CITY OF BREMERTON

Stormwater Management Action Plan

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ACRONYMS AND ABBREVIATIONS

BMC	Bremerton Municipal Code
BMPs	Best Management Practices
City	City of Bremerton
CIP	Capital Improvement Program
CAO	Critical Areas Ordinance
Ecology	Washington State Department of Ecology
FC	Fecal Coliform
ft, ft2	Feet, Square feet
GIS	Geographic Information System
GMA	Growth Management Act
KPHD	Kitsap Public Health District
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System
NBK	Naval Base Kitsap
NPDES	National Pollution Discharge Elimination System
O&M	Operation and Maintenance
Permit	Municipal Phase 2 NPDES Stormwater Permit
PORT	Port of Bremerton
PSIC	Puget Sound Industrial Center
PSNS	Puget Sound Naval Shipyard
PW&U	City of Bremerton Public Works & Utilities Department
SMAP	Stormwater Management Action Plan
Utility	Stormwater Utility
SWMMWW	Stormwater Management Manual for Western Washington
SWCP	Surface and Stormwater Comprehensive Plan
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
UGA	Urban Growth Area

EXECUTIVE SUMMARY

This Stormwater Management Action Plan (SMAP) has been prepared by the City of Bremerton (City) pursuant to section S5.C.1.d of the 2019 Western Washington Phase II Municipal Stormwater Permit (Permit). The Permit requires local jurisdictions to conduct a planning process that prioritizes a sub-watershed basin where stormwater management programs and capital projects, if implemented, could have measurable effects on water quality. Pursuant to Permit requirements, this prioritization process and action plan is to be documented within a SMAP.

Receiving Water Conditions Assessment and Basin Prioritization

The goal of the Receiving Water Conditions Assessment (RWCA) is to develop data to compare existing water quality and stormwater conditions in the City's stormwater basins. A total of 24 stormwater basins have been delineated in the City. These 24 basins were aggregated based on receiving waters into 12 stormwater basin groups which are each between 0.7 and 23.8 square miles in size.

Each of the 12 stormwater basin groups were evaluated based on physical characteristics, receiving water conditions, and stormwater management influence. A total of six basins were removed from further evaluation due to low levels of development or relatively low portion within City jurisdiction. The remaining six basin groups were evaluated based on existing water quality conditions, pollutant loading, existing stormwater treatment, and existing and potential future development.

The combined existing receiving water quality and stormwater influence assessment results provides a scored comparison of relative conditions across the six primary basins (Table 1 on the following page). The purpose of the combined RWCA scoring was to identify the list of basins to move forward for prioritization. Based on the results in Table 1, the three basins with highest combined scores moved forward to the prioritization step of the SMAP; Kitsap Lake, Oyster and Ostrich Bay, and the West Narrows basins.

The purpose of basin prioritization was to determine which of the City's receiving waters are most likely to benefit the most from stormwater management planning and actions. These priority basins were then advanced to the third and final step of the SMAP process, which is preparation of the SMAP and associated implementation plan.

Table 1. Combined receiving water and stormwater influence rating and ranking.

Stormwater Basin	Receiving Water Rank	Stormwater Influence Rating	Summary Rating	**Final Rank**	Advanced to Prioritization Step
Kitsap Lake	1	1	2	**1**	Yes
Oyster & Ostrich Bay	2	3	5	**2**	Yes
West Narrows	3	2	5	**2**	Yes
East Narrows	4	4	9	**3**	No
Sinclair	5	5	9	**3**	No
Stephenson	6	6	12	**4**	No
Anderson Creek	**Eliminated in Tier 1 screening**				No
Gorst Creek					No
Tracyton					No
Chico Creek					No
Union River					No
Case Inlet					No

Prioritization criteria included beneficial uses of the receiving waters, the degree of impairment to these beneficial uses and the extent to which beneficial uses could be restored and maintained through stormwater management actions. The Oyster and Ostrich Bay and Kitsap Lake basins were selected as the City's top priority basins and were advanced to the strategic retrofit and management strategies steps of the SMAP. These two basins were identified as top priorities based on moderate levels of impairment and high levels of beneficial use, which makes these basins likely to benefit more quickly from stormwater management actions.

Stormwater Management Action Plan

The SMAP addresses current land use management programs and describes the specific projects, management actions, Operations and Maintenance (O&M) strategies, schedule and financial plan the City anticipates using to implement projects and activities in the priority basins.

Land use management actions within the Kitsap Lake basin consist of requiring phosphorous treatment for new development that triggers treatment thresholds under the City's stormwater code. Enhanced O&M in both priority basins would consist of higher frequency of street sweeping and catch basin maintenance.

The Permit requires both short and long term implementation schedules and budgets for the SMAP. Potential short-term actions would occur over the six-year period from 2023-2029 and would consist of a combination of enhanced maintenance activities and treatment retrofit capital project design and construction. The estimated total cost for these short term actions is approximately $7.9M with $5.5M in funding anticipated from grants and $2.4M anticipated from City funds. Table 2 summarizes short term implementation actions and costs.

Table 2. SMAP Implementation Short Term (6 Year) Actions and Cost Summary.

Project	Area Treated	Approx. Acres Effected	Est. Cost	Estimated Schedule
Structural Retrofits				
Kitsap Lake Park Retrofit	Kitsap Lake Park parking lot	1.0	$100,000	2024
Kitsap Lake Outfalls (4) Retrofit	Private parking lots, commercial development, residential development, public roads	77.4	$2,416,000	2024-25
Kitsap Lake Francis Street Retrofit	Private parking lots, commercial development, residential development, public roads	69.3	$1,579,000	2025-26
Oyster Bay Retrofit, Phase 1 Including New Outfall	Private parking lots, commercial development, residential development, public roads	48.2	$3,343,000	2028-29
	TOTAL SHORT TERM STRUCTURAL RETROFITS	**228.4**	**$7,438,000**	**2023-29**
Land Use Management Actions				
Kitsap Lake Phosphorous Limitation Designation	Kitsap Lake, basin wide	1,256	$10,000	2023
Enhanced Operation and Maintenance				
Targeted Enhanced Maintenance Assessment and Planning	Priority Basins	2,841	$10,000/yr.	Annually
Increased frequency street sweeping for priority areas	Public roads, Kitsap Lake and Oyster/Ostrich Bay basin wide	2,841	$30,000/yr.	Annually
Increased frequency catch basin maintenance for priority areas	Public roads, Kitsap Lake and Oyster/Ostrich Bay basin wide	2,841	$30,000/yr.	Annually
	TOTAL SHORT TERM ENHANCED O&M	**2,841**	**$70,000/yr. $430,000 over 6 years**	
	TOTAL SHORT TERM (6 YEAR) COSTS		**$7,868,000**	**2023-29**

Potential long-term actions would occur over the 2029-2043 period and will consist of a combination of enhanced maintenance activities and capital projects. The estimated costs for these long-term actions is $3.64M. The schedule for individual long-term projects has not been determined and will be developed at a later date as part of the City's annual capital project planning process.

The City relies on state and federal grant funds to pay for approximately 75 percent of capital project costs including both design and construction elements. Because the City relies on grants to fund capital projects, the City's implementation plan is subject to change. A financial assessment with strategies for funding capital projects is included in the City's draft 2023 Comprehensive Stormwater Management Plan, which is planned for adoption in mid-2023.

1 INTRODUCTION

This Stormwater Management Action Plan (SMAP) has been prepared by the City of Bremerton (City) pursuant to requirements of the 2019 Western Washington Phase II Municipal Stormwater Permit (Permit). The 2019 Permit Section S5, Special Conditions for Stormwater Management Program for Cities, Towns, and Counties, includes provisions requiring comprehensive stormwater planning. This SMAP meets requirements of condition S5.C.1.d of the Permit.

1.1 Background

The Municipal Separate Storm and Sewer System (MS4) Permit issued by the Washington State Department of Ecology (Ecology) requires jurisdictions to implement a wide range of programmatic stormwater management actions to protect beneficial uses of receiving waters. The Permit requirements are generally based on technical assessments showing significant increases in riparian restoration, stormwater detention and infiltration, and water quality treatment are needed to improve receiving water conditions (Ecology 2019). The 2019 Permit was expanded to include prioritizing one or more stormwater basins where stormwater management programs and capital projects, if implemented, could have measurable effects on water quality. This prioritization process and action plan is to be documented within a SMAP.

This SMAP was prepared in accordance with Ecology's SMAP Guidance (Ecology 2019), which provides instruction to Permittees on selecting the highest priority drainage basin(s) for implementing management action plans to improve water quality conditions in receiving waters.

1.2 SMAP Goals and Objectives

According to Ecology guidance, *"A successful SMAP strategically identifies approaches – in addition to current requirements of the Permit – to accommodate future growth and development while preventing water quality degradation and/or improving conditions in receiving waters harmed by past development."*

The SMAP focuses on identifying and addressing impacts to receiving water quality, and helps to answer the following questions:

- How can existing stormwater problems be most strategically addressed?
- How can water quality goals be accomplished while still meeting future population and density targets?

1.3 SMAP Approach

The approach used to prepare this SMAP focuses on identifying priority basins using the following generalized two-step process:

1. Conduct a Watershed Inventory and Receiving Water Conditions Assessment (RWCA) that determines the influence and relative contribution of the City's jurisdictional area on the receiving water. For Phase II permittees like the City, the urbanized areas and designated Urban Growth Areas (UGAs) are required to be included in this step. The outcome of the RWCA is a list of stormwater basins to be prioritized in Step 2.
2. Basins identified in Step 1 are prioritized based on the water quality conditions in the respective receiving waters. Receiving waters conditions were assessed by identifying the beneficial uses and existing water quality conditions. The highest priority was given to basins with the following characteristics:
    - Higher levels and variety of beneficial uses;
    - Moderate to high levels of impairment;
    - Where the City has potential to exert a greater influence on land management decisions and project implementation decisions; and
    - Where site-specific or regional management efforts can be effectively focused.

1.4 SMAP Content and Organization

The content and organization of the SMAP plan is summarized below.

Chapter 1 – Introduction: Chapter 1 provides an overview of plan purpose, scope, objectives, and organization.

Chapter 2 – Basin Inventory: Chapter 2 describes basins in the City and their basic attributes.

Chapter 3 – Receiving Water Conditions Assessment: The Receiving Water Conditions Assessment describes water quality, habitat and beneficial uses in City basins.

Chapter 4 – Basin Prioritization: This chapter describes prioritization criteria, basin scoring and selection of priority basins.

Chapter 5 – Stormwater Management Action Plan: Chapter 5 describes the City's stormwater proposed plan for implementing the SMAP.

1.5 Public Involvement Conducted for This Plan

The City solicited input from the public through the City's website and targeted emails to specific stakeholders, which consisted of other City departments, Kitsap County, the City of Port Orchard, the US Navy, the Washington Department of Fish and Wildlife, the Kitsap Public Health District and the Suquamish Tribe. The draft SMAP and associated GIS Story Map were posted to the City's web site on April 18, 2023, along with a comment form. The SMAP website is located at http://www.bremertonwa.gov/1309/Stormwater-Management-Action-Plan.

Feedback was received from Kitsap County, the City of Port Orchard and one citizen. Copies of feedback received are provided in Appendix A.

2 BASIN INVENTORY

The City of Bremerton is part of Kitsap County, in west Puget Sound (Figure 1). The City encompasses approximately 32 square miles and supports a population of approximately 43,900 (2021).

The initial step in the basin inventory was to delineate basin areas in the City's jurisdiction (Figure 2). A total of 24 stormwater basins were delineated in the City using ArcMap GIS (Figure 2 and Table 4 on following page).

The 24 basins were aggregated into stormwater basin groups based on Ecology's SMAP guidance (Ecology 2019) which recommends a basin scale of 1 to 20 square miles. Basins were aggregated based on receiving water into 12 stormwater basin groups, each of which are between 0.7 and 23.8 square miles in size (Table 4).

2.1 Tier One Basin Screening

Pursuant to the project Technical Approach TM (City of Bremerton 2022a), a tiered analysis was used for the RWCA (City of Bremerton, 2022b). The Tier 1 analysis consisted of screening the existing basins to identify those that have low potential for stormwater impacts. This was determined by evaluating each basin relative to the criteria shown in Table 3.

Table 3. Tier 1 evaluation thresholds.

Criteria	Tier 1 Threshold
Percent basin developed	≤ 10%
Percent of basin in City	≤ 50%
Basin Area	< 100-acres

As shown in Table 4, a total of 18 basins within six separate stormwater basin/receiving water areas were selected for more detailed Tier 2 analysis.

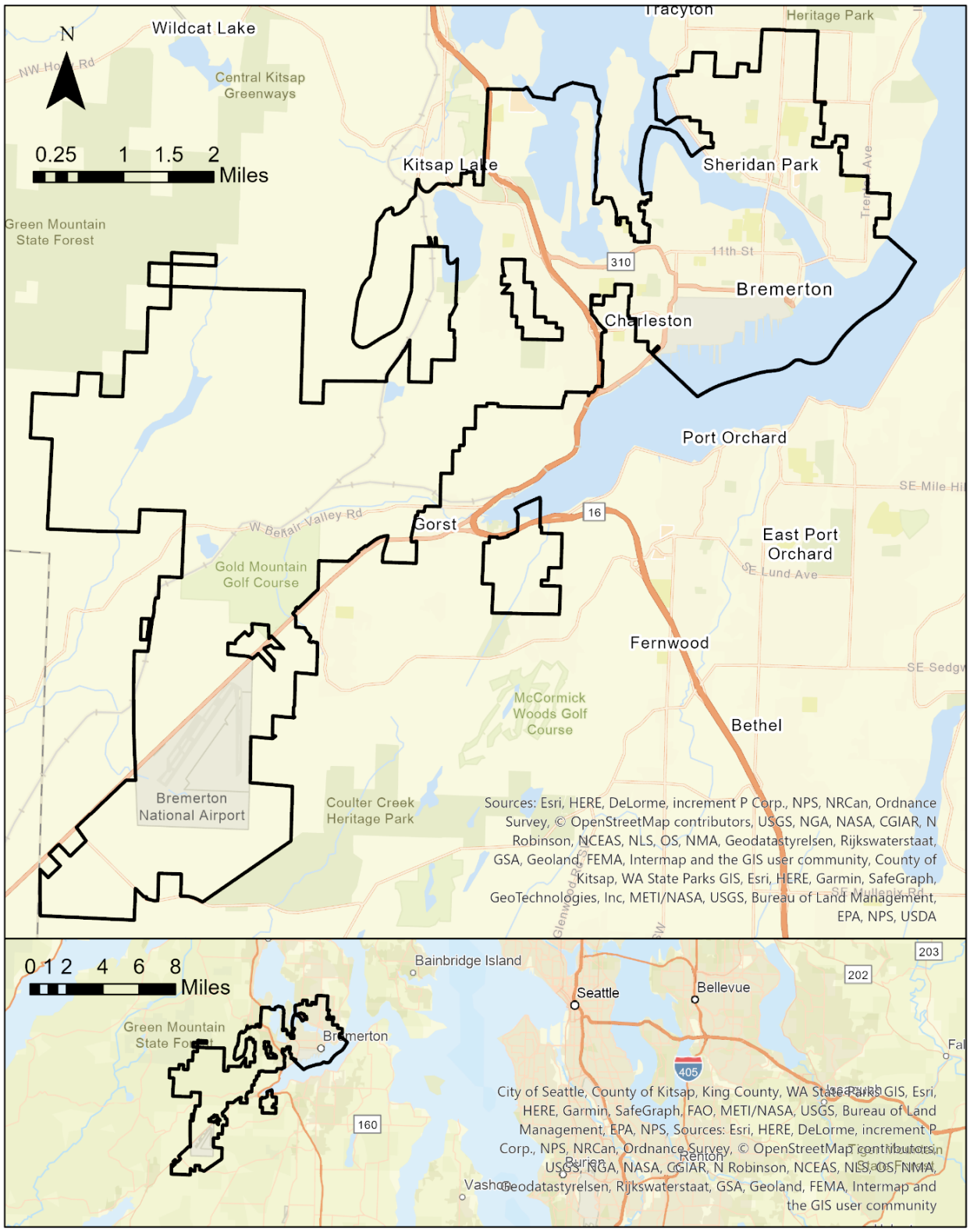
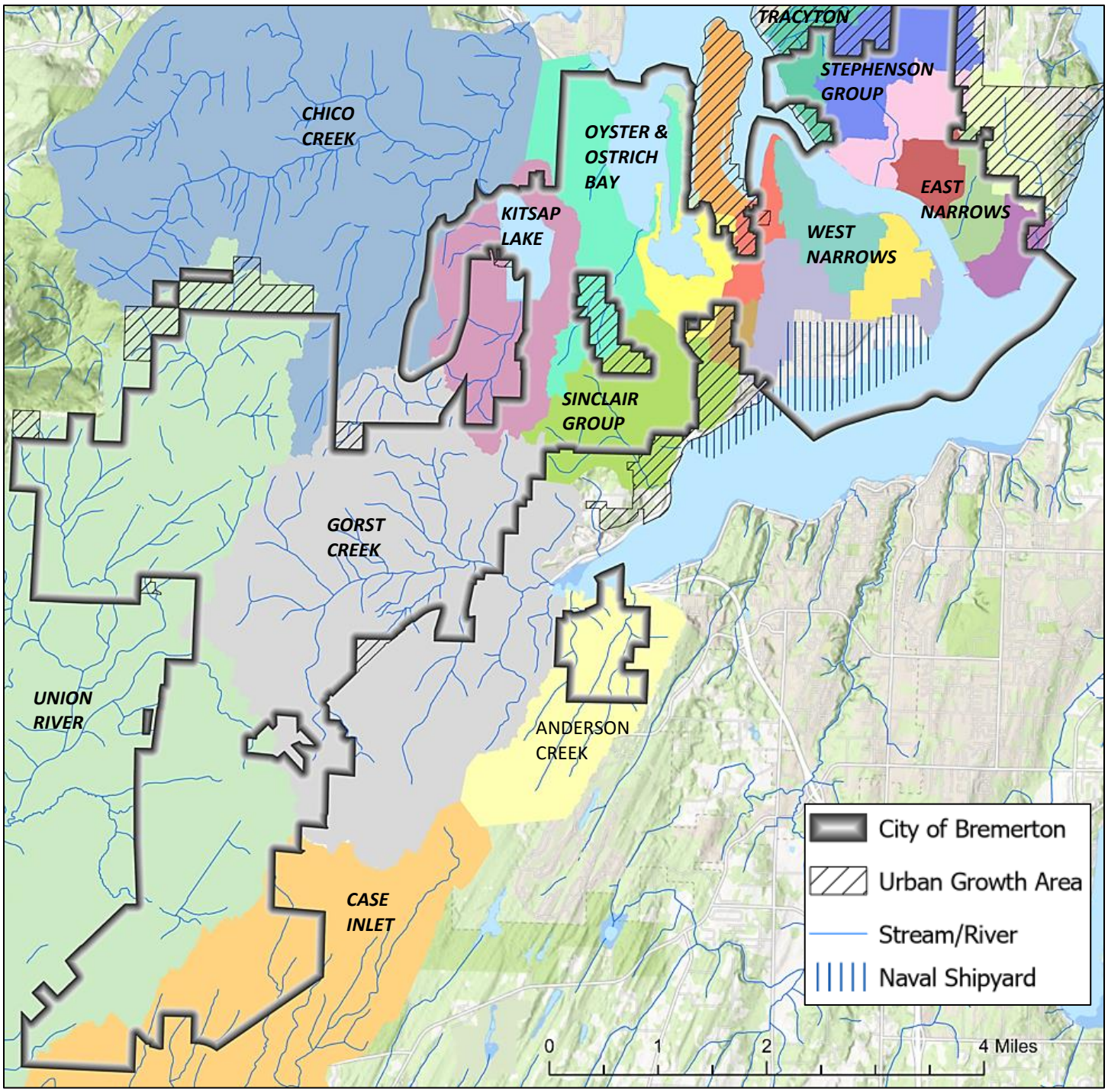


Figure 1. City of Bremerton Location
Stormwater Management Action Plan
City of Bremerton



Stormwater Basins

Anderson Cove	Ostrich Bay	East Park	Sinclair Park
Anderson Creek	Oyster Bay	Enetai Creek	Stephenson Creek
Callow Ave	Pacific Ave	Gorst Creek	Tracyton
Cherry Ave	Phinney Bay	Kitsap Lake	Trenton Ave
Chico Creek	Pine Road	Marine Drive	Union River
Coulter Creek	Rocky Point	Marion Ave	Warren Ave

Figure 2. Stormwater Basins and Receiving Waters

Stormwater Management Action Plan

City of Bremerton

Table 4. Receiving Waters and Basins.

Stormwater Basin	Receiving Water	Tributary To	Basins	Total Acres	Total Sq. Mi.	Acres in Bremerton	Percent in Bremerton	Percent Developed
OYSTER & OSTRICH BAY	Oyster Bay	Dyes Inlet	Oyster Bay	358		331	92%	94%
	Ostrich Bay	Dyes Inlet	Ostrich Bay	1,166		904	78%	80%
	Mud Bay	Dyes Inlet	Marine Drive	61		52	85%	85%
			Subtotal	*1,585*	*2.48*	*1,287*	*81%*	*83%*
KITSAP LAKE	Chico Creek	Dyes Inlet	Kitsap Lake	1,256	1.96	820	65%	40%
EAST NARROWS	P. W. Narrows	Dyes Inlet	Trenton Ave	278		251	90%	80%
	P. W. Narrows	Dyes Inlet	East Park	277		259	94%	90%
	P. W. Narrows	Dyes Inlet	Cherry Ave	226		222	98%	95%
	Enetai Creek	P.O. Passage	Enetai Creek	456		54	12%	70%
			Subtotal	*1,237*	*1.93*	*786*	*64%*	*81%*
STEPHENSON GROUP	P. W. Narrows	Stephenson Cr.	Stephenson Cr.	451		429	95%	90%
	P. W. Narrows	Dyes Inlet	Pine Road	963		564	59%	80%
			Subtotal	*1,414*	*2.21*	*993*	*70%*	*83%*
WEST NARROWS	P. W. Narrows	Dyes Inlet	Anderson Cove	410		410	100%	90%
	P. W. Narrows	Dyes Inlet	Warren Ave	265		265	100%	98%
	Sinclair Inlet	Dyes Inlet	Pacific Ave	88		88	100%	100%
	P. W. Narrows	Dyes Inlet	Phinney Bay	253		214	85%	80%
	Phinney Bay	Dyes Inlet	Rocky Point	357		4	1%	80%
			Subtotal	*1,373*	*2.15*	*981*	*71%*	*88%*
SINCLAIR GROUP	Sinclair Inlet	Sinclair Inlet	Sinclair Park	1,294		854	66%	50%
	Sinclair Inlet	Sinclair Inlet	Callow Ave	411		403	98%	95%
	Groundwater	Infilt. Pond	Marion Ave	129		70	54%	65%
			Subtotal	*1,834*	*2.87*	*1,327*	*72%*	*61%*
Stormwater Basins Eliminated from Further Assessment [1]								
UNION RIVER	Union River	Hood Canal	Union River	15,259	23.84	5,524	36%	< 5%
CHICO CREEK	Chico Creek	Dyes Inlet	Chico Creek	9,873	15.43	902	9%	10%
CASE INLET	Coulter Creek	Case Inlet	Coulter Creek	8,679	13.56	1,127	13%	12%
GORST CREEK	Sinclair Inlet	Gorst Creek	Gorst Creek	6,573	10.27	3,737	57%	10%
ANDERSON CREEK	Anderson Cr.	Sinclair Inlet	Anderson Cr.	1,450	2.27	461	32%	35%
TRACYTON	Dyes Inlet	Dyes Inlet	Tracyton	427	0.67	177	41%	50%

[1] Red text indicates basin meets elimination criteria. See Table 2 for criteria.

3 RECEIVING WATER CONDITION ASSESSMENT

This Receiving Water Conditions Assessment (RWCA) describes the City of Bremerton's receiving waters, stormwater contributing areas, existing water quality conditions, and the potential impacts of land use activities on those receiving waters. The RWCA was used to guide stormwater basin prioritization, and to identify the receiving waters that would be most likely to benefit from stormwater management planning and implementation.

3.1 Purpose and Scope

The purpose of the RWCA was to develop existing data to provide a comparison of current water quality and stormwater conditions in the City's stormwater basins. Basin and water quality information and attributes were developed to allow a consistent, quantitative comparison.

The RWCA scope follows the general assessment process recommended in Ecology's guidance (2019), as follows:

- Delineate all of the basins and receiving waters in the City's jurisdiction for stormwater basins that have areas of approximately one square mile or greater;
- Perform a relatively rapid assessment of existing information about water quality, habitat and land use conditions in each stormwater basin;
- Assess the relative current and potential future influence of the City's stormwater system on receiving waters; and
- Evaluate and summarize the information to identify the basins/receiving waters that are to be advanced to a more detailed prioritization analysis.

The specific technical analysis also reflects the scope of work within the Ecology grant agreement with the City, as follows:

- Describe basins including size, jurisdictional area, and land use;
- Perform a pollutant loading analysis;
- Evaluate and map shoreline sediment deposition potential;
- Estimate the level of water quality treatment and flow control at the basin scale;
- Assess stormwater influence in each basin, and
- Develops a ranked list candidate basins for the Receiving Water Prioritization.

The RWCA compiled and reviewed a variety of available information to describe conditions within each basin. This information and the associated data variables were identified based on a combination of designated beneficial uses and available data sets, consistent with both Ecology guidance (Ecology 2019) and guidance from *Building Cities in the Rain* (Commerce 2016). As shown in Table 5, data used in the RWCA consisted of a combination of national, state and local data sets.

Table 5. Summary of Data Sets and Beneficial Uses for RWCA.

Data Category	Beneficial Use/Criteria	Data Sets Used in RWCA [1]
WATER QUALITY	Aquatic Life	Ecology 303(d) List/Water Quality Atlas
	Shellfish Harvesting - Recreational	Kitsap Health Dist.(KHD) and Wash. Dept of Health (WDOH)
	Shellfish Harvesting - Commercial	KHD and WDOH marine ambient monitoring data
	Aquatic Life	WDFW Mussel Tissue Monitoring SAM Report
	Primary Contact Recreation	KHD and WDOH ambient monitoring data
POLLUTANT LOADING	Aquatic Life/Shellfish	Nature Conservancy Heat Map
	Aquatic Life	Ecology NPDES Data Characterization
	Aquatic Life	Dyes/Sinclair Inlet TMDL Study
	Sediment Deposition	Washington Coastal Atlas
HYDROLOGY	Aquatic Life	Ecology Watershed Characterization
HABITAT	Aquatic Habitat	Ecology Watershed Characterization
	Salmonid Habitat	WDFW Salmonscape GIS
	T&E Listed ESA Species	WDFW Salmonscape GIS
	Forage Fish Spawning	WDFW Forage Fish Spawning GIS
	ESA Critical Habitat	NOAA and USFWS Critical Habitat
SHELLFISH AND FINFISH CONSUMPTION	Shellfish Harvesting - Recreational	WDOH Commercial Shellfish and Beach Closure GIS
	Shellfish Harvesting - Commercial	WDOH Commercial Shellfish and Beach Closure GIS
	Finfish Harvesting - Recreational	WDOH Commercial Shellfish and Beach Closure GIS
LAND USE	Water Quality, Water Flow and Habitat	City of Bremerton Zoning
		High ADT Road miles, City of Bremerton
		City of Poulsbo Parks Plan
		Land Cover and Impervious Surfaces
STORMWATER INFRASTRUCTURE	Water Quality, Water Flow and Habitat	City of Bremerton GIS

[1] Also see References list for additional details on data sources.

3.2 Jurisdictional Areas and Land Use

As shown in Table 4, City jurisdiction ranges from 65 to 81 percent in the top six receiving water basin areas. Kitsap County has jurisdiction in basin areas that are outside the City. Federal jurisdiction within the Naval Base Kitsap – Puget Sound Naval Shipyard was not considered in this assessment as this facility is regulated under a separate federal stormwater NPDES Permit. Land use zoning in the City is shown in Figure 3.

3.3 Existing Water Quality Conditions

Existing water quality conditions were assessed using available information on conditions in both marine water and freshwater and are summarized on the following page.

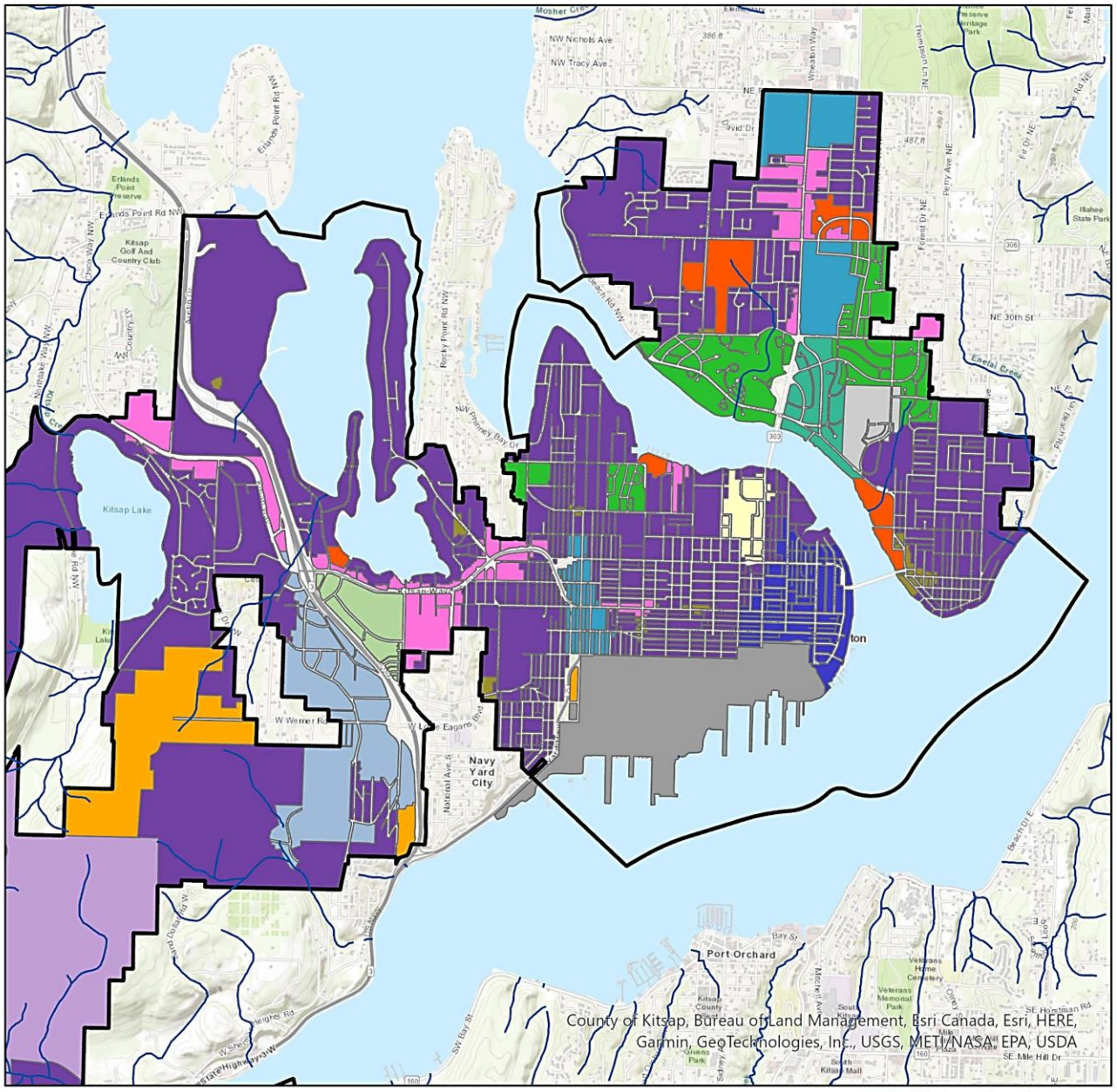


Figure 3. Bremerton Zoning
Stormwater Management Action Plan
City of Bremerton

3.3.1 Marine Water Quality

Marine water quality conditions were analyzed for compliance with the fecal coliform (FC) standard using data obtained by the Kitsap Public Health District (KPHD). Table 6 provides a summary of water quality conditions. The KPHD historically monitored 15 marine water stations near Bremerton monthly through 2017. Marine water quality data collected by KPHD in 2017 met all water quality standards and showed a long-term improvement trend (KPHD 2017).

KPHD data were supplemented with marine water quality data collected by Washington Department of Health (WDOH) Shellfish Section from 14 locations in Oyster and Ostrich Bay over the 2017 -2021 period. Marine water quality data collected by WDOH met all water quality standards (WDOH 2022).

3.3.2 Stream/Fresh Water Quality and Public Health Advisories

Stream and lake water quality data collected by the KPHD over the 2019-2020 period showed the following lakes and streams in the City did not meet bacterial water quality standards:

- Kitsap Lake
- Ostrich Creek
- Enetai Creek
- Phinney Creek

Wright Creek, which drains much of the Sinclair stormwater basin, did meet FC water quality standards. Public health advisories for direct contact recreation posted by either the City or the KPHD in 2021-22 due to microbial or toxic algae pollution of freshwater bodies were also considered and are reflected in Table 6.

3.3.3 Mussel Tissue Monitoring

Mussel tissue monitoring was performed at four locations in the Bremerton vicinity by the WDFW in 2017/2018 as part of the Stormwater Action Monitoring (SAM) program (Langness 2020). Table 6 shows the parameters in mussel tissue at each location that exceeded the 75th percentile for the Puget Sound region.

Table 6. Summary of existing water quality conditions.

SMAP Stormwater Basin Group	Basins	WDFW/SAM Tissue [1]	303d listings [2]		Fecal Coliform			FC Rating [5]	City/KPHD WQ Public Health Advisories [6]	Summary of Ratings	Overall Rank
					KPHD Monitoring [3]		WDOH Marine Monitoring [4] (Mts Stdrd. Y/N)				
			Parameters	Conv. & Toxics Rating	Freshwater (Mts Strd. Y/N)	Marine Water (Mts Strd. Y/N)					
OYSTER & OSTRICH BAY	Oyster Bay	PCBs, PBDEs, DDT, Hg, Cu/Zn/Pb	Freshwater: DO, TEMP	HIGH	NO	YES	YES	MODERATE	YES/HIGH	H/M/H	2
	Ostrich Bay		Marine Water: FC, DO, Temp								
	Marine Drive		Tissue: Hg								
			Sediment: Bioassay								
KITSAP LAKE	Kitsap Lake	NA	Freshwater: FC, P	HIGH	NO	NA	NA	HIGH	YES/HIGH	H/H/H	1
			Marine Water: NA								
			Tissue: Hg, pesticides								
			Sediment: None								
EAST NARROWS	Trenton Ave	PCBs, Hg	Freshwater: FC, Temp,	HIGH	NO	YES	NA	MODERATE	NO/LOW	H/M/L	4
	East Park		Marine Water: FC, Temp, pH								
	Cherry Ave		Tissue: PAHs, PCBs, pesticides								
			Sediment: None								
	Enetai Creek										
STEPHENSON GROUP	Stephenson Cr.	PAHS, PCBs, DDT, Hg	Freshwater: None	MODERATE	NA	YES	NA	LOW	NO/LOW	M/L/L	6
			Marine Water: FC, Temp, pH								
	Pine Road		Tissue: PAHs, PCBs, pesticides								
			Sediment: None								
WEST NARROWS	Anderson Cove	PAHs, PCBs, DDT, Hg	Freshwater: FC	HIGH	NO	YES	NA	MODERATE	NO/LOW	H/M/L	3
	Warren Ave		Marine Water: FC, DO, Temp								
	Pacific Ave		Tissue: PAHs, PCBs								
	Phinney Bay		Sediment: PCBs								
	Rocky Point										
SINCLAIR GROUP	Sinclair Park	PAHs, PCBs, PBDEs, DDT, Hg, Cu/Zn/Pb	Freshwater: FC	HIGH	YES	YES	NA	LOW	NO/LOW	H/L/L	5
	Callow Ave		Marine Water: FC, PAHs, DO, Temp, PCBs, Hg								
	Marion Ave		Tissue: PAHs, PCBs, pesticides								
	Subtotal		Sediment: Hg, PCBs								

[1] Parameters in mussel tissue, upper 75th percentile of Puget Sound region, WDFW 2020.

[2] Assessment Category 2-5. Rating criteria: High: Elevated or does not meet standards for Tissue, Freshwater, Marine Water. Moderate: Elevated for Tissue, and Marine Water but Meets Freshwater Standard.

[3] KPHD monitoring; marine water 2017; freshwater 2020.

[4] Wash. State Dept. of Health marine water data, 2017 -2021.

[5] Rating Criteria: High = Fails both parts FC standard; Moderate = Fails 1 part of FC standard; Low = Meets both parts of FC standard.

[6] Source: KPHD 2022. Does not include advisories due to sanitary sewer spills/overflows.

3.3.4 State 303(d) List

Impaired waters as shown on Ecology's Water Quality Atlas (2022a) were summarized for each basin and media (marine water, freshwater, tissue, and sediment) for parameters identified in Ecology's Water Quality Assessment Categories 2 through 5.

3.4 Pollutant Loading Analysis

The objective of the analysis is to develop estimates of stormwater pollutant loading for each Tier 2 basin group. Estimated pollutant loads for each of the Tier 2 basins were calculated using data available from StormwaterHeatmap.org (Nature Conservancy 2022), the Sinclair and Dyes Inlet Fecal Coliform TMDL Study (May 2005), and relative loading calculated using the Simple Method (Schueler 1987). Table 7 summarizes parameters that were used from each of these sources and additional detail on each data source is provided below.

Table 7. Tier 2 Pollutant Loading Parameters and Data Sources.

Data Source	Parameters
StormwaterHeatmap.org	Copper, Zinc, TSS, Total N, Total P
StormwaterHeatmap.org	Mean annual runoff volume
Sinclair and Dyes Inlet FC Model	Fecal coliform bacteria
Kitsap Public Health District	Fecal coliform bacteria
Simple Method	TPH - Dx, Total PAHs,

3.4.1 StormwaterHeatmap.org

The recently completed *Stormwater Heat Map* interactive watershed tool developed by the Nature Conservancy (2022) was used to derive loading estimates of selected metals and nutrients. The Nature Conservancy (NC) heat map tool utilizes water quality data from Ecology's *Western Washington NPDES Phase 1 Stormwater Permit: Final Data Characterization 2009-2013 (2015)* and hydrology from continuous Hydrological Simulation Program-FORTRAN (HSPF) using regional pre-calibrated parameters. Figure 4 depicts typical NC Heat Map visual presentation.

3.4.2 ENVVEST Fecal Coliform Model and KPHD Data

The ENVVEST model used an HSPF hydrologic model in combination with site specific FC monitoring data to develop FC loading estimates from all primary stormwater outfalls and streams in the City. The model was calibrated and shown to be Fair to Exceptional in predicting FC concentrations (Johnston 2009). FC data used in the ENVVEST model are over 15 years old and were therefore updated and/or supplemented where available by more recent data collected by the KPHD ambient water quality monitoring program.

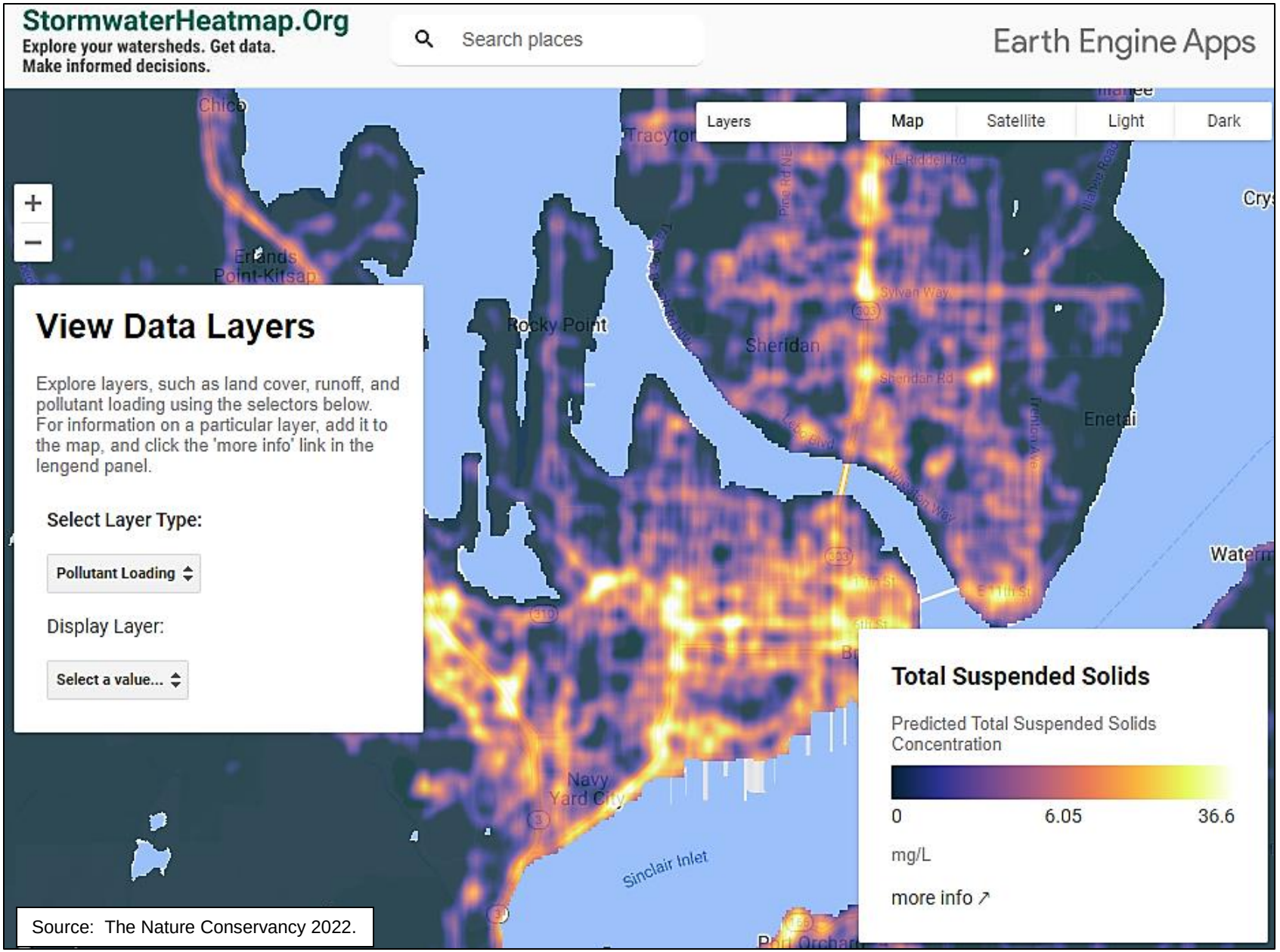


Figure 4. Stormwater Heat Map
Stormwater Management Action Plan
City of Bremerton

3.4.3 Simple Method

The Simple Method (Schueler 1987) was used to supplement data from the NC Heat Map and ENVVEST study for selected organic chemicals (see Table 8). The Simple Method provides general planning level estimates of pollutant loading that are suitable for a relative basin comparison where a ranked outcome is desired. This method estimates pollutant loads for chemical constituents as a product of annual runoff volume and pollutant concentration, as:

$$L = 0.226 * R * C * A$$

Where: L = Annual load (lbs.)

R = Annual runoff (inches)

C = Pollutant concentration (mg/L)

A = Area (acres)

0.226 = Unit conversion factor

Pollutant loading estimates were developed for the organic chemical parameters shown in Table 8 since these parameters are not available from the NC Stormwater Heatmap tool. Runoff volumes used in Simple Method calculations were derived using the Stormwater Heatmap tool.

3.5 Pollutant Loading Results

Pollutant loading results are shown in Table 8. Overall, pollutant loading was highest in the Ostrich and Oyster Bays basin, followed by the West Narrows (along the west side of Port Washington Narrows), East Narrows (east Bremerton area along Port Washington Narrows) and Sinclair basin groups. Pollutant loading was strongly influenced by basin size and impervious area, with older, more developed areas of the City typically generating higher pollutant loads. On a total load weight basis, Total Suspended Solids generated the highest load, followed by nutrients (Total N and Total P), petroleum, hydrocarbons, and zinc.

3.6 Sediment Deposition Potential

The objective of the shoreline deposition analysis was to identify shoreline stormwater depositional potential to support evaluation of potential impacts of stormwater on sediments. The technical approach reflects the findings of the *Nearshore Sediment Monitoring for the Stormwater Action Monitoring (SAM) Program, Puget Sound, Western Washington* (USGS 2018). This study found that sediment chemical concentrations were significantly higher in drift cells with limited sediment movement compared to those with higher energy. Sediment grain size and watershed characteristics were only weakly related to sediment concentrations.

Table 8. Pollutant loading analysis results.

SMAP Stormwater Basin Group	Receiving Water	Tributary To	Basins	Total Acres	Acres in Bremerton	Annual Runoff Volume (Mgal) [1]	Annual Load (lbs./year) [1]					Annual Runoff (inch) [1]	Annual Load (lbs./year) [2]		FC Load (Million/Rel.Avg. Day) [3]	Overall Rank [4]
							Cu	Zn	TSS	Tot. N	Tot. P		TPH - Dx	Total PAHs		
OYSTER & OSTRICH BAY	Oyster Bay	Dyes Inlet	Oyster Bay	358	331	153.04	25.49	159.31	63,882	1,752.41	159.31	15.72	550.72	0.21	487	1
	Ostrich Bay	Dyes Inlet	Ostrich Bay	1,166	904	249.23	41.51	259.44	104,031	2,594.35	259.44	7.86	896.85	0.34	225	
	Mud Bay	Dyes Inlet	Marine Drive	61	52	7.82	2.17	13.57	5,442	54.29	8.14	4.72	28.15	0.01	15	
			Subtotal	1,585	1,287	410.09	69.17	432.32	173,354	4,401.05	426.89	-	1,475.72	0.55	727	
KITSAP LAKE	Kitsap Creek	Chico Creek	Kitsap Lake	1,256	820	185.24	11.18	55.89	78,442	838.38	100.61	5.42	666.59	0.25	32	6
EAST NARROWS	P. W. Narrows	Dyes Inlet	Trenton Ave	278	251	103.99	24.74	98.97	37,205	1,237.10	148.45	13.76	374.20	0.14	128	3
	P. W. Narrows	Dyes Inlet	East Park	277	259	59.21	4.93	36.98	17,300	246.53	36.98	7.86	213.06	0.08	18	
	P. W. Narrows	Dyes Inlet	Cherry Ave	226	222	120.77	24.14	130.74	44,360	1,206.84	130.74	19.65	434.58	0.16	15	
	Enetai Creek	P.O. Passage	Enetai Creek	456	54	60.92	24.35	121.75	48,821	811.68	101.46	4.91	219.21	0.08	18	
			Subtotal	1,237	786	344.88	78.16	388.44	147,686	3,502.15	417.63	-	1,241.05	0.46	179	
STEPHENSON GROUP	P. W. Narrows	Stephenson Cr.	Stephenson Cr.	451	429	98.81	20.07	100.35	40,238	802.78	140.49	8.06	355.57	0.13	239	5
	P. W. Narrows	Dyes Inlet	Pine Road	963	564	200.69	68.57	299.97	85,919	2,142.68	257.12	7.66	722.19	0.27	674	
			Subtotal	1,414	993	299.50	88.64	400.32	126,157	2,945.46	397.61	-	1,077.75	0.40	913	
WEST NARROWS	P. W. Narrows	Dyes Inlet	Anderson Cove	410	410	175.27	32.84	127.72	43,896	1,824.50	127.72	15.72	630.71	0.24	39	2
	P. W. Narrows	Dyes Inlet	Warren Ave	265	265	141.61	28.30	141.51	42,558	1,533.03	129.72	19.65	509.57	0.19	190	
	Sinclair Inlet	Dyes Inlet	Pacific Ave	88	88	56.43	10.96	58.74	19,628	548.24	58.74	23.58	203.06	0.08	125	
	P. W. Narrows	Dyes Inlet	Phinney Bay	253	214	40.56	18.01	45.03	27,087	337.76	56.29	5.90	145.95	0.05	267	
	Phinney Bay	Dyes Inlet	Rocky Point	357	4	66.77	12.71	111.21	31,852	317.73	47.66	6.88	240.27	0.09	45	
			Subtotal	1,373	981	480.63	102.83	484.20	165,021	4,561.25	420.12	-	1,729.56	0.65	666	
SINCLAIR GROUP	Sinclair Inlet	Sinclair Inlet	Sinclair Park	1,294	854	373.39	23.03	57.58	57,725	575.83	115.17	10.61	447.88	0.17	37	4
	Sinclair Inlet	Sinclair Inlet	Callow Ave	411	403	263.55	43.89	237.76	66,005	2,011.85	237.76	23.58	948.38	0.35	387	
	Groundwater	Infilt.. Pond	Marion Ave	129	70	26.19	6.89	22.96	11,509	114.81	22.96	7.47	94.26	0.04	0	
			Subtotal	1,834	1,327	663.13	73.82	318.31	135,240	2,702.49	375.89	-	1,490.52	0.56	424	
			TOTALS	8,699	6,194	2,383	424	2,079	825,901	18,951	2,139	-	7,681	2.87	2,941	

[1] Values derived from NRC Heat Map, 2022.

[2] TPH-Dx and PAH median concentrations from Ecology 2013.

[3] Fecal coliform loads from May 2005.

[4] Rank based on sum of annual total load of all parameters.

3.6.1 Drift Cell Mapping and Analysis

Existing drift cell mapping, available from Ecology's Coastal Atlas Map and mapping completed as part of the *East Kitsap County Nearshore Habitat Assessment and Restoration Prioritization Framework* (2009) was utilized to identify drift cell locations and nearshore characteristics including net shore drift direction and transport/depositional zones. Hydrodynamic mapping from the study area was used to supplement drift cell information and was based on modeling results presented in the *An Integrated Watershed and Receiving Water Model for Fecal Coliform Fate and Transport in Sinclair and Dyes Inlets, Puget Sound, WA* (Johnston, et.al 2009). This study/model identified current speeds and directions of nearshore drift in both Dyes and Sinclair Inlet.

3.6.2 Sediment Deposition Potential – Results

Figure 5 depicts sediment deposition potential based on a combination of drift cell transport zones and sediment delivery estimates for specific discharge locations (streams or storm outfalls). Annual estimated outfall sediment delivery volumes were derived from the Nature Conservancy Heat Map model described in the Pollutant Loading section above. This model computes annual Total Suspended Solids (TSS) load based on a combination of an HSPF model and TSS data from Ecology's *Western Washington NPDES Phase 1 Stormwater Permit: Final Data Characterization 2009-2013 (2015).* Relative sediment delivery volumes are depicted on Figure 4 across a generalized scale from High to Low.

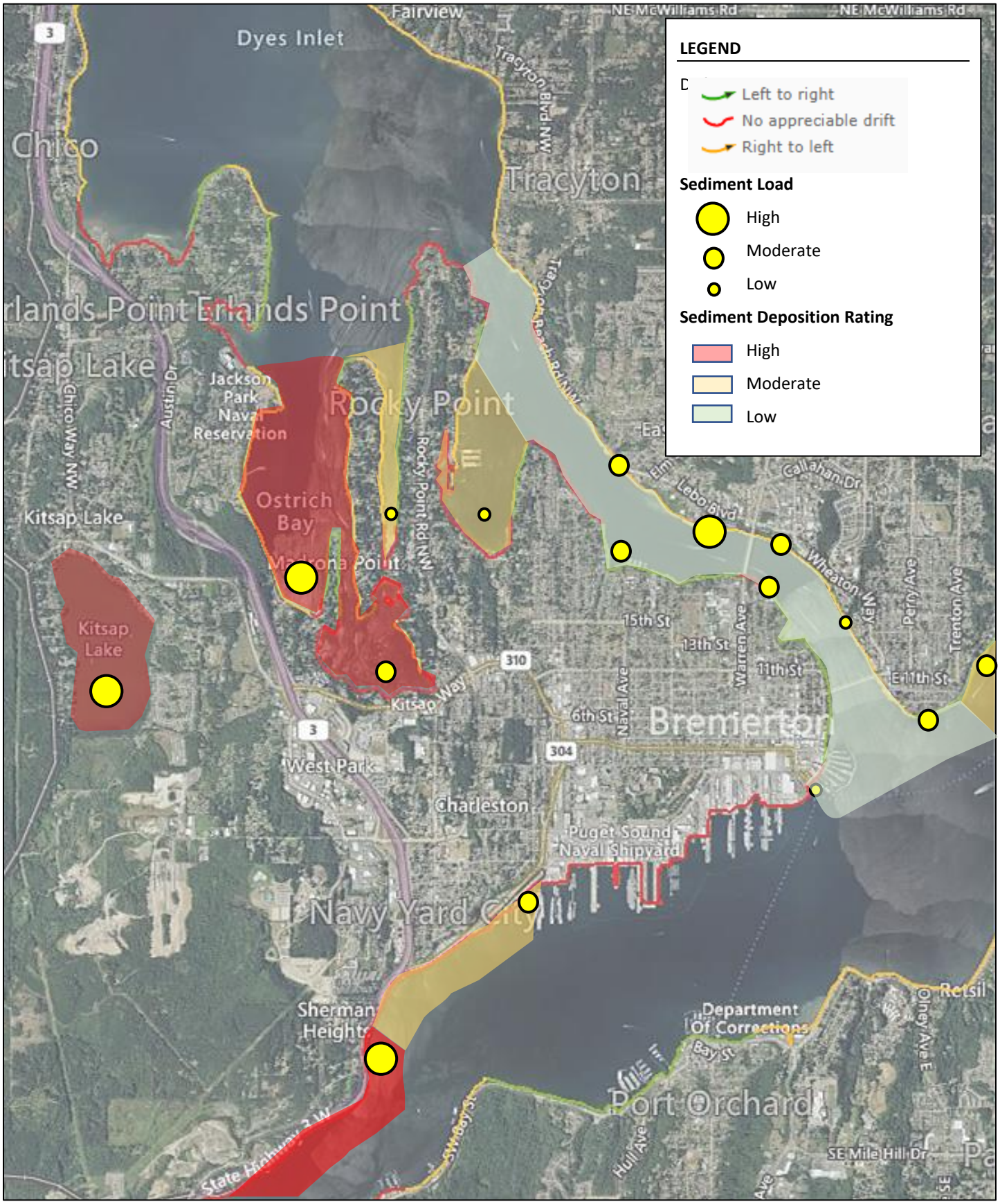
Sediment depositional potential was highest in shallow, sheltered water bodies that also receive relatively large sediment loads. These areas are shown in Figure 5 and include Oyster and Ostrich Bay, Kitsap Lake and the west end of Sinclair Inlet.

3.7 Stormwater Management Influence Assessment

The assessment of stormwater management influence considers the relative conditions of receiving waters and identifies the receiving waters that are most likely to benefit from stormwater management planning and associated implementation. This ranking becomes the list of candidate basins for the prioritization process. The prioritization process and associated criteria are addressed in section 4, Basin Prioritization.

The stormwater management influence assessment incorporates the results of the receiving water assessment described above as well as the following additional criteria:

- Total Impervious Area (TIA),
- High Average Daily Traffic (ADT) road density,
- Development pressure, and



SCALE IN FEET
0 2,500 5,000

Figure 5. Sediment Depositional Potential
Stormwater Management Action Plan
City of Bremerton

- Estimates of existing flow control and water quality treatment.

Figure 6 depicts TIA in the east and west Bremerton areas of the City. High ADT roads were derived from the NC Heat Map. Development pressure was determined by comparing land use zoning to percent of basin developed. Basins with high density zoning designations but lower percent existing development were considered to have higher development pressure.

Estimated levels of stormwater flow control and water quality treatment from BMPs at the basin scale were developed based on City mapping of treatment and flow control facilities and knowledge of City staff. Treatment and flow control estimates are reported on a high/medium/low basis, with relative effectiveness considered based on the type and age of the treatment facility and the City's knowledge of performance. Existing treatment and flow control facility locations are shown in Figures 7 and 8.

3.8 Scoring Methodology

The stormwater management influence scoring methodology uses a rating scale of High, Medium, or Low for each rating criteria. The basis for each rating is described in Table 9. Stormwater management influence rating and overall basin rankings are shown in Table 10.

Table 9. Stormwater management influence scoring methodology.

Criteria	Basis for Score		
Jurisdictional Control	High: > 80% in City	Moderate: < 80% and > 50% in City	Low not used
Pollutant Loading	High: One of top 3 highest load basins	Moderate: One of lower 3 load basins	Low not used
Hydrology [1]	High = High Waterflow importance	Moderate = Mod High/Moderate water flow Importance	Low = Low water flow importance
Zoning and Development	High > 80% res+com+ind zoning & High development pressure [2]	Moderate < 80% res+com+ind zoning &/or Moderate development pressure	Low not used
Total Impervious Area	High > 40% TIA & High Road Density	Moderate 10% - 40% TIA and/or Moderate Road Density	Low < 10% TIA and/or Mod-Low Road Density
Existing Treatment and Flow Control	High: High: > 90 of basin not treated	Moderate: 10 - 20% of basin treated	Low < 10% basin treated

[1] Data source: Ecology Watershed Characterization tool (2022).
[2] Development pressure rating: High < 80% developed & > 80% residential (res) +commercial (com) +industrial (ind) zoning; Moderate > 80% developed &/or < 80% res+com+ind zoning; Low not used.

The summary rating for each receiving water was determined by summing the individual High/Medium/Low ratings as shown in Table 10. Overall, Kitsap Lake had the highest stormwater management influence rating, followed by the West Narrows and Oyster and Ostrich Bay basins, respectively.

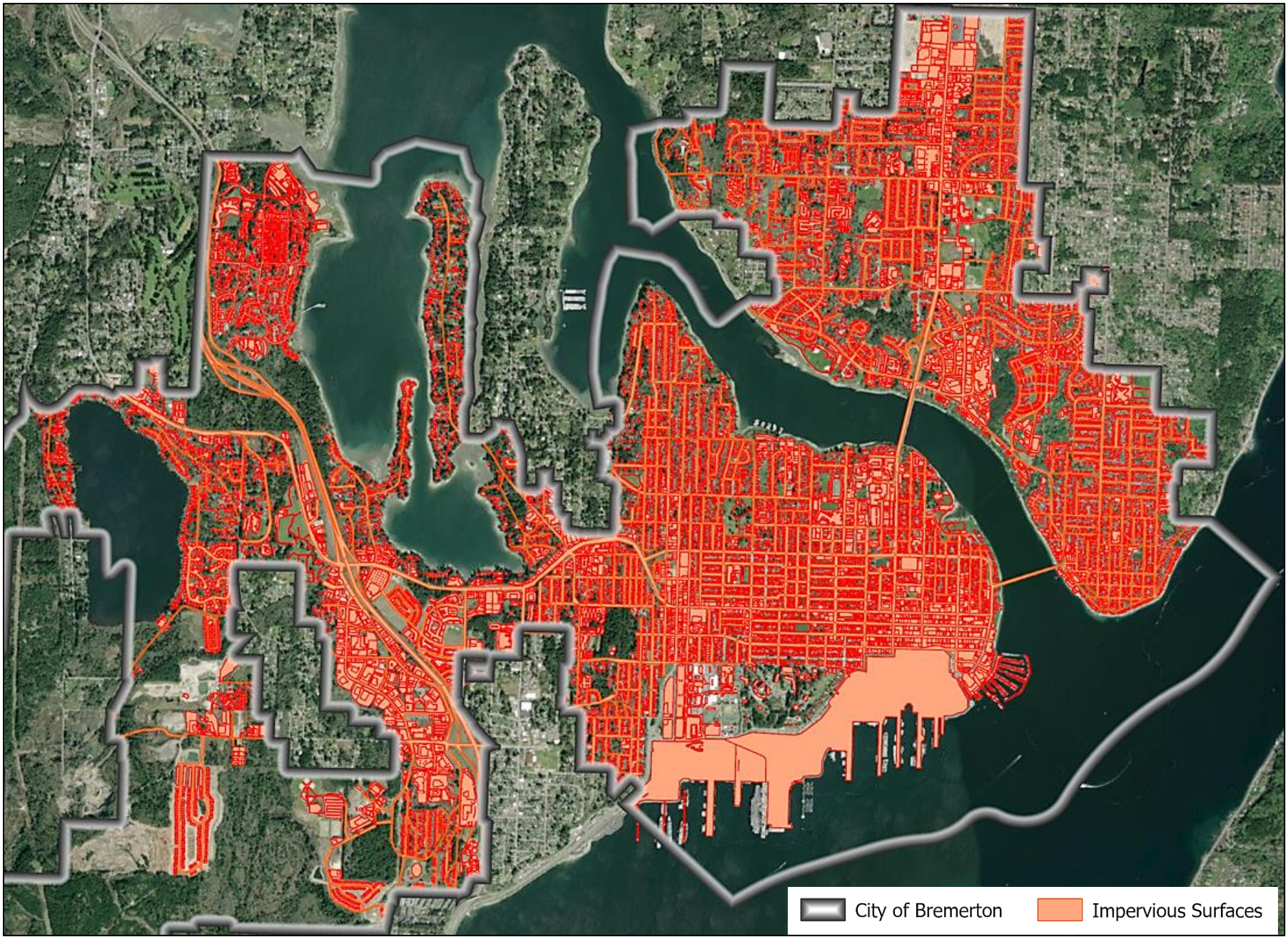


Figure 6. Impervious Surfaces
Stormwater Management Action Plan
City of Bremerton

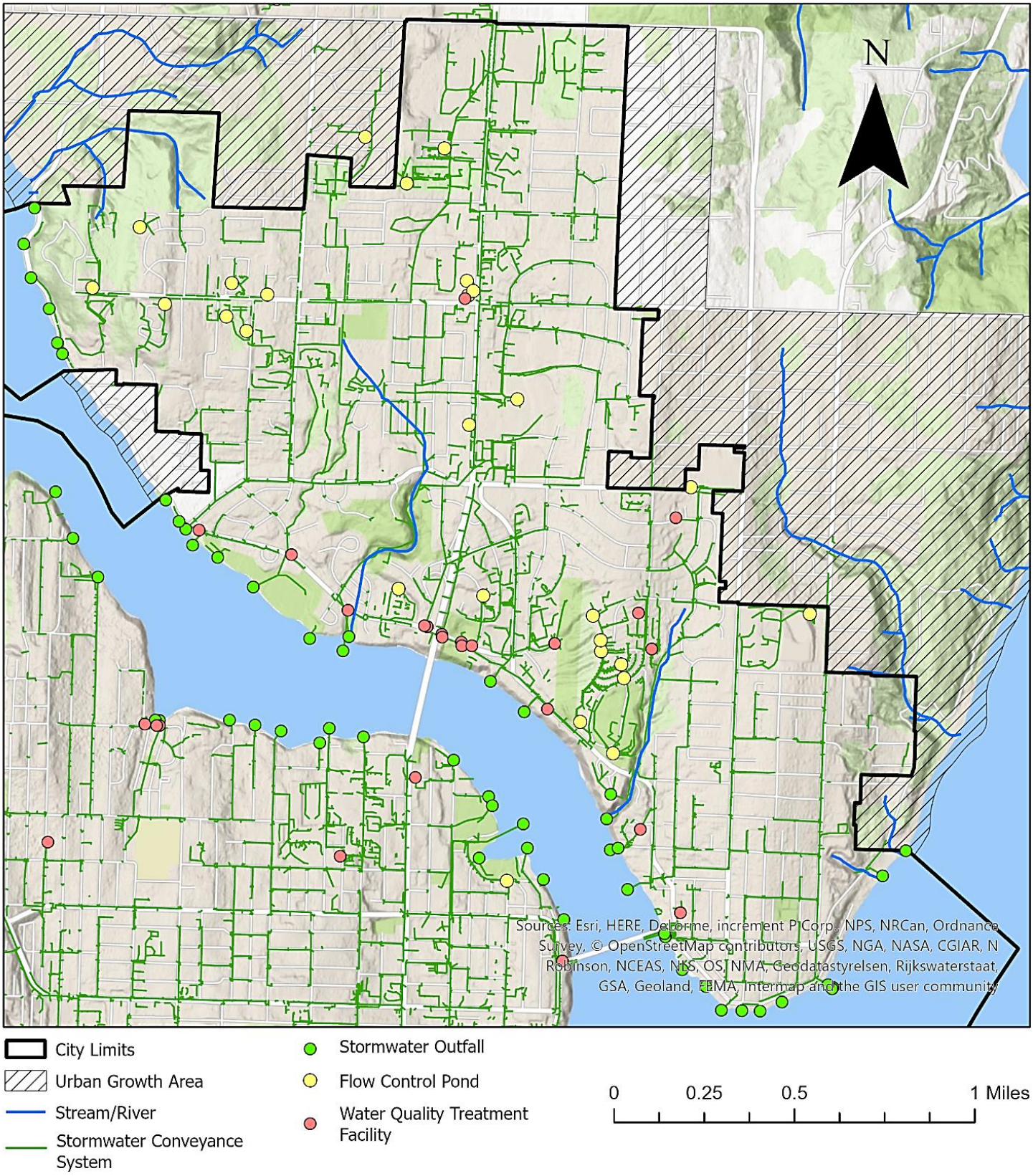


Figure 7. Treatment and Flow Control Facility Locations, East Bremerton Area

Stormwater Management Action Plan

City of Bremerton

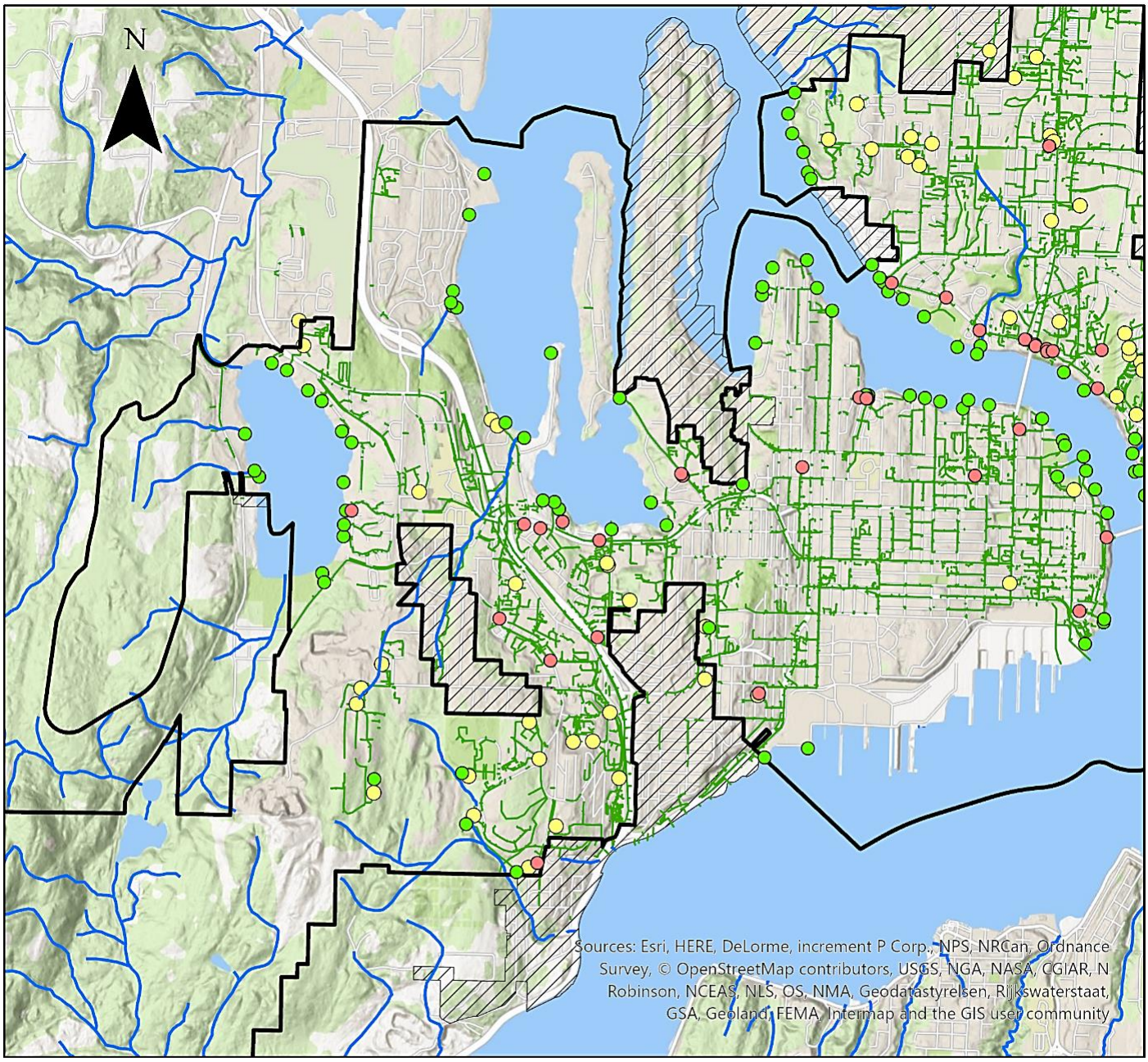


Figure 8. Treatment and Flow Control Facility Locations, Central Bremerton Area

Stormwater Management Action Plan

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Table 10. Stormwater management influence summary.

SMAP Stormwater Basin Group	Basins	Jurisdictional Control		Pollutant Loading (H/M/L) [1]	Hydrology (H/M/L) [2]	ZONING & DEVELOPMENT [3]							Existing Impervious Areas			Existing Treatment [10]	Summary of Ratings	Overall Rating	Overall Rank
		Percent in Bremerton	Rating (H/M/L)			Residential	Commercial & Institutional	Industrial	Other [4]	Percent Developed	Development Pressure (H/M/L) [5]	Z&D Rating [6]	% TIA [8]	High ADT Road Density (H/M/L) [7]	TIA Rating [9]				
OYSTER & OSTRICH BAY	Oyster Bay	92%	H							94%			38%	H	H	M	H/H/M/M/M/M	M-H	3
	Ostrich Bay	78%	M							80%			28%	M	M				
	Marine Dr.	85%	H							85%			14%	L	L				
	Subtotal	81%	H	H	M	68%	11%	3%	18%	83%	M	M	30%	H	M				
KITSAP LAKE	Kitsap Lake	65%	M	M	H	66%	5%	22%	7%	40%	H	H	11%	M	M	H	M/M/H/H/M/H	H	1
EAST NARROWS	Trenton Ave	90%	H							80%			31%	M	M	H	M/H/M/M/M/H	M-H	4
	East Park	94%	H							90%			36%	M	M				
	Cherry Ave	98%	H							95%			39%	H	H				
	Enetai Creek	12%	L							70%			33%	L	M				
	Subtotal	64%	M	H	M	72%	3%	0%	25%	81%	M	M	35%	M	M				
STEPHENSON GROUP	Stephenson Cr.	95%	H							90%			34%	M	M	H	M/M/L/M/M/H	M	6
	Pine Road	59%	L							80%			38%	M	M				
	Subtotal	70%	M	M	L	59%	33%	4%	4%	83%	M	M	36%	M	M				
WEST NARROWS	Anderson Cove	100%	H							90%			40%	H	H	H	M/H/M/M/H/H	H	2
	Warren Ave	100%	H							98%			58%	H	H				
	Pacific Ave	100%	H							100%			79%	H	H				
	Phinney Bay	85%	H							80%			35%	M	M				
	Rocky Point	1%	L							80%			25%	L	L				
	Subtotal	71%	M	H	M	55%	13%	0%	31%	88%	M	M	47%	H	M				
SINCLAIR GROUP	Sinclair Park	66%	M							50%			22%	L	L	M	M/M/H/M/M/M	M	5
	Callow Ave	98%	H							95%			49%	H	H				
	Marion Ave	54%	L							65%			31%	L	L				
	Subtotal	72%	M	H	H	49%	25%	3%	24%	61%	H	M	31%	M	M				

[1] Rating scale: High = top 3 loading basins; Moderate = lower 3 loading basins. See Pollutant loading table for detail.

[2] Rating scale: High = High Waterflow Importance; Moderate = Mod High/Moderate Importance; Low = Low Importance.

[3] Bremerton zoning map 2022. Land use aggregated according to general zoning category.

[4] Other zoning including right of way, utility lands, parks.

[5] Development pressure rating: High < 80% developed & > 80% res+com+ind zoning; Moderate > 80% developed &/or < 80% res+com+ind zoning;

[6] Zoning and development rating scale: High > 80% res+com+ind zoning & High Dev.Pres.; Moderate < 80% res+com+ind zoning &/or Moderate Dev.Pres.

[7] Data derived from NRC Heat Map, 2022. Road density rating key: High: > 3 miles ADT > 20,000. Moderate: 1-3 miles ADT > 20,000. Low: < 1 mile ADT > 20,000

[8] TIA is for areas within City of Bremerton city limits.

[9] TIA rating scale: High >40% TIA & High Road Density.; Moderate 10% - 40% TIA and/or Mod Rd.Den.; Low < 10% TIA and/or Mod-Low Rd.Den..

[10] Existing treatment and flow control scale: High: > 90 of basin not treated; Moderate: 10 - 20% of basin treated; Low < 10% basin treated

H = High, M-H = Moderate-High, M = Moderate, L = Low

3.9 Combined Receiving Water and Stormwater Influence Analysis

In summary, 12 stormwater basin groups, made up of 24 separate stormwater basins, were evaluated based on physical characteristics, receiving water conditions and stormwater management influence. A total of six basins were eliminated in the Tier 1 evaluation due to low levels of development or relatively low portion within City jurisdiction. The remaining six basin groups were evaluated relative to existing water quality conditions, pollutant loading, existing treatment, and existing and potential future development.

The combined existing receiving water quality and stormwater influence assessment results provide a comparison of relative conditions across the basins (Table 11). The purpose of the combined scoring was to identify the list of basins to move forward for prioritization. Based on the results in Table 11, the three basins with highest combined scores were moved forward to the prioritization step of the SMAP. As shown in Table 11, the top three basins have a significantly higher summary rating than the remaining three Tier 2 basins. Accordingly, Kitsap Lake, Oyster and Ostrich Bay and the West Narrows basins groups were advanced to the prioritization step of the SMAP.

Table 11. Combined receiving water and stormwater influence rating and ranking.

Stormwater Basin	Receiving Water Rank	Stormwater Influence Rating	Summary Rating	**Final Rank**	Advanced to Prioritization Step
Kitsap Lake	1	1	2	**1**	Yes
Oyster & Ostrich Bay	2	3	5	**2**	Yes
West Narrows	3	2	5	**2**	Yes
East Narrows	4	4	9	**3**	No
Sinclair	5	5	9	**3**	No
Stephenson	6	6	12	**4**	No
Anderson Creek	**Eliminated in Tier 1 screening**				No
Gorst Creek					No
Tracyton					No
Chico Creek					No
Union River					No
Case Inlet					No

4 RECEIVING WATER AND BASIN PRIOITIZATION

The receiving water prioritization is the second step in the three-step SMAP development process. The purpose of the prioritization process is to determine which of the City's receiving waters would be most likely to benefit from stormwater management planning and actions. The priority basins then advance to the third and final step of the SMAP process, which is preparation of the SMAP and associated implementation plan.

The purpose of the basin prioritization is to document the process and criteria that were used to prioritize candidate basins, and to identify the two highest priority basins for inclusion in the SMAP Implementation Plan. The basin prioritization reflects the following process:

- Develop list of top three candidate stormwater basin areas (completed as part of the RWCA);
- Develop scoring and ranking methodology to prioritize top three basins;
- Evaluate candidate basins relative to scoring criteria;
- Identify the two highest priority basins;
- Identify top retrofit priority stormwater catchment area within each priority basin; and
- Conduct outreach with stakeholders and the public to elicit feedback on proposed priorities.

The analysis presented in this TM also reflects the scope of work in the City's grant agreement with Ecology, which consists of the following:

- Prepare draft prioritization scoring methodology narrative and Prioritization and Ranking Matrix,
- Provide the public and stakeholders with an opportunity to comment on draft prioritized basins, and
- Prepare a summary of stakeholder and public outreach.

4.1 Basin Prioritization Approach

The RWCA evaluated and ranked all basin groups within the City and was the first step in the prioritization process. The RWCA resulted in Oyster Bay and Ostrich Bay, Kitsap Lake, and West Narrows groups as the top three candidates.

The City's prioritization approach for the top three candidate basins follows Ecology's guidance (2019) and the *Building Cities in the Rain* (Commerce 2016). The City's approach uses applicable prioritization principles as described in SMAP guidance, tailored to reflect specific local conditions in the City of Bremerton.

The prioritization approach used a four-step process:

Step 1: Characterize receiving water beneficial uses;

Step 2: Identify the degree of impairment to beneficial uses;

Step 3: Sort the top three candidate basins into four different management strategy categories: "Protection", "Restoration", "Conservation", and "Development"; and

Step 4: Prioritize the top two basins based on a combination of outcomes from steps 1, 2 and 3.

4.2 Prioritization Scoring and Ranking Methodology

Prioritization criteria were divided into three general categories:

- Type and extent of beneficial use and degree of impairment,
- Extent and intensity of development and future growth, and
- Water quality and habitat conditions.

Each basin was assigned a score for each criterion, with a higher priority score associated with a higher level of beneficial use, development or habitat value. The highest-priority basins were then identified by summing point values for each criterion. Explanations for scoring of the ranking criteria are provided in the sections below. Scoring criteria are described in Table 12 and 13. Detailed scoring and ranking data tables are provided in Appendix B.

4.2.1 Beneficial Uses

Beneficial uses are generally defined as uses that provide for the public's enjoyment of specific natural resources (Table 12). Impairment criteria are the metrics used to assess the condition and degree that these beneficial uses are degraded by stormwater related impacts (Table 13).

Parks, swimming beaches and areas of direct contact recreation (paddle boards, kayaks, etc.) were calculated based on number of parks and magnitude of historical recreational uses. A higher prioritization was assigned to basins with a higher level of direct contact recreation.

Shellfish harvesting prioritization scoring was based on WDOH harvesting area classification and the basis for the classification (WDOH 2023a). Finfish harvest criteria are based on WDOH advisories due to toxics bioaccumulation (WDOH 2023a). Areas that are consider potential shellfish harvest areas and are monitored by WDOH were assigned a higher priority than areas that are restricted or prohibited to harvesting because of discharges and/or potential pollution from point sources.

Table 12. Beneficial Use Type and Extent Scoring Criteria.

Metric	Score	Description
Direct Contact Recreation	3	Extensive and frequent direct contact recreation including swimming and boating.
	2	Periodic direct contact recreation including wading and boating.
	1	No direct contact recreation.
Commercial or Recreational Shellfish Harvest	3	Portion of shoreline area approved for recreation or commercial harvest.
	2	Area monitored for commercial shellfish use but currently not approved. Freshwater areas that do not support shellfish habitat.
	1	Commercial shellfish harvest prohibited and recreational harvest not recommended.

Table 13. Beneficial Use Impairment Scoring Criteria.

Metric	Score	Description
Direct Contact Recreation	3	Extensive and frequent direct contact recreation closures due to fecal coliform, *e. coli* and/or toxic blue-green algae.
	2	Periodic direct contact recreation closures due to fecal coliform, e. coli and/or toxic blue-green algae.
	1	No direct contact recreation closures.
Commercial or Recreational Shellfish or Finfish Harvest	3	Commercial shellfish closure due to stormwater and other non-point sources.
	2	Shellfish closure due to location near point source WWTP facility outfall or marina. Finfish harvest advisory due to bioaccumulation.
	1	Shellfish harvest allowed/not impaired.

4.2.2 Development and Future Growth

Development and future growth was assessed using total impervious area (TIA), type and extent of high density development, percent of developed area without stormwater treatment, and extent of high average daily traffic (ADT) roads (Table 14).

Percentage of zoning classification for each basin was calculated from City zoning. Priority scoring was based on percent of basin zoned for high intensity uses (commercial, industrial, high density residential) since these uses typically have greater potential to contribute to water quality impairments.

Percent TIA for each of basin was calculated from land cover GIS data evaluated as part of the RWCA. Higher scores were assigned to basins with higher levels of TIA. Miles of arterial and collector roads were calculated for each basin as part of the RWCA. High ADT roads are known to be significant stormwater pollutant sources. Basins with a higher number of miles of arterial and collector roads were therefore assigned a higher priority score.

Table 14. Development and Growth Scoring Criteria.

Metric	Score	Description
Total Impervious Area	3	40% or greater TIA
	2	20% - 30% TIA
	1	10% - 20% TIA
Development Pressure	3	Existing development < 20% of available high density zoning (i.e., high level of vacant urban zoned land)
	2	Existing development between 20% and 85% of available high density zoning
	1	Existing development > 85% of available high density zoning
Existing Treatment and Flow Control	3	More than 90% of area developed without stormwater BMPs
	2	90% - 20% of area developed without stormwater BMPs
	1	Less than 20% of area developed without stormwater BMPs
High ADT Roads	3	More than 3 miles of high ADT roads (> 20,000 trips/day)
	2	One to three miles of high ADT roads (> 20,000 trips/day)
	1	Less than 1 mile of high ADT roads (> 20,000 trips/day)

4.2.3 Water Quality, Hydrology and Habitat Conditions

Overall water quality was rated based on a pollutant load per acre index developed as part of the RWCA. Basins with higher load index were assigned a higher score.

Habitat analysis was based on the number of salmonid species present in the freshwater portion of each basin. Marine water salmonid presence was not used since multiple salmonid species are present at some life stage in all of the City's marine receiving water. Data for this criterion were obtained from the WDFW Salmonscape tool (WDFW 2023a). Higher scores were given to basins with the most salmonid species.

Fish passage barrier ratings were calculated based on the number of known partial or complete fish passage barriers as mapped by WDFW (WDFW 2023b). Forage fish scores were based on the number of forage fish species mapped as using nearshore areas for spawning (WDFW 2023c).

Hydrology data were derived from the Ecology Watershed Characterization tool (Ecology 2022b). The tool rates the level of importance to maintaining overall water flow processes with ranks of Low, Moderate, Moderate High, and High. A higher score was assigned to basins with streams that were rated Moderate/High or High. Table 15 summarizes scoring.

Table 15.Habitat Scoring Criteria.

Metric	Score	Description
Freshwater Salmon and Trout Presence	3	Three or more salmonid species presence
	2	One to three salmonid species presence
	1	No salmonid species presence
Fish Passage Barriers	3	Five or more fish passage barriers
	2	One to five fish passage barriers
	1	No fish passage barriers
Forage Fish Nearshore Use	3	Three forage fish species use/presence
	2	One to two forage fish species/use presence, or freshwater lake
	1	No forage fish species/use presence
Water Quality and Pollutant Loading	3	Pollutant load/acre index > 100
	2	Pollutant load/acre index between 50 and 100
	1	Pollutant load/acre index < 50
Hydrology	3	High water flow importance
	2	Moderate water flow importance
	1	Low water flow importance

4.3 Basin Scoring Results and Management Matrix

Basin scoring and ranking are summarized in Table 16. Additional scoring detail is provided in Appendix B. Basin scoring is summarized as follows:

- Oyster and Ostrich Bay was the top ranked basin with a total score of 31,
- Kitsap Lake was the second highest ranked basin with a score of 29, and
- West Narrows was the lowest ranked of the top three candidate basins with a score of 25.

Table 16. Receiving Water Prioritization Summary.

SMAP Stormwater Basin Group	Area (Ac)	Ranking Criteria													Total Score	Overall Rank
		Dir. Contact Recreation	Shellfish or Finfish Harvest	Dir. Contact Recreation Impairment	Shellfish or Finfish Harvest Impairment	Total Impervious Area	Develop-ment Pressure	Extent of Existing SW Treatment	High ADT Roads	Salmonid Presence	Fish Passage Barriers	Forage Fish Use	WQ Pollutant Loading	Hydro-logy		
OYSTER & OSTRICH BAY	1,524	2	2	2	3	2	2	2	3	3	3	2	3	2	31	1
KITSAP LAKE	1,256	3	2	3	1	1	3	3	2	2	2	2	2	3	29	2
WEST NARROWS	1,270	2	1	2	2	3	1	3	3	1	0	2	3	2	25	3

4.3.1 Stormwater Basin Matrix and Approach

The three candidate basins were evaluated for placement in one of four management categories (Figure 9) based on prioritization guidance provided by the Washington Department of Commerce (2016) and Ecology's Puget Sound Watershed Characterization Project (2016).

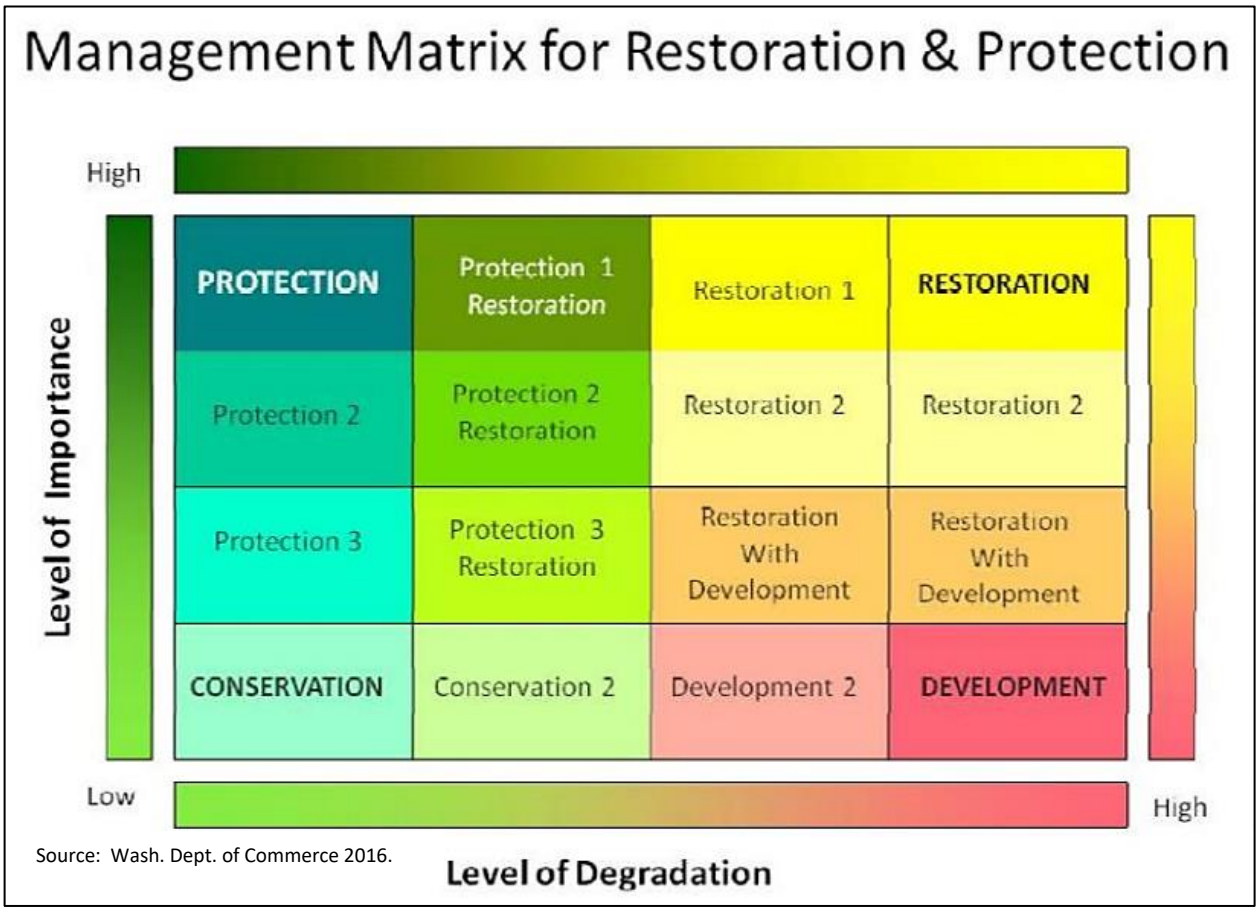


Figure 9. Stormwater Basin Management Matrix.

The basin management framework is based on a combination of *Level of Importance* and *Level of Degradation*. In general, *Level of Importance* is considered relative to beneficial uses and "*Level of Degradation*" is considered relative to level of beneficial use impairment, development and future growth.

Both *Protection* and *Restoration* basins are characterized by high and moderate beneficial use support. A *Protection* basin has lower levels of development, while a *Restoration* basin has higher levels of development. *Conservation* and *Development* basins are characterized by lower beneficial use support, with *Development* basins having higher levels of development and more degraded receiving water conditions.

Under this framework, basins are considered to be more appropriately oriented toward a particular management strategy depending on where their combined importance and degradation ranking falls on the matrix. *Protection* and *Restoration* basins are considered higher priority for stormwater retrofits and stormwater management actions than *Development* and *Conservation* basins due to higher beneficial use support and potential to benefit more quickly as a result of stormwater actions (Ecology 2019). Stormwater retrofits are also appropriate in *Development* basins but are typically considered a lower priority.

The results of the basin management matrix approach are summarized in Table 17. Both Oyster and Ostrich Bay and Kitsap Lake basins are oriented toward a Restoration management approach, with a higher priority for stormwater retrofits.

Table 17. Basin Management and Retrofit Strategies for Bremerton Candidate Basins.

Stormwater Basin Area	Beneficial Use Support	Habitat	Development and Growth	Management Approach	Retrofit Priority
Oyster-Ostrich Bay	High	High	Moderate	Restoration	High
Kitsap Lake	High	High	High	Restoration	High
West Narrows	Moderate	Low	Low	Restoration with Development	Moderate

4.4 Candidate Basin Evaluation Summary

Three candidate basins were evaluated as potential priorities for the strategic SMAP elements recommended by Ecology (2019); Oyster and Ostrich Bay basin, Kitsap Lake basin, and the West Narrows basin. These basins are shown in Figures 10, 11 and 12, respectively.

The Oyster and Ostrich Bay and Kitsap Lake basins were ranked as the City's top priority basins, and accordingly will advanced to the strategic retrofit and management strategies steps of the SMAP. These two basins were identified as top priorities based on the following:

- Both Oyster and Ostrich Bay and Kitsap Lake basins have moderate levels of impairment and high levels of beneficial use. Both basins are therefore suited for a Restoration management approach that includes stormwater retrofits. Receiving waters in these basins are expected to benefit more quickly as a result of stormwater management actions.
- The City has jurisdiction over the majority of these basin areas that have urban land use, higher development and growth expectations. The City therefore has greater ability to implement actions that have potential to improve water quality.
- Designating both of these basins as priorities is consistent with existing City plans and policies. The City has previously identified the Oyster and Ostrich Bay basins as a priority location for stormwater improvements.

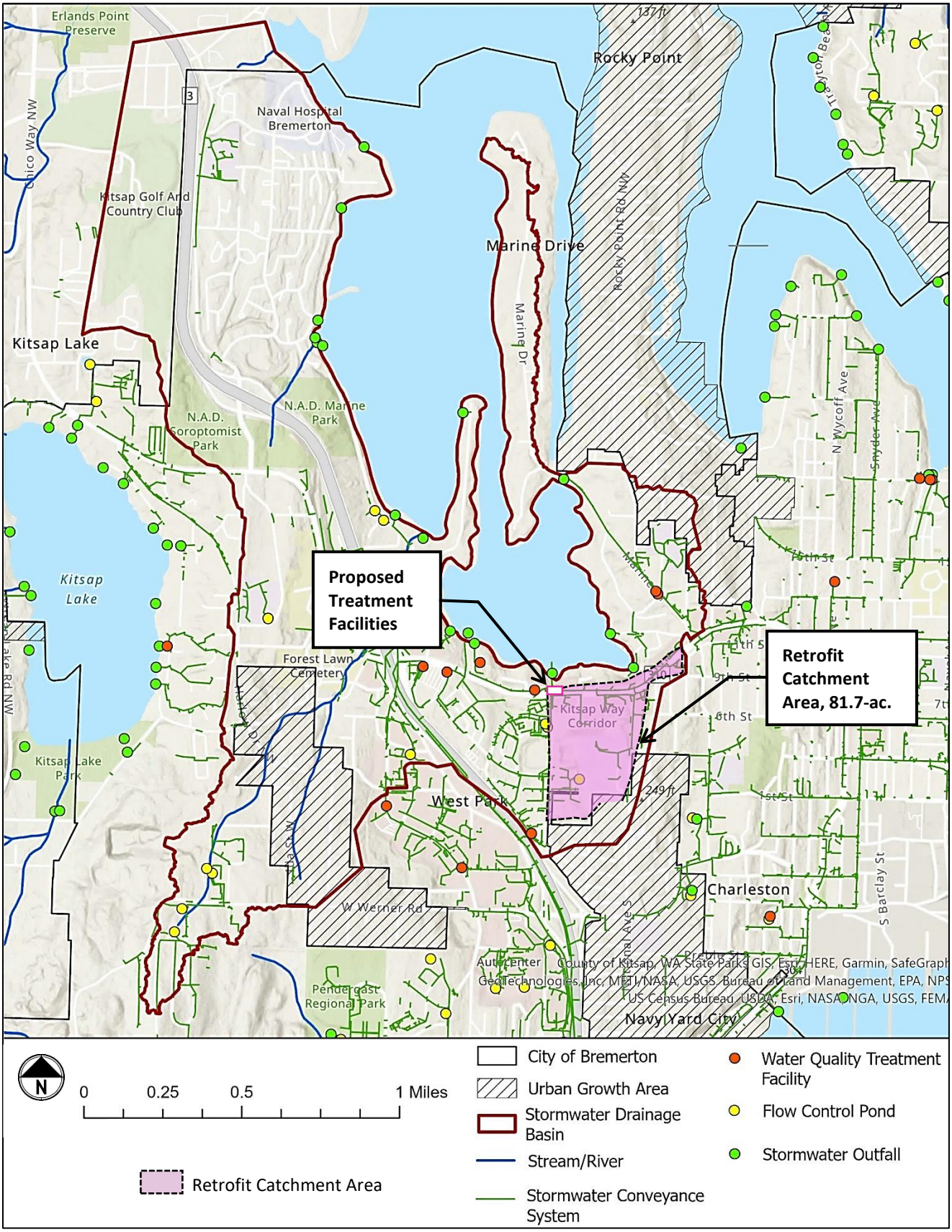


Figure 10. Oyster and Ostrich Bay Basin
Stormwater Management Action Plan
City of Bremerton

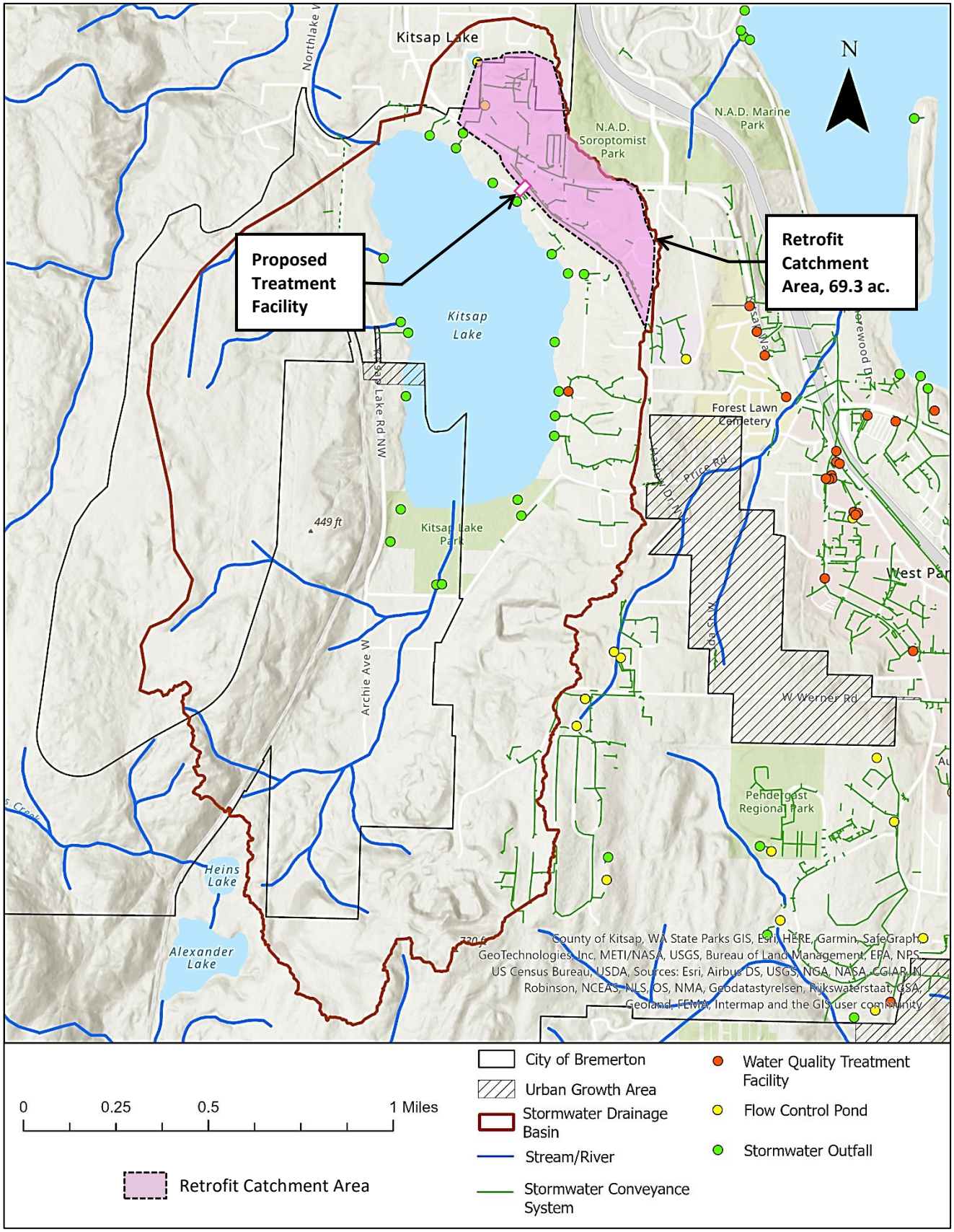


Figure 11. Kitsap Lake Basin
Stormwater Management Action Plan

City of Bremerton

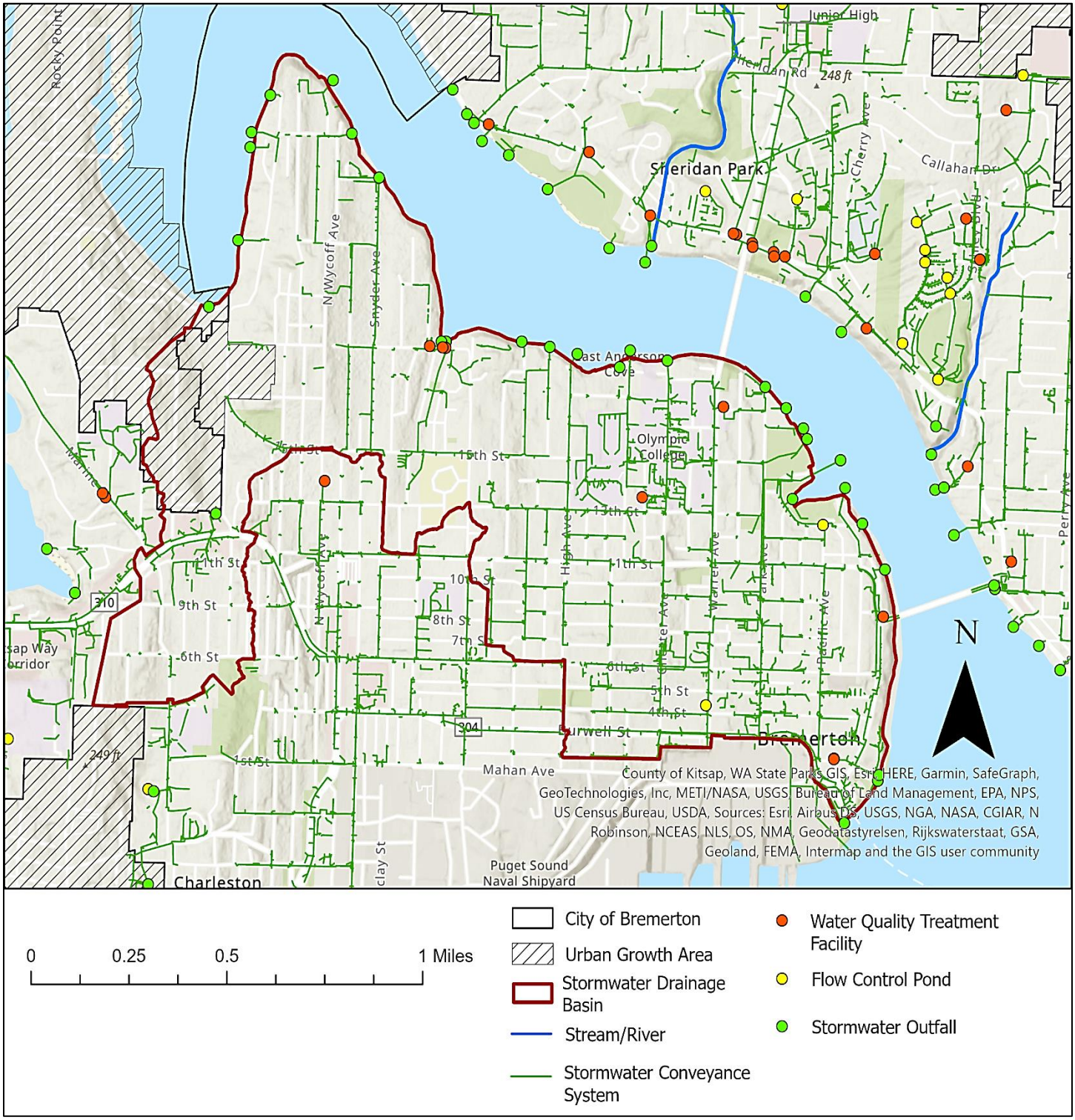


Figure 12. West Narrows Basin
Stormwater Management Action Plan
City of Bremerton

This historical prioritization reflects multiple beneficial uses and habitat values in the basin, as well as historical water quality monitoring by the KPHD that shows high levels of bacterial contamination (KPHD 2021). Similarly, the City has prepared a Watershed Management Plan for the Kitsap Lake basin, which reflects the importance of Kitsap Lake beneficial uses and habitat.

The West Narrows basin area was not selected as a priority due its lower level of beneficial uses, lower level of development pressure, and higher levels of existing development. However, as the third highest ranking basin in the City, the City will continue to look for opportunities to support and/or implement stormwater retrofits and enhanced management actions as part of other projects proposed by the City, regional stakeholders or the public.

4.5 Social Equity and Environmental Justice

Ecology guidance (2019) recommends giving a higher priority to basins with overburdened communities where the water quality issues and human health impacts overlap and can be addressed (at least partly) through stormwater management improvements.

Equity metrics were calculated using data from the *Washington Environmental Health Disparities Map* (WDOH 2023b) and the *Kitsap Overburdened Communities Assessment* (Kitsap County 2023). The percentage of potentially sensitive or disadvantaged populations were used to quantify a relative level of social equity and environmental justice across the three candidate basins. The combined Over Burdened Summary Rank reflects both the potential vulnerability of populations and the potential threat from environmental exposures.

Table 18 presents a summary of social equity and environmental justice variables for the three candidate basins. Overall, the socioeconomic and environmental justice analysis aligns with water quality and land use based priority basin ranking by demonstrating that Oyster and Ostrich Bay is the highest ranked over-burdened community, followed by Kitsap Lake basin and the West Narrows basin.

Table 18. Social Equity and Environmental Justice Ranking.

Basin	Ethnicity (% POC)[1]	% Population with Income Below Poverty Level	% Population > 65 years age	WDOH Environ. Health Disparity Score [2]	Over-burdened Summary Rank
Oyster-Ostrich Bay	27%	22%	41%	6.5	1
Kitsap Lake	37%	14%	21%	7	2
West Narrows	27%	10%	34%	7	3

[1] POC = People of color.
[2] Score range 1-10, with 10 = largest disparity.

4.6 Selection of Retrofit Catchment Areas

The final step in the prioritization process consisted of identifying specific stormwater catchment areas within each of the Oyster and Ostrich Bay, and Kitsap Lake basins where stormwater facility retrofits would be most beneficial for receiving waters. These retrofits will consist of construction of new treatment facilities at optimal locations that benefit water quality as shown schematically in Figures 10 and 11.

The proposed Oyster and Ostrich Bay retrofit will treat approximately 82-acres of urban commercial, residential and industrial development. The proposed Kitsap Lake retrofit facility will treat approximately 69-acres of urban commercial and residential development. Retrofit basins and treatment sites were selected based on the following criteria:

- Existing high density development in the contributing basin area,
- No basin transfer or wetland hydrology impacts,
- Suitable "end of pipe" sites already owned by the City that are capable of supporting treatment facilities, and
- Existing outfall facilities that are appropriately sized for peak flow discharges.

Preliminary design including hydrologic and hydraulic modeling for both basins is underway and will be completed in mid-2023.

4.7 Sinclair and Dyes Inlet TMDL Considerations

Ecology guidance (Ecology 2019) states that SMAPs with priority basins that drain to impaired waterbodies with current Total Maximum Daily Load (TMDL) plans must document how SMAP investments will go above and beyond current TMDL requirements, and what the additional investments will achieve.

All of the City of Bremerton receiving waters are within the limits of the Sinclair Inlet and Dyes Inlet Fecal Coliform TMDL Plan (Ecology 2012). This plan was developed using data from 2003 and 2009. The TMDL Plan called for several actions to be completed by the City of Bremerton to help reduce fecal coliform (FC) levels in receiving waters of proposed priority basins in order to meet water quality standards by 2016. These TMDL actions and status of the City's response are summarized in Table 19 on the following page.

As shown in Table 19, the City has met TMDL implementation actions and goals including attaining water quality standards in Oyster Bay. As such, the proposal SMAP priority basin investments go above and beyond TMDL requirements. The proposed SMAP retrofit and management actions will help to sustain and enhance water quality improvements in Oyster and Ostrich Bay, as well as address water quality impairments in Kitsap Lake, which was not specifically addressed as part of the 2012 TMDL.

Table 19. Summary of City of Bremerton TMDL Implementation Actions.

TMDL Plan Action	City Response Status	Comment
Extend sanitary sewer to Gorst community	Completed in 2012	
Implement public education measures to reduce pet waste and stormwater pollution	Implemented 2016	On-going action part of City's education program
Implement IDDE program	Implemented in 2016 and continuing	On-going action part of City's IDDE program
Implement stormwater system O&M program	Implemented in 2016 and continuing	On-going action part of City's O&M program
Reduce FC levels in Ostrich Creek	Implemented regional stormwater treatment retrofits in 2020 and 2022	Multiple agencies responsible for implementation
Reduce FC levels in Oyster Bay	Implemented and continuing	Most recent marine monitoring in 2021 met standards (WDOH 2021)

5 STORMWATER MANAGEMENT ACTION PLAN

This chapter describes the specific projects, management and O&M strategies, schedule and financial plan the City anticipates using to implement the SMAP.

5.1 Short Term Structural Management Actions

Potential short term (6-year period 2023-2029) stormwater facility retrofit projects were identified based on the analysis shown in Chapters 3 and 4. In general, proposed short term structural water quality retrofits propose vault type treatment units due to lack of suitable soil for infiltration and limited right-of-way for facility construction. Potential retrofit locations are shown schematically in Figure 13 and are summarized in Table 13.

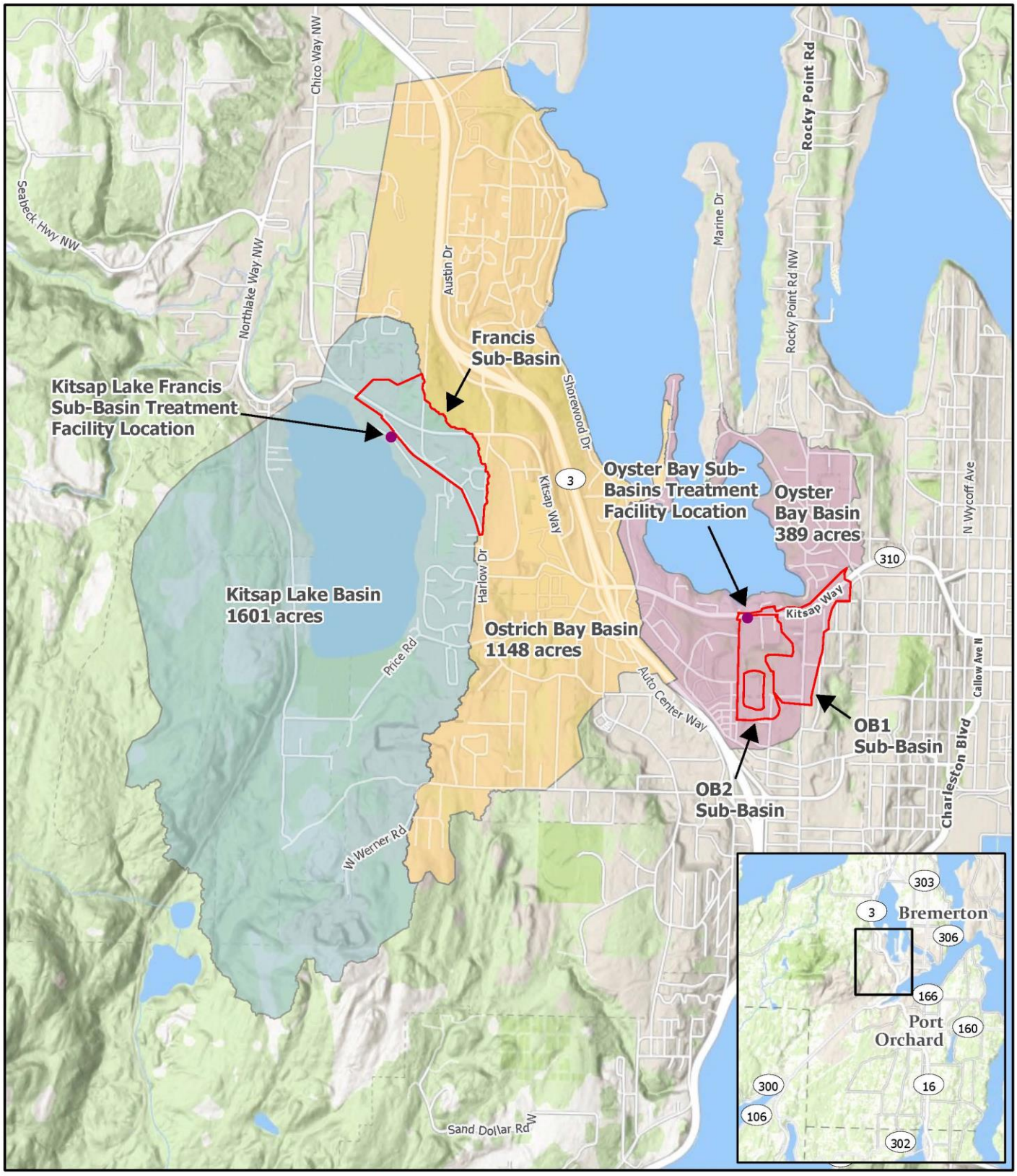
The City has prepared a retrofit Design Report for both the Kitsap Lake and Oyster-Ostrich Bay basins (Parametrix 2023). This work was performed under a grant agreement with Ecology. The design report addresses the projects shown in Figures 14 and 15 and identifies the 30 percent design features and costs for the City's preferred treatment facility types and locations.

5.1.1 Oyster and Ostrich Bay Retrofits

Oyster and Ostrich Creek retrofits will treat 81.7-acres of urban land near Kitsap Way in west Bremerton (see Figure 14) with two underground vault facilities. These facilities will provide Basic and phosphorus treatment and will discharge to an existing outfall to Oyster Bay.

Due to costs and construction logistics, treatment and conveyance facilities in this basin will be implemented in two phases. Phase 1 will be implemented in the 6-year short term and consists of a vault for the eastern 48.2-acre portion of the basin (sub-basin OB-1), to be installed near the intersection of Kitsap Way and Oyster Bay Avenue. Phase 1 is also anticipated to include replacement of the existing Oyster Bay stormwater outfall, which is in a deteriorated condition and has capacity constraints (see outfall assessment in Appendix C). Phase 2, which will be implemented in the long term period, will consist of a vault for the western 33.5-acre portion of the basin (sub-basin OB-2), to be installed west of the intersection of Kitsap Way and Oyster Bay Avenue. Phases 1 and 2 are expected to cost approximately $3.34M and $1.56M respectively, including final design, permits, construction, construction administration and contingency (Table 20).

Final design and construction of the Oyster Bay Phase 1 treatment facility is anticipated in the 2028-29 period, and Phase 2 in the 2030-31 period. The implementation schedule for both phases is contingent on obtaining grant funding.



Date: 3/22/2023
Sources: City of Bremerton, Kitsap County, Washington, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes.

Figure 13. Retrofit Locations
Stormwater Management Action Plan
City of Bremerton

Date: 3/23/2023
Sources: City of Bremerton, Kitsap County, Washington, WA DNR, USGS, ESRI
Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes.

Oyster Bay Basin - 389 Acres
Oyster Bay Sub-basin 1 (OB1)
Oyster Bay Sub-basin 2 (OB2)
Proposed Stormwater Treatment Facility

0 200 400 800
Feet

Figure 14. Oyster Bay Basin Retrofit Locations

Stormwater Management Action Plan
City of Bremerton

5.1.2 Kitsap Lake Basin Retrofits

Two retrofit projects are proposed in the Kitsap Lake basin in the short term. The Kitsap Lake outfall retrofit project has been designed and is proposed for construction funding by Ecology in 2024-25. This project will treat 77.4 acres of the Kitsap Lake basin.

The Kitsap Lake Francis Street retrofit would treat 69.3-acres of urban land at the northwest corner of Kitsap Lake (see Figure 15) with an underground vault facility. The facility would provide Basic and phosphorous treatment and would discharge to an existing outfall to Kitsap Lake. The facility is expected to cost approximately $1.58M, including final design, permits, construction, construction administration and contingency (Table 20.) Final design and construction of the Francis Street facility is anticipated in the 2025-26 period, contingent on obtaining grant funding.

Table 20. Summary of Short Term Structural Retrofit Costs.

FACILITY	CONSTRUCTION [1]	DESIGN [2]	CONST. MGMT. [2]	CONTINGENCY [2]	TOTAL
Kitsap Lake Park Retrofit	$100,000	-	-	-	$100,000
Kitsap Lake Outfalls (4)	$2,416,000	-	-	-	$2,416,000
Kitsap Lake Francis Street	$1,056,000	$158,000	$101,000	$264,000	$1,579,000
Oyster Bay, Phase 1 Treatment	$1,029,000	$154,000	$103,000	$257,000	$1,543,000
Oyster Bay, Phase 1 Outfall	$1,200,000	$180,000	$120,000	$300,000	$1,800,000
TOTALS	$5,801,000	$492,000	$324,000	$821,000	$7,438,000

[1] Concept level estimate, 2023 dollars.
[2] Design (15%), construction management (10%) and contingency (25%) as percent of construction.

5.2 Long Term Structural Management Actions

Potential long term stormwater facility structural retrofit projects consist of conveyance and treatment improvements that would be implemented after 2028-29. Potential long term retrofit projects are described below, and locations are shown schematically in Figure 16. Potential long term project costs are summarized in Table 21. The implementation schedule for long term projects is contingent on obtaining grant funding.

5.2.1 Oyster Bay Retrofit, Phase 2

The Oyster Bay retrofit, Phase 2 will consist of a vault for the western 33.5-acre portion of the basin (sub-basin OB-2), which would be installed west of the intersection of Kitsap Way and Oyster Bay Avenue. This project is described in additional detail in the City of Bremerton SMAP Design Report provided under separate cover (Parametrix 2023). Phase 2 is currently anticipated to cost approximately $1.56M including final design, permits, construction, construction administration and contingency (Table 21). The implementation schedule for the project is estimated at 2030-31.

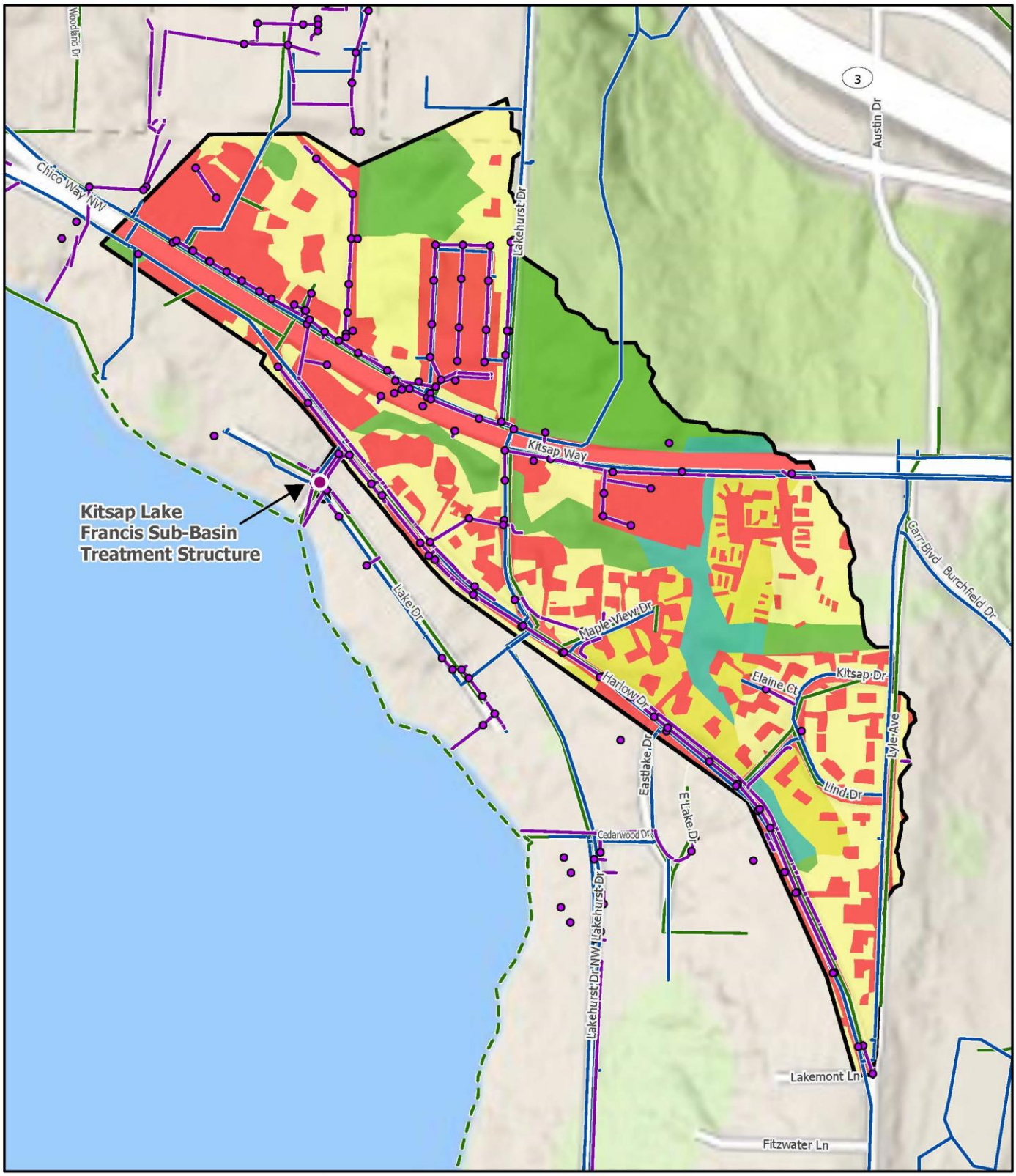


Figure 15. Kitsap Lake Basin Retrofit Locations

Stormwater Management Action Plan
City of Bremerton

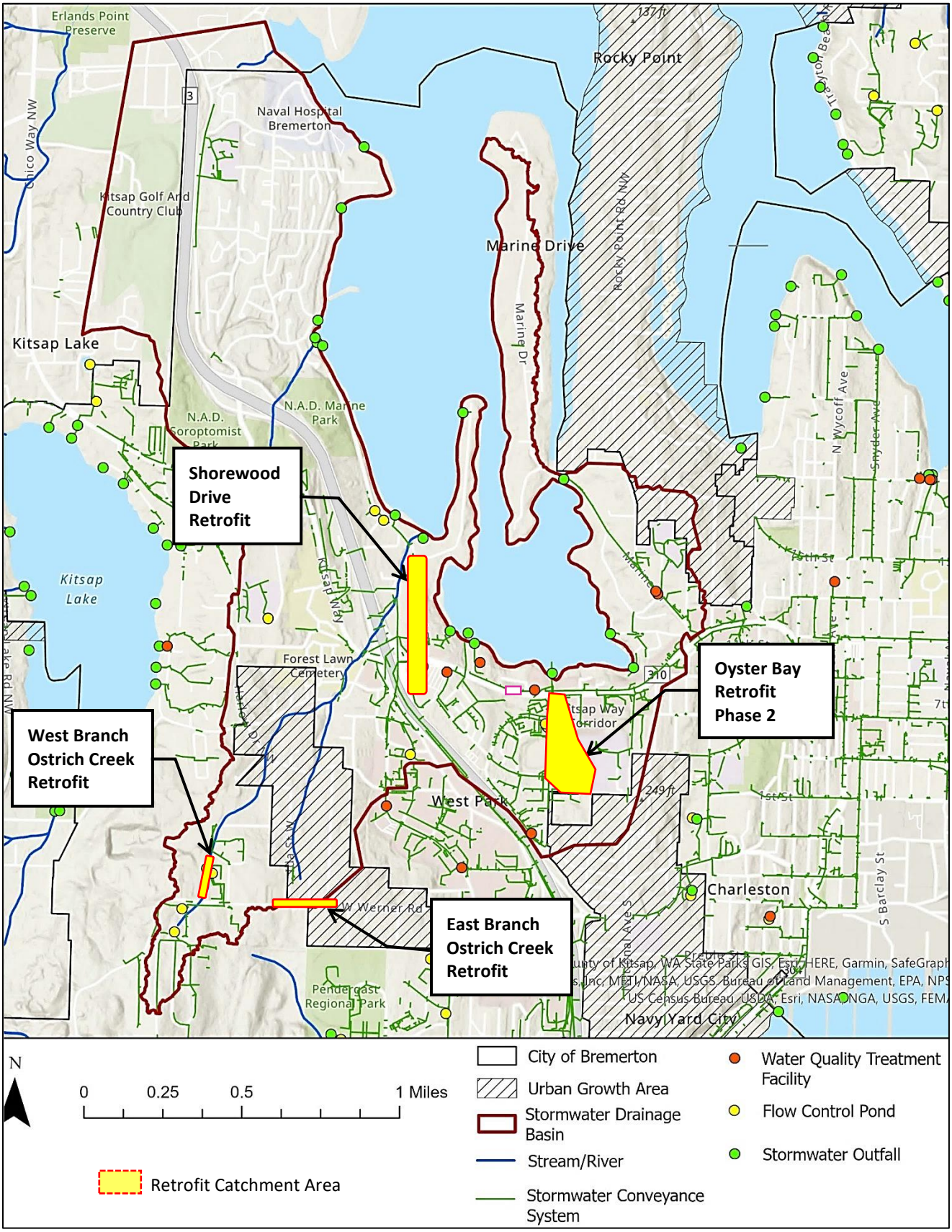


Figure 16. Long Term Project Locations
Stormwater Management Action Plan
City of Bremerton

5.2.2 West Branch Ostrich Creek Conveyance and Treatment Retrofit

This project would replace and upgrade an existing conveyance pipeline in the upper West Branch Ostrich Creek basin and provide water quality treatment for a portion of Werner Road. The project would replace approximately 230 lineal feet of existing undersized pipe with new 24-inch diameter pipe and enhance an existing outfall to Ostrich Creek. Water quality treatment facilities would also be provided for City road runoff. Refer to the Design Report for additional conveyance details (Parametrix 2023). The current estimated cost for this project is $465,000 (Table 21) including both conveyance and treatment components. The schedule for the project is to be determined at a later date as part of on-going City capital project planning.

5.2.3 Werner Road Conveyance and Treatment Retrofit

This project would construct new conveyance, flow control and treatment facilities adjacent to Werner Road in the vicinity of Ida Street and Skylark Drive (see Figure 16). These facilities would provide flow control and water quality treatment for contributing areas that include a high traffic arterial road, commercial development and industrial development. Benefits of this retrofit project would include improved water quality in Ostrich Creek and reduction of peak flows to Ostrich Creek that have resulted in stream channel incision and bank erosion. The estimated cost for this project including property acquisition is $1.155M (Table 21). The schedule for the project is to be determined at a later date as part of on-going City capital project planning.

Additional detail on Werner Road site conditions and retrofit options is provided in Appendix D.

5.2.4 Lower Shorewood Drive Conveyance and Treatment Retrofit

This project would construct conveyance improvements and water quality treatment for discharges from Shorewood Drive, which outfalls to lower Ostrich Creek. The project would provide treatment for an approximate 15-acre contributing basin consisting of roads, commercial development and urban residential development. The estimated cost for this project is $465,000 (Table 21) including both conveyance and treatment components. The schedule for the project is to be determined at a later date as part of on-going City capital project planning.

Table 21. Summary of Potential Long Term Structural Retrofit Costs.

FACILITY	CONSTRUCTION [1]	DESIGN [2]	CONST. MGMT. [2]	CONTINGENCY [2]	TOTAL
Oyster Bay Retrofit, Phase 2	$1,038,000	$158,000	$104,000	$259,000	$1,559,000
W. Branch Ostrich Creek Retrofit	$300,000	$45,000	$30,000	$90,000	$465,000
Werner Road Retrofit	$808,000	$63,000	$42,000	$242,000	$1,155,000
Shorewood Drive Retrofit	$300,000	$45,000	$30,000	$90,000	$465,000
TOTALS	$2,038,000	$308,000	$204,000	$539,000	$3,644,000

[1] Concept level estimate, 2023 dollars.
[2] Design (15%), construction management (10%) and contingency (25%) as percent of construction.

5.3 Targeted Non-Structural Management Strategies

Potential targeted management strategies generally consist of planning, regulatory and O&M tools that help to conserve, protect, and/or restore receiving waters. The following targeted strategies are addressed in this SMAP:

- Phosphorous control and treatment for new development in the Kitsap Lake basin.
- Intergovernmental coordination with Kitsap County for extension of sanitary sewers in the Kitsap Lake basin and the upper portions of the Ostrich Creek basin where failing on-site septic systems have been identified as a pollutant source.
- Enhanced O&M source control strategies in priority areas.
- Targeted Education and Outreach behavior change program.

5.3.1 Kitsap Lake Phosphorous Control

Prior studies have determined that phosphorous sources in Kitsap Lake include both internal recycling, as well as input from development within the watershed (KPHD 2011).

Accordingly, the City implemented an ongoing annual lake treatment program in 2020 to reduce existing phosphorous recycling. The City is also in the process of implementing multiple stormwater retrofits to reduce phosphorous loading from existing development.

Total phosphorous sources include runoff from bare soil and developed areas. Phosphorus occurs naturally, in human and animal waste and is added to some detergents and fertilizers. Roofs, driveways, and other impermeable surfaces interrupt the absorption and filtration provided by forests and soils, and instead send phosphorus-laden stormwater directly to the receiving water (Ecology 2016).

Both the City's lake treatment program and stormwater treatment retrofits will help to control phosphorous levels in Kitsap Lake. However, due to the sensitivity of Kitsap Lake to phosphorous loading, and the extensive amount of undeveloped, urban zoned land in the Kitsap Lake watershed, additional protective measures are needed to ensure that new development does not contribute phosphorous levels that negate or decrease the water quality gains from prior/on-going lake treatment and City-sponsored stormwater retrofits.

To protect Kitsap Lake water quality in the long term, the City is designating Kitsap Lake as a phosphorous limited water body. This designation will require all new development to meet the phosphorous treatment requirements of the most current Stormwater Management Manual for Western Washington (SWMMWW). The technical and regulatory basis for this requirement and associated implementation measures are described below.

Basis for Designation

Pursuant to the 2019 SWMMWW, phosphorous treatment BMPs are required for new development in watersheds that local governments, Ecology or the USEPA have determined to be sensitive to phosphorus and are being managed to control phosphorus. Under the SWMMWW, local government can use the following criteria for determining whether a water body is sensitive to phosphorus:

- Those waterbodies reported under section 305(b) of the Clean Water Act and designated as not supporting beneficial uses due to phosphorous or other water quality criteria related to excessive phosphorus.

Kitsap Lake is listed under Ecology's 305(b) report as limited for total phosphorous (Ecology 2023b) and therefore meets the requirement for a local agency water body designation as "phosphorous limited".

Treatment Requirements for New Development

Pursuant to the designation of Kitsap Lake as a phosphorous sensitive water body, all future development in the City portion of the contributing basin to Kitsap Lake that triggers water quality treatment under MR-6, as currently defined in the SWMMWW or amended, will be required to implement phosphorous treatment as defined under the SWMMWW. Phosphorous treatment will be in addition to Enhanced treatment.

5.3.2 On-site Sewage Systems and Sanitary Sewer Extensions

Approximately half of Kitsap Lake is served by sanitary sewer within the Bremerton City limits. The remainder of the lake is in unincorporated Kitsap County with no sanitary sewer service available. These properties use on-site septic systems to treat household wastewater and many of these systems are more than 40 years old with some likely in need of replacement.

The upper portion of the Ostrich Creek basin has been identified as an area with historically high on-site septic system failure rates (KPHD 2009) and extension of City sanitary sewer infrastructure has been identified as a potential long-term solution. This portion of the basin is within unincorporated Kitsap County, and generally consists of an overburdened population with a poverty level of more than 25 percent. Extension of sanitary sewer service may therefore require grant funding, and close coordination between the City and Kitsap County.

The City will continue to work with Kitsap County and the KPHD to assess opportunities and needs for extending municipal sewer infrastructure. This assessment will occur as part of on-going water quality monitoring and watershed plan development.

5.3.3 Enhanced Operation and Maintenance

Existing City owned and maintained stormwater facilities in priority basins will be assessed for opportunities to enhance performance through modified O&M procedures and schedules.

5.3.4 Targeted Education and Outreach Behavior Change Program

The current City behavior change campaigns are focused on pet waste clean-up and natural yard care, both of which are critical efforts in protecting and improving receiving water quality. Areas identified for increased public engagement include:

- Create and mail informational material to homeowners within the selected basins that is designed to inform property owners about ways to prevent pollution and protect water quality.
- Provide locally relevant information to residents regarding sources of nutrient loading, and the relationship between excess nutrients and algae blooms.
- Staff will provide on-site technical assistance as requested by property owners.

5.4 Implementation Plan

The implementation plan describes the anticipated budget and schedule to implement SMAP structural retrofits and management activities. The Permit requires both a proposed short term and long-term implementation schedule and budget for the SMAP, as follows:

- Short-term actions (*i.e.*, actions to be accomplished within six years), and
- Long-term actions (*i.e.*, actions to be accomplished within seven to 20 years).

5.4.1 Short Term Actions

Potential short term actions would occur over the six year period 2023-2029 and are summarized in Tables 22 and 23 on the following pages. Short term actions would consist of a combination of structural retrofit capital projects (Table 22), targeted management actions (Table 23) and enhanced maintenance activities. The estimated total capital cost for short term retrofit actions is approximately $7,440,000 with approximately $5,580,000 in funding from grants (75%) and $1,860,000 from the City (25%).

Short-term targeted enhanced O&M activities include Kitsap Lake phosphorous limitation designation, increased frequency of street sweeping, and increased frequency of catch basin maintenance (Table 22).

5.4.2 Long Term Actions

Long term actions are those expected to occur past the 6-year short term period, but within the next 20-years. Currently identified long term structural retrofit actions are identified in Table 22. Coordination with Kitsap County to extend sanitary sewer service in the Kitsap Lake the upper Ostrich Creek basins is a long term action that would require the participation of Kitsap County.

5.4.3 Potential Funding Sources

The City relies on state and in some cases federal grant funds to pay for approximately 75 percent of stormwater treatment capital project costs including both design and construction elements. The City's Stormwater Utility collects rates from City property owners, and general facility charges from new development. These revenues are used to fund the City's stormwater activities including O&M, program administration, NPDES compliance requirements and match for capital projects.

Table 22. Summary of Anticipated Short and Long Term Structural Retrofits.

Basin	Action	Description	Time Frame	Est. Cost	Est. Year Complete
Kitsap Lake	Kitsap Lake Park Retrofit	Kitsap Lake Park parking lot	Short Term	$0.10M [1]	2024
	Kitsap Lake Outfall Retrofits	Four locations around Kitsap Lake	Short Term	$2.42M [1]	2024-25
	Francis Street Retrofit	NW corner of basin	Short Term	$1.58M [2]	2025-2026
			Subtotal Kitsap Lake Basin	*$4.10M*	*2024 -2026*
Oyster and Ostrich Bay	Kitsap Way, Phase 1 Retrofit	Kitsap Way east of Oyster Bay Ave. and National Avenue, includes outfall replacement	Short Term	$3.34M [2]	2028-29
	Kitsap Way, Phase 2 Retrofit	Kitsap Way west of Oyster Bay Ave.	Long Term	$1.56M [2]	2030-31
	W. Branch Ostrich Creek Retrofit	Conveyance improvements and treatment in upper West Branch Ostrich Creek basin	Long Term	S0.47M [2]	2032-2035
	Werner Road Treatment Retrofit	New conveyance, flow control and treatment facility for Werner Road near intersection with Ida Street and Skylark Dr.	Long Term	S1.155M [2]	2032-2035
	Shorewood Drive Retrofit	Conveyance and treatment for Shorewood Dr. area between Kitsap Way and Ostrich Creek	Long Term	S0.47M [2]	2035-2038
			Subtotal Oyster and Ostrich Bay Basin	*$7.0M*	*2028 -2038*
			TOTAL SHORT TERM AND LONG TERM CAPITAL PROJECTS	**$11.1M**	**2024 -2038**

[1] Construction cost.
[2] Final design and construction cost.

Because the City relies on grants to fund the majority of stormwater capital projects, the City's financial ability to meet the implementation target dates in Table 21 is subject to change. A financial assessment that includes strategies for funding capital projects is included in the City's draft 2023 Comprehensive Stormwater Management Plan, which is planned for adoption in mid-2023.

Table 23. Anticipated Targeted Non-Structural Management Actions.

Basin	Action	Location	Frequency	Est. Cost	Schedule
Kitsap Lake	Kitsap Lake Basin Phosphorous Limitation Designation	BMC Code Update	One-time action, then on going implementation	$10,000	2023
All Priority Basins					
Targeted Enhanced Maintenance Assessment and Planning	Identify priority areas and schedule	Priority Basins	Annually	$10,000	Annually
Enhanced targeted street sweeping for priority areas	Street sweeping	High ADT arterials	3x/year	$30,000/yr.	Start 2023, then annually
Increased frequency of catch basin maintenance for priority areas	Inspection and maintenance	High ADT arterials	Inspect 2x/year, maintain as needed	$30,000/yr.	Start 2024, then annually
TOTAL ANNUAL NON-STRUCTURAL COSTS				**$70,000**	

Potential Funding for Short Term Action

Anticipated funding needed to implement short-term actions is approximately $7.9M including both structural projects ($7.44M) and non-structural projects ($430,000). Grants are anticipated to fund 75 percent of structural retrofit design and construction, with City funding the remaining 25 percent. Structural retrofit project costs will be incorporated into the City's 6-year CIP in 2023-24 as additional cost information is developed. Non-structural costs are included as part of the existing Stormwater Program Operations budget.

Potential Funding for Long Term Action

Potential funding for long term activities has not been determined due to uncertainties regarding project scope, cost and schedule. Similar to short term capital project funding, long term capital project funding is anticipated to be largely dependent on grants.

5.5 Cost-Benefit Analysis

Cost benefit analysis for the proposed structural retrofits and targeted management actions is provided in Table 24. In general, structural retrofits are expected to cost between approximately $23,000 and $69,000/acre for treatment, which is well within the range of typical regional treatment facility costs. Costs for targeted management and O&M actions are relatively low on a per acre basis, ranging from $8 to $11 per acre annually.

Table 24. Cost-benefit analysis of proposed short-term SMAP actions.

ACTION	TOTAL COST	ACRES/TREATED	COST/ACRE
Kitsap Lake Outfalls Retrofit	$2,416,000	77.4	$31,000
Kitsap Lake Francis Street Retrofit	$1,579,000	69.3	$23,000
Oyster Bay Retrofit, Phase 1	$3,343,000	48.2	$69,000
Oyster Bay Retrofit, Phase 2	$1,559,000	33.5	$46,000
Kitsap Lake T Phosphorous Designation	$10,000 [1]	1,256	$8
Enhanced Street Sweeping	$30,000 [2]	2,841	$11
Enhanced CB Maintenance	$30,000 [2]	2,841	$11

[1] Costs for staff time to develop and adopt code updates.
[2] Estimated annual labor and equipment costs to implement enhanced O&M activities in priority basins.

5.5.1 Proposed Implementation Schedule

The anticipated schedule for implementation of short term actions over next 6 years is shown in Table 25 on the following page.

5.6 Future Assessment and Feedback Processes

The Permit requires a process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures and projects. This process will consist of the following measures:

- Annual review of implementation progress as part of the City's annual Stormwater Management Report prepared pursuant to NPDES requirements, and
- Review of annual stream, outfall and marine water quality monitoring results conducted by the City, KPHD and WDOH (as part of commercial shellfish bed monitoring).

5.6.1 Monitoring and Coordination

Historic and on-going monitoring programs have provided valuable information to support Permit compliance, progress assessment and prioritization of staff and capital resources. Within priority basins, on-going monitoring would provide important information to validate capital project prioritization, identify source control needs and ensure that water quality gains from City actions are sustained over time. Specific monitoring recommendations include:

- On-going monitoring of Kitsap Lake phosphorous levels to assess performance of recent and planned treatment facilities;
- Coordination with Kitsap County Public Works to add an aquatic benthic macroinvertebrates monitoring station to the middle or lower segment of Ostrich Creek;

- Coordination with the Suquamish tribe on salmon escapement surveys to assess whether stormwater conditions in Ostrich Creek may be potentially contributing to pre-spawn salmon mortality; and

Table 25. Anticipated Implementation Plan and Schedule.

ACTION	PROJECT ELEMENT	YEAR	FUNDING SOURCE	STATUS
STRUCTURAL RETROFITS				
Kitsap Lake Outfalls Retrofit	Construction	2024-25	Grants (75%) City funds (25%)	Funded
Kitsap Lake Park Retrofit	Construction	2024	Grants (75%) City funds (25%)	Funded
Kitsap Lake Francis Street Retrofit	Preliminary Design (30%)	2023	Grants (75%) City funds (25%)	Funded
Kitsap Lake Francis Street Retrofit	Final Design and Construction	2025 - 26	Grants (75%) City funds (25%)	Not Yet Funded
Oyster Bay Kitsap Way Retrofit, Phase 1 & 2	Preliminary Design (30%)	2023	Grants (75%) City funds (25%)	Funded
Oyster Bay Kitsap Way Retrofit, Phase 1	Final Design and Construction	2027-28	Grants (75%) City funds (25%)	Not Yet Funded
TARGETED MANAGEMENT ACTIONS				
Kitsap Lake Basin Phosphorous Limitation Designation	BMC Code Update	2024	City funds	Funded
Targeted Enhanced Maintenance Assessment and Planning	Priority Basins	Annually	City Funds	2023-24
Enhanced O&M – Oyster and Ostrich Bay, and Kitsap Lake	Targeted, Enhanced Street Sweeping and	2025-26	City funds	Funded
Enhanced O&M – Kitsap Lake	Increased frequency of CB cleaning	2025-26	City funds	Funded

5.6.2 Adaptive Management

Adaptive management is the systematic use of information to improve operations, especially in the face of uncertainty. The adaptive management process can be applied at any scale, from budget processes to individual projects to overall stormwater management programs. This systematic process identifies uncertainties, monitors results, and informs actions. A formalized program that clearly articulates the uncertainties and monitors results reduces the risk of errors and allows programs to move forward in the face of uncertainty.

The SMAP is comprised of program activities and individual projects that have been identified through prior data collection and system evaluations regarding water quality, flow control and habitat. These programmatic activities and projects are typically reviewed annually as part of

capital project planning and budgeting. Data collection also occurs annually as part of routine monitoring, and as part of special time-limited projects. Combining annual programmatic planning with annual data review provides an opportunity to apply the adaptive management approach. More detailed program analysis, financial assessment and capital project planning occurs on a 6 to 7-year cycle as part of comprehensive planning and provides an additional opportunity for adaptive management measures.

Emerging issues related to climate change, sea level rise and impact of stormwater on threatened and endangered salmonids indicate that more frequent data and programmatic analysis may be warranted to ensure capital and O&M investments reflect both City priorities and existing conditions. A formal adaptive management process that focuses on targeted data collection (both qualitative and quantitative) can ensure that management actions maximize benefit for lowest cost for both O&M and capital program elements.

6 REFERENCES

City of Bremerton 2022a. Receiving Water and Stormwater Management Influence Assessment. Technical Memorandum prepared by Struck Environmental, Inc. December 2022.

Bremerton, City of 2022b. Deliverable 2.1: Technical Memorandum for Shoreline Deposition Analysis, Pollutant Loading Analysis and GIS Heat Maps. Bremerton Watershed Planning Grant, #WQC-2022-BremPW-00140. July 2022.

Bremerton, City of 2022c. Watershed Inventory. City of Bremerton Stormwater Management Action Planning, March 31, 2022 submittal to Ecology.

Ecology (Washington State Department of Ecology) 2023. Puget Sound Watershed Characterization Project. Online GIS map application accessed November 2022. https://fortress.wa.gov/ecy/coastalatlas/wc/landingpage.html

Ecology 2022a. Water Quality Atlas. Online GIS map application accessed November 2022. https://apps.ecology.wa.gov/waterqualityatlas/wqa/map

Ecology 2022b. Washington State Coastal Atlas. Online GIS map application accessed November 2022. https://apps.ecology.wa.gov/coastalatlas/

Ecology (Washington State Department of Ecology) 2022c. Puget Sound Watershed Characterization Project. Online GIS map application accessed November 2022. https://fortress.wa.gov/ecy/coastalatlas/wc/landingpage.html

Ecology 2019a. Stormwater Management Action Planning Guidance. Phase I and Western Washington Phase II Municipal Stormwater Permits. Prepared by Washington State Department of Ecology, Olympia, Washington. Publication 19-10-010. August 2019.

Ecology 2019b. Stormwater Management Action Planning Guidance. Phase I and Western Washington Phase II Municipal Stormwater Permits. Prepared by Washington State Department of Ecology, Olympia, Washington. Publication 19-10-010. August 2019.

Ecology 2016. Lake Whatcom Watershed Total Phosphorus and Bacteria Total Maximum Daily Loads Volume 2. Water Quality Improvement Report and Implementation Strategy. Water Quality Program Bellingham Field Office, Washington State Department of Ecology. February 2016.

Ecology 2012. Sinclair and Dyes Inlets Fecal Coliform Bacteria Total Maximum Daily Load TMDL and Water Quality Implementation Plan. Publication 11-10-051. June 2012.

Hobbs, W., B. Lubliner, N. Kale, and E. Newell. 2015. Western Washington NPDES Phase 1 Stormwater Permit: Final Data Characterization 2009-2013. Washington State Department of Ecology, Olympia, WA. Publication No. 15-03-001.

Johnston, R. K. et. al. 2009. An Integrated Watershed and Receiving Water Model for Fecal Coliform Fate and Transport in Sinclair and Dyes Inlets, Puget Sound, WA. Prepared by Battelle

Marine Sciences Laboratory. Prepared for U.S. Army Engineer Research and Development Center. Technical Report 1977. December 2009.

Kitsap County 2023. Overburdened Communities Assessment on-line tool. Available at: https://storymaps.arcgis.com/stories/81f3c2629b1540a3bc7f0929d0df6af1

Kitsap Public Health District 2021. 2021 Water Quality Report. Annual Water Quality Report. https://kitsappublichealth.org/environment/files/reports/2021/WaterQualityReport.pdf

Kitsap Public Health District 2020. 2020 Water Quality Report. Annual Water Quality Report. https://kitsappublichealth.org/environment/files/reports/2020/WaterQualityReport.pdf

KPHD 2017. Water Pollution Identification and Correction Program 2017 Annual Water Quality Report. https://kitsappublichealth.org/environment/files/reports/2017/Intro.pdf

KPHD 2011. Kitsap Lake Phosphorus Reduction Plan, Final Report. June 30, 2011. Kitsap County Health District Water Protection Program.

KPHD 2009. Dyes Inlet Restoration Project, Final Report. Kitsap County Health District Water Protection Program. December 2009.

Langness, et al. 2020. Stormwater Action Monitoring 2017/18 Mussel Monitoring Survey Final Report October 2020. WDFW Report Number FPT 20-13.

May, C.W. et al. 2005. An Analysis of Microbial Pollution in the Sinclair-Dyes Inlet Watershed. WA. Washington State Department of Ecology, Publication No. 05-03-042, November 2005.

Parametrix 2023. City of Bremerton Stormwater Management Action Plan Design Report. Prepared for City of Bremerton. May 2023.

Schueler, T. 1987. Controlling urban runoff: a practical manual for planning and designing urban BMPs. Metropolitan Washington Council of Governments. Washington, DC.

The Nature Conservancy 2022. Stormwater Heat Map. On-line assessment tool accessed October-November 2022. The Nature Conservancy StormwaterHeatmap | The Nature Conservancy StormwaterHeatmap

USGS 2018. Nearshore Sediment Monitoring for the Stormwater Action Monitoring (SAM) Program, Puget Sound, Western Washington.

Washington Department of Commerce 2016. Building Cities in the Rain. Watershed Prioritization for Stormwater Retrofits. Publication 006. September 2016.

Washington Department of Fish and Wildlife 2023a. Salmonscape on-line data tool. Accessed January 2023. https://apps.wdfw.wa.gov/salmonscape/

Washington Department of Fish and Wildlife 2023b. Fish Passage Barrier on-line data tool. Accessed January 2023.

Washington Department of Fish and Wildlife 2023c. Forage Fish on-line data tool. Accessed January 2023. https://wdfw.wa.gov/fishing/management/marine-beach-spawning

Washington Department of Fish and Wildlife 2022. Salmonscape on-line data tool. Accessed November 2022. https://apps.wdfw.wa.gov/salmonscape/

Washington Department of Health 2023a. Fish and Shellfish Consumption Advisories and Commercial Shellfish Growing Area Monitoring Data. On line https://www.doh.wa.gov/CommunityandEnvironment.

Washington Department of Health 2023b. Environmental Health Disparity. On line https://fortress.wa.gov/doh/wtnibl/WTNIBL/

Washington Department of Health 2021. Dyes Inlet Annual Shellfish Growing Area Review. On-line

https://doh.wa.gov/sites/default/files/legacy/Documents/4400/dyes.pdf?uid=63c86ecb49ea3

APPENDIX A:

PUBLIC AND AGENCY OUTREACH DOCUMENTATION

<Naomi.Gebo@dfw.wa.gov>; Grant.Holdcroft@kitsappublichealth.org
Cc: Sarah Wilson <SARAH.WILSON@CI.BREMERTON.WA.US>; Gunnar Fridriksson <Gunnar.Fridriksson@ci.bremerton.wa.us>; Garrett Jackson <Garrett.Jackson@ci.bremerton.wa.us>; Ned Lever <Ned.Lever@ci.bremerton.wa.us>; Bob Zurbrugg <Bob.Zurbrugg@ci.bremerton.wa.us>; Darrell Clauson <Darrell.Clauson@ci.bremerton.wa.us>
Subject: RE: Bremerton Stormwater Management Action Planning (SMAP) draft basin prioritization

Hi Everyone,

The City is in the process of preparing our *Stormwater Management Action Plan*, and we would appreciate a few minutes of your time to review and comment on our proposed basin prioritization analysis. The draft *Basin Prioritization* and the draft *Receiving Water Assessment* are attached to this email for your convenience.

Thanks in advance for your time and consideration. I know you are all busy, and the City appreciates any review and comment you are able to provide. If at all possible, please email me any comments or questions on or before Friday February 11.

Chance

Chance W Berthiaume, CPMSM
Stormwater Permit Coordinator
City of Bremerton Public Works & Utilities
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From: Michelle Perdue <mperdue@kitsap.gov>
Sent: Monday, January 30, 2023 3:25 PM
To: Zack Holt <zholt@portorchardwa.gov>; Chance Berthiaume <Chance.Berthiaume@ci.bremerton.wa.us>; Alison Osullivan (aosullivan@suquamish.nsn.us) <aosullivan@suquamish.nsn.us>; Satter, Allison E CIV (USA) <allison.e.satter.civ@us.navy.mil>; Alexia.Henderson@dfw.wa.gov; Gebo, Naomi (DFW) <Naomi.Gebo@dfw.wa.gov>; Grant.Holdcroft@kitsappublichealth.org
Cc: Sarah Wilson <Sarah.Wilson@ci.bremerton.wa.us>; Gunnar Fridriksson <Gunnar.Fridriksson@ci.bremerton.wa.us>; Garrett Jackson <Garrett.Jackson@ci.bremerton.wa.us>; Ned Lever <Ned.Lever@ci.bremerton.wa.us>; Bob Zurbrugg <Bob.Zurbrugg@ci.bremerton.wa.us>; Darrell Clauson <Darrell.Clauson@ci.bremerton.wa.us>
Subject: Re: Bremerton Stormwater Management Action Planning (SMAP) draft basin prioritization

Echoing that this looks great, and looking forward to seeing where we can put heads together to amplify mutual actions.

I caught one typo on page 7/Table 5. Line - Forage Fish Nearshore Use. "Thee": should this be "three"?

Great job!

Michelle Perdue

Stormwater Program Manager

Kitsap County Public Works

360-337-5777

Pronouns: she/her/hers

mperdue@kitsap.gov

Clean Water Kitsap
Partners in Stormwater Solutions

Please note that I do not expect a reply on evenings and weekends.

From: Zack Holt <zholt@portorchardwa.gov>
Sent: Monday, January 30, 2023 2:15 PM
To: Chance Berthiaume <Chance.Berthiaume@ci.bremerton.wa.us>; Alison Osullivan (aosullivan@suquamish.nsn.us) <aosullivan@suquamish.nsn.us>; Satter, Allison E CIV (USA) <allison.e.satter.civ@us.navy.mil>; Michelle Perdue <mperdue@kitsap.gov>; Alexia.Henderson@dfw.wa.gov <Alexia.Henderson@dfw.wa.gov>; Gebo, Naomi (DFW) <Naomi.Gebo@dfw.wa.gov>; Grant.Holdcroft@kitsappublichealth.org <grant.holdcroft@kitsappublichealth.org>
Cc: Sarah Wilson <SARAH.WILSON@CI.BREMERTON.WA.US>; Gunnar Fridriksson <Gunnar.Fridriksson@ci.bremerton.wa.us>; Garrett Jackson <Garrett.Jackson@ci.bremerton.wa.us>; Ned Lever <Ned.Lever@ci.bremerton.wa.us>; Bob Zurbrugg <Bob.Zurbrugg@ci.bremerton.wa.us>; Darrell Clauson <Darrell.Clauson@ci.bremerton.wa.us>
Subject: RE: Bremerton Stormwater Management Action Planning (SMAP) draft basin prioritization

[**CAUTION:** This message originated outside of the Kitsap County mail system. **DO NOT CLICK on links** or **open attachments** unless you were expecting this email. If the email looks suspicious, contact the Helpdesk immediately at 360-337-5555, or email at Helpdesk@kitsap.gov]

Looks pretty good overall! Nice work Bremerton team! My only comments:
Graphics in both TM's are a bit grainy. May want to up the resolution of the graphics?
Pg. 17 of the RWA (Impervious area map) has a blue spot not labeled on the legend. Unsure of the significance?
Perhaps consider moving the ESRI disclaimer out of the images into a text box for ease of reading and map clarity?
Pages 20-23 of RWA: footer in lower left corner shows 11/29/92. Is this a date?

Those are my only comments. Looks great!

Zack

From: Chance Berthiaume <Chance.Berthiaume@ci.bremerton.wa.us>
Sent: Friday, January 27, 2023 10:13 AM
To: Alison Osullivan (aosullivan@suquamish.nsn.us) <aosullivan@suquamish.nsn.us>; Satter, Allison E CIV (USA) <allison.e.satter.civ@us.navy.mil>; Zack Holt <zholt@portorchardwa.gov>; mperdue <mperdue@kitsap.gov>; Alexia.Henderson@dfw.wa.gov; Gebo, Naomi (DFW)

From: Chance Berthiaume
Sent: Wednesday, February 22, 2023 12:08 PM
To: Debbie Coil <debicoil@gmail.com>
Subject: RE: City Watershed Project

Hi Debbie,

Thanks for asking about the planning effort.
1. Does the project only cover the greater Bremerton area or will it also involve Manette?
This project includes all of Bremerton including the Urban Growth Areas (UGA's) and portions of Kitsap County and the City of Port Orchard that drain to the City stormwater system. We are determining where stormwater is negatively impacting water quality.

2. Where will the money come from for the project?
The SMAP project is funded with an Ecology grant and match from the Stormwater Utility. The projects generated by the SMAP are eligible for Ecology grants that will cover 75% of the total project cost with the remaining 25% coming from the Stormwater Utility. We will apply for grant funding this coming fall.

3. Will the project be put to a vote of those affected by the construction?
The City will provide outreach to the adjacent property owners/business owners in the immediate area of the project to discuss the project and any impacts they may see. Property owners in the immediate area of the project will be notified about the project and we will work with them to reduce the impact the project may have on them. Unfortunately, construction is always an inconvenience to the traveling public, local residents, and businesses but we do try to mitigate as

much as possible.

4. When is the project planned to commence?
The SMAP project has been underway since August of 2022. We plan to have this SMAP approved by April and move on to work on the next stormwater basins. Two project areas are expected to be implemented over the next two years, provided we receive grant funds to begin the design work which will be followed by construction. The projects are on Kitsap Way at Oyster Bay Ave N., and on Francis Drive at Kitsap Lake. These are the highest ranked sites where stormwater treatment will provide the most benefit to improving receiving water quality. We will continue our planning efforts in the other drainage basins throughout the City over the coming years.

5. Will other construction projects [like round abouts] be happening simultaneously? If so are you planning to coordinate efforts for the least impact to peak commute times?
We continually work with our transportation project engineers to coordinate projects. An example of this is the current E. 11th and Perry Avenue project where stormwater treatment was included with the local road improvements. Traffic considerations are always part of project design and implementation. Selecting the placement of the treatment systems is an important consideration for not only the construction of the system but also the semi-annual maintenance that our staff needs to complete. This approach reduces the impact to the commuting public and residences located by the treatment systems.

6. Will people in affected communities be part of the planning phase beyond this meeting? Example- A select group from the community to listen to and weigh in on planning and execution of the project throughout the initiative [example of select groups: Manette Neighborhood Coalition or the Manette Business Association; or other people living in the area.]

As noted above, we will be meeting with businesses/owners, and residential property owners adjacent to the project sites to inform and coordinate the project considerations as the final designs and construction plans are developed.

Thanks again for your questions.

V/R, Chance

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From: Debbie Coil <debicoil@gmail.com>
Sent: Friday, February 17, 2023 1:23 PM

To: Chance Berthiaume <Chance.Berthiaume@ci.bremerton.wa.us>
Subject: City Watershed Project

Hi Chance,

At first glance of the project information these questions come to mind:
1. Does the project only cover the greater Bremerton area or will it also involve Manette?
2. Where will the money come from for the project?
3. Will the project be put to a vote of those affected by the construction?
4. When is the project planned to commence?
5. Will other construction projects [like round abouts] be happening simultaneously? If so are you planning to coordinate efforts for the least impact to peak commute times?
6. Will people in affected communities be part of the planning phase beyond this meeting? Example- A select group from the community to listen to and weigh in on planning and execution of the project throughout the initiative [example of select groups: Manette Neighborhood Coalition or the Manette Business Association; or other people living in the area.]

I may have more questions.
Thank you for inviting questions & comments.

Regards,

Debbie Coil - debicoil@gmail.com

APPENDIX B:

PRIOITIZATION SCORING AND RANKING TABLES

Table A. Beneficial Uses and Development-Growth Scoring Summary.

SMAP Stormwater Basin Group	Basins	Area (Ac)	Public Dir. Contact Rec. [1]		Shellfish and Finfish Harvest		Total Impervious Area [5]	Develop-ment Pressure [6]	Extent Existing SW Treatment [7]	High ADT Roads [8]	Total Score	Overall Rank
			Use (H/M/L)	Impaired [2]	Commercial Monitored Areas [3]	Impaired [4]						
OYSTER & OSTRICH BAY	Oyster Bay	1,524	2	2	2	3	2	2	2	3	18	1
	Ostrich Bay		2	2	2	3	2			2		
	Marine Drive		2	2	2	3	1			1		
	Score		2	2	2	3	2	2	2	3		
KITSAP LAKE	Kitsap Lake	1,256	3	3	1	2	1	3	3	2	18	1
	Score		3	3	1	2	1	3	3	2		
WEST NARROWS	Anderson Cove	1,270	2	2	1	2	3	1	3	3	17	2
	Warren Ave		2	2	1	2	3		3	3		
	Pacific Ave		1	2	1	2	3		3	3		
	Phinney Bay		2	2	1	2	2		3	2		
	Rocky Point		2	2	1	2	2		3	1		
	Score		2	2	1	2	3	1	3	3		

[1] 3 = full immersion swimming and boating; 2 = wading and partial immersion; 1= no significant direct contact recreation.

[2] 3 = frequent public health closures; 2 = occasional public health closures; 1 = infrequent or no public health closures.

[3] Shellfish harvest areas per WDOH 2023. 3= Approved commercial shellfish area; 2 = Monitored potential commercial shellfish area; 1 = Closed commercial or recreation shellfish

[4] Commercial or recreational beaches listed by WDOH due to stormwater/non-point sources = 3. Listing due primarily to point sources = 2. Finfish harvest advisory per WDOH = 2. All others = 1.

[5] TIA > 40% = 3; TIA 20% - 40% = 2: TIA < 20% = 1

[6] High density dev. & existing dev < 20% = 3; High density dev. & existing dev < 85% = 2; High density dev. & existing dev > 85% = 1

[7] > 90% area without BMPs = 3; 90% -20% of are without BMPs = 2; <20% of area without BMPs = 1.

[8] > 3 miles ADT = 3; 1-3 miles ADT = 2; < 1 mile high ADT = 1

Table B. Habitat, Water Quality and Hydrology Scoring Summary.

SMAP Stormwater Basin Group	Basins	Salmonid Presence and Use [1]					No. Fish Passage Barriers [2]	Forage Fish Spawning [3]		Water Quality [4]	Hydrology [8]	Total Score	Overall Rank
		Area (Ac)	FW Species Use	Spawning	Rearing	Salmonid Rating		Species	Extent (H/M/L)				
OYSTER & OSTRICH BAY	Oyster Bay	1,524	None	No		Moderate	13	S	Moderate		Moderate/low storage and recharge	13	2
	Ostrich Bay		c, fc, rt	Yes	Yes	High	6	S, SL	High				
	Marine Drive		None	No	No	Moderate	0	S	Low				
	Score		3				3	2		3	2		
KITSAP LAKE	Kitsap Lake	1,256	c, rt	No	No	Moderate	3	FW	Moderate		High storage and recharge	11	1
	Score		2				2	2		2	3		
WEST NARROWS	Anderson Cove	1,270	No	No	No	Low	0	S, SL	Moderate		Moderate/low storage and recharge	8	3
	Warren Ave		No	No	No	Low	0	None	Low				
	Pacific Ave		No	No	No	Low	0	S	High				
	Phinney Bay		No	No	No	Low	0	S	Moderate				
	Rocky Point		No	No	No	Low	0	S	Moderate				
	Score		1				0	2		3	2		

[1] Salmonid key: c = coho, fc = fall chum, rt = resident trout, ch = chinook, sh = steelhead

[2] Both full and partial barriers per WDFW 2023. > 5 barriers = 3; 2-4 barriers = 2; 1-2 barriers = 1; No barriers = 0

[3] Forage fish key: S = smelt, SL = sand lance, H = herring, FW = Freshwater spp.

[4] Pollutant loading index per Table 5 criteria.

[5] Rating per Ecology Watershed Characterization Tool 2023. High = 3: Moderate = 2: Low = 1.

APPENDIX C:

OYSTER BAY OUTFALL PRELIMINARY ASSESSMENT

APPENDIX D:

WERNER ROAD RETROFIT AND WETLANDS – PRELIMINARY ASSESSMENT