a focus group is selected to build general awareness and effect behavior change; for example using environmentally friendly lawn-care practices to reduce the use of chemical lawn fertilizers, and participating in activities such as stream teams, storm drain marking, volunteer monitoring, and pledges. The program measures the understanding and adoption of a specific behavior for a focused audience and uses the results to direct education resources and evaluate changes in adoption of the behavior.

Other focused efforts include:

- Directing outreach to specific business types, land use types, and/or geographic locations that have a higher risk as sources of pollutants reaching a stream, wetland, or lake without treatment.
- Offering technical assistance, support, and training on the City's temporary erosion and sediment control inspection and enforcement program.
- Developing and implementing Stormwater Pollution Prevention Plans (SWPPPs) for equipment and storage facilities owned or managed by the City to ensure that best management practices are followed.

Illicit Discharge Prevention

In addition to increasing awareness and involvement of the public, the Utility provides illicit discharge prevention training for its staff. Training includes spill identification and response, Certified Erosion and Sediment Control Lead (CESCL) training, Road Maintenance training, field application of best management practices (BMPs), and BMPs for in-water work.

The Utility has conducted various studies and analysis to assist in prioritizing Illicit Discharge Detection and Elimination (IDDE) work efforts. This body of work has helped identify areas that require targeted outreach, maintenance and repairs, capital improvements, and more detailed investigations. These studies are summarized in the *2010 GIS Basin Analysis*.

Illicit Discharge Investigation

Illicit discharges and connections to the municipal stormwater system (MS4) are identified through citizen reporting, inspections, and observations reported by City staff. The Utility responds to illicit discharges the same as any other emergency. Response times are 15 minutes during business hours and one hour during non-business hours. Standard Operating Procedures for illicit discharges/spills are followed to minimize public or environmental health and safety.

Illicit connections to the MS4 are not common. However, once identified an "all hands on deck" approach to investigate, correct, and communicate is performed to minimize current and future risks to public and environmental health and safety.

Spill Response

Utility O&M crews are charged to respond, clean up, document, and report spills of contaminants that enter the MS4. This duty is shared with Wastewater Utility O&M staff, as well as the Transportation O&M section. The Utility's spill hotline operates 24 hours per day, seven days per week. Spill kits have been installed in all Utility fleet vehicles.

City employees and citizens are encouraged to contact Public Works Dispatch (360-753-8333) if they witness a spill or any suspicious discharge into the City's stormwater system, streets, ditches, streams, or wetlands.

Stormwater Facility Inspection and Maintenance

Untreated or poorly treated stormwater runoff is the most significant source of water pollution in urban areas. Properly maintaining treatment facilities and conveyance systems helps to prevent pollution by moderating flows and removing sediments and other pollutants from stormwater before they enter water bodies. For an inventory and description of these facilities, see Chapter 4, Section 4.2. Water quality impacts are discussed in Chapter 7.

Storm Ponds and Treatment Facilities

The Utility's storm ponds are inspected annually as required by the City's National Pollutant Discharge Elimination System (NPDES) permit. Stormwater ponds that are identified as not functioning to as-built conditions are placed on a priority maintenance schedule. These facilities are then properly cleaned during the dry season. The Utility also maintains a growing list of treatment structures that are inspected yearly and maintained as needed. Maintenance involves removing sediment using a Vactor™ truck, excavator, or other means and can involve soil and vegetation restoration as well.

Private Stormwater Systems

The City's NPDES permit requires the private storm systems constructed since 2005 to be inspected annually and to be maintained per the adopted maintenance standards. Additionally, several hundred private storm systems were constructed prior to 2005. The primary objective of the program is to ensure compliance with the NPDES permit by ensuring 100% of the post-2005 systems are inspected and maintained by the private property owners. A secondary objective as time allows is to expand the number of inspections to include older systems, especially those with maintenance agreements and/or systems with a more critical need for maintenance (i.e., those using compost filters).

Catch Basins

The City's NNPDES permit requires inspecting and cleaning each catch basin at least once every two years. Beginning in 2014, the Utility began a strategic approach to catch basin inspections that documents structure condition and measures sediment deposits in each catch basin.

As required, the Utility inspects and cleans each catch basin every two years, except those within the snow route sanding path, which are inspected and cleaned annually. During each inspection, a vacuum/jetter truck removes the sediment and transports it to the Utility's maintenance facility.

Sediment has been measured and cleaned from nearly all the Utility's publicly owned catch basins (some catch basins have been missed due to mapping errors). As this program continues, basin and sub-basin sediment trends should emerge. Staff can then develop routes for street sweeping to remove sediment before it enters catch basins. Collecting sediment before it enters a catch basin reduces maintenance costs and prevents sediment from entering the MS4.

Street Sweeping

Street sweeping has been demonstrated to be one of the most cost effective means of reducing pollutants in stormwater runoff. The Utility and the Transportation line of business split funding of the street sweeping

program. The Utility uses a high efficiency regenerative air sweeper for deeper cleaning. Zonar, an online fleet management system, records real-time vehicle movement along with other operating parameters. The sweeper's GPS data is imported into a GIS database and mapped to display the streets swept and the streets that have not been swept.

The current sweeper schedule is designed to target downtown and arterials with bike lanes and then complete other streets by sweep zone on a rotating basis. The sweeper program tracks lane miles swept and tons of material removed, and tests the waste for pollutants once a year. As sediment trends arise from the catch basin program, the sweeper route is adjusted accordingly.

Solids Management

The Utility collects, removes and disposes of more than 400 tons of sediment annually from maintenance of treatment facilities, overhaul of stormwater ponds, and catch basin cleaning. This material is stored under cover at the City's central maintenance facility in an area that allows the solids to settle. The wet material is periodically turned, and the liquids drain into the sanitary sewer system. When dry, the solids are hauled to an approved solid waste facility for proper handling and disposal.

This process is labor intensive and expensive. As maintenance management strategies focus on sediment removal, disposal costs are expected to increase.

9.8 Habitat Management

The Utility currently dedicates approximately 1.7 FTE to Habitat Management.

Managing aquatic and related habitat functions in Olympia's urban landscape is challenging. These resources are subject to pressure from frequent human disturbance, and changes in hydrology and water quality from stormwater runoff, invasive species, and lack of natural disturbances. Examples of these impacts include increased high flows and erosion from runoff of impervious surfaces, ivy overtaking native vegetation in forested stream buffers, disturbance and feces from domestic animals, and changes in the depth and variability of water levels in wetlands.

This core service is key to meeting the Utility's goal of protecting, enhancing, and restoring aquatic habitat functions. Primary programs are Education and Outreach, Stewardship Planning, Restoration and Enhancement, Noxious Weed Coordination, and Collaboration with Partners.

Potential changes to these programs, based on strategies to improve the Utility's ability to achieve its goals, are discussed in Chapter 10.

Education and Outreach

Protecting and enhancing habitat citywide depends on an informed public motivated to make positive changes in the community. The Utility hopes that widespread awareness of how fish, wildlife, and people depend on streams, wetlands, lakes, shorelines, and adjacent forests will lead to a stewardship ethic and support for habitat and water quality protection.

Federal, State, and City laws and regulations protect most aquatic habitats to some degree. The Utility supplements these regulations by offering information, technical assistance, and incentives to private landowners with aquatic habitats on their property.

Activities include workshops about habitat enhancement techniques, lectures about local wildlife and aquatic habitats, citizen science monitoring, volunteer opportunities, and general environmental education for adults and school age children. The Utility publishes and distributes information about managing invasive species, native plants, aquatic habitat function and values, and improving yards for wildlife and pollinators. The Utility also offers technical assistance to public and private landowners. Incentives for participating private landowners with aquatic habitat may include free habitat assessment and enhancement recommendations, free native trees and shrubs, and/or a few hours of labor to perform habitat enhancements or invasive species

control. These incentives provide public benefits by increasing stewardship of local aquatic resources, which can improve water quality local surface waters and improve habitat for local wildlife.

Citizen Science/Volunteer Activities on Public Lands

The Cities of Olympia, Lacey, and Tumwater and Thurston County, jointly manage a Stream Team program that offers education, outreach, and volunteer opportunities to the public. This partnership began in 1990 as a way for local governments to involve citizens in watershed planning. The Utility supports this partnership by providing staff and sharing financial costs of the program with the other jurisdictions.

Organizing volunteers in a combination of citizen science and on-the-ground action projects is a great way to increase general knowledge of the function and values of aquatic and related habitats and understanding of how urbanization and personal choices impact these areas.

Stream Team organizes many free habitat workshops, volunteer planting and restoration events, and citizen science opportunities (e.g. water quality monitoring and wildlife surveys).

Education/Technical Assistance for Public and Private Landowners

Some aquatic habitat is on land owned and managed by the City (parks, rights of way, stormwater facilities), but much of it is owned and managed by other organizations and private citizens. In addition to regulatory protection, providing information, technical assistance, and incentives to these landowners can directly benefit aquatic habitat health.

Education about the function and value of aquatic habitats can help property owners understand the reason for environmental regulations. Technical assistance can help them manage their property to maximize habitat value; for example, by controlling noxious and invasive weeds, improving riparian vegetation structure and diversity, and increasing shade on streams. These efforts are branded as OlyWild, rolled out as a pilot project in 2016, and planned for expansion in future years.

Stewardship Planning

Protecting and enhancing ecosystem function begins by assessing the condition of vulnerable habitats on City-managed property, other publicly managed sites, and private lands. Utility staff does this with a combination of remote sensing, on-the-ground surveys, reference sites, and historical information. They use this information to document habitat conditions, make recommendations, and develop stewardship plans to protect, enhance, and restore the function of key critical areas and aquatic habitat. Assessing beaver activity and flood risk while maintaining habitat and water quality benefits is one component of stewardship planning.

Restoration and Enhancement

The Utility works with public (and at times private) landowners on a variety of restoration and enhancement projects. For example, managing invasive species and planting appropriate native species in wetlands and streamside forests enhances and maintains the structure and function of these areas. Introducing logs or large woody debris into a stream helps filter nutrients and sediment from surface runoff; reduces erosion; and provides refuge for aquatic species, shade to moderate water temperatures, and nutrients for aquatic food webs. Tree planting to create a diverse community of native forest species helps ensure resiliency and provides food sources and homes for native wildlife and pollinators. More intensive structural projects such as culvert replacements are included in the capital facilities core service.

Aquatic Habitat Monitoring

Tracking the quantity and quality of Olympia's aquatic and upland habitats is a key stewardship task. Utility staff uses the best available science, methods, and tools to collect data relevant to water quality, flood management, natural hydrologic function, and habitat for native plants and wildlife. Assessment at various scales and level of detail (from parcels to watersheds and citywide) are developed using a range of data

collection techniques, including aerial photography and other remote sensing, and site specific monitoring plots of forestry, vegetation, and special habitat feature data.

Noxious Weed Coordination

Utility staff works coordinates citywide efforts to comply with County weed board requirements, working with County weed staff. This involves managing data on known locations of specific species, tracking treatments, and ensuring compliance with applicable local, State, or federal regulations.

Collaboration with Partners

Utility staff collaborates with other departments, community groups, outside agencies, and tribes on habitat protection, stewardship, enhancement, and restoration efforts. These include stream, riparian, wetland, and shoreline enhancement and restoration efforts; fish passage retrofits; identifying and acquiring important habitat areas or easements; and climate change/sea level rise planning and adaptation.

9.9 Capital Improvements Program

The Utility dedicates approximately 3.15 FTE to the Capital Improvements Program.

The Utility's capital facilities are publicly funded construction projects designed to minimize flooding, maintain or improve water quality, and protect or enhance aquatic habitat. Capital facilities are the public infrastructure that collects, conveys, stores, and treats stormwater as it flows through Olympia. In recent years, capital facilities projects have also included land acquisition, habitat restoration, and revegetation to mitigate human impacts to the natural "infrastructure." See Chapter 4 for a description of the built and natural infrastructure and Chapter 11 for additional information on the Capital Improvements Program.

Capital facilities are the most visible of the Utility's services. For capital projects, Utility funds support hydrologic evaluation, engineering design, construction management, stormwater planning, and administration. Typical capital facilities projects include:

- Stormwater pipe systems
- Regional stormwater pond (flow control) facilities
- Curbside and regional treatment facilities
- Fish ladders and culvert replacements
- Stream bank and channel stabilization
- Revegetation and acquisition of sensitive areas

Capital facilities projects are financed through Utility rates, general facilities charges (paid by new development for connecting to and utilizing existing City stormwater systems), fee-in-lieu charges (for new developments that do not provide on-site stormwater management facilities), loans, and occasionally grants. Projects are approved initially by the Utility Advisory Committee and ultimately by City Council in the annual update of the six-year Capital Facilities Plan. Capital facility projects are funded on a pay-as-we-go basis, but alternatives such as public works trust fund loans and bonding with low interest rates are also considered.

See Chapter 11 for capital projects recommended in this Plan.

Flooding: Reducing the Frequency and Severity of Flooding

In the past, most of the Utility's capital projects were associated with correcting flooding problems. The Utility was originally created to reduce flooding. Many major flooding problems have been corrected through the Capital Improvement Program, but many more still persist. Flooding is typically associated with under capacity stormwater conveyance systems (pipes and ditches). These problems are addressed by either increasing the conveyance capacity or constructing regional ponds to control peak runoff flows. Repairs to damaged pipes also insure conveyance capacities are maintained.

As sea levels rise, downtown Olympia grows more vulnerable to flooding. The Engineered Response to Sea Level Rise identified a complete menu of projects to adapt the downtown stormwater drainage system to sea level rise. These projects include installation of tide gates, consolidation of downtown stormwater outfalls and eventually construction of stormwater pumping stations.

Water Quality: Pollution Prevention and Treatment

The Utility strives to construct at least one capital project each year to provide water quality treatment where none currently exists. The Utility applies to Ecology for grant funding for these retrofit projects. The Utility takes into account existing stormwater infrastructure, drainage basins, land uses, roadway classifications, traffic volumes, and constructability when prioritizing retrofit projects. The 2010 GIS Basin Analysis supports prioritizing projects in the Budd Inlet, Capitol Lake, Moxlie Creek and Indian Creek basins. Areas with higher intensity land uses and higher traffic volumes are also prioritized.

Aquatic Habitat: Protection, Enhancement, Restoration

Capital projects address a variety of habitat issues. Culvert replacements or retrofits provide fish passage and increase access and connectivity for fish and other aquatic life. Stream bank or channel stabilization projects prevent erosion and protect downstream habitats or adjacent infrastructure. Acquisition of parcels containing key wetlands, stream segments, and/or riparian areas can protect wildlife habitat, water quality, and hydrologic functions of remaining natural aquatic habitats. Assessment of habitat conditions and restoration of native forest and vegetation communities adjacent to streams, wetlands, and marine shoreline may also rise to the level of capital projects. Habitat related capital projects may involve collaboration with other City departments, like Parks, Arts, and Recreation, or external partners like nonprofit organizations, other jurisdictions, agencies, or Tribes.

9.10 Utility Administration and Support Services

The Utility currently dedicates approximately 3.72 FTE to Administration and Support Services.

The Administration and Support core service is comprised of three primary programs: Budgeting, Staff Management, and Support Services. Potential changes to these programs, based on strategies to improve the Utility's ability to achieve its goals, are discussed in Chapter 10.

Budgeting

The Utility develops Operating and Capital Facilities budgets and sets rates annually. Budgets and rates are reviewed and approved by the Utility Advisory Committee and City Council. Utility revenues and expenditures are forecast out approximately five years. When possible, staff pursues grant and low interest loan opportunities to fund the Utility's efforts.

Staff Management

Staff Management focuses on the tasks associated with leading and managing staff. This includes developing programs, work planning, reporting accomplishments, and staff training. Program managers also facilitate and coordinate staff meetings among the Utility's Planning and Engineering, Operations, and Environmental Services sections, as well as other Public Works Lines of Business, City departments, and other agencies (see Chapter 3, Section 3.2).

In addition to the management programs described below, hiring, training, and equipping new employees are significant management responsibilities. Hiring and retaining high quality employees continues to be a Utility priority.

Performance & Employee Development Plan (PEDP)

The PEDP process clearly identifies responsibilities and expectations for each individual staff member as part of an annual work planning process. The plan includes metrics that measure staff performance relative

to the Utility's Goals, Objectives, and Strategies. Training and professional development are another key component of each PEDP. Training and safety benchmarks are done by job classification with cross-training encouraged once minimum standards are met. Each PEDP includes direct reference to the Public Works Departments Mission, Vision, and Values.

Safety Monitoring and Training

The Utility has an active safety program guided by the City's Safety Coordinator. A safety committee meets monthly to monitor and discuss ways to improve safety. The committee reviews accidents or near misses as well as new training opportunities and regulations. Monthly training keeps employees up to date on changes in industry practice in areas such as blood-borne pathogens, confined space, excavations, lock out/tag out, respiratory protection, and hazard communications. Regular emergency response training keeps staff up to date on current procedures. The following certifications are required for O&M and some field staff to perform their essential responsibilities safely:

- Driver's License
- CDL, Class A with tanker endorsement (by job classification)
- Confined Space Training
- Competent Person Training
- First Aid, CPR Training
- Flagging Certificate
- Cranes, Hoists, and Rigging
- Asbestos Abatement

Technical Training

Maintenance, inspection, and repair of Utility infrastructure require staff to be trained on specific Utility processes and best management practices. The following training and certification programs provide the technical expertise staff needs to maintain a high level of service:

- Pipeline Assessment and Certification Program (PACP)
- Manhole Assessment and Certification Program (MACP)
- Certified Erosion and Sediment Control Lead (CESCL)
- Low Impact Development Training
- Illicit Discharge Detection and Elimination (IDDE) Training
- Spill Response Training
- FEMA/First Responder Training

Leadership Training

Providing the highest level of core services to the community takes a great team. That team starts with good leadership, and good leadership takes hard work and commitment. As some people retire, it is important to prepare new leaders to carry the torch. The following trainings provide the foundation for future leaders within the Utility:

- The Northwest Public Works Institute and American Public Works Association (APWA) provide training opportunities for future leaders working in the public works field. Utility leaders are encouraged to complete the 90-hour Public Works Supervision and Management program.
- The Washington Cities Insurance Authority provides many training opportunities free of charge for participating agencies. The following WCIA courses are recommended for developing current and future leaders:
 - Building Supervisory Skills 101

- Building Supervisory Skills 201
- Building Supervisory Skills 301
- Employment Law for Supervisors

Support Services

Utility support staff provides a variety of administrative services. These include support for developing the annual budget, communications and outreach, legal requests, meeting setup, correspondence, recruiting and training new staff, and more typical secretarial tasks. In addition, the Utility dedicates 0.575 FTE to managing work orders, entering data, and purchasing parts and materials for the operation and maintenance of Utility infrastructure.



Chapter 10 –Strategies

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CHAPTER 10 – STRATEGIES

This chapter contains the strategies the Utility intends to pursue during the next ten years to protect the community from flooding, improve water quality, and protect and enhance aquatic habitat. The strategies support and complement both program services and capital projects. Planned capital projects are detailed in the Capital Improvement Program, Chapter 11.

Many of the strategies proposed in this chapter represent a continuation of the Utility’s existing core services as described in Chapter 9, while others represent an enhancement of these core services.

In this Plan, “goal”, “objective”, and “strategy” have the following meanings:

- **Goal:** Broad, qualitative statements of what the Storm and Surface Water Utility intends to achieve.
- **Objective:** Specific, measurable statements of what will be done to achieve the goals within a certain time frame.
- **Strategy:** General approaches or methods for achieving objectives and resolving specific issues. Strategies speak to the question: “How will we go about accomplishing our objectives?”

The goals, objectives, and strategies presented here offer a roadmap for the Utility. This roadmap was prepared to address the challenges faced by the Utility as described in Chapters 6 through 8 and as summarized in Table 10.1. The chapter concludes with the Utility’s implementation plan.

10.1 Goals and Objectives

During the next ten years, the Utility will focus on achieving the goals and objectives listed on the next page.

10.2 Key Challenges Facing the Utility

Although the Utility has made considerable progress in its first 30 years to address flooding, improve water quality, and enhance aquatic habitat, many challenges remain. Table 10.1 summarizes the key known challenges the Utility must address in the next ten years. For more details on these challenges and “Why” they are important to address, see Chapters 6-8. Table 10.1 also identifies the goals and strategies planned to meet the challenges. The strategies themselves are detailed in Section 10.3, and capital projects are outlined in Chapter 11.

Storm and Surface Water Utility Goals and Objectives

Goal 1 Reduce the frequency and severity of flooding so hazards are eliminated.	
Objective 1A	Improve the stormwater system in areas that are vulnerable to flooding.
Objective 1B	Prepare for emergency response during storm events.
Objective 1C	Mitigate the effects of urban stormwater runoff by implementing low impact development techniques.
Objective 1D	Plan for the anticipated impacts of sea level rise.
Goal 2 Improve surface water quality.	
Objective 2A	Prioritize source control of pollution citywide.
Objective 2B	Retrofit stormwater treatment in areas of the City with little or no water quality treatment.
Objective 2C	Educate the community about water quality with emphasis on how people can be a part of the solution.
Objective 2D	Partner with other agencies, jurisdictions, and organizations in order to leverage water quality planning projects.
Objective 2E	Comply with all federal and state permits and regulations.
Goal 3 Protect, enhance, and restore aquatic habitat functions provided by wetlands, streams, lakes, marine shorelines, and riparian areas.	
Objective 3A	Protect intact aquatic habitat from degradation.
Objective 3B	Enhance aquatic habitat that is already impaired.
Objective 3C	Restore degraded aquatic habitat to increase ecosystem function.
Objective 3D	Participate in and give technical support to City and regional environmental planning efforts and implementation projects.
Objective 3E	Increase community awareness of aquatic habitat function and benefits through outreach, education, and volunteer activities.
Goal 4 Ensure reliable functioning of the built and natural stormwater infrastructure.	
Objective 4A	Develop and implement an asset management program for the built and natural infrastructure.
Objective 4B	Design and construct infrastructure to ensure reliable, cost effective function.
Objective 4C	Further develop and implement the Utility's private and public stormwater system inspection programs.
Objective 4D	Continue to improve maintenance management, including preventive maintenance, repairs, and replacements.
Goal 5 Manage Utility finances responsibly and recover costs equitably.	
Objective 5A	Set rates that reflect financial policies and recover the cost of providing services to customers in each category.
Objective 5B	Manage Utility rates and connection fees consistent with the City's guiding principle of growth paying for growth.
Objective 5C	Use debt financing responsibly to support needed capital facility investments and "smooth" rate impacts.

Table 10.1 Key Challenges Facing the Utility

Challenges		Strategies to Address the Challenges							
General Challenges									
Equitable and Predictable Rates and Fees	Goal 2: Improve Water Quality	2-9							
	Goal 5: Manage Finances Responsibly	5-1	5-2	5-3	5-4	5-5	5-6	5-7	
Legacy Development	Goal 1: Reduce Flooding	1-1							
	Goal 2: Improve Water Quality	2-8	2-12	2-19					
Reliance on Choices by Individuals	Goal 1: Reduce Flooding	1-4	1-6						
	Goal 2: Improve Water Quality	2-1	2-6						
	Goal 4: Ensure Reliable Functioning	4-10							
Land Development Pressure	Goal 1: Reduce Flooding	1-2	1-9	1-14	1-15	1-16	1-17		
	Goal 2: Improve Water Quality	2-16	2-21						
	Goal 4: Ensure Reliable Functioning	4-6	4-16						
Climate Change and Sea Level Rise	Goal 1: Reduce Flooding	1-11	1-12	1-13	1-18				
	Goal 2: Improve Water Quality	2-13							
	Goal 3: Protect Aquatic Habitat	3-1							
	Goal 4: Ensure Reliable Functioning	4-17							
Flooding Challenges									
Asset Management	Goal 1: Reduce Flooding	1-3	1-8	1-10					
	Goal 2: Improve Water Quality	2-5	2-7	2-20	2-23				
	Goal 4: Ensure Reliable Functioning	4-1	4-2	4-3	4-4	4-5	4-7	4-9	4-12
		4-13	4-15	4-18	4-19	4-20	4-21	4-22	4-24
		4-25	4-26	4-27	4-28	4-29	4-30		
Limitations of Low Impact Development	Goal 1: Reduce Flooding	1-5	1-7						
	Goal 4: Ensure Reliable Functioning	4-23							
Water Quality Challenges									
Increasing Permit Requirements	Goal 2: Improve Water Quality	2-2	2-3	2-4	2-11	2-17	2-18	2-22	
	Goal 4: Ensure Reliable Functioning	4-8	4-11	4-14					
Reliance on the Public for Nonpoint Pollution Prevention	Goal 2: Improve Water Quality	2-1	2-15						
Aquatic Habitat Challenges									
Multiple Public/Private Ownership	Goal 3: Protect Aquatic Habitat	3-4	3-6	3-12	3-13	3-14	3-16		
Habitat Fragmentation	Goal 2: Improve Water Quality	2-10	2-14						
	Goal 3 Protect Aquatic Habitat	3-2	3-3	3-5	3-9	3-10	3-11	3-15	
Legacy Impacts of Urban Development	Goal 3: Protect Aquatic Habitat	3-7	3-8						

10.3 Continuation and Enhancement Strategies

After analyzing existing conditions (Chapters 6-8) and developing goals and objectives, Utility staff crafted strategies to achieve Plan objectives and meet key challenges. The Utility proposes two types of strategies: those that continue the Utility's existing core services and those that enhance existing services.

Many of the Plan's strategies and capital projects address multiple objectives. For example, maintaining properly functioning stormwater infrastructure can both reduce flood hazards and improve water quality; a habitat restoration capital project can also be an opportunity for public education and outreach. All strategies do, however, influence how the Utility will deliver its core services into the future.

Strategies and Core Services

Table 10.2 is an index of Plan strategies, identifying whether they are continuations and/or enhancements of the Utility's nine core services, which are identified in the following key:

Storm and Surface Water Utility Core Services Key					
AM	Asset Management	FP	Flood Prevention	PP	Pollution Prevention
CFP	Capital Facility Program	HM	Habitat Management	TR	Technical Review
ER	Emergency Response	LRP	Long Range Planning	UA	Utility Admin

The Capital Facilities Program (CFP) outlined in Chapter 11 describes the projects planned for the next 20 years.

Table 10.2 Storm and Surface Water Plan Strategies

Strategies		Enhance	Continue
Goal 1 – Reduce the frequency and severity of flooding so hazards are eliminated			
1-1	Identify conveyance capacity problems in the City system. Develop a priority ranking procedure for correcting flooding issues.	CFP	FP
1-2	Evaluate possibilities for regional, City-owned detention facilities and support design and construction where determined feasible through basin planning.	CFP FP	
1-3	Evaluate existing public stormwater detention facilities for effectiveness and potential improvements.	CFP FP	
1-4	Provide information to customers to help investigate and solve drainage issues at their homes or businesses.		TR
1-5	Ensure public and private development complies with the City of Olympia Drainage Design and Erosion Control Manual.		TR
1-6	Provide public education and outreach on how to reduce stormwater runoff.		FP
1-7	Develop post-construction inspection and maintenance capabilities for public stormwater facilities. Focus should be on LID implementation, staffing, and training.	FP	
1-8	Map impervious and pervious surfaces and track implementation of LID stormwater facility installations.		AM
1-9	Encourage use of permeable paving materials and native vegetation in Public Works construction projects.		TR
1-10	Consolidate downtown outfalls to improve manageability.	FP CFP	
1-11	Install tide gates on downtown outfalls to reduce flood risks.	FP CFP	
1-12	Consider separation of storm drainage from combined sewers to protect wastewater treatment plant (LOTT).	FP CFP	

Strategies		Enhance	Continue
1-13	Develop structural alternatives to mitigate long-term or projected sea level rise impacts.	FP CFP	
1-14	Provide emergency response training to staff.		FP ER
1-15	Respond in a timely manner to emergencies with adequate resources.		FP ER
1-16	Coordinate with other City departments, agencies and local entities to be prepared for emergencies.		FP ER
1-17	Partner with Planning & Engineering, Olympia Fire Department, State and local agencies to develop and implement emergency response plans in the downtown core.		FP ER
1-18	Perform inspections, maintenance, repairs, and installations of Utility infrastructure in anticipation of sea level rise.		PP
Goal 2 – Improve surface water quality			
2-1	Provide education and outreach about water quality with emphasis on how to reduce or eliminate behaviors and practices that contribute to negative stormwater impacts.		TR PP
2-2	Support the City's temporary erosion and sediment control inspection and enforcement program.	TR	PP LRP
2-3	Maintain and improve the program to address illicit discharges, including spills and illicit connections.	PP	
2-4	Adopt regulations that expand and simplify enforcement of illicit discharges.	LRP	
2-5	Develop a street sweeping program focused on improving water quality. (See also Strategy 4-26.)	PP	
2-6	Develop a business pollution prevention program that includes coordination with adjacent jurisdictions.	PP	
2-7	Map and evaluate drainage sub-basins to determine their level of water quality treatment and help prioritize projects that will provide higher levels of water quality treatment.		AM
2-8	Develop a program to evaluate and prioritize retrofits of existing untreated pollution generating infrastructure.	CFP	PP
2-9	Develop a rate structure to incentivize retrofitting private stormwater systems to provide higher levels of water quality treatment.	UA	AM LRP
2-10	Continue to monitor the health and water quality of City streams and lakes.		PP
2-11	Ensure stormwater pollution prevention plans (SWPPPs) are developed and implemented for all heavy equipment and/or material storage facilities owned or operated by the City.	PP	AM LRP
2-12	Develop and implement a plan to identify and evaluate onsite septic systems in priority watersheds (Indian, Moxlie, and Mission).	PP	
2-13	Coordinate with the LOTT Clean Water Alliance to evaluate options for providing higher levels of water quality treatment, particularly in coordination with consolidation of the stormwater conveyance system associated with sea level rise.	LRP	
2-14	Develop and implement an integrated pest management plan in coordination with other City departments.	LRP HM	
2-15	Update annually Olympia's Stormwater Management Program (SWMP) to document the City's plan for ongoing compliance with the Western Washington Phase II Municipal Stormwater Permit.		PP
2-16	Enforce Olympia's Drainage Design and Erosion Control Manual.	TR	
2-17	Provide technical assistance to other City departments to ensure ongoing permit compliance.		TR
2-18	Participate in development of Total Maximum Daily Loading (TMDL) plans and implement resulting required actions.	PP	LRP
2-19	Ensure inspection and maintenance standards for private and public stormwater treatment facilities are being met.	AM PP	TR
2-20	Develop sediment tracking program for management of sources through maintenance activities (street sweeping, ponds, catch basin, ditch maintenance, etc.)	PP	

Strategies		Enhance	Continue
2-21	Investigate sources of pollutants of concern citywide.		PP
2-22	Respond, document and report spills in a timely manner.		TR PP
2-23	Develop a pollution prevention training and tracking program for field staff with responsibilities in Illicit Discharge Detention and Elimination (IDDE)/Spills, Erosion Control, and O&M.	PP	
Goal 3 – Protect, enhance, and restore aquatic habitat functions provided by wetlands, streams, lakes, marine shorelines, and riparian areas (Chapter 8).			
3-1	Collaborate with other agencies, tribes, and community organizations to support stream, riparian, wetland, and shoreline enhancement and restoration, fish passage, and adaptation to climate change/sea level rise.	HM LRP CFP	
3-2	Collaborate with other departments to develop a comprehensive integrated pest management strategy to guide noxious weed control and vegetation management efforts.	HM LRP	
3-3	Develop and implement vegetation and habitat management plans for City-owned properties containing aquatic and associated habitat to improve habitat, protect water quality, and support native species.	HM LRP	
3-4	Identify and acquire important habitat areas or easements (collaborating with internal and external partners).	HM LRP	CFP
3-5	Identify and manage invasive species in aquatic and associated habitats to protect habitat and water quality functions.	HM LRP	AM
3-6	Identify important corridors and support efforts linking important habitats across the City and adjacent jurisdictions.	AM LRP	
3-7	Identify, prioritize, and implement aquatic habitat protection and enhancement opportunities by watershed to enhance and restore ecosystem function (i.e. implement the <i>Habitat Stewardship Strategy</i>).	LRP	HM
3-8	Influence and assess effectiveness of City regulations that protect aquatic resources (e.g. Critical Areas Ordinance and Shoreline Master Program).	LRP	
3-9	Manage beaver activity to provide habitat and water quality benefits while mitigating flooding risk.	LRP FP	HM
3-10	Manage vegetation in riparian areas in order to improve habitat and water quality functions.	HM	AM
3-11	Monitor aquatic habitat quality and quantity based on the best scientific information, methods, and tools available.	LRP HM AM	
3-12	Participate in regional planning to support salmon and Puget Sound recovery (e.g. WRIA 13 and Alliance for a Healthy South Sound).		LRP
3-13	Provide outreach and education to the community around aquatic habitat, wildlife and ecosystem function (wetlands, streams, marine shoreline, lakes, buffers and associated wildlife).	HM	
3-14	Provide focused outreach, technical assistance and incentives to private properties containing aquatic and associated habitats, while promoting voluntary stewardship.	HM LRP TR	
3-15	Provide technical support to City projects with aquatic permitting requirements (e.g. CWA 401/404 and HPA) or that are specifically habitat related.		TR LRP
3-16	Support partners and community efforts to protect, steward, and restore aquatic and associated habitats.	LRP HM TR CFP	
Goal 4 – Ensure reliable functioning of the built and natural stormwater infrastructure.			
4-1	Continue to maintain and improve mapping/geodatabase.		AM
4-2	Continue pipe condition rating program.		AM FP
4-3	Continue catch basin and manhole inspection and cleaning program.		AM PP

Strategies		Enhance	Continue
4-4	Develop a natural infrastructure asset management program	AM HM	
4-5	Provide operational support and feedback to engineering staff regarding location, function, constructability and maintenance of Utility infrastructure improvements.		CFP
4-6	Require development to construct stormwater infrastructure in compliance with the <i>Olympia Drainage Design and Erosion Control Manual</i> and the <i>Engineering Design and Development Standards</i> .		TR
4-7	Design and plan the Utility's capital improvements to complement natural infrastructure.	CFP HM	
4-8	Comply with NPDES permit requirements.		PP
4-9	Develop SOPs for inspections preventive maintenance and correction programs	LRP	
4-10	Enhance public outreach and education for stormwater system functions, operations and maintenance.		PP FP
4-11	Develop enforcement capabilities (facilities to be maintained for the design purpose) in Olympia Municipal Code (OMC).	LRP	
4-12	Develop level of service standards for public stormwater facilities.	AM	
4-13	Monitor resources through work order system and identify any additional needs.	AM	
4-14	Expand inspections beyond NPDES permit requirements.	PP TR	AM
4-15	Keep current with training as new technologies and techniques emerge.		UA
4-16	Update emergency response processes and procedures regularly.		ER
4-17	Develop and implement a sea level rise response plan. Use the best available science and the experiences of other communities in formulating plans for sea level rise. Partner with government entities and key stakeholders. Engage the community in a discussion of various sea level rise scenarios, how the City will respond to lessen the impact and costs.	LRP FP	
4-18	Annually update the Storm and Surface Water component of the City's <i>Capital Facilities Plan</i> .		CFP
4-19	Develop a priority ranking system for proposed capital projects.	CFP	
4-20	Integrate data-based decision making processes into section programs.		AM
4-21	Develop CCTV program to provide long term condition rating, investigation, and emergency response.	AM	
4-22	Continue cleaning and inspection program.		AM FP
4-23	Transition vegetation and LID maintenance programs from Environmental Services to Stormwater Operations.	HM FP	
4-24	Develop and implement field-based data collection tools for public and private stormwater utility infrastructure.	AM	FP PP
4-25	Implement basin approach to utility infrastructure maintenance with an emphasis on sediment management.	AM	FP PP
4-26	Implement a street sweeping program to remove sediment before it enters the stormwater system. (See also Strategy 2-5.)	AM	
4-27	Perform stormwater system repairs and maintenance based on utility wide priorities.		AM FP
4-28	Manage sediment in a manner that complies with applicable regulations and is done in a cost-efficient manner.		PP
4-29	Identify essential training and safety benchmarks by job classification.		UA
4-30	Develop employee training program to meet training and safety benchmarks by job classification.		UA
Goal 5 – Manage Utility finances responsibly and recover costs equitably			
5-1	Continue the capital funding strategy that utilizes existing resources from reserves and general facility charges first before relying on debt financing.		UA
5-2	Pursue grants and state low-interest loans when available.		UA

Strategies		Enhance	Continue
5-3	Perform operations and maintenance of utility infrastructure in a fiscally thoughtful and strategic manner which reflects positively on the utility.		UA
5-4	Evaluate alternative rate structures and pursue implementation if found beneficial.		UA
5-5	Develop incentives for stormwater retrofit.		UA
5-6	Coordinate regular rate studies with the City's other water resources utilities, so that the full impact of rate increases on customers is considered and rates are equitably distributed to customers		UA
5-7	Review general facilities charges regularly to ensure that they accurately and equitably distribute system costs to new development and are adjusted for inflation.		UA

Storm and Surface Water Utility Core Services Key					
AM	Asset Management	FP	Flood Prevention	PP	Pollution Prevention
CFP	Capital Facility Program	HM	Habitat Management	TR	Technical Review
ER	Emergency Response	LRP	Long Range Planning	UA	Utility Admin

Enhancement Strategies

For strategies that represent an enhancement of the Utility's core services, details of "How" the strategy could be implemented, including cost assumptions and a level of priority, are presented in the following pages.

Full implementation of many of the enhancement strategies will require additional resources; others will require redeployment of existing resources (i.e. staff) to a new priority.

For details on the strategies representing a continuation of the Utility's core services, see Chapter 9 for descriptions of "How" the Utility implements its core services and programs.

STRATEGY 1-1 Identify conveyance capacity problems in the City system. Develop a priority ranking procedure for correcting flooding issues		
CORE SERVICES: Capital Facilities Program, Flood Prevention		
Currently, conveyance capacity problems are identified empirically through observations or reported incidents during major storm events. The Utility proposes modeling key sub-basins to identify existing and future flow capacity problems. Implementation of this strategy will require temporarily redirecting a portion of the Stormwater Engineer's time and purchase of software.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding (CFP)	<0.1 FTEs annually to conduct analysis. - This cost estimate reflects software purchase and licensing.	\$5,000
Priority Level: Medium Regulatory Requirement: No		

STRATEGY 1-2 Evaluate possibilities for regional, City-owned detention facilities and support design and construction where determined feasible through basin planning.		
CORE SERVICES: Flood Prevention, Capital Facilities Program		
The Utility has historically looked for opportunities to construct regional stormwater facilities like the Yauger Park, Black Lake Meadows, the Auto Mall facilities and the Taylor Wetlands facilities that serve large sub-basins. Regional facilities are best located in the lower portion of a sub-basin, near outfalls to surface water. Staff continually looks for regional opportunities, but the strategy will benefit from a formalized basin planning approach. Implementation of this strategy will require hiring a consultant and redirection of a portion of the Stormwater Engineer's time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding (CFP)	<0.1 FTEs annually. - This cost estimate reflects consultant fees, though grant funding may be applicable.	\$100,000
Priority Level: Low		
Regulatory Requirement: No, but the Permit encourages basin planning		

STRATEGY 1-3 Evaluate existing public stormwater detention facilities for effectiveness and potential improvements.		
CORE SERVICES: Flood Prevention, Capital Facilities Program		
Many of the City's stormwater flow control facilities were constructed prior to current modeling best management practices. This strategy will evaluate older facilities to determine whether modifications to the outlet could better optimize flow control (flood prevention). If public or environmental benefits can be documented, the Utility could extend this strategy to private facilities. Implementation of this strategy will require redirection of a portion of the Stormwater Engineer's time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding (CFP)	<0.1 FTEs annually.	Pending
Priority Level: Low		
Regulatory Requirement: No		

STRATEGY 1-7 Develop post-construction inspection and maintenance capabilities for public stormwater facilities. The focus should be on LID implementation, staffing, and training.		
CORE SERVICES: Flood Prevention		
New LID regulations and development standards are expected to result in the construction of significant quantities of new LID infrastructure within the public right-of-way. In 2016, an Operations and Maintenance (O&M) impact analysis was completed as part of the LID code amendment process. This analysis determined that the Utility will need to expand staffing and equipment within the O&M Division to meet the operational demands created by new LID facilities. The impact analysis estimated that an additional 0.5 FTE will be required each year to support LID inspection and maintenance. Much of this work will be performed by seasonal staff, however supervision and year-round operational support is also needed. The Utility will also evaluate contracting for these services.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Stormwater Facility Maintenance (including vegetation management) (FP)	1.0 FTE – Maintenance II (2018) 1.0 FTE – Maintenance II (2020) 1.0 FTE – Maintenance I (2023) 1.0 FTE – Maintenance I (2025)	- Med. Pick-Up Truck (Starting 2019, \$7,500 annually) - Med. Pick-Up Truck (Starting 2020, \$7,500 annually) - Med. Pick-Up Truck (Starting 2023, \$7,500 annually) \$25,000/yr increase seasonal labor starting 2026
Priority Level: High		
Regulatory Requirement: Yes (NPDES)		

STRATEGY 1-10 Consolidate downtown outfalls to improve manageability.		
CORE SERVICES: Flood Prevention, Capital Facilities Program		
Currently, more than 100 stormwater outfalls connect the downtown drainage system with Budd Inlet and Capitol Lake. Backflow of water up several of the outfalls can result in flooding of low-lying areas. Consolidation of outfalls will reduce the number of outfalls needing to be managed. As sea levels rise, this will become increasingly important. Eventually, key outfalls will require construction of pumping stations to prevent flooding of downtown.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding (CFP)	<0.1 FTEs annually. - Costs were identified in the <i>Engineered Response to Sea Level Rise</i> (2010).	\$7,800,000
Sea Level Rise (FP)	3 FTEs – Eventually, a citywide program will be needed to address adaptation to sea level rise. It is expected the Utility will play a role in this program.	Pending
Priority Level: Low		
Regulatory Requirement: No		

STRATEGY 1-11 Install tide gates on downtown outfalls to reduce flood risks.		
CORE SERVICES: Flood Prevention, Capital Facilities Program		
Currently, more than 100 stormwater outfalls connect the downtown drainage system with Budd Inlet and Capitol Lake. Backflow of water up several of the outfalls can result in flooding of low-lying areas – some several times a year. Installation of tide gates will help prevent backflow of water. As sea levels rise, this will become increasingly important.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding (CFP)	<0.1 FTEs annually	\$600,000
Sea Level Rise (FP)	3 FTEs – Eventually, a citywide program will be needed to address adaptation to sea level rise. It is expected the Utility will play a role in this program.	Pending
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 1-12 Protect wastewater treatment plant (LOTT) from combined sewer flooding.		
CORE SERVICES: Flood Prevention, Capital Facilities Program		
Currently, more than 120 catch basins connected to the combined sewer system and the wastewater treatment plant are susceptible to inundation in a 100-year flood. Inundation by marine water could kill biological activity in the plant. As sea levels rise, this risk will increase. Through the sea level response planning process, the Utility will work with the LOTT Clean Water Alliance to identify projects and practices that can protect the wastewater treatment plant. Implementation of this strategy will require redirection of a portion of the Stormwater Engineer's time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding (CFP)	<0.1 FTEs annually. - This strategy is assumed to be funded by the LOTT Clean Water Alliance.	Pending
Sea Level Rise (FP)	3 FTEs – Eventually, a citywide program will be needed to address adaptation to sea level rise. It is expected the Utility will play a role in this program.	Pending
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 1-13 Develop structural alternatives to mitigate long-term or projected sea level rise impacts.		
CORE SERVICES: Flood Prevention, Capital Facilities Program		
As sea levels rise, the risk of downtown flooding will increase. Modifications to the stormwater drainage system alone will not prevent flooding. Structural barriers like levees and sea walls will become necessary. Through the sea level response planning process, the Utility will work with the LOTT Clean Water Alliance and the Port of Olympia to identify projects.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Sea Level Rise (FP)	3 FTEs – Eventually, a citywide program will be needed to address adaptation to sea level rise. It is expected the Utility will play a role in this program. Costs were identified in the <i>Engineered Response to Sea Level Rise</i> (2010). Costs will be shared with the LOTT Clean Water Alliance, the Port of Olympia, and the State Department of Enterprise Services.	\$54,500,000
Priority Level: Medium Regulatory Requirement: No		

STRATEGY 2.2 Support the City's temporary erosion and sediment control inspection and enforcement program.		
CORE SERVICE(s): Technical Review, Pollution Prevention, Long Range Planning		
The City's pollution prevention program continues to refine itself in reducing erosion and sediment discharges on construction sites. Utility staff will work collaboratively with internal departments and staff in helping to establish guidelines and procedures to ensure elements of the NPDES permit are being met. This includes defining roles and responsibilities, developing standard operating procedures (SOPs), amending code language for clarification, providing technical support and identify training opportunities. Development of a construction stormwater education and outreach campaign targeted at the building community will help encourage voluntary compliance of sediment management on construction sites.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Technical Expertise In-house and Out (TR)	Will require reallocation of 0.05 FTE's to work closely with plans examiners, inspectors, and enforcement staff to understand work flow, shortfalls, and develop SOPs	Pending
Illicit Discharge Prevention (PP)	Will require reallocation of 0.05 FTE to provide periodic training of staff to ensure compliance with NPDES permit requirements.	Pending
WQ Coordination (LRP)	Will require reallocation of 0.05 FTE to Develop guidelines, procedures, and code language	Pending
Education and Outreach (PP)	Will require reallocation of 0.25 FTE (for 2-3 years) to develop a construction stormwater campaign utilizing social marketing analysis, focus groups, and marketing materials.	Pending
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 2-3 Maintain and improve the program to address illicit discharges, including spills and illicit connections.		
CORE SERVICE: Pollution Prevention		
The City will continue to operate a spill complaint hotline (both phone number and e-mail). Staff will respond to and investigate complaints and/or field observations of discharges. Typically, discharges are classified as one-time spills, illegal dumping, illicit connections, or illicit discharges. Depending on the classification and severity of the discharge, staff will respond by investigating the sources of the discharge, providing prevention education, providing technical assistance, taking corrective actions, and/or referring to the appropriate agency for follow up action. For discharges that threaten the Municipal Separate Storm Sewer System (MS4), or Waters of the State, Utility crews will be mobilized to contain and/or clean up as appropriate. The program scope and priority are expected to expand and largely be driven by requirements within the City's NPDES permit and the Henderson and Deschutes TMDL's.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Illicit Discharge Investigation (PP)	▪ Pending	Pending
Illicit Discharge Prevention (PP)	▪ Pending	Pending
O&M Spill Response (PP)	▪ Pending	Pending
Education and Outreach (PP)	▪ Pending	Pending
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 2-4 Adopt regulations that expand and simplify enforcement of illicit discharges.		
CORE SERVICE: Long Range Planning		
Currently, the Utility relies upon agreements established with new development to enforce pollution source control and maintenance of stormwater facilities. This method is problematic for developments built before maintenance agreements were required. Specific maintenance regulations and procedures for escalating enforcement also need to be developed.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding and Water Quality Coordination	▪ 0 FTE – This strategy will develop an enforcement ordinance and should not increase long-term workloads.	Pending
Priority Level: High Regulatory Requirement: Yes		

STRATEGY 2-5 Develop a street sweeping program focused on improving water quality.		
CORE SERVICE: Pollution Prevention		
Currently, although the Utility funds half of the program, the Transportation line of business manages the street sweeping program. Street sweeping has been demonstrated to be one of the most cost effective means of reducing pollutants in stormwater runoff. With a focus on water quality, the Utility proposes to play a greater role in management of street sweeping. Proposed improvements include: • Monitoring sweeping routes using Fleet’s existing and available GPS tracking • Tracking miles swept, tons of sediment collected, and street coverage as performance metrics • Developing manageable daily sweeping routes to ensure citywide sweeping coverage • Pursuing more cost effective means of responsibly disposing of street wastes This strategy will redirect a portion of a senior program specialist’s staff time and complements Strategy 4-26.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Street Sweeping (PP)	▪ 0 to 1 FTEs – Costs assume program enhancement costs will initially be 75% grant funded.	Pending
Priority Level: High Regulatory Requirement: No		

STRATEGY 2-6 Develop a business pollution prevention program that includes coordination with adjacent jurisdictions.		
CORE SERVICE: Pollution Prevention		
A business pollution prevention program will be incorporated into ongoing education and outreach programs being developed by the regional Stream Team’s Stormwater Outreach Group. Education will be targeted toward businesses with the greatest polluting potential based on the type of business and/or the highest risk of pollutants reaching a receiving water body without treatment. The program scope and priority are expected to expand and largely will be driven by requirements within the City’s NPDES permit, the Henderson TMDL, and the Deschutes TMDL.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Education and Outreach (PP)	Pending	Pending
Illicit Discharge Prevention (PP)	Pending	Pending
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 2-8 Develop a program to evaluate and prioritize retrofits of existing untreated pollution generating infrastructure.		
CORE SERVICE: Capital Facilities Program, Pollution Prevention		
The Utility has evaluated all arterial and collector roadways taking into account existing level of water quality treatment, traffic counts, pollution generating impervious surfaces, zoning and drainage basins. This enhancement will formalize the process for prioritizing retrofits taking into account cost efficiency and constructability. The Utility proposes to use “Envision,” a comprehensive framework of sustainability criteria that address a full range of environmental, social, and economic impacts to sustainability in project design, construction, and operation. Implementation of this strategy would require temporarily redirecting a portion of the Stormwater Engineer’s time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Water Quality (CFP)	▪ <0.1 FTEs annually.	Pending
Priority Level: High Regulatory Requirement: Possibly a Deschutes TMDL requirement		

STRATEGY 2-9 Develop a rate structure to incentivize retrofitting private stormwater systems to provide higher levels of water quality treatment.

CORE SERVICES: Utility Administration, Long Range Planning, Asset Management

Currently, the Utility has a three-tier rate structure for non-residential stormwater utility accounts. The tiers are categorized by year of construction. The Utility proposes to revise the rate structure based on the level of stormwater management provided (greater stormwater management gets a lower rate). The intent will be to provide existing developed properties with incentives to retrofit and provide a higher level of stormwater management. The rate structure will be developed in coordination with the Utility's financial consultant, FCS Group.

PROGRAM	COST ASSUMPTION	COST ESTIMATE
Budgeting (UA)	0 FTE – This strategy will develop a new rate structure and should not increase long-term workloads.	\$0
Water Quality Coordination (LRP)	0 FTE – This strategy will develop a new rate structure and should not increase long-term workloads.	\$0
Mapping (AM)	1 FTE for six months, this strategy requires auditing impervious surfaces and infrastructure associated with utility accounts.	\$0

Priority Level: Medium

Regulatory Requirement: No

STRATEGY 2.11 Ensure stormwater pollution prevention plans (SWPPPs) are developed and implemented for all heavy equipment and/or material storage facilities owned or operated by the City.

CORE SERVICE(s): Pollution Prevention, Asset Management, Long Range Planning

Two SWPPPs have been developed and implemented for City Facilities. One is for the Maintenance Center (MC) and the other for Priest Point Park Maintenance Facility. As operations and maintenance activities continue to expand, a need for updated SWPPPs will be necessary. An assessment of existing heavy equipment and/or material storage facilities is warranted to determine current and future planning requirements.

PROGRAM	COST ASSUMPTION	COST ESTIMATE
Illicit Discharge Prevention (PP)	0.0 FTE Periodic training of staff to ensure compliance with SWPPP site facility requirements.	Pending
Mapping (AM)	Temporary reallocation of .05 FTE's to complete and update mapping on an as-needed basis.	Pending
WQ Coordination (LRP)	Temporary reallocation of .05 FTE's for 3-6 months to perform site assessments, analysis, and development of SWPPPs.	Pending

Priority Level: Medium

Regulatory Requirement: Yes (NPDES)

STRATEGY 2-12 Develop and implement a plan to identify failing onsite sewage systems and cross-connections.		
CORE SERVICE: Pollution Prevention		
This strategy will improve the existing protocol for illicit discharge detection and elimination (IDDE) fecal coliform investigations. The protocol will establish a decision-making process and standard procedures for source investigations when a sample indicates an exceedance of the water quality standards. Implementation of this strategy will require redirection of a portion of the IDDE investigator's time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Illicit Discharge Investigations (PP)	<0.1 FTE – Costs assume increased sampling	\$1,000 annually
Priority Level: Medium		
Regulatory Requirement: Yes (NPDES and TMDL)		

STRATEGY 2-13 Coordinate with the LOTT Clean Water Alliance to evaluate options for providing higher levels of water quality treatment, particularly in coordination with consolidation of the stormwater conveyance system associated with sea level rise.		
CORE SERVICE: Long Range Planning		
The downtown stormwater drainage system will need to be modified to adapt to sea level rise. Modifications may include revising combined sewer sub-basins. An example would be separating the South Capitol neighborhood combined sewer sub-basin and exchanging it for an equivalent or smaller downtown combined sewer sub-basin. This strategy could alleviate conveyance capacity problems in the South Capitol neighborhood and improve water quality treatment in higher traffic commercial areas downtown. The strategy will be considered in coordination with the LOTT Clean Water Alliance, through the sea level response planning process.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Sea Level Rise (FP)	3 FTEs – Eventually, a citywide program will need to be developed to address adaptation to sea level rise. It is expected the Utility will play a role in this program.	Pending
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 2-14 – Collaborate with other departments to develop a comprehensive integrated pest management strategy to guide noxious weed control and vegetation management efforts.		
CORE SERVICE(s): Long Range Planning, Habitat Management		
The NPDES municipal permit requires the City to implement practices, policies and procedures to reduce stormwater impacts associated with the use of pesticides and herbicides and using more environmentally friendly alternatives. The Utility has also taken on coordination of legally mandated noxious weed management citywide and control work on Public Works managed sites and ROW. Collaboration with other city departments and programs to develop a coordinated citywide integrated pest management strategy will meet regulatory and environmental needs.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Implementation of this strategy will require dedicated staff time to manage the coordination and planning process. Implementation is possible by permanently funding and retasking the Habitat Planner position	Pending
Noxious Weed Coordination (HM)	Use of maintenance or seasonal workers to implement weed control work may require additional staffing. Potential reimbursement by other programs will offset the majority of these costs.	Pending
Priority Level: Medium Regulatory Requirement: Yes		

STRATEGY 2-16 Enforce Olympia's Drainage Design and Erosion Control Manual.		
CORE SERVICE: Technical Review		
Although the Utility currently implements and enforces the <i>Drainage Design and Erosion Control Manual</i> , Utility staff anticipates that new low impact development practices adopted in the 2016 Manual will require additional staff time for education, review, and inspection. Implementation of this strategy will require temporarily redirecting a portion of the Stormwater Engineer.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Development Review (TR)	0.25 FTE – Combination of review and inspection services.	Pending
Priority Level: Medium Regulatory Requirement: Yes		

STRATEGY 2-18 Participate in development of Total Maximum Daily Loading (TMDL) plans and implement resulting required actions.		
CORE SERVICES: Long Range Planning, Pollution Prevention		
The Henderson TMDL, completed in 2007, includes several conditions and allocations that have since been incorporated into the City's NPDES permit as specific requirements. The "Deschutes TMDL" has been a long-running analysis of the Deschutes River, Percival Creek, Capital Lake, Budd Inlet and Budd Inlet tributaries. The process culminated in the first phase of a Water Quality Improvement Report and Implementation Plan (draft published in April 2015). Staff participated in the development of this document and responded during public comment with a lengthy evaluation of the City's concerns. This draft has been forwarded to the Environmental Protection Agency for review and approval. It is still under review. When/if approved by the EPA, Ecology will incorporate conditions and allocations into specific requirements that will be included in the issuance of the City's next NPDES permit. At minimum, staff expects specific impacts to require the re-direction of staffing resources and possibly staffing enhancements in illicit discharge investigations, illicit discharge prevention, and education and outreach. The second phase of the Deschutes TMDL, which includes nutrients and covers the marine waters of Budd Inlet, is currently underway. Staff continues to participate in the public process and are preparing to provide written comments as appropriate. The specific impacts are not known, but if implemented through this process the nutrient waste load allocations could result in significant fiscal impacts to the Utility.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Water Quality Coordination (LRP)	Pending	Pending
Illicit Discharge Investigation (PP)	Pending	Pending
Illicit Discharge Prevention (PP)	Pending	Pending
Education and Outreach (PP)	Pending	Pending
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 2-19 Ensure inspection and maintenance standards for private and public stormwater treatment facilities are being met.		
CORE SERVICE(s): Technical Review, Pollution Prevention, Asset Management		
The Utility is currently conducting inspections on all public stormwater facilities and audits to all private stormwater facilities constructed after 2005. Requirements for maintenance are provided in the Drainage Design and Erosion Control Manual. New low impact development (LID) standards adopted in 2016 are anticipated to increase the need for inspection and maintenance of facilities such as bio-swales, porous pavement and pervious concrete features.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Technical Expertise (TR)	0 FTE, This strategy will not increase workloads.	\$0
Public Storm Infrastructure Management (AM)	? FTE, This strategy will require a phased increase in inspections of facilities.	Pending
Private Storm Facility Management (AM)	? FTE, This strategy will require a phased increase in inspections of facilities.	Pending
O&M Cleaning (PP)	? FTE, This strategy will require a phased increase in maintenance of public sites and increase in workloads.	Pending
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 2-20 Develop sediment tracking program for management of sources through maintenance activities (e.g., street sweeping, maintenance of ponds, catch basins, ditches).		
CORE SERVICES: Pollution Prevention		
Sediment with the potential of impairing water quality is collected through street sweeping, catch basin cleaning, and pond, ditch and treatment facility maintenance. Currently, the quantity of sediment removed through maintenance activities is not tracked. This strategy will develop a means of tracking sediment removed by each maintenance activity. This strategy will redirect a portion of a senior program specialist's staff time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Solids Management (PP)	▪ 0 FTE	Pending
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 2-23 Develop WQ pollution prevention training and tracking program for field staff with responsibilities in Illicit Discharge Detection and Elimination (IDDE)/Spills, Erosion Control, and O&M.		
CORE SERVICE(s): Pollution Prevention		
Pollution prevention training for municipal field staff is currently being conducted on an as-needed basis and is tracked through sign-in sheets.		
Utility staff have been participating on a steering committee with other municipal permit jurisdictions to develop training tailored to field staff. This training will include the development of private & public stormwater facilities inspections, spill response and clean up and LID infrastructure inspection & maintenance.		
Refinement of a more advanced data management system for tracking staff training will be developed.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Illicit Discharge Prevention (PP)	▪ 0 FTE, This strategy will require hiring of a contract consultant to provide training. As well development of a data management system for training tracking purposes.	Pending
Priority Level: High		
Regulatory Requirement: Yes, NPDES Permit		

STRATEGY 3-1 Collaborate with other agencies, tribes, and community organizations to support stream, riparian, wetland, and shoreline enhancement and restoration, fish passage, and adaptation to climate change/sea level rise.		
CORE SERVICES: Capital Facilities Program, Long Range Planning, Habitat Management		
Collaboration with other entities is a key aspect of improving local aquatic habitat conditions and planning for long-term climate changes. This work requires staff to attend various meetings, communicate with potential collaborators, and facilitate cooperative projects with partners. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	▪ Reallocation of CFP funds to operating budget to support new Habitat Planner position. (.05 FTE starting in 2018)	Pending
Collaboration (HM)	▪ Reallocation of CFP funds to operating budget to support new Habitat Planner position.	Pending
Aquatic Habitat (CFP)	▪ Continue to fund the WCC and potentially habitat improvement infrastructure projects (e.g. culvert retrofit projects) via the CFP	(See Strategy 3.03)
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 3-2 Collaborate with other departments to develop a comprehensive integrated pest management strategy to guide noxious weed control and vegetation management efforts.

CORE SERVICES: Long Range Planning, Habitat Management

The NPDES permit requires the City to implement practices, policies, and procedures to reduce stormwater impacts associated with the use of pesticides and herbicides, and to use more environmentally friendly alternatives. The Utility also coordinates legally mandated noxious weed management on Public Works-managed sites and rights of way. Collaboration with other City departments and programs to develop a coordinated citywide integrated pest management strategy will meet regulatory and environmental needs. This enhancement will permanently staff the habitat management program piloted in 2014.

PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Requires dedicated staff time to manage coordination and a planning process. Implementation is possible by permanently funding and retasking the habitat planner position (0.05 FTE).	Pending
Collaboration (HM)	Use of maintenance or seasonal workers for weed control may require additional staffing. Reimbursement by other programs may offset most of these costs.	Pending

STRATEGY 3-3 Develop and implement vegetation and habitat management plans for City-owned properties containing aquatic and associated habitat to improve habitat, protect water quality and support native species.

CORE SERVICES: Long Range Planning, Habitat Management

The City owns and manages diverse properties that contain significant aquatic habitat. On these sites, the Utility has the most direct ability to steward, protect, and enhance ecosystem function and values. Management of these sites is primarily the responsibility of Public Works and Parks Departments. Management requires collecting information on aquatic resources; developing prioritized recommendations; and implementing enhancement actions.

PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Coordination, prioritization and assessments are possible with the reallocation of CFP funds to operating budget to support new Associate Planner (habitat) and Program Specialist (Wildlife Biologist) positions. (0.4 FTE starting in 2018)	Pending
Stewardship Planning (HM)	Implementation of the recommendations from plans will require coordination by the planner and contract crew to perform the work (WCC or similar).	\$150,000

Priority Level: High?

Regulatory Requirement: No

STRATEGY 3-4 Identify and acquire important habitat areas or easements (collaborating with internal and external partners).		
CORE SERVICES: Long Range Planning, Habitat Management, Capital Facilities Program		
Additional analysis to prioritize and coordinate acquisition and easement programs will ensure the most efficient use of limited funds to protect ecosystem function. The focus will be on wetlands, streams, riparian areas, and shoreline that provide important hydrologic and habitat ecosystem services. Partnership opportunities will be critical to leverage limited funds. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Analysis and prioritization supported by Associate Planner (habitat) funded with reallocation of CFP funds to operating budget. (0.05 FTE starting in 2018)	Pending
Collaborate with Partners (HM)	Coordination supported by Associate Planner (habitat) funded with reallocation of CFP funds to operating budget.	Pending
Priority Level: Medium?		
Regulatory Requirement: No		

STRATEGY 3-5 Identify and manage invasive species in aquatic and associated habitats to protect habitat and water quality functions.		
CORE SERVICES: Long Range Planning, Habitat Management, Asset Management		
Invasive species are widespread in urban environments; they reduce native plant diversity and can affect aquatic habitat function. This category includes widespread non-native species (e.g. ivy, blackberry, holly, and bullfrogs). The Utility will seek to reduce negative impacts of these species in City-managed aquatic habitats and buffers and provide outreach and information to raise residents' awareness of negative impacts and best management practices. The existing asset management core service supports ongoing efforts to manage these species in public stormwater facilities. (See Strategy 3-3 for actions related to legally mandated noxious weed control.) This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Associate Planner (habitat) funded with reallocation of CFP funds to operating budget and existing outreach and education staff (0.05 FTE starting in 2018)	Pending
Restoration and Enhancement (HM)	Coordination by the planner and crew to perform the work (WCC or/or seasonal employees).	Pending
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 3-6 Identify important corridors and support efforts linking important habitats across the City and adjacent jurisdictions.		
CORE SERVICES: Long Range Planning, Asset Management		
Critical areas and buffers (e.g. stream corridors, wetlands, and steep slopes) often provide habitat corridors for many wildlife species. Identifying these linked areas, crossing multiple public and private properties, will help guide management to support the movement, breeding, and foraging requirements of various species. Other efforts may identify projects or best management practices to support wildlife movement across busy roads or other infrastructure. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Associate Planner (habitat) funded with reallocation of CFP funds to operating budget and existing staff support (0.05 FTE starting 2018)	Pending
Habitat Monitoring and Evaluation (AM)	Associate Planner (habitat) funded with reallocation of CFP funds to operating budget	Pending
Priority Level: Medium or low?		
Regulatory Requirement: No		

STRATEGY 3-7 Identify, prioritize, and implement aquatic habitat protection and enhancement opportunities by watershed to enhance and restore ecosystem function (i.e. implement the Habitat Stewardship Strategy).		
CORE SERVICES: Long Range Planning, Habitat Management		
Habitat challenges and opportunities exist in all Olympia watersheds. The 2013 <i>Habitat and Stewardship Strategy</i> provides an initial inventory of remaining habitat. This information needs to be refined and prioritized. Programs and projects developed to address the various opportunities and challenges are needed. This strategy will require work by a planner and possible newly focused efforts by existing staff. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Associate Planner (habitat) funded with reallocation of CFP funds to operating budget and existing staff support (0.5 FTE starting in 2018)	Pending
Education and Outreach, Stewardship Planning, Restoration and Enhancement, and Collaboration with Partners (HM)	Associate Planner (habitat) and Program Specialist (Wildlife Biologist) funded with reallocation of CFP funds to operating budget and refocused efforts by existing staff toward this strategy.	Pending
Priority Level: High - Medium?		
Regulatory Requirement: No		

STRATEGY 3-8 Influence and assess effectiveness of City regulations that protect aquatic resources (e.g. Critical Areas Ordinance and Shoreline Master Program).		
CORE SERVICE: Long Range Planning		
Certain City ordinances are critical to protecting and enhancing aquatic habitat quality and quantity. When these ordinances are revised every few years, as required by State law, Utility staff will participate to ensure that the provisions for flood prevention, water quality, and habitat protection are appropriate for local stream, wetland, and riparian forest and shoreline conditions. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Associate Planner (habitat) funded with reallocation of CFP funds to operating budget and existing staff support (0.05 FTE starting in 2018)	Pending
Priority Level: High (but periodic timing every few years)		
Regulatory Requirement: No		

STRATEGY 3-9 Manage beaver activity to provide habitat and water quality benefits while mitigating flooding risk.		
CORE SERVICES: Long Range Planning, Flood Prevention, Habitat Management		
Beavers can provide water quality, hydrologic, and habitat functions by building dams that retain floodwater, trap sediment, and creating wetlands that filter water and provide habitat for wetland dependent and associated species. However, beaver activity can conflict with built infrastructure (e.g. culverts and water level control structures) and increase flood risk for adjacent areas. To allow beavers and humans to co-exist, physically excluding beavers from critical infrastructure and managing maximum water levels are viable long-term, low-cost, low-maintenance solutions. Tasks include identifying problem sites, planning to retrofit vulnerable infrastructure, and maintaining these sites. Other proactive actions are to develop standard operating procedures for identifying beaver activity and implement beaver resistant exclusion and/or water level management retrofits of critical infrastructure.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination and Standard Operating Procedures (LRP)	Associate Planner (habitat) funded with reallocation of CFP funds to operating budget and existing staff support (0.05 FTE starting in 2018)	Pending
Stormwater Facility Maintenance (FP)	Refocus maintenance address beaver activity with a proactive approach (reprioritize existing staff time).	Pending
Education and Outreach (HM)	Include information about beaver and positive functions in existing programing.	Pending
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 3-10 Manage vegetation in riparian areas to improve habitat and water quality functions.		
CORE SERVICES: Habitat Management, Asset Management		
Riparian vegetation provides many water quality and habitat functions. Invasive species (e.g. ivy and blackberry), urban development and other pressures negatively affect these waterside wetlands and forests. Active management of these areas will maintain and improve their water quality and habitat functions. This strategy involves working on public property with other departments (e.g. Parks), on Public Works-managed parcels, with partners, and a renewed focus to engage private owners of riparian and other aquatic habitats in voluntary stewardship activities. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Stewardship Planning (HM)	Associate Planner (habitat) and Program Specialist funded with reallocation of CFP funds to operating budget and existing staff support (0.05 FTE starting in 2018)	Pending
Restoration and Enhancement (HM)	Associate Planner (habitat) and Program Specialist funded by reallocating CFP funds to the operating budget and using existing staff support. Funding for crew to implement management actions in the CFP.	Pending
Education and Outreach (HM)	Program Specialist funded by reallocating CFP funds to the operating budget and refocusing existing efforts on private property stewardship.	Pending
Collaboration with Partners (HM)	Associate Planner (habitat) and Program Specialist funded by reallocating CFP funds to the operating budget and using existing staff support.	Pending
Priority Level: High Regulatory Requirement: No		

STRATEGY 3-11 Monitor aquatic habitat quality and quantity based on the best scientific information, methods, and tools available.		
CORE SERVICES: Long Range Planning, Asset Management, Habitat Management		
Tracking the quantity and quality of aquatic habitat provides baseline information to determine progress at meeting the Utility goals to maintain and enhance aquatic habitat. This monitoring can occur with varied methods. Remote sensing (e.g. aerial photos and lidar) provides City-scale information; site-based data collection and assessments informs management decisions on public property; and monitoring enhancement projects allows for adjusting methods to improve the project effectiveness and efficiency. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Associate Planner (habitat) and Program Specialist (Wildlife Biologist) funded with reallocation of CFP funds to operating budget and existing staff support (0.05 FTE starting in 2018)	Pending
Mapping (AM)	Associate Planner (habitat) and Program Specialist (GIS) funded with reallocation of CFP funds to operating budget and existing staff support	Pending
Stewardship Planning & Aquatic Habitat Monitoring (HM)	Program Specialist (Wildlife Biologist) funded with reallocation of CFP funds to operating budget and existing staff support (0.25 FTE starting in 2019)	Pending
Priority Level: High Regulatory Requirement: No		

STRATEGY 3-13 Provide outreach and education to the community around aquatic habitat, wildlife and ecosystem function (wetlands, streams, marine shoreline, lakes, buffers, and associated wildlife).		
CORE SERVICE: Habitat Management		
Public knowledge of the extent and function of aquatic habitats is important to their protection. A key aspect of Utility outreach work is providing information about what resources are at risk from stormwater pollution, functions provided by aquatic habitat (e.g. habitat, water quality, and flood reduction), ways to reduce impacts, and the value of protection and stewardship activities. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Education and Outreach (HM)	No new costs – refocus existing staff and efforts.	NA
Priority Level: High		
Regulatory Requirement: Yes – NPDES		

STRATEGY 3-14 Provide focused outreach, technical assistance and incentives to private properties containing aquatic and associated habitats, while promoting voluntary stewardship.		
CORE SERVICES: Long Range Planning, Habitat Management, Technical Review		
Most of the aquatic habitat remaining in the City is on private property. Maintaining and enhancing aquatic habitat quantity and quality citywide requires a programmatic approach focusing on voluntary stewardship on private property. These efforts will be focused on increasing stewardship activities in key watersheds and providing information and assistance to benefit habitat and water quality. These efforts will expand a successful 2016 pilot project in the Mission Creek Watershed called OlyWild. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Associate Planner (habitat) and Program Specialist (Wildlife Biologist) funded with reallocation of CFP funds to operating budget and existing staff support (0.05 FTE starting in 2018)	Pending
Education and Outreach, Stewardship Planning, Restoration and Enhancement (HM)	Refocus existing Program Specialist (Habitat Biologist) with support from intern. Associate Planner (habitat) and Program Specialist (Wildlife Biologist) funded with reallocation of CFP funds to operating budget and existing staff support (0.25 FTE starting 2019)	Pending
Priority Level: High - Medium		
Regulatory Requirement: No		

STRATEGY 3-16 Support partners and community efforts to protect, steward, and restore aquatic and associated habitats.		
CORE SERVICES: Long Range Planning, Technical Review, Habitat Management, Capital Facilities Program		
The Utility is best able to leverage its resources on larger habitat initiative and projects by collaborating with both internal (e.g. Parks) and external entities (e.g. neighborhoods, community groups, Tribes, and non-profits). These efforts are often longer term and larger in scale. A recent example is the collaboration between the Utility, Parks, Port of Olympia, and Squaxin Island Tribe on the <i>West Bay Environmental Restoration Assessment</i> . This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (LRP)	Associate Planner (habitat) funded by reallocating CFP funds to the operating budget and using existing staff support.	Pending
Internal/External Technical Support (TR)	Associate Planner funded by reallocating CFP funds to the operating budget and using existing staff support.	Pending
Stewardship Planning, Collaboration with Partners (HM)	Associate Planner (habitat) and Program Specialist (Wildlife Biologist) funded by reallocating CFP funds to the operating budget and existing staff support.	Pending
Aquatic Habitat (CFP)	Associate Planner (habitat) funded by reallocating CFP funds to the operating budget and existing staff support and refocusing of existing CFP priorities and projects.	Pending
Priority Level: High Regulatory Requirement: No		

STRATEGY 4-4 Develop a natural infrastructure asset management program		
CORE SERVICE(s): Asset Management, Habitat Management		
The hydrologic, water quality and habitat functions of aquatic habitat are all affected by their health and condition. Tracking their health and planning stewardship activities to maintain these critical functions is a key aspect of preserving and enhancing the role of remaining aquatic habitats and associated uplands. Integrating stewardship of Olympia's aquatic habitats and recognizing their functions and values as natural assets is an important aspect of tracking and improving the condition of local natural infrastructure. This enhancement will permanently staff the habitat management program piloted in 2014.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Monitoring and Evaluation (AM)	Reallocation of existing resources	Pending
Aquatic Habitat Monitoring & Restoration and Enhancement (HM)	Coordination, prioritization and assessments are possible with the reallocation of CFP funds to operating budget to support new Associate Planner (habitat) and Program Specialist (Wildlife Biologist) positions.	Pending
Priority Level: Medium Regulatory Requirement: No		

STRATEGY 4-7 Design and plan the Utility's capital improvements to complement natural infrastructure		
CORE SERVICE(s): Habitat Management, Capital Facilities Program		
Capital improvements represent significant long term investments in water quality treatment, flood management or aquatic habitat connectivity or condition. This enhancement will align these investments to complement and protect the function and condition of remaining aquatic habitat and natural infrastructure. Increasing the planning and design level consideration of the natural systems context of any project will improve long term outcomes.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Habitat Coordination (HM)	Coordination, prioritization and assessments are possible with the reallocation of CFP funds to operating budget to support new Associate Planner (habitat) position	Pending
Flooding, Water Quality, & Aquatic Habitat (CFP)	Refocus of existing CFP program to incorporate this strategy.	Pending
Priority Level: Medium/High Regulatory Requirement: No		

STRATEGY 4-9 Develop SOPs for inspections, preventative maintenance, and correction programs.		
CORE SERVICE(s): Long Range Planning		
Some standard operating procedures (SOPs) have been developed for programs and activities managed by the Utility. Existing SOPs are located in multiple locations, not all are in electronic format, many are difficult to understand, out of date and/or no longer apply to work the utility conducts. Therefore, it is logical to both develop new SOPs and make appropriate updates. The utility would like to adopt the Peabody Communications method to writing SOPs. Written in simple "plain talk" style with action verbs, this format will help identify responsibilities, ease interpretation of tasks, direction, and identification of all staff involved.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
SOPs (LRP)	0 FTE This strategy will develop SOPs with no increase in workloads.	\$0
Priority Level: High Regulatory Requirement: Yes, NPDES Permit		

STRATEGY 4-11 Develop enforcement capabilities (facilities to be maintained for design purpose) in OMC.		
CORE SERVICE(s): Long Range Planning		
Transferring ownership of stormwater facilities from a developer to a property owner or land manager after construction often leads to misinterpretation and misunderstanding of maintenance requirements. Without the proper oversight and maintenance of stormwater facilities failures in function can lead to significant flooding or pollutant loading problems. The utility strives to gain compliance through education and technical support solutions. In some cases, this may not be effective and a more involved enforcement process may be required for compliance. The utility will develop clear and easy to interpret code language to allow enforcement as a means of last resort.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
City Wide Planning (LRP)	0 FTE, This strategy will develop new code language without increasing workloads.	\$0
Priority Level: Medium Regulatory Requirement: No		

STRATEGY 4-12 Develop level of service standards for public stormwater facilities.		
CORE SERVICE: Asset Management		
Utility staff proposes development of formalized maintenance plans with level of service standards for public stormwater facilities. Implementation of this strategy will require temporarily redirecting a portion of the Stormwater Engineer or a Senior Planner's time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Public Storm Infrastructure Management (AM)	0.1 FTE – This strategy will develop levels of service, but should not increase long-term workloads.	Pending
Priority Level: Medium Regulatory Requirement: No		

STRATEGY 4-13 Monitor resources through work order system and identify any additional work.		
CORE SERVICE: Asset Management		
Managing Utility infrastructure involves multiple working groups. Utility construction, Utility repair, Utility vegetation crews, Streets operations, Environmental Services, and others play a role in the management of Utility assets. Currently, Viewworks software is the Utility's primary work order management tool. New asset management software options are anticipated in the near future. Additional staff effort will be needed to integrate current work flows with a new software platform.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Public Storm Infrastructure Management (AM)	One time staff support to transition existing work flows into a new software platform, as well as train staff how to use it.	Pending
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 4-14 Expand inspections beyond NPDES requirements.		
CORE SERVICE(s): Technical Review, Pollution Prevention, Asset Management		
Currently the utility annually only inspects private stormwater treatment facilities constructed after 2005. This means many facilities built before 2005 may not be in compliance in regards to functional design standards. The utility proposes to eventually research, map, analyze and inspect all existing stormwater facilities located throughout the city. Priority will be given to facilities with direct discharges to the MS4 and surface waterbodies.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Technical Expertise (TR)	0.10 FTE, This strategy will minimally increase short-term workloads.	Pending
Private Storm Facility Management (PP)	0.50 - 1 FTE, This strategy will increase long-term workloads.	Pending
Mapping (AM)	0.25 FTE, This strategy requires researching as-built plans and importing data into GIS.	Pending
Data Management (AM)	0.10 FTE, Long term data management is required.	Pending
Priority Level: High Regulatory Requirement: No		

STRATEGY 4-17 Develop and implement a sea level rise response plan. Use the best available science and the experiences of other communities in formulating plans for sea level rise. Partner with government entities and key stakeholders. Engage the community in a discussion of various sea level rise scenarios, how the City will respond to lessen the impact, and costs.		
CORE SERVICE: Long Range Planning, Flood Prevention		
Sea levels are rising and the rate of sea level rise is accelerating. The City must plan for sea level rise because as sea level rises the risk of downtown flooding will increase. The City will partner with the LOTT Clean Water Alliance, the Port of Olympia, the State Department of Enterprise Services, the community, and key stakeholders to develop plans for responding to sea level rise.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Sea Level Rise (FP)	3 FTEs – Eventually, a citywide program is needed to address adaptation to sea level rise. It is expected the Utility will play a role in this program. Costs were identified in the <i>Engineered Response to Sea Level Rise</i> (2010). Costs will be shared with the LOTT Clean Water Alliance, the Port of Olympia, and the State Department of Enterprise Services.	\$62,000,000
Priority Level: High		
Regulatory Requirement: No		

STRATEGY 4-19 Develop a priority ranking system for proposed capital projects.		
CORE SERVICES: Capital Facilities Program		
Utility staff proposes development of a more formalized protocol for evaluating and ranking capital projects. Building on existing criteria identified in Chapter 11, the protocol will provide a consistent basis for characterizing the benefits from capital projects and restoration efforts, comparing projects and documenting the reasons why certain projects are selected for funding. The Utility proposes to use “Envision,” a comprehensive framework of sustainability criteria that address a full range of environmental, social, and economic impacts to sustainability in project design, construction, and operation. Implementation of this strategy would require temporarily redirecting a portion of the Stormwater Engineer’s time.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Flooding, Water Quality and Habitat (CFP)	<0.1 FTEs annually	Pending
Priority Level: High		
Regulatory Requirement: No		

STRATEGY 4-21 Develop CCTV program to provide long term utility condition rating, investigation, and emergency response.		
CORE SERVICE(s): Asset Management		
The Utility currently contracts inspection of gravity mains using closed circuit television (CCTV) technology. The City has the equipment and staff capable of performing the work, but they are currently dedicated to wastewater infrastructure inspections. As the conditions of both the wastewater and stormwater gravity conveyance systems are better understood, the televising workloads are expected to diminish at which time the Utility should have the in-house resources to perform televising of stormwater infrastructure. Due to stormwater infrastructure locations, additional staff are typically required for traffic control.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Pipe Condition Rating/ CCTV (AM)	0.5 to 1 FTEs	Pending
Priority Level: Medium		
Regulatory Requirement: No		

STRATEGY 4-23 Transition vegetation and LID maintenance programs from Environmental Services to Stormwater Operations.		
CORE SERVICE(s): Flood Prevention, Habitat Management		
Currently, stormwater facility vegetation maintenance, noxious weed management, and habitat vegetation work is being performed with the Environmental Services Section of the Utility. Facilitating a maintenance work group out of City Hall has limitations which affect program effectiveness. Transitioning this work group to organizationally fall within Stormwater Operations will reduce redundancy within the Utility and provide the foundation to build an LID maintenance program. Strategy 4-23 supports 1-7.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Stormwater Facility Maintenance (including vegetation management) (FP)	1 FTE reclassification	- Reconfigure office space at MC for one Lead Worker. - Reconfigure crew space at MC for up to 4 permanent maintenance workers.
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 4-24 Develop and implement field based data collection tools for public and private stormwater utility infrastructure.		
CORE SERVICE(s): Flood Prevention, Asset Management, Pollution Prevention		
Field based data collection tools provide improved communication, reduce data entry needs, and provide a consistent data set to make asset management decisions. This consolidated data improves reporting and compliance efficiency for the Utility.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Stormwater Facility Maintenance (including vegetation management) (FP, PP)	This is a continuation of an existing Utility effort. As asset management tools change, increased staff support may be necessary. Currently, field data collection tools (ESRI Collector) have been integrated into most Utility operational work groups.	- Data collection platforms such as iPads. - New software integration - Complete costs are pending
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 4-25 Implement basin approach to Utility infrastructure maintenance with an emphasis placed on sediment management.		
CORE SERVICE(s): Asset Management, Flood Prevention, Pollution Prevention		
The Utility is currently conducting annual inspections and maintenance on over 7,800 catch basins city wide. The data collected will help develop a strategic approach to sediment management. The intent is to strategically perform preventative maintenance using a street sweeper and vacuum/jetter truck to reduce the more costly maintenance of treatment facilities and ponds.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Solids Management (PP)	This is a continuation of an existing Utility effort. Current staff will continue to implement sediment management strategies. However, the additional sediment generated will require staff time to manage and track, and enhancing the street sweeping program may require an additional FTE.	- Additional sweeper maintenance if another shift is added. - Increased sediment disposal costs as volumes increase.
Priority Level: High Regulatory Requirement: Yes (NPDES)		

STRATEGY 4.26 Implement a street sweeping program to remove sediment before it enters the stormwater system.		
CORE SERVICE(s): Pollution Prevention		
Currently, the Transportation line of business, in collaboration with the Utility, manages the street sweeping program. Street sweeping has been demonstrated to be one of the most cost effective means of reducing pollutants in stormwater runoff. The street sweeper is currently operated one shift each work day. The Utility proposes to add one half to one full operating shift each day. The Utility will pursue grant funding to implement the additional shift for the street sweeper. This strategy complements Strategy 2.5.		
PROGRAM	COST ASSUMPTION	COST ESTIMATE
Street Sweeping (PP)	0.5 to 1 FTEs Costs assume program enhancement costs will be 75% grant funded	Pending
Priority Level: High Regulatory Requirement: No		

10.3 Implementation Plan

The Utility's ability to implement the Plan's strategies – both those representing a continuation of existing core services and those representing an enhancement – is impacted by multiple factors. These include:

- Availability of funds
- Contingent projects
- Availability and expertise of staff resources
- Level of cooperation from private landowners
- Opportunities to partner with others
- New information, regulations, or emerging issues

As described in Chapter 1, the Utility is organized into three sections: Planning and Engineering, Operations, and Environmental Services. Implementation of the Plan's strategies will require coordination among the three sections.

The Utility intends to use the information contained in this Plan to inform the development of annual program plans. See Appendix 4 for a program plan template.

To ensure cross-section coordination and a consistent annual program plan development process, the following general steps will be followed by the Storm and Surface Water Utility Planning and Engineering Manager, Operations Supervisor, and Environmental Services Supervisor to develop annual program plans:

- Review the past year annual program plan's performance against performance measures.
- Identify and articulate Utility goals and objectives. Consider Plan enhancement strategies for implementation.
- Identify and differentiate roles and responsibilities between sections.
- Identify, prioritize, and articulate program mandates, drivers, and major responsibilities.
- Evaluate workloads and individual staff capacities.
- Analyze budget requirements and limitations against program priorities.
- Finalize annual program plans.

See Chapter 11 for an explanation of the Utility's capital project decision process, and Chapter 12 for the financial implications of the Plan strategies.



Chapter 11 – Capital Improvement Program

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CHAPTER 11 – CAPITAL IMPROVEMENT PROGRAM

The Storm and Surface Water Utility (Utility) uses the Capital Improvement Program (CIP) to strategically plan for investments in capital projects over a 20-year planning period. As part of the budgeting process each year, the Utility develops a Capital Facilities Plan (CFP). City Council adopts the CFP, appropriating funds for projects to be implemented during a six-year planning period.

A capital project is a structure, improvement, restoration, piece of equipment, land, or other major asset that has a useful life of at least five years and a project cost that exceeds \$50,000.

The CIP presented in this plan incorporates projects and program goals also described in:

- Chapter 4 – Infrastructure
- Chapter 6 – Flooding
- Chapter 7 – Water Quality
- Chapter 8 – Aquatic Habitat
- Chapter 9 – Core Services

This chapter describes the methodology used in developing the CIP, proposed ranking procedures, and the costs and schedule for projects planned for implementation in 2017 – 2036.

11.1 Development of the Capital Improvement Program

The Utility staff continually works to identify projects that address stormwater drainage system and aquatic habitat needs or deficiencies. Projects focus on the Utility's mission of reducing flooding, improving surface water quality, and enhancing habitat.

Because of the Utility's success in resolving flooding problems during the last 20 years, capital facilities funds can now be more broadly used for non-flooding problems. The Utility now also focuses on water quality treatment of urban stormwater runoff, replacement of aging infrastructure, and aquatic habitat (vegetation and fish passage) projects.

Capital projects constructed by the Utility have historically been prioritized based on professional judgement by staff and informed by basin studies performed by the City or in conjunction with Thurston County. Utility staff engineers and habitat biologists propose, evaluate, and rank needs based on observed deficiencies in the infrastructure and opportunities for water quality, flooding, and habitat improvements. All proposed projects entered in the Storm and Surface Water CIP are evaluated in consideration of the criteria described below. Higher priority projects are scheduled for implementation within the six-year planning horizon and included in the City's CFP.

Cost estimates for projects are developed and escalated to the anticipated year of implementation. Many water quality and aquatic habitat projects are identified as contingent upon qualifying for funding from outside sources, such as grants from Washington State Department of Ecology (Ecology).

Regulatory Compliance

The City's Phase II Municipal Stormwater Permit (or NPDES Permit) from Ecology provides guidelines and minimum standards for water quality and maintenance of stormwater infrastructure. Many capital projects focus on improvements to existing systems to comply with this permit. Other projects may comply with goals and actions described in the City's Comprehensive Plan.

Public Safety and Protection of Property

Projects that eliminate or reduce threat to human safety, health, and/or welfare are often ranked high in the CIP. Opportunities to correct an existing drainage or flooding problem are weighed against frequency of occurrence and maximum benefit to the public. The CIP also prioritizes areas prone to flooding that causes property damage or limit emergency services during storm events.

Water Quality

Capital projects focused on improving surface water quality are ranked based on overall impact to the basin or watershed. Water quality retrofit projects aim to maximize treatment of runoff from pollution-generating impervious surface (e.g. paved streets and parking lots used by vehicle traffic). The level of water quality treatment that can be provided is also considered against other watershed needs.

Water Quantity

Capital projects are considered to mitigate the impacts of urban development such as flooding or stream channel degradation. Utility staff evaluates opportunities to minimize peak flows, limit stormwater runoff, or increase the capacity of the stormwater conveyance system (e.g. pipes and ditches). As with water quality projects, priority is given to projects that serve a large urban area or discharge to a natural drainage course.

Project Location

Evaluation partially depends on the specific needs of the watershed. Historical issues of flooding, water quality, or degraded stream conditions are well documented in each of the City's stream basins or watersheds. Staff continues to monitor and evaluate these watersheds to determine project needs and improvements.

Projects located near fish-bearing waters, within groundwater protection areas, impaired surface waters and streams, or that provide water quality treatment for high use streets typically have higher priority.

Project Feasibility

Once the need for a project is identified, the feasibility of completing that project is considered. Sufficient space, land ownership, project permitting, impact to other utilities, constructability, and access for construction or maintenance are evaluated for project feasibility. In many cases, aging or problematic configuration of existing infrastructure make a project difficult to complete even if the need is great. Project feasibility is also based on cost and available grant funding.

Environment and Habitat

Opportunities to improve or enhance habitat for fish and other species are encouraged with capital projects. Consideration is given to priority habitats, forest and native vegetation restoration, removal of invasive species, and recreational opportunities for the public.

Public Stewardship and Utility Goals

In addition to the Utility mission of reducing flooding, improving surface water quality, and enhancing habitat, capital projects are selected that provide maximum benefit to the Utility, ratepayers, and public facilities. Project benefits may include reducing maintenance and operations costs for the Utility; supporting inter-jurisdictional water quality efforts; increasing public education and citizen involvement; and supporting equitable and responsible management of Utility finances.

Discretionary Rating

Sometimes a capital project involves a scope or consideration that is not captured by the other criteria listed above, such as demonstrated neighborhood support or a City Council initiative (for example downtown street improvements). In these cases, Utility staff has the opportunity to use best professional judgment when ranking projects.

While this method has proven very effective, this Plan proposes development of a more formal evaluation process for capital projects. The Utility proposes developing a protocol to more systematically compare and prioritize the wide range of potential capital improvement projects. The protocol will provide a consistent basis for characterizing the benefits from capital projects and restoration efforts, comparing projects, and documenting the reasons why certain projects are selected for funding. Refer to Chapter 10 for further explanation.

Cost Estimating Methodology

Total project-level cost estimates have been developed for each potential capital project included in the 2017-2036 CIP. Many cost estimates were generated during development of the City's 2017-2023 Capital Facilities Plan, and are included using 2016 values, according to the Engineering News Record (ENR) cost indexes. For newly developed project cost estimates, each cost includes the following components:

- **Base construction cost.** Includes all labor and material costs needed to construct a project.
- **Sales tax.** Calculated as 8.8 percent (the 2016 local tax rate) of the base construction cost.
- **Construction contingency.** Takes into account the uncertainties associated with estimating project costs at this planning level. Calculated as 25 percent of the total of base construction plus sales tax.
- **Design engineering.** Includes City and consultant design costs, and other related costs, such as permitting and construction administration. For most projects, this is calculated as 25 percent of the base construction cost. However, for projects with more complex design or permitting needs, a higher percentage of the base construction cost is used.

These elements are summed to determine the total planning-level cost estimate for a project, expressed in September 2016 dollars. Where applicable, design and construction costs are depicted spanning multiple years, to reflect the phasing typically used for larger projects.

11.2 2017-2036 Planned Projects

The Utility has identified capital projects planned for implementation between 2017 and 2036. Only the first six years of the 20-year CIP presented here have been submitted for inclusion in the City's 2017-2022 Capital Facilities Plan. Projects identified beyond 2022 have not undergone a priority ranking procedure, but are included as identified candidates for future capital improvement projects.

Table 11.1 presents the schedule of CIP projects planned for implementation between 2017 and 2036. Descriptions of each project are organized by project type. Developer-contributed projects are not included in this table. They will not require City funding, although they may involve alterations to the City's stormwater infrastructure.

Some projects have received prior appropriations from City Council through adopted Capital Facilities Plans, while others would need future appropriations. The City's future CFPs will reflect the new appropriations needed to implement the CIP shown in Table 11.1. Map 11.1 depicts approximate project locations.

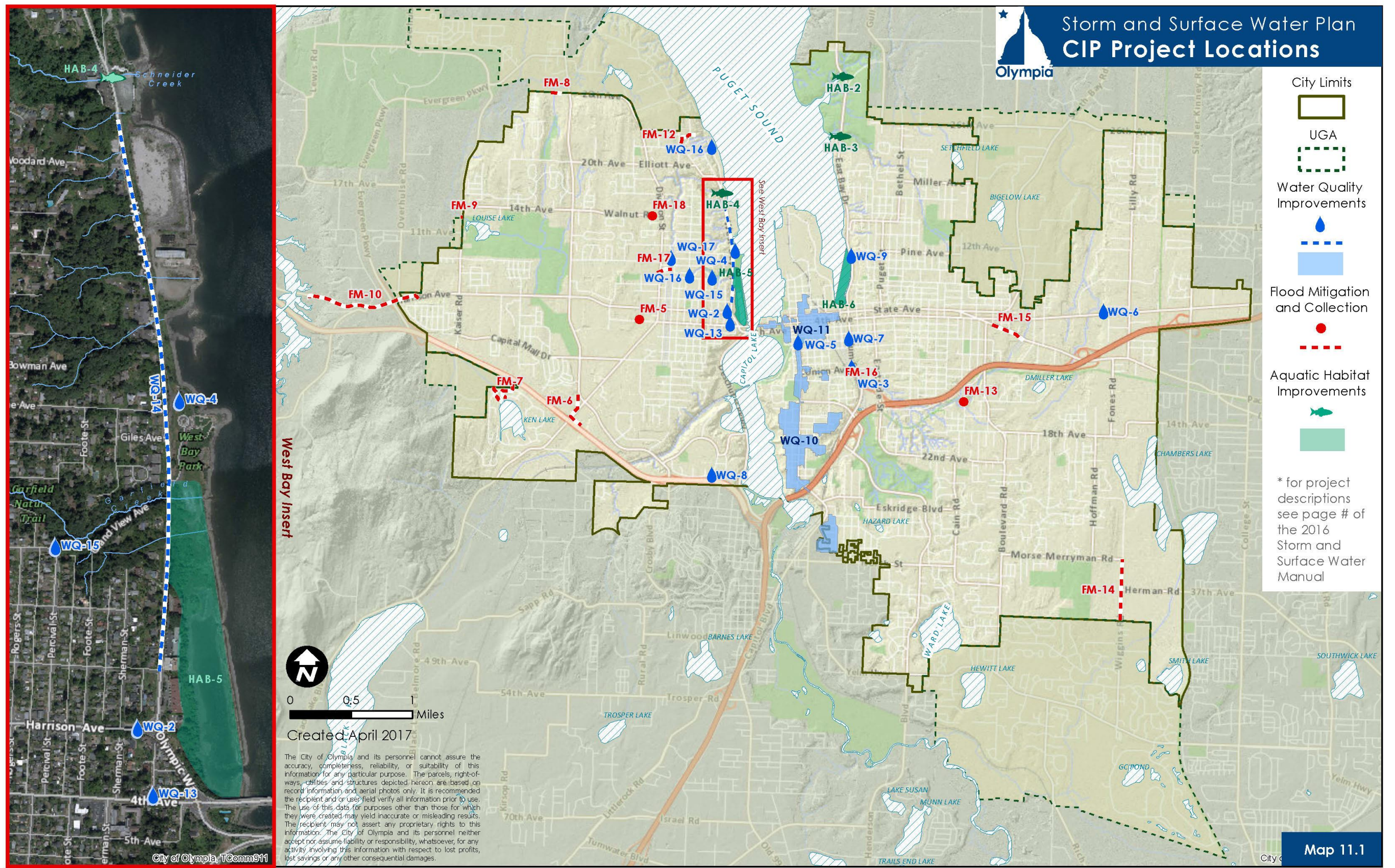
Table 11.1 20-Year Capital Improvement Program

Storm & Surface Water Utility - Public Works Water Resources															
Project Schedule and Costs (in thousands of dollars) ¹															
Code	Project	Priority	Quadrant	% GFC Funding	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2036
Asphalt Overlay Adjustments															
	Asphalt Overlay Adjustments		Citywide		187	187	187	187	187	187	187	187	187	187	1,865
Aquatic Habitat Improvements															
HAB-1	Habitat Improvement/Stewardship	med	Citywide		266	266	266	266	266	266	266	266	266	266	2,660
HAB-2	Ellis Creek Fish Passage *#	low	NW								375	750	750		
HAB-3	Mission Creek Fish Passage - Feasibility Study and Concept Design	low	NE								100				
HAB-4	Schneider Creek Fish Passage	med	NW							1,000					
HAB-5	West Bay Shoreline Improvements – Garfield Creek/Lagoon Reaches *#	low	Downtown												750
HAB-6	East Bay Shoreline and Salt Marsh*	low	Downtown												1,250
HAB-7	Property Acquisition		Citywide								100	100	100	100	1,000
	# = Funded 50% by Grants														
	* = 25% Design/Engineering, 75% Construction														
	Yearly Program Funding Total				266	266	266	266	266	1,266	841	1,116	1,116	366	5,660
Water Quality Improvements															
WQ-1	Neighborhood LID Design Grant	low	Varies		150										
WQ-2	Harrison Avenue Water Quality Retrofit	high	NW		534										
WQ-3	Union Avenue at Plum Water Quality Retrofit	high	Downtown			600									
WQ-4	Brawne Avenue Retrofit (West Bay #5)	med	NW				800								1,000
WQ-5	Capitol Way Water Quality Retrofit	high	Downtown					640							
WQ-6	Martin Way at Mary Elder Road Water Quality Retrofit	high	NE						550						
WQ-7	Plum Street Water Quality Retrofit	high	Downtown							800					
WQ-8	Evergreen Park Drive Treatment Facility Construction	med	SW								551				
WQ-9	East Bay Drive	med	NE									600			
WQ-10	South Capitol Way Combined Sewer/Storm Separation w/ LID	med	S									200	200	200	
WQ-11	Downtown Outfall Consolidation	med	Downtown										300	300	300
WQ-12	Arterial Roadway Retrofit	high	Citywide											500	5,000
WQ-13	4th Avenue West Water Quality Retrofit	med	SW												1,450
WQ-14	West Bay Drive Retrofit (West Bay #17)	med	NW									46	185		2,850
WQ-15	Madison Avenue and Percival Street NW (West Bay #13)	med	NW											220	900
WQ-16	Madison Avenue and Thomas Street NW (West Bay #14)	med	NW												900
WQ-17	Giles Avenue Facility Upgrade (West Bay #18)	med	NW												1,120
	All Water Quality Improvement Projects funded 75% by Grants														
	Yearly Program Funding Total				684	600	800	640	550	800	551	846	685	1,220	13,520

Code	Project	Priority	Quadrant	% GFC Funding	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2036
Flood Mitigation and Collection															
FM-1	Conveyance Spot Repairs (Pipe Replacement)	high	Citywide		79	79	79	79	79	79	79	79	79	79	790
FM-2	Condition Rating Existing Conveyance	high	Citywide		142	142	142	142	142	142	35	35	35	35	350
FM-3	Public Pond Rehabilitation (“City Owned Stormwater Pond Rehab”)	high	Citywide		50	50	50	50	50	50	50	50	50	50	500
FM-4	Downtown Flood Mitigation	high	Downtown		123	123	123	123	123	123					
FM-5	Ascension Avenue and 4th Avenue Facility	med	NW	25%		277									
FM-6	Cooper Point Road and Black Lake Boulevard Conveyance	med	SW	50%			4,700								
FM-7	Ken Lake Flood Conveyance	med	SW	50%					170	490					
FM-8	2900 Block 28th Avenue NW - Street and Storm Reconstruction	low	NW	25%											150
FM-9	1300 Block Kaiser Road at Green Cove Creek Culvert Replacement	low	NW	25%											50
FM-10	4800 Block Harrison Road Closed Depression Emergency Overflow	low	SW	25%											300
FM-11	900 Block Poplar St SE/Woodland Trail Swale Closed Depression Analysis	low	SE	25%										60	
FM-12	2300 Block of Crestline Boulevard – Conveyance and Street Improvements	med	NW	25%											400
FM-13	1400 Block Frederick Street SE – Culvert Replacement	low	SE	25%									50		
FM-14	Wiggins Road Ditch Reconstruction	high	SE	50%					250	250	250				
FM-15	Pacific Avenue at Chambers Street – Pipe Replacement	med	NE	25%								120			
FM-16	Indian Creek Culverts at Plum Street	med	SE	25%											
FM-17	Coleman, Bing and Walnut Conveyance	med	NW	25%											
FM-18	Division Street and Scammel Avenue Conveyance	med	NW	25%											
	^ = Not in 2017-2022 CFP														
	Yearly Program Funding Total				394	670	5,094	394	814	1,134	414	284	214	224	2,540
Infrastructure Predesign and Planning															
PL-1	Infrastructure Predesign and Planning		Citywide		50	50	50	50	50	50	50	50	50	50	500
PL-2	Pervious Pavement Contingency Fund		Citywide		25	25	25	25	25	25	25	25	25	25	250
PL-3	Storm and Surface Water Utility Master Plan Update		Citywide								150				300
PL-4	Drainage Design and Erosion Control Manual Updates		Citywide						60					60	120
	Yearly Program Funding Total				75	75	75	75	135	75	225	75	75	135	1,170
Total Funding					1,605	1,798	6,421	1,561	1,951	3,461	2,217	2,508	2,277	2,132	24,755

Code	Project	Priority	Quadrant	% GFC Funding	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027-2036
Sea Level Rise															
SLR-1	Outfall Consolidation – East Bay	med	Downtown											2,500	
SLR-2	Outfall Consolidation – Capitol Lake	med	Downtown												100
	Outfall Consolidation – West Bay														
SLR-3	North Trunk Line*	med	Downtown												1,599
SLR-4	North Trunk Line Laterals*	med	Downtown												716
SLR-5	South Trunk Line*	med	Downtown												2,489
SLR-6	South Trunk Line Laterals*	med	Downtown												249
SLR-7	Outfall Pipe from Structure to Bay*	med	Downtown												90
	Flood Barrier Construction – Phase I (1 foot SLR)														
SLR-7	Capitol Lake/Heritage Park Area*	med	Downtown												636
SLR-8	West Bay Marina*	low	Downtown												868
SLR-9	Yacht Club Peninsula*	med	Downtown												1,642
SLR-10	West Side Port Peninsula*	med	Downtown												3,628
SLR-11	North Shoreline Port Peninsula*	med	Downtown												2,205
SLR-12	East Shoreline Port Peninsula*	med	Downtown												915
SLR-13	500 cfs Pump Station*	med	Downtown												37,500
SLR-14	50 cfs Pump Station*	med	Downtown												8,750
SLR-15	Small Pump Station*	med	Downtown												563
SLR-16	Tide Gate Installation	med	Downtown												106
	* = 25% Engineering, 75% Construction														
	Yearly Program Funding Total													2,500	62,053
Total Funding with Sea Level Rise					1,605	1,798	6,421	1,561	1,951	3,461	2,217	2,508	2,277	4,632	86,808

1. In September 2017 dollars. Totals of individual years may not equal subtotals, due to rounding.



Map 11.1 CIP Project Locations

The largest projects included in the first ten years of the CIP (2017-2036) are:

- Conveyance improvements at the outlet from Yauger Park along Cooper Point Road and Black Lake Boulevard to improve flood conditions during extreme storm events
- Ken Lake flood conveyance improvements and mitigation
- Water quality treatment retrofit along Plum Street and other arterials
- Habitat improvements to Ellis Creek
- Habitat and environmental stewardship

In addition to these and other capital projects, the CIP includes significant investment in ongoing rehabilitation and replacement of system assets such as damaged pipes and maintenance of treatment facilities and ponds.

Asphalt Overlay Adjustments (Program #9001)

- **Asphalt Overlay Adjustments** (2017-2036, estimated \$3,730,000)

Description: This fund is directed to the Parks and Pathways sidewalk program to offset stormwater mitigation costs associated with sidewalk projects.

Justification/Need: Following a cost-sharing policy approved by City Council in 2009, the Storm and Surface Water Utility allocates funding annually to the Transportation Program to cover a portion of stormwater mitigation costs on transportation projects.

Aquatic Habitat Improvements (Program #9024)

Following are habitat and environmental improvement projects that address deficiencies or needs described in Chapter 8. Projects in this program are assumed funded 50% by available grants.

- **HAB-1 Habitat Improvement & Stewardship** (2017-2036, estimated \$7,200,000)

Description: Implement habitat restoration strategies that protect and enhance aquatic and associated terrestrial habitat in Olympia. This work involves removing invasive species and planting native trees and shrubs to enhance riparian buffers along streams throughout the City. By collaborating with Olympia Parks, neighborhoods, private landowners, and community organizations the Utility can target properties containing aquatic resources and adjacent forested buffer areas. This project funds a Washington Conservation Corps crew each year to implement restoration and enhancement projects on high priority properties; it also funds acquisition, easements, and/or incentives to protect important aquatic habitats citywide.

Justification/Need: This project will protect and enhance aquatic and associated terrestrial habitat by implementing stewardship strategies as identified and prioritized in the Utility's *Habitat and Stewardship Strategy*.

- **HAB-2 Ellis Creek Fish Passage** (2023-2025, estimated \$1,875,000)

Description: Design and install a fish passable culvert where Ellis Creek passes under East Bay Drive into Ellis Cove and Budd Inlet.

Justification/Need: The existing culvert is a partial fish passage barrier at the mouth of arguably the best remaining salmon stream in Olympia. This project was attempted in 2009 and needs a new design and construction approach to allow fish passage to high quality habitat and facilitate fixes at upstream barriers in Thurston County.

- HAB-3 Mission Creek Fish Passage – Feasibility Study and Design** (anticipated 2023, estimated \$100,000)
Description: Perform a feasibility assessment and design (if appropriate) to fix the fish passage barrier culvert under East Bay Drive in the lower reach of Mission Creek.
Justification/Need: This culvert is a full barrier on a stream with potential fish use. A number of chum salmon returned to the lower reach in recent years, but cannot access habitat upstream of East Bay Drive. An assessment of this site will determine the feasibility, benefits, and costs to retrofit this culvert.
- HAB-4 Schneider Creek Fish Passage** (2022, estimated \$1,000,000)
Description: Complete work to make a culvert at the mouth of Schneider Creek fish passable.
Justification/Need: The existing culvert is not fish passable.
- HAB-5 West Bay Shoreline Improvements** (anticipated 2027, estimated \$750,000)
Description: Implement shoreline improvements described in the *West Bay Environmental Restoration Assessment*, likely in partnership with other departments or agencies (e.g. Olympia Parks or Port of Olympia).
Justification/Need: There is an opportunity to enhance and restore shoreline habitat functions in an area transitioning from industrial use, by working with partners to improve the potential pocket estuary at the mouth of Garfield Creek and lagoon at West Bay Park.
- HAB-6 East Bay Shoreline and Salt Marsh Restoration** (2030-2032, estimated \$1,250,000)
Description: Restore salt marsh habitat at the mouth of Moxlie Creek and along the armored shoreline adjacent to East Bay Drive in the southernmost portion of East Bay
Justification/Need: The habitat function of this section of Budd Inlet is heavily impacted by historic fill, armoring, and past industrial use. If clean dredge material were to become available from a local source, a vegetated salt marsh with diverse habitat could evolve, benefitting water quality, fish, and wildlife in East Bay.
- HAB-7 Property Acquisition** (2023-2036, estimated \$1,400,000)
Description: Acquire important aquatic and adjacent habitats (e.g. streams, wetlands, shoreline).
Justification/Need: Acquisition of these areas will protect important water quality, flood reduction, and habitat functions and complement built infrastructure by protecting healthy natural assets.

Water Quality Improvements (Program #9027)

Following are water quality improvement projects that address deficiencies or needs described in Chapter 7. Projects in this program are assumed funded 75% by available grants.

- WQ-1 Neighborhood LID Design Grant** (anticipated 2017, estimated \$150,000)
Description: Create stormwater facilities in existing neighborhoods with the goal of providing water quality treatment to currently unmanaged runoff. Opportunities to partner with neighborhoods to provide facilities which enhance the neighborhood will be sought. A strong secondary goal is to incorporate public outreach and education into the facility design and operation process.
Justification/Need: Road runoff from most of the City receives no water quality treatment.

- **WQ-2 Harrison Water Quality Retrofit** (anticipated 2017, estimated \$534,000)

Description: Construct a water quality treatment facility for runoff from Harrison Avenue between West Bay Drive and Milroy Street.

Justification/Need: The Harrison Avenue drainage basin, which is tributary to Budd Inlet, currently receives no water quality treatment. Its more than 20 acres are mostly zoned High Density Corridor.
- **WQ-3 Union Avenue Water Quality Retrofit** (anticipated 2018, estimated \$600,000)

Description: Construct a stormwater treatment facility for currently untreated runoff from approximately 35 acres along Union Avenue and Jefferson Street.

Justification/Need: The drainage basin, which is tributary to Moxlie Creek, currently receives no water quality treatment. The basin includes high traffic arterial roadways and is zoned Downtown Business and High Density Commercial.
- **WQ-4 Brawne Avenue Water Quality Retrofit** (anticipated 2019, estimated \$800,000)

Description: Construct a water quality treatment facility near the intersection of Brawne Avenue and West Bay Drive to treat runoff from an approximately 45-acre basin.

Justification/Need: Runoff from the tributary area currently receives no water quality treatment before discharging directly to Budd Inlet. This project was identified in the *West Bay Environmental Restoration Assessment*.
- **WQ-5 Capitol Way Water Quality Retrofit** (anticipated 2020, estimated \$640,000)

Description: Construct a water quality treatment facility for runoff from an area roughly bounded by Capitol Way, Adams Street, 7th Avenue, and Union Avenue.

Justification/Need: The drainage basin, which is tributary to Capitol Lake, currently receives no water quality treatment. The basin's approximately 20 acres are fully developed.
- **WQ-6 Martin Way at Mary Elder Water Quality Retrofit** (anticipated 2021, estimated \$550,000)

Description: Construct water quality facilities for runoff from Martin Way between Mary Elder Road to Sleater Kinney Road.

Justification/Need: Martin Way is an arterial roadway located in a High Density Corridor zone. Polluted street runoff from over eight acres of street right-of-way currently flows untreated to Woodard Creek just west of Mary Elder Road.
- **WQ-7 Plum Street Water Quality Retrofit** (anticipated 2022, estimated \$800,000)

Description: Construct water quality treatment facilities for runoff from Plum Street and areas east to Quince Street.

Justification/Need: The approximately 42-acre area, tributary to Moxlie Creek, currently receives no water quality treatment. Plum Street is a high traffic, arterial roadway zoned Downtown Business, Professional Office, High Density Commercial Service, and Residential Mixed Use.
- **WQ-8 Evergreen Park Drive Treatment Facility Construction** (anticipated 2023, estimated \$550,500)

Description: Construct a stormwater treatment facility for currently untreated runoff from Evergreen Park Drive. Evaluate different treatment technologies and locations for the project.

Justification/Need: Runoff from the drainage basin receives no water quality treatment before discharging directly to Capital Lake or Percival Cove.

- **WQ-9 East Bay Drive** (anticipated 2024, estimated \$600,000)

Description: Construct roadside water quality treatment facilities for runoff from approximately 15 acres along East Bay Drive.

Justification/Need: East Bay Drive, an arterial roadway, receives no water quality treatment before discharging directly to Budd Inlet.
- **WQ-10 South Capitol Combined Sewer/Storm Separation** (anticipated 2024-2026, estimated \$600,000)

Description: Separate stormwater from portions of the South Capitol neighborhood. The project will construct stormwater conveyance and water quality treatment facilities to discharge to an existing outfall.

Justification/Need: Separation of the combined sewer will increase capacity in the LOTT Clean Water Alliance Budd Inlet Treatment Plant. The additional capacity will be traded for treatment of runoff from higher intensity land uses in portions of the downtown. Secondary objectives are to better handle downtown runoff in anticipation of sea level rise.
- **WQ-11 Downtown Outfall Consolidation** (anticipated 2025-2026, estimated \$900,000)

Description: Begin consolidation of stormwater outfalls to Budd Inlet in anticipation of sea level rise. The combined sewer system basins may be reconfigured in some cases to provide treatment for stormwater and to provide greater protection to the LOTT Clean Water Alliance Budd Inlet Treatment Plant.

Justification/Need: Managing stormwater outfalls to prevent downtown flooding is becoming increasingly important because of anticipated sea level rise.
- **WQ-12 Arterial Roadway Water Quality Retrofit** (anticipated 2027-2036, estimated \$5,000,000)

Description: Annually construct water quality facilities to retrofit existing roadways. The focus will be on arterial and collector roadways in commercial zones tributary to Moxlie and Indian Creeks, Capitol Lake, and Budd Inlet. These projects will focus on arterial and collector roadways, based on the assumption that greater traffic volumes are correlated with increased pollutant generation.

Justification/Need: Stormwater runoff from most Olympia roadways does not receive water quality treatment before being discharged to surface water. These projects will help fulfill the Utility's goal to improve water quality citywide.
- **WQ-13 4th Ave West Water Quality Retrofit** (anticipated 2028, estimated \$650,000)

Description: Construct a water quality treatment facility near the intersection of 4th Avenue and West Bay Drive to treat runoff from an approximately 76-acre basin.

Justification/Need: Runoff from the tributary area currently receives no water quality treatment before discharging directly to Budd Inlet. This project was identified in the *West Bay Environmental Restoration Assessment*.
- **WQ-14 West Bay Drive Water Quality Retrofit** (anticipated 2024-2025, estimated \$231,000)

Description: Construct roadside water quality treatment facilities for runoff from approximately five acres along West Bay Drive.

Justification/Need: Most of West Bay Drive, a major collector roadway, receives no water quality treatment before discharging directly to Budd Inlet. This project was identified in the *West Bay Environmental Restoration Assessment*.

- **WQ-15 Madison Avenue and Percival Street NW Water Quality Retrofit** (anticipated 2026-2028, estimated \$1,120,000)

Description: Construct a water quality treatment facility for runoff from approximately 28 acres in the headwaters of Garfield Creek.

Justification/Need: Runoff from the tributary area currently receives no water quality treatment before discharging directly to Garfield Creek and eventually Budd Inlet. This project was identified in the *West Bay Environmental Restoration Assessment*.

- **WQ-16 Madison Avenue and Thomas Street Water Quality Retrofit** (anticipated 2029-2031, estimated \$900,000)

Description: Construct a water quality treatment facility for runoff from approximately 28 acres in the headwaters of Garfield Creek.

Justification/Need: Runoff from the tributary area currently receives no water quality treatment before discharging directly to Garfield Creek and eventually Budd Inlet. This project was identified in the *West Bay Environmental Restoration Assessment*.

- **WQ-17 Giles Avenue Treatment Facility Upgrade** (anticipated 2031-2032, estimated \$1,120,000)

Description: Expand the existing Giles Avenue water quality treatment facility.

Justification/Need: The Giles water quality treatment facility is undersized. Expansion will improve treatment capabilities for a 196-acre drainage basin tributary to Budd Inlet.

Flood Mitigation and Collection (Program #9028)

Following are stormwater collection, conveyance, and flow control improvement projects that address deficiencies or needs described in Chapter 6.

- **FM-1 Conveyance Spot Repairs** (anticipated 2017-2036, estimated \$1,659,000)

Description: Provides for minor spot repairs to the stormwater conveyance system at locations prioritized by the condition-rating database. Repairs to the worst portions of the storm sewer system are typically accomplished within two years of identifying a problem.

Justification/Need: Repairs of structural defects like collapsed pipes are necessary to prevent flooding and sinkholes.

- **FM-2 Condition Rating Existing Conveyance** (anticipated 2017-2036, estimated \$1,378,200)

Description: Provide television inspection and condition rating for existing stormwater conveyance systems.

Justification/Need: Condition rating is an important part of asset management. Outcomes are used to determine and prioritize replacement and repair schedules. Approximately 172 miles of storm sewer are owned and operated by the Utility.

- **FM-3 Public Pond Rehabilitation** (anticipated 2017-2036, estimated \$1,010,000)

Description: Rehabilitate City-owned stormwater facilities including removing sediments, amending soils, establishing attractive low maintenance landscaping, and modifying structures as needed. Cost includes disposal of sediments.

Justification/Need: Maintenance is necessary to maintain pond capacities and water quality treatment functions.

- **FM-4 Downtown Flood Mitigation** (anticipated 2017-2022, estimated \$735,000)

Description: Consolidate and/or install tide gates on key stormwater outfalls to Budd Inlet and Capitol Lake, to prevent tidewater from flowing up pipes and discharging to low lying downtown streets.

Justification/Need: Olympia's downtown is vulnerable to tidal flooding. The problem is likely to be exacerbated by anticipated sea level rise.
- **FM-5 Ascension Avenue and 4th Avenue Facility** (anticipated 2018, estimated \$276,000)

Description: Construct a stormwater facility on City-owned land between 4th and Ascension Avenues.

Justification/Need: The stormwater conveyance system downstream of this location has limited capacity. Construction of the facility will provide flow control to help mitigate flooding downstream. The pond will also provide water quality treatment.
- **FM-6 Cooper Point Road and Black Lake Boulevard Conveyance Construction** (anticipated 2019, estimated \$4,700,000)

Description: Increase the capacity of an extensive westside stormwater conveyance system serving approximately 700 acres of development. The project builds on recent work to improve the capacity of Yauger Park. This project will require a Public Works Trust Fund loan.

Justification/Need: The project will reduce the potential for flooding of this vital intersection for access to Olympia's westside.
- **FM-7 Ken Lake Flood Conveyance Construction** (anticipated 2021, estimated \$660,000)

Description: Construct a stormwater conveyance system to reduce historical overland flooding associated with the Gruen Swale and Stonewall Swale tributary to Ken Lake.

Justification/Need: The project will reduce persistent flooding problems that have resulted in structural damage.
- **FM-8 2900 Block 28th Avenue NW – Street and Storm Reconstruction** (anticipated 2028, estimated \$150,000)

Description: Replace an existing culvert and modify the roadway prism.

Justification/Need: Over roadway flooding in this location occasionally isolates a neighborhood.
- **FM-9 1300 Block Kaiser Road at Green Cove Creek – Culvert Replacement** (anticipated 2029, estimated \$50,000)

Description: Replace an existing culvert that conveys Green Cove Creek.

Justification/Need: Over-roadway flooding in this location occasionally closes the roadway.
- **FM-10 4800 Block Harrison Avenue – Closed Depression Emergency Overflow** (anticipated 2030, estimated \$300,000)

Description: This project will construct a stormwater conveyance to provide an emergency overflow for a closed depression.

Justification/Need: This project will reduce closures of Harrison Avenue resulting from flooding.
- **FM-11 900 Block Poplar Street SE/Woodland Trail Swale – Closed Depression Analysis** (anticipated 2026, estimated \$60,000)

Description: Evaluate options for reducing flooding of a closed depression.

Justification/Need: The roadway and commercial properties regularly flood at this location.

- **FM-12 2300 Block Crestline Boulevard – Conveyance and Street Improvements** (anticipated 2032, estimated \$400,000)

Description: Replace or add capacity to the existing regional stormwater drainage system between Crestline Boulevard and Budd Inlet.

Justification/Need: The under-capacity stormwater drainage system results in flooding along Crestline Boulevard.
- **FM-13 1400 Block Frederick Street SE – Culvert Replacement** (anticipated 2025, estimated \$50,000)

Description: Replace an existing culvert that conveys Indian Creek.

Justification/Need: Over-roadway flooding in this location occasionally closes the roadway.
- **FM-14 Wiggins Road Ditch Reconstruction** (anticipated 2021-2023, estimated \$750,000)

Description: Reconstruct the stormwater conveyance system along Wiggins Road south of Morse-Merryman Road in coordination with the Transportation line of business.

Justification/Need: This project will improve safety and conveyance capacity.
- **FM-15 Pacific Avenue at Chambers Street – Pipe Replacement** (anticipated 2023, estimated \$120,000)

Description: Replace or rehabilitate severely corroded corrugated metal pipe in Pacific Avenue.

Justification/Need: The existing pipe has exceeded its functional life. Portions of the adjacent pipe were replaced in 2013 as an emergency repair. Proactive replacement will prevent future emergency repairs.
- **FM-16 Indian Creek Culverts** (TBD, estimated cost TBD)

Description: Evaluate and correct culverts conveying Indian Creek under Plum Street.

Justification/Need: The existing culverts embed with sediment, which reduces capacity and requires frequent maintenance. Reduced conveyance capacity could flood Plum Street, a critical arterial roadway.
- **FM-17 Division Street and Scammel Avenue Conveyance – Pipe Replacement** (TBD, estimated cost TBD)

Description: Replace or add capacity to the existing regional stormwater drainage system near Division Street and Scammel Avenue.

Justification/Need: The under-capacity stormwater drainage system results in flooding along Division Street.
- **FM-18 Coleman, Bing and Walnut Conveyance** (TBD, estimated \$TBD)

Description: Replace or add capacity to an existing regional stormwater drainage system in the vicinity of Coleman Avenue, Bing Street, and Walnut Road. The current stormwater system was installed by private property owners over many years. Due to increasing regional flows using the system, the City took over its maintenance and operation.

Justification/Need: The under-capacity stormwater drainage system results in flooding at Bing Street and Coleman Avenue.

Infrastructure Predesign and Planning (Program #9903)

- **PL-1 Infrastructure Predesign and Planning** (anticipated 2017-2036, estimated \$1,000,000)

Description: Provides the means for the Utility to contract with consultants for professional services such as soils and geotechnical investigations, hydraulic modeling, and computer simulations of the stormwater network, and project feasibility analyses for capital projects.

Justification/Need: For successful outcomes, pre-design and planning efforts are necessary to scope, budget, and right size capital projects.

- **PL-2 Pervious Pavement Contingency Fund** (anticipated 2017-2036, estimated \$500,000)

Description: Provides a means for the Utility to manage pervious pavement in sidewalks, one of its key innovative technologies. The contingency fund is jointly funded by the General Fund and Storm and Surface Water Utility as pervious pavement projects are built. The fund builds in overtime and is used to repair or mitigate the impacts of a potential failure of pervious pavement projects.

Justification/Need: In the long run, the technology is seen as an effective means for managing stormwater runoff. However, in the short-term, some level of problems or failures can be expected and have been observed.

- **PL-4 Storm and Surface Water Utility Master Plan Updates** (2023, 2029, 2035, estimated \$450,000)

Description: Provides the means for the Utility to contract with consultants for professional services such as utility finance analyses, technical writing, and engineering services for development of storm and surface water plans.

Justification/Need: Although storm and surface water plans are not a State requirement, plans are necessary to guide work efforts and financing.

- **PL-5 Drainage Design and Erosion Control Manual Updates** (2020-2036, estimated \$240,000)

Description: Provides the means for the Storm and Surface Water Utility to contract with consultants for professional services such as utility finance analyses, technical writing and engineering services for updating the *Drainage Design and Erosion Control Manual*.

Justification/Need: Within designated timeframes, the State Department of Ecology occasionally revises the *Stormwater Management Manual for Western Washington* and requires the City to adopt an equivalent manual for Olympia (*Drainage Design and Erosion Control Manual*).



Financial Program

Chapter 12

Chapter 12 – Financial Program

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Table 12.1 Revenue Requirement Forecast (\$000s) 4

Chapter 12 – Financial Program

This chapter describes the current finances of the Storm and Surface Water Utility, and summarizes its financial policies and the funding needed to implement this Plan. A detailed financial analysis was performed by the Utility's financial consultant, FCS Group (Appendix 5). The results indicate that the overall financial condition of the Utility remains healthy. The Utility, through this Plan, will continue to be guided by prudent financial management principles.

Direction is provided for this chapter by the City's *Comprehensive Plan*. In particular, Utilities Goal 2 and its associated policies help guide the Utility's financial program:

Reliable utility service is provided at the lowest reasonable cost, consistent with the City's aims of environmental stewardship, social equity, economic development and the protection of public health.

12.1 Fiscal Policies

The Utility is responsible for funding all its related costs through user fees; it does not depend on tax revenues or General Fund resources. The primary source of funding for the Utility is stormwater rate revenue; miscellaneous operating revenues and investment earnings provide additional resources to fund the utility's revenue needs. The City's utilities are financed and operated like private business enterprises, which requires periodic determination of revenues earned, expenses incurred, and net income for capital, maintenance, public policy, management control, and accountability.

Like any business, municipal utilities require certain minimum levels of cash reserves to operate. These reserves address variability and timing of expenditures and receipts, as well as occasional disruptions in activities, costs, or revenues. Given the Utility's responsibility to provide an essential service at a certain standard, protection against financial disruptions is even more important than it would be for a private-sector or non-essential counterpart. The Operating Fund is intended to maintain a minimum reserve balance equal to 10% of annual operating expenses. The Capital Fund is assumed to maintain a minimum reserve balance equal to 5% of active capital appropriations as a capital contingency reserve.

12.2 Rates and Rate Structure

The Utility's rate structure is designed to be fair and equitable in distributing the costs of managing flooding, water quality and aquatic habitat according to each customer's relative impact.

Rates and General Facility Charges (GFCs) are based on impervious surface area. The link between impervious surface, runoff contribution, and increased flooding, water quality degradation, and damage to habitat is scientifically strong and supportable. This basis appropriately links land development with issues addressed in this Plan, such as flooding (conveyance capacity), water quality, and habitat protection.

For non-residential customers, the existing rate structure incorporates the actual amount of impervious surface area on the parcel and rate categories based on the date of development. Impervious surface establishes a link to a property's contribution to stormwater runoff. It is expressed as a number of impervious units, with one unit equal to 2,528 square feet of impervious surface. This measurement approximates the average amount of impervious surface on a developed residential parcel in Olympia. The date distinction recognizes the relative stormwater management practices required by regulations imposed on development compared to current standards. The existing category break-points for this rate basis are: prior to January 1980, between January 1980 and January 1990, and after January 1990.

The Utility proposes to move to a rate structure also based on impervious surface, but with categories based on the actual onsite stormwater mitigation installed and maintained on a property rather than a date of construction. FCS Group performed a detailed review of the Utility's expenses and found that about two-thirds of the Utility's annual costs are fixed and do not vary with onsite mitigation. Recognizing that onsite mitigation only impacts about one-third of the Utility's costs, the proposed rate structure reflects a modified structure of credits.

The rate structure the Utility is considering will have three categories:

- Properties with no stormwater mitigation will pay the full rate
- Properties with flow control and/or water quality treatment will receive up to a 20% discount
- Properties designed to fulfill low impact development or 100 percent infiltration will receive up to a 50% discount

It is worth noting that the Utility does not have to offer discounts at all, but can choose to do so as a policy decision to encourage environmentally sustainable development.

Rate revenue requirements are discussed in Section 12.4. A series of rate increases (13%-3% per year) are proposed to accommodate projected operating and capital needs during the 2018-2023 planning period. This results in a cumulative increase of roughly 55% over the six-year period. The primary factors driving the need for the proposed rate increase are: capital projects, staffing increases to support low impact development inspection and maintenance, and making the pilot habitat management program permanent.

FCS Group determined that Olympia's storm and surface water rates are comparable to a group of peer jurisdictions. It should be noted that Olympia, unlike many of its peers, encompasses significantly greater stream miles and shoreline and has been proactive in constructing and maintaining regional stormwater facilities to retrofit developed areas.

12.3 Capital Funding Strategy

For the 2018-2023 planning period, the proposed capital facilities projects will cost an estimated total of \$17.4 million, as shown in Chapter 11, Table 11.1. The Utility funds its capital program using resources in the following priority order:

1. Available grant funding.
2. Available low interest loans.
3. Accumulated capital reserves.
4. Annual revenue collections from GFCs.
5. Annual resources from rates earmarked for system reinvestment funding.
6. Annual transfers of excess resources (over minimum balance targets) from the Operating Fund, if any.
7. Interest earned on Capital Improvement Fund balances and other miscellaneous capital resources.
8. Revenue bond financing.

GFCs are imposed on new customers connecting to the system as a condition of service and are in addition to any other costs related to onsite stormwater mitigation. The GFC is typically based on a blend of historical and planned future capital investment in system infrastructure. Its underlying premise is that growth (future customers) will pay for growth-related costs that the Utility has incurred (or will incur) to provide capacity to serve new customers. GFC revenues provide a source of cash funding for the Capital Facilities Plan (CFP).

The Utility bases GFCs on impervious units (2,528 sq. ft. of impervious surface) and average daily vehicle trips based on the Institute of Traffic Engineers' Trip Generation Manual. As explained in Section 12.2, there is a

scientific link between impervious surface and stormwater degradation (flooding, water quality, and habitat). There is similarly a correlation between traffic density (average daily vehicle trips) and water pollutant levels

FCS Group calculated an updated GFC as part of the financial analysis for this Plan. The analysis determined that increases in the GFC are justified. The GFC per impervious unit could be increased by \$1,193 or about 100.0% from the 2017 charge of \$1,190 and the per average daily vehicle trip could be increased to \$19.04 or about 423.1% from the 2017 charge of \$4.50 per average daily vehicle trip. The Utility's practice is to phase increases to smooth impacts to customers. In coming years, the Utility will consider increases to per impervious unit and per average daily vehicle trip GFCs.

In addition to funding the capital program with charges to new customers, the Utility requires existing ratepayers to support the City's full cost of providing service, including annual depreciation expense on existing Utility assets. Existing customers benefit from a system of infrastructure that has been funded through a combination of sources; this infrastructure deteriorates over its useful life and will eventually fail, requiring replacement.

12.4 Evaluation of Revenue Requirements

FCS Group analyzed the annual revenue required to fund the projected operating expenses, capital costs, and policy-based requirements (e.g. reserve funding, system reinvestment funding). Rate and other operating revenues must be sufficient to meet the utility's projected cash needs including operations and maintenance, debt service, system reinvestment funding, and any reserve funding needed to meet the minimum balance target for the Operating Fund. Table 12.1 summarizes the annual revenue requirement forecast through 2022. It shows that rate increases will be needed primarily due to the capital program, which impacts rates through additional cash funding requirements.

Table 12.1 Revenue Requirement Forecast (\$000s)

	2017	2018	2019	2020	2021	2022
Revenues						
Rate Revenue at Existing Rates	\$5,029	\$5,041	\$5,053	\$5,064	\$5,076	\$5,087
Other Revenues	13	11	10	8	8	8
Total	\$5,042	\$5,052	\$5,063	\$5,072	\$5,084	\$5,095
Expenses						
Operating Expenses	\$4,504	\$4,662	\$4,854	\$5,062	\$5,283	\$5,442
Debt Service	123	123	208	431	426	422
System Reinvestment	688	909	1,200	1,400	1,600	1,700
Total	\$5,315	\$5,694	\$6,262	\$6,893	\$7,309	\$7,564
Net Cash Flow at Existing Rates	(\$273)	(\$642)	(\$1,199)	(\$1,821)	(\$2,225)	(\$2,469)
Annual Rate Adjustment		13.0%	13.0%	10.0%	7.0%	3.0%
Summary After Rate Adjustments:						
Rate Revenue	\$5,029	\$5,696	\$6,452	\$7,113	\$7,628	\$7,875
Net Cash Flow	(\$273)	(\$62)	\$39	(\$7)	\$34	(\$1)
Ending Operating Fund Balance ¹	\$1,109	\$971	\$554	\$548	\$581	\$580
Minimum Operating Fund Balance	\$450	\$466	\$485	\$506	\$528	\$544

¹ Ending balance reflects transfers in 2018 and 2019 totaling \$531,000 to the Capital Fund to pay for projects.