

Prepared by

Skagit County, Washington



# Stormwater Management Action Plan

Big Lake East Catchment - March 2023



# Skagit County: Stormwater Management Action Plan – Big Lake East Catchment

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## List of Abbreviations

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AU	Assessment Unit
BMPs	best management practices
CIP	Capital Improvement Program
County	Skagit County
CWA	Clean Water Act
DMP	Drainage Management Plan
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
ER&R	Equipment Rental & Revolving Fund Division
GIS	geographic information system
IDT	Interdisciplinary Team
LMD	Lake Management District
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PCBs	polychlorinated biphenyls
PDS	Planning and Development Services
Permit	NPDES MS4 Phase II Permit
permit area	NPDES Permit area
SMAP	Stormwater Management Action Plan
SR	State Route
SWMP	Stormwater Management Program
TSS	total suspended solids
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WDOH	Washington Department of Health
WSDOT	Washington State Department of Transportation

# Definitions

Term	Definition
Best Management Practice (BMP)	BMPs include stormwater management facilities, schedules of activities, prohibition of practices, maintenance procedures and other management practices designed to prevent or reduce pollution. BMPs also include treatment requirements, operating procedures, and practices to control stormwater runoff.
County	Skagit County
Design Storm	The distribution of rainfall intensity over time (typically 24 hours), identified to have a probability of recurrence given in years (e.g., 5-year design storm).
Detention	The release of surface water runoff from a site at a slower rate than it is collected by the drainage system and/or stormwater management facility, the difference being held in temporary storage.
Development	<p>Any human made change to improved or unimproved real estate, including but not limited to the addition of buildings or other structures, utility infrastructure, impervious surfaces, other structures or facilities; the activities of mining, dredging, paving, filling, or excavation; or the addition of any surface type that changes or impedes the natural flow of stormwater runoff. Development also includes partitions, subdivisions and land divisions redevelopment or modifications to the existing impervious surface footprint on a property. Development does not include the following:</p> <ol style="list-style-type: none"> <li>1. Stream enhancement or restoration projects approved by the County.</li> <li>2. Farm structures and private roads outside of the County's Stormwater Management Area.</li> <li>3. Lot Line adjustments.</li> <li>4. Measures to replace within the existing footprint, a structure(s) lost due to a catastrophic event such as fire, provided that such measures are consistent with County regulations.</li> <li>5. Linear utility projects that replace existing impervious surface with equivalent material.</li> <li>6. Non-pollution generating (i.e., not roads), linear projects (ex. Pedestrian pathways) that shed runoff onto green space.</li> <li>7. Modular/temporary structures.</li> </ol>
Discharge	Any addition of treated or untreated water, stormwater, wastewater, process water or any pollutant or combination of pollutants to waters of the State of Washington, directly or indirectly, by actions of dumping, spilling, disposing, or physically connecting to the public storm system or natural drainage conveyance.
Engineer	A registered professional engineer licensed to practice in the State of Washington, who is responsible for the design and construction of the site stormwater management plan. This person is also referred to as the project engineer or engineer.
Erosion	The visual or measurable movement of soil particles resulting from the flow of, or pressure from, water, wind, or earth movement.
Infiltration	The process by which stormwater penetrates into soil.
Municipal Separate Storm Sewer System (MS4)	A storm drainage system(s) (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human made channels, or storm drains) as defined in 40 Code of Federal Regulations (CFR) 122.26(b)(8).
National Pollutant Discharge Elimination System (NPDES) Permit	A permit issued pursuant to Chapter 402 of the Clean Water Act (40 CFR 122, 123, 124, and 504).
NPDES Permit Area (permit area)	The Permit requirements apply largely to unincorporated areas scattered throughout the County, informally known as the "NPDES permit area" (or permit area) which is approximately 12,838 acres total (see Figure 1-2).
Pollutant	Stormwater pollutants that can harm rivers, streams, lakes, and coastal waters are generally separated into the following categories: suspended solids/sediment (i.e., trash), oxygen-demanding pollutants, temperature, bacteria, organic carbon, organic matter (i.e., leaves, flowers, twigs, pollen), hydrocarbons, metals (i.e., lead, copper, zinc, and cadmium), nutrients (i.e., nitrogen and phosphorous), pathogens (i.e., animal feces, leaking sewers) and toxins (i.e., pesticides, chemical toxins).
Project	A project includes all infrastructure related items for both development and redevelopment conditions. Projects include the organized effort to construct a building or structure and associated utilities and amenities. In the fields of civil engineering and architecture, construction projects involve the process that consists of tangibly assembling infrastructure or buildings.
Proprietary Stormwater Treatment Device	A manufactured stormwater treatment device, in which stormwater receives treatment before being discharged to the storm drainage system, to a stormwater management facility, or to the receiving water. This is a broad

Term	Definition
	category of stormwater management facilities with a variety of pollutant removal mechanisms and varying pollutant removal efficiencies.
Soil	The upper layer of earth in which plants grow which is a black or dark brown material typically consisting of a mixture of organic remains, clay, and rock particles.
Stormwater or Stormwater Runoff	Includes snow melt runoff, and surface runoff and drainage, and is defined in 40 CFR §122.26(b)(13). “Stormwater” means that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels, or pipes into a defined surface water channel or a constructed infiltration facility.
Stormwater Management	A program to provide surface water quality and quantity controls through structural and nonstructural methods. Examples of structural controls include swales, planters, rain gardens, and retention basins as well as structural source controls (e.g., covers and awnings, curbs for isolation, spill control manholes, and shut-off valves). Nonstructural controls include maintenance of surface water facilities, maintenance of roads (e.g., street sweeping, inlet cleaning), public education, implementation of intergovernmental agreements to provide for regional coordination, inspections, and preparation of water quality control ordinances and regulations.
Stormwater Pond	A basin designed to capture and infiltrate runoff water or hold runoff water to allow soil and debris to settle at the bottom as sediment.
Stream	A surface concentration of flow in an open channel in which flow of water occurs either perennially or intermittently.
Waters of the State	Those waters defined in 40 CFR Subpart 122.2 or as amended, which include tributaries, lakes, ponds, adjacent wetlands, and the territorial seas within the geographic boundaries of Washington State, and those waters defined in Chapter 90.48 RCW which includes lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and water courses within the jurisdiction of the State of Washington.
Wetlands <sup>a</sup>	<p>Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are those areas identified and delineated by a qualified wetlands specialist as set forth in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, January 1987, or by an ODSL/USACE 404 permit. Wetlands may also consist of:</p> <ol style="list-style-type: none"> <li><b>Constructed Wetlands.</b> Wetlands developed as a water quality or quantity facility, subject to change and maintenance as such. These areas must be clearly defined and separated from naturally occurring or created wetlands.</li> <li><b>Created Wetlands.</b> Created wetlands are wetlands developed in an area previously identified as a non-wetland to replace, or mitigate, wetland destruction or displacement. A created wetland shall be regulated and managed the same as an existing wetland.</li> <li><b>Existing Wetlands.</b> Existing wetlands are those identified and delineated as set forth in the Federal Manual for Identifying the Delineating Jurisdictional Wetlands, January 1987, or as amended, by a qualified wetlands specialist.</li> </ol>

<sup>a</sup>Skagit County Code Chapter 14.24 Critical Areas Ordinance.

## Document Control

The purpose of this section is to track the version history of the SMAP and to summarize updates to the SMAP planning process and actions. Table 1-1 provides a location for SMAP versions to be recorded with a change reference.

Date	Author	Version	Change Reference
3/31/2023	C. Thao, J. Quigley	01	Original



# Executive Summary

Skagit County, Washington, (County) is permitted to discharge stormwater runoff to streams, rivers, lakes, bays, and other waters of the state. All discharges from the County drainage system to waters of the state must comply with the Western Washington Phase II Municipal Stormwater Permit (the Permit). The Washington State Department of Ecology (Ecology) issued the Permit in July 2019 in compliance with the provisions of the federal Water Pollution Control Act (or Clean Water Act, i.e., CWA) and State of Washington Water Pollution Control Law. The Permit expires July 31, 2024. The Permit requires permittees to develop a plan to accommodate future growth and development, while preventing water quality degradation and/or improving water quality and aquatic habitat conditions in receiving waters, harmed by past or existing development. That plan must be prepared according to guidance from Ecology. This report includes details of that plan, which focuses on a 530-acre catchment delineated along the east shore of Big Lake in Skagit County (Figure ES-1).

The County completed this Stormwater Management Action Plan (SMAP) to meet the requirements of Special Condition S5.C.1.d.iii in the Permit. The County completed the following three-part process as prescribed in the Permit:

1. Receiving Water Assessment to document and assess existing conditions and information for watershed basins.
2. Receiving Water Prioritization to determine which receiving waters will receive the most benefit from implementation of water quality improvements and other land/development management actions.
3. Stormwater Management Action Plan (SMAP, the Plan) to identify potential retrofit opportunities, land management/development strategies and/or actions, targeted enhancement strategies, implementation schedule and budget sources as well as a strategy for future plan updates.

The County followed Ecology's 2019 Stormwater Management Action Planning Guidance<sup>1</sup> to meet the Permit requirements. That process identified the Big Lake basin as a priority for the SMAP. From there, a catchment was delineated along the east shore of Big Lake in which to develop proposals for the SMAP. Through this process the County identified appropriate retrofits, land management strategies and actions, and specific stormwater management actions for the catchment. This SMAP includes the following elements:

## Stormwater Retrofits

Four retrofits were identified and are included from the 2007 Big Lake Drainage Management Plan<sup>2</sup>. The County identified two additional retrofits, which include improving an existing stormwater pond and implementing a pilot program for phosphorus treatment systems. These retrofits aim to reduce phosphorus and total suspended solids (TSS) loads, address sedimentation and erosion issues, reduce maintenance costs, and mitigate localized flooding.

The SMAP actions associated with these projects will be funded by future Capital Improvement Program (CIP) allocations and/or funding received through Ecology's grants and loans programs.

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<sup>1</sup> 2019 Stormwater Action Management Planning Guidance (Publication 19-10-010) by Ecology.

<sup>2</sup> 2007 Skagit County Public Works Department Big Lake Drainage Management Plan by Montgomery Water Group, Inc. and MGS Engineering Consultants.

See Section 3.1 for more information on Stormwater retrofits.

## Land Management/Development Strategies

The SMAP identified two land management strategies in the catchment:

- Stormwater Design Standards for In-Fill Projects
- Update Development Review Process

These two efforts aim to ensure appropriate standards are in place that accommodate current water quality and water quantity issues, as well as for future growth and climate change trends.

The SMAP actions associated with these two efforts will be completed by 2025 and will be funded under the existing Drainage Utility budget and future CIP allocations.

See Section 3.2 for more on land management and development strategies.

## Customized Stormwater Management Actions

The County has identified seven actions to customize its Stormwater Management Program. These initiatives aim to customize various aspects of the County’s ongoing Operations and Maintenance (O&M) activities, the Natural Resource Division’s Public Education and Outreach Program, and the Regional Source Control Program.

SMAP actions associated with these initiatives will be funded through reallocations from the existing Drainage Utility budget along with future Ecology grants.

See Section 3.3 for more information on these customized initiatives.

## Changes Needed to Other Long-Range Plans

No changes to other County long-range planning efforts have been identified through this SMAP effort. With its stormwater planning Interdisciplinary Team (IDT), the County will continue coordinating with other County planning efforts and ensure that the SMAP will inform updates to the current County Comprehensive Plan going forward.

These coordination efforts are ongoing and are funded through the existing operating budget for the County.

## Implementation Schedule and Budget Sources

Section 4 provides detailed information on the implementation schedules and budget sources for each action described in Section 3. The schedule includes short- and long-term actions, where Ecology defines short-term as being accomplished within six years and long-term as being accomplished within seven to 20 years. For each action item, the most probable source(s) of funding is identified. If County budget reallocations are necessary, they will be sourced from other County Department budgets or future Ecology grants. All budget reallocations will seek approval from the County’s Board of County Commissioners.

See Tables 4-1 and 4-2 for management actions, schedules, and anticipated budget sources.

## Future Assessment and Adaptive Management to the SMAP

This SMAP and each of the short- and long-term actions described in Section 4.2 will be reviewed annually and updated as necessary by incorporating an adaptive management approach. Throughout the implementation process, the County will be open to changing or modifying each action item over time to accommodate improvement opportunities or to address challenges that arise. Any resulting modifications to the SMAP will be reviewed by the County’s IDT.

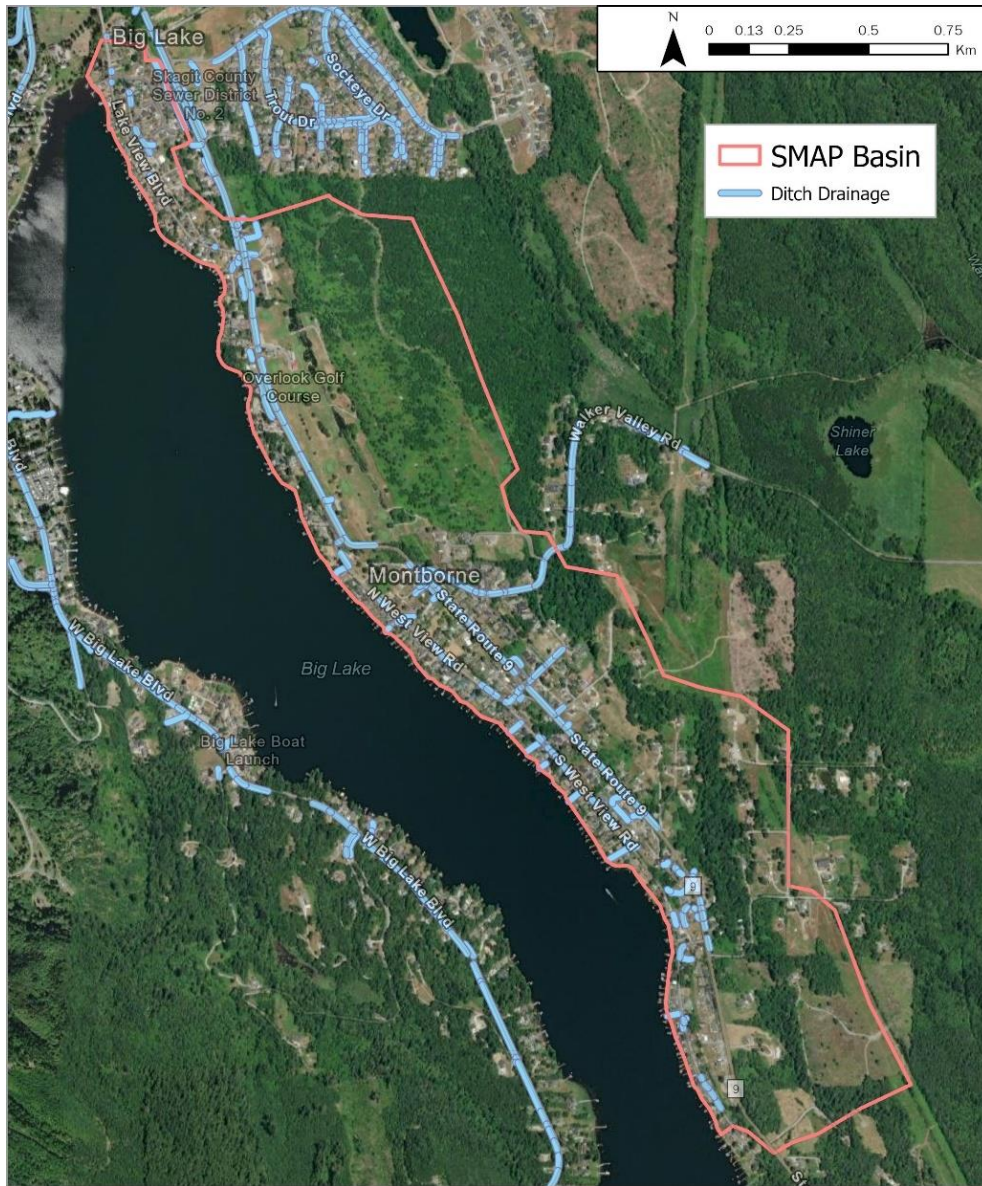


Figure ES-1 Big Lake east catchment

## Section 1

# Purpose and Background

Regulated by the Western Washington Phase II Municipal Stormwater Permit (Permit), Skagit County (County) is tasked with developing a Stormwater Management Action Plan (SMAP). This section describes the SMAP planning process (Figure 1-1), identifies goals of the Skagit County SMAP, and provides background information on the selected study area (catchment) for consideration.

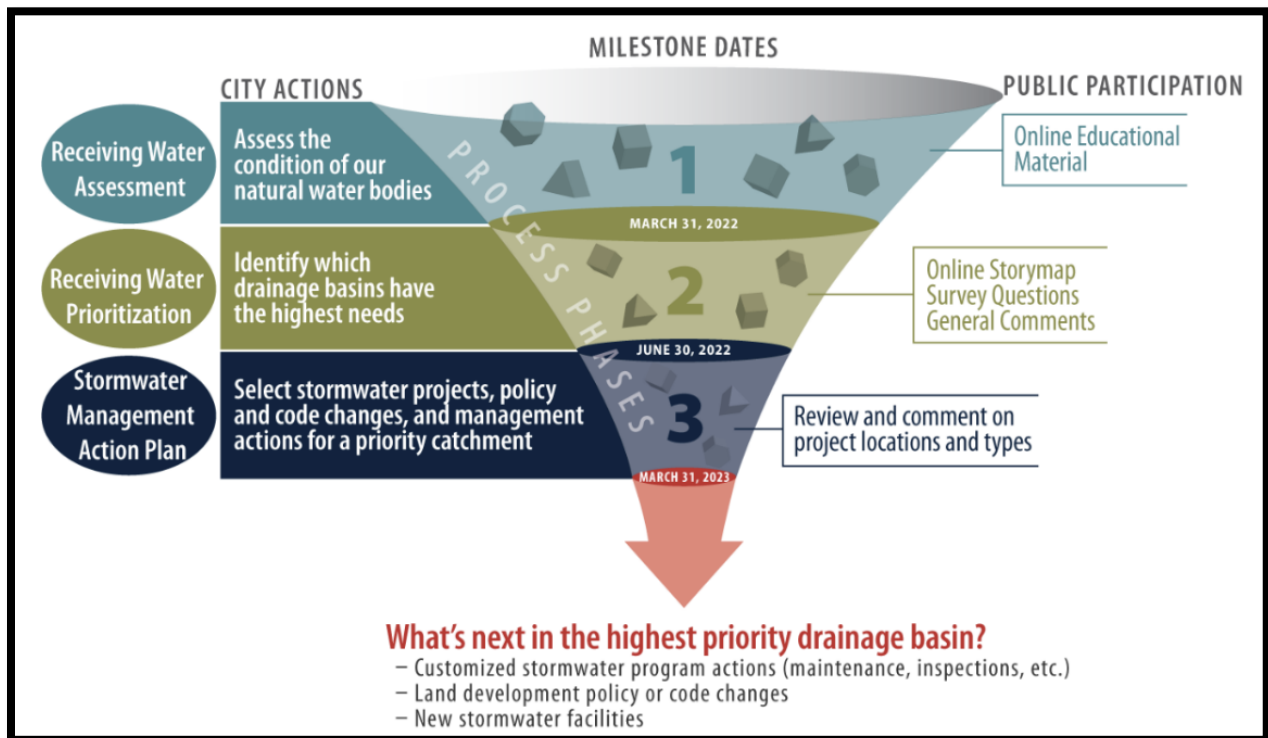


Figure 1-1. SMAP planning process

As of this report, the Permit requirements apply largely to unincorporated areas scattered throughout the County. This area is informally known as the “NPDES permit area” (or permit area), which is approximately 12,838 acres total (Figure 1-2). While the permit area is taken into consideration for this study, the SMAP planning process evaluated places outside of the permit area due to complexities presented by watershed characteristics, such as topography, stormwater infrastructure, drainage complaints, etc., which have significant water quality implications despite the permit area.

Guided by the SMAP planning process, the County generated a list of receiving waters and selected Big Lake as its prioritized receiving water for this SMAP. With that consideration, a drainage area (catchment) along the east shore of Big Lake was delineated and serves as the focus area for SMAP actions.

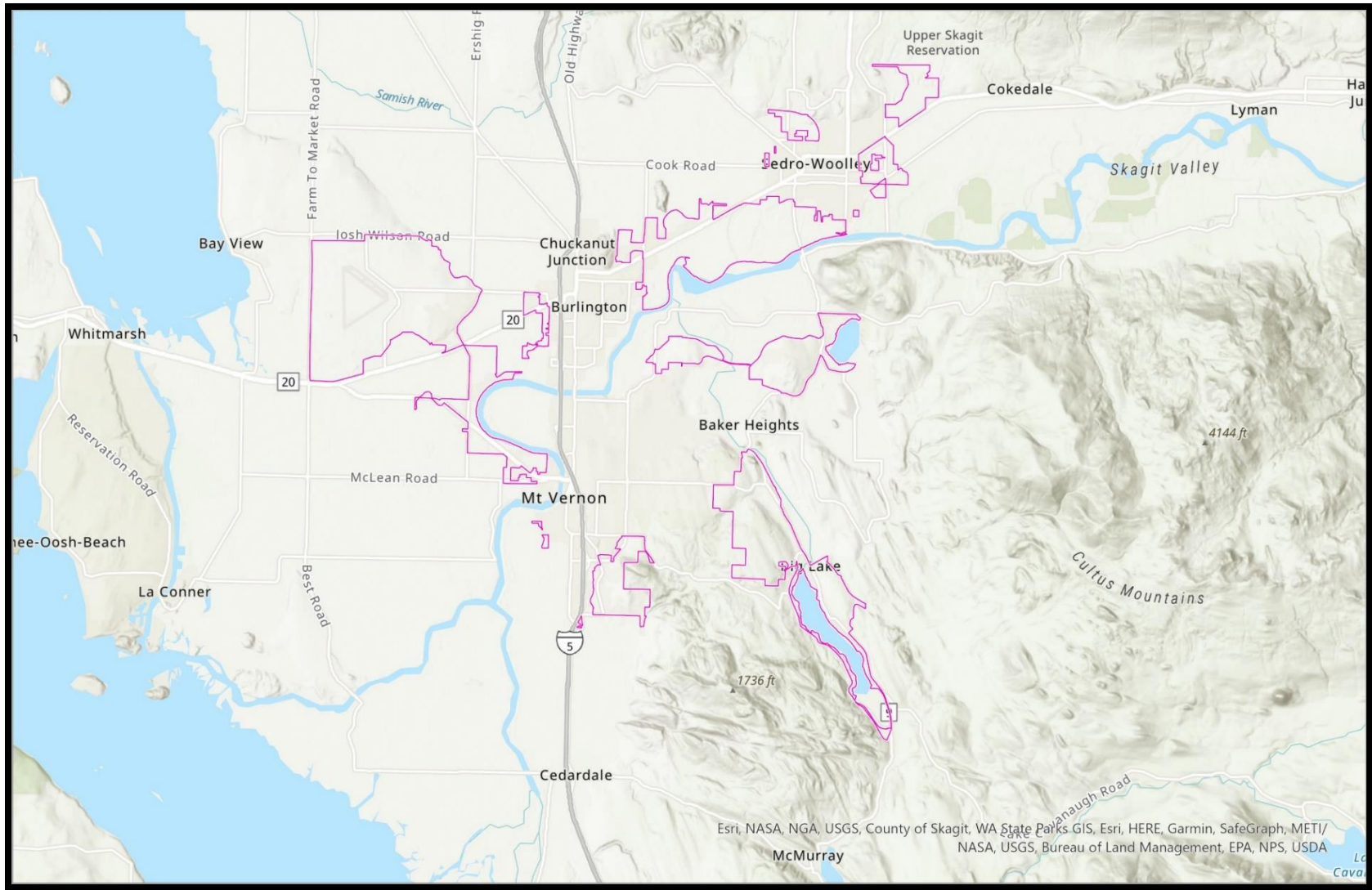


Figure 1-2. Skagit County's MS4 NPDES permit area

## 1.1 Purpose

Skagit County is covered by the Western Washington Phase II Municipal Stormwater Permit. This combination of National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit authorizes discharges from the County’s Municipal Separate Storm Sewer System (MS4) to waters of the state.

Section S5.C.1.d. of the current (2019-2024) Permit requires Stormwater Management Action Planning. The Ecology’s 2019 Stormwater Management Action Planning Guidance (Ecology SMAP Guidance, August 2019, Publication 19C-10-010) describes a SMAP process with three components:

- S5.C.1.d.i Receiving Water Assessment
- S5.C.1.d.ii Receiving Water Prioritization
- S5.C.1.d.iii Stormwater Management Action Plan Development

Skagit County prepared this SMAP to in accordance with the Permit Special Condition S5.C.1.d and Ecology’s 2019 SMAP Guidance.

Special Condition S5.C.1.d of the Permit requires the County to (1) conduct a receiving water assessment, (2) develop a receiving water prioritization to determine which receiving water will receive the most benefit from a suite of actions, and (3) develop a SMAP for at least one high-priority catchment area by March 2023. The County must conduct a similar process and consider the range of issues outlined in Ecology’s 2019 SMAP Guidance, which states:

*“SMAP is focused on addressing impacts from the cumulative development in a watershed rather than on single site or subdivision impacts. SMAP helps to answer these two important questions:*

- 1. How can we most strategically address existing stormwater problems?*
- 2. How can we meet our future population and density targets while also protecting and improving conditions in receiving waters?*

*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.”*

As noted above, the Permit outlines three work stages in the SMAP planning process, which is also previously shown in Figure 1-1:

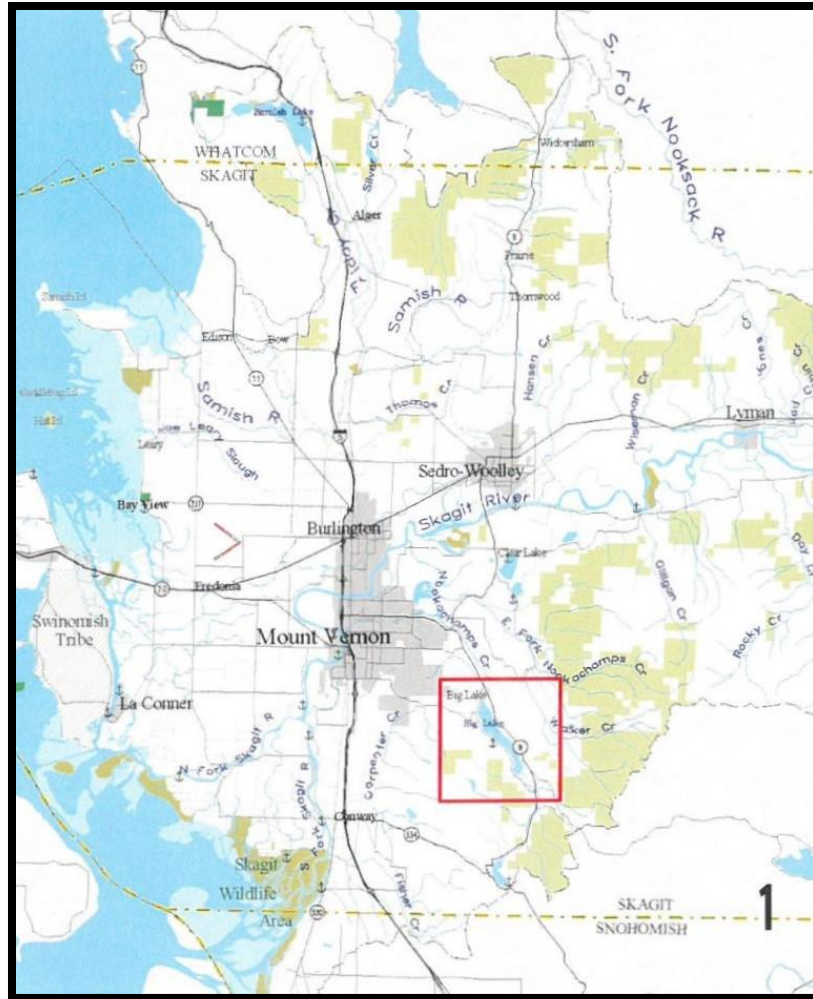
- 1. Special Condition S5.C.1.d.i Receiving Water Assessment.** Assess and document existing information to determine which receiving waters would receive the greatest benefit from stormwater management planning. Documentation shall include the relative conditions of the receiving waters and contributing areas, the relative influence of stormwater management on the receiving waters, a watershed inventory table, and a map that references the table. These items were required to be submitted to Ecology no later than March 31, 2022.
- 2. Special Condition S5.C.1.d.ii Receiving Water Prioritization.** Define and implement a prioritization process to select basins where SMAP planning can reduce pollutant loading and hydrologic impacts of existing and future development. The Permit requires the documented prioritization process and a ranked list of receiving waters submitted to Ecology no later than June 30, 2022.

3. **Special Condition S5.C.1.d.iii Stormwater Management Action Plan.** Develop a SMAP for one high priority catchment area that identifies retrofits, land management strategies, and stormwater management strategies. Permittees shall develop and submit a finalized SMAP by March 31, 2023, for at least one high priority catchment area from (ii), above, that identifies all of the following:
- Stormwater Retrofit Needs
  - Land Management Strategies
  - Targeted Actions

## 1.2 Background

Since time immemorial, Coast Salish people have established winter villages in the uplands with extended families and neighboring villages (J. Willup, personal communication, 2023). Whether the people were from upland or nearshore summertime villages, areas like Big Lake provided protection from winter weather and flood waters. Peoples from Swinomish, Lower Skagit, Kikialus and Samish have used the area currently called Big Lake as a home for wintering or year-long uses. The area has also been home to Peoples from Sauk-Suittle and Stillaguamish. After signing the Point Elliott Treaty in 1855, Coast Salish people moved to nearby reservations such as Swinomish, Tulalip, and Nooksack (J. Willup, personal communication, 2023).

Big Lake is located five miles southeast of Mount Vernon, Washington, along the west side of State Route 9 (see Figure 1-3). Big Lake is a glacially formed landscape. Surrounding soils are mostly silty loams or gravelly loams, with the west shore comprised mostly of outwash and east shore comprised of till (MWG, 2007). The lake has a surface area of 535 acres with its deepest point reaching 22 feet. The lake is fed by Lake McMurry, which flows to Big Lake via Lake Creek from the south. Big Lake drains to the north into Nookachamps Creek. There are 44 tributaries that discharge into Big Lake and the upper Nookachamps Creek (MWG, 2007). The 2018 Washington State Water Quality Assessment (Ecology, 2022) identified eight water quality impairments for Big Lake, some of which included total phosphorus and toxic compounds found in fish tissue, such as polychlorinated biphenyls (PCBs) and methyl mercury.



**Figure 1-3. Big Lake vicinity map**

The catchment for this study is approximately 530 acres, running along the east shore of Big Lake (see Figure 3-1 in Section 3). The catchment represents a sub-basin of Washington State Department of Ecology’s Assessment Unit (AU) 3292 developed in the Puget Sound Watershed Characterization Project (Stanley et al., 2010). The catchment starts at the north end of Big Lake near Day Lumber Lane (by Nookachamps Creek) and stretches south nearly to the end of Sulfur Springs Road. It is approximately one third of a mile in width beginning at the east shoreline. Big Lake is the only receiving water in this catchment, which flows into Nookachamps Creek to the north. Nookachamps Creek is a tributary to Skagit River, which flows to Puget Sound.

The east shore contains the majority of stormwater structures around Big Lake. These facilities include ditches, culverts, pipes, and catch basins (Types I & II & Burlington Boxes). With limited vacant land, existing structures offer the opportunity for retrofit assessments and implementation (e.g., installing proprietary stormwater treatment devices) to address water quality issues. Additionally, the east shore has the highest concentration of resident complaints related to drainage and flood issues in the Big Lake watershed.

By addressing water quality and quantity through actions of the SMAP (upgrading culverts, installing treatments, ditch maintenance, etc.), drainage throughout the catchment is anticipated to improve, while potentially mitigating flood issues. With soil classifications predominantly in Hydrologic Group B



on the west shore, Group C on the east shore, and Group D along Big Lake itself (MWG, 2007), infiltration is not feasible in this catchment.

In addition to drainage, the SMAP will aim to improve water quality in Big Lake. Nutrients (total phosphorus) are among the list of water quality impairments, and they contribute to toxic blue-green algal blooms that threaten human, pet, and wildlife health. Algal blooms tend to occur in mid- to late-summer when recreation on the lake is high.

Big Lake is home to a variety of native and non-native fish species. Washington Department of Fish & Wildlife survey reports included coho salmon (*Oncorhynchus kisutch*), black crappie (*Pomoxis nigromaculatus*), brown bullhead (*Ameiurus nebulosus*), resident coastal cutthroat trout (*O. clarkii*), largemouth bass (*Micropterus salmoides*), pumpkinseed sunfish (*Lepomis gibbosus*), and yellow perch (*Perca flavescens*). Although not surveyed, the Dolly Varden trout (*Salvelinus malma*) is known to be present in Big Lake and Nookachamps Creek and is listed under the Federal Endangered Species Act (ESA). Coho salmon, which do appear in Big Lake surveys, is currently a candidate for being listed under the ESA. The mainstream Nookachamps Creek is home to a fall run of chinook salmon (*Oncorhynchus tshawytscha*), another ESA-listed species.

Lake improvements are largely led by Lake Management District #1 (LMD#1). This includes managing noxious weeds such as Brazilian waterweed (*Brazilian elodea*), Eurasian watermilfoil (*Myriophyllum spicatum*), fragrant water lily (*Nymphaea odorata*), yellow flag iris (*Iris pseudacorus*), and harmful algal blooms. While chemical treatments in the littoral zone have been relatively successful in reducing invasive aquatic plants, native species have started becoming a problem for recreation due to high plant densities.

Developments in the Big Lake watershed continue to be permitted, some of which are expected to impact drainage in the east catchment. Overlook Crest, a 106-lot project planned for construction uphill of Overlook Golf Course, is currently undergoing a permitting process. A 2007 Drainage Management Plan (DMP) was completed to address NPDES-related stormwater program needs and assess existing stormwater facilities. The DMP noted that out of 600 drainage facilities inventoried (culvert inlets & outlets), nearly half of the facilities were damaged or impaired by the accumulation of sediment and debris (MWG, 2007). Skagit County Public Works continues to be engaged in the Big Lake watershed to address new and ongoing drainage concerns. While the SMAP is focused on the east shore, the Big Lake watershed in general continues to see new construction permits. More future proposals for development are expected.

### 1.3 Plan Outline

The remaining sections of this report are listed below. These sections include a detailed approach in selecting a catchment for the SMAP including specific proposals for improvement, how proposals will be implemented (including short-term and long-term goals, and an adaptive management component), an explanation of the public involvement process, and concluding remarks. Contents include:

- Section 2 Approach
- Section 3 Action Plan Elements
- Section 4 Plan Implementation
- Section 5 Public Involvement
- Section 6 Conclusion
- Section 7 References
- Appendices

## Section 2

# Approach

Guided by the National Pollutant Discharge Elimination System (NPDES) MS4 Phase II Permit (Permit) language and the Washington State Department of Ecology’s (Ecology) Stormwater Management Action Plan (SMAP) Guidance, Skagit County (County) considered a range of issues within catchment areas of receiving waters inside and outside of the County’s permit area (see Figure 1-2), as encouraged by Ecology’s guidance. Various receiving waters were included in the SMAP planning process to ensure the results would help produce the strongest candidates from which to select a high-priority receiving water. The County also used internal data on drainage complaints collected through September 2021 (see Appendix A).

Additionally, the County reached out to various partners and entities via a survey to collect information on what important factors the County should assess when selecting an area to perform water quality work. Among the top three factors were:

1. The presence of high-quality waterbodies that need protection (91%),
2. The presence of waterbodies that are degraded and need restoring (73%), and
3. How much of the existing drainage infrastructure is too small or aged to handle current or future storm flows (73%).

Survey recipients included:

- City of Anacortes
- City of Burlington
- City of Mount Vernon
- City of Sedro-Woolley
- Port of Skagit
- Samish Indian Nation
- Sauk-Suiattle Indian Tribe
- Skagit Conservation District
- Skagit Council of Governments
- Skagit Fisheries Enhancement Group
- Skagit Land Trust
- Skagit Parks and Recreation Department
- Skagit Watershed Council
- Skagit PUD
- Skagit River System Cooperative
- Skagit Transit
- Swinomish Indian Tribal Community
- Town of Concrete
- Town of Hamilton
- Town of La Conner
- Town of Lyman
- United States Army Corp of Engineers
- Upper Skagit Indian Tribe
- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- Washington Department of Natural Resources

Using this data and the approaches described below, the County selected the Big Lake basin (Assessment Unit 3292, or AU 3292) and delineated a drainage area (catchment) on the east shore of Big Lake as the focus for the SMAP (see Figure 3-1).

## 2.1 Receiving Water Conditions Assessment

Special Condition S5.C.1.d.i of the Permit requires permittees to compile and submit a Receiving Water Assessment containing:

- Receiving water names
- Total watershed area
- Percent of total watershed within the permittees' jurisdiction; and
- The findings of the stormwater management influence assessment

The Permit also states that the Receiving Water Conditions Assessment shall include a brief description of the receiving waters and contributing areas and shall indicate which receiving waters will be included in the next step, the Receiving Water Prioritization.

Permittees then identify which basins are expected to have a relatively low Stormwater Management Influence for SMAP, as defined in Ecology's SMAP Guidance. Basins having relatively low expected Stormwater Management Influence for SMAP did not need to be included in addressing Special Conditions S5.C.1.d.ii-iii of the Permit.

Ecology encouraged Phase II County permittees to consider areas outside of their jurisdiction's NPDES permit area (permit area, see Figure 1-2). This would allow permittees, like Skagit County, to make more informed decisions on protecting water quality in receiving waters. The County used the Assessment Units (AU) defined in the Puget Sound Watershed Characterization Project map (Stanley et al., 2010) to create an inventory of receiving waters. County staff selected 78 individual AUs (see Figure B-3 in Appendix B) for the Receiving Water Conditions Assessment. In that selection, 19 included some extent of the County's permit area. For each AU assessed, 30 criteria were evaluated. Figure B-1 in Appendix B lists each AU with their SMAP Influence ranking, total watershed area, and percentage of overlap with the permit area. Figure B-2 in Appendix B lists 27 other criteria evaluated as part of the Receiving Water Conditions Assessment.

While 30 criteria were evaluated, some were notably impactful on the County's selection process for being a measure of NPDES compliance, known water quality issues, potential for development, existing infrastructure, and Environmental Justice:

- Total Watershed Area (square miles)
- Percentage of Watershed in Permit Area
- Relative Conditions and Contributions
- Receiving Water 303(d) Listing
- SMAP Influence on Stormwater Management
- Health Disparities Map Environmental Factors (Washington Department of Health {WDOH} 2020)

Additionally, a high-level review of existing landscape, zoning, and current activity helped rank the AUs for overall restoration value. The goal was to identify AUs where stormwater retrofits and action plans can most efficiently use County resources and yield the best results for water quality and reduce flood potential. This review also helped the County assign an overall ranking to each AU.

While the assessment was based on multiple criteria using data sources recommended by Ecology's SMAP Guidance, the County chose to assess data beyond Ecology's recommendations. Examples include:

- Number of *Oncorhynchus* species and migratory fish runs (if the receiving water was a fish-bearing stream)
- County knowledge of existing water quality issues

- Water quality, drainage, and infrastructure improvement opportunities identified through knowledge of County staff from the Drainage Utility Program (DU), Planning and Development Services (PDS), Natural Resources Division (NRD), and Operations Division

By recommendation of Ecology’s SMAP Guidance, the County generated a list of receiving waters with a “high” SMAP Influence ranking (i.e., receive most benefits from a SMAP). This resulted in eight AUs that would be included in the Receiving Water Prioritization process and considered for a SMAP (see Figure C-1 in Appendix C).

## 2.2 Receiving Water Prioritization

Special Condition S5.C.1.d.ii of the Permit requires permittees to develop and implement a prioritization method and process to determine which receiving waters will receive the most benefit from the implementation of stormwater management actions. These actions may be stormwater facility retrofits, tailored implementation of Stormwater Management Program (SWMP) actions, and/or other land development management actions. This requirement establishes that by June 30, 2022, permittees shall:

- Document the SMAP priority ranking process used; and
- Identify a high-priority catchment area for the Stormwater Management Action Plan.

The ranking process shall include the identification of high-priority catchment area(s) for focus of the Stormwater Management Action Plan (SMAP).

Following the Receiving Water Conditions Assessment, eight priority receiving waters were identified – Big Lake, Middle Big Indian Slough, Upper Big Indian Slough-Bayhill, Bayview, Padilla Heights, Otter Pond, No Name Slough, and Upper Joe Leary Slough. Figure C-1 in Appendix C includes a list of the eight receiving waters and various criteria evaluated. The County’s Interdisciplinary Team (IDT) further evaluated these AUs by conducting a two-phase review with the goal of selecting a final AU for the SMAP. This review process reexamined some criteria referenced in Section 2.1 in combination with best professional judgment and knowledge from the County (as per Ecology’s SMAP Guidance).

The first phase reviewed and prioritized the AUs by:

1. Percentage of total AU area within the NPDES permit area
2. Percentage of total AU area within the County’s jurisdiction
3. Presence and number of ambient water quality sites (County sampling sites) in the AU

The second phase reviewed and prioritized the AUs by:

1. Percentage of total AU area within the NPDES permit area (reviewed with new variables below)
2. Restoration potential
3. Amount of tree cover

This review process identified Big Lake (AU 3292) as the top candidate for the SMAP. This selection was further justified by evaluating more data specific to the Big Lake basin. These included:

- Water quality data (2003-present) from ambient sampling sites within the Big Lake basin
- Feedback from Lake Management District #1 (LMD#1)
- Number and nature of drainage complaints around Big Lake received by the DU Program from year 2001 through September 2021.

Evaluating 30 criteria in combination with the County’s knowledge and professional judgment resulted in selecting the Big Lake AU. The following are notable factors which had significant influence on the final selection:

- Percentage of the AU in the NPDES permit area
- High SMAP Influence ranking
- High restoration potential ranking (only two AUs in the permit area received a high ranking)
- Aged and undersized stormwater structures in the Big Lake basin (traditionally installed as needed, as opposed being constructed from platted developments)
- Lack of flow control or water quality treatment for existing development
- Amount of infill projects/reconstruction in recent years
- Anticipated future development
- Big Lake flows to Nookachamps Creek, a degraded salmon stream
- Big Lake has a 303(d)/303(b) listing for:
  - Category 2 Total Phosphorous, 4,4'-DDE, Hexachlorobenzene, 2,3,7,8-TCDD TEQ, and Polychlorinated Biphenyls (PCBs)
  - Category 4C Non-Native Aquatic Plants
  - Category 5 Methyl mercury
- Nookachamps Creek has a 303(d)/303(b) listing for:
  - Category 1 Ammonia-N, pH
  - Category 2 Temperature
  - Category 4A Bacteria - Fecal coliform, Temperature
  - Category 5 Dissolved Oxygen
- Existing Big Lake Drainage Management Report (MWG, 2007) from which to leverage recommendations for the SMAP
- Overall number and nature of drainage-based complaints in the Big Lake basin

The Big Lake AU is approximately 5.2 square miles in which 1.1 square miles include the permit area (21% of the AU). With consideration for County resources, the staff used desktop analysis and field reconnaissance to delineate a 530-acre catchment along the east shore of Big Lake in which to focus the SMAP. This catchment encompasses a large number of drainage complaints and a wide range of stormwater structures. The entire catchment is within the permit area and serves as the primary location for SMAP actions.

## Section 3

# Stormwater Management Action Planning Elements

Section 3 identifies the actions Skagit County (County) must complete in order to meet the requirements of the first three Stormwater Management Action Planning (SMAP) Program elements. (Special Conditions S5.C.1.d.iii.(a) through (c) of the National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) Phase II Permit). These actions must include the following:

- Special Condition S5.C.1.d.iii.(a):
  - A description of the stormwater facility retrofits needed for the area, including the Best Management Practices (BMPs) types and preferred locations.
- Special Conditions S5.C.1.d.iii.(b):
  - Land management/development strategies and/or actions identified for water quality management.
- Special Conditions S5.C.1.d.iii.(c):
  - Targeted, enhanced, or customized implementation of stormwater management actions related to permit Special Condition S5, including Illicit Discharge Detection and Elimination field screening, Prioritization of Source Control inspections, operations and maintenance (O&M) inspections or enhanced maintenance, or Public Education and Outreach behavior-change programs.

## 3.1 Stormwater Retrofits

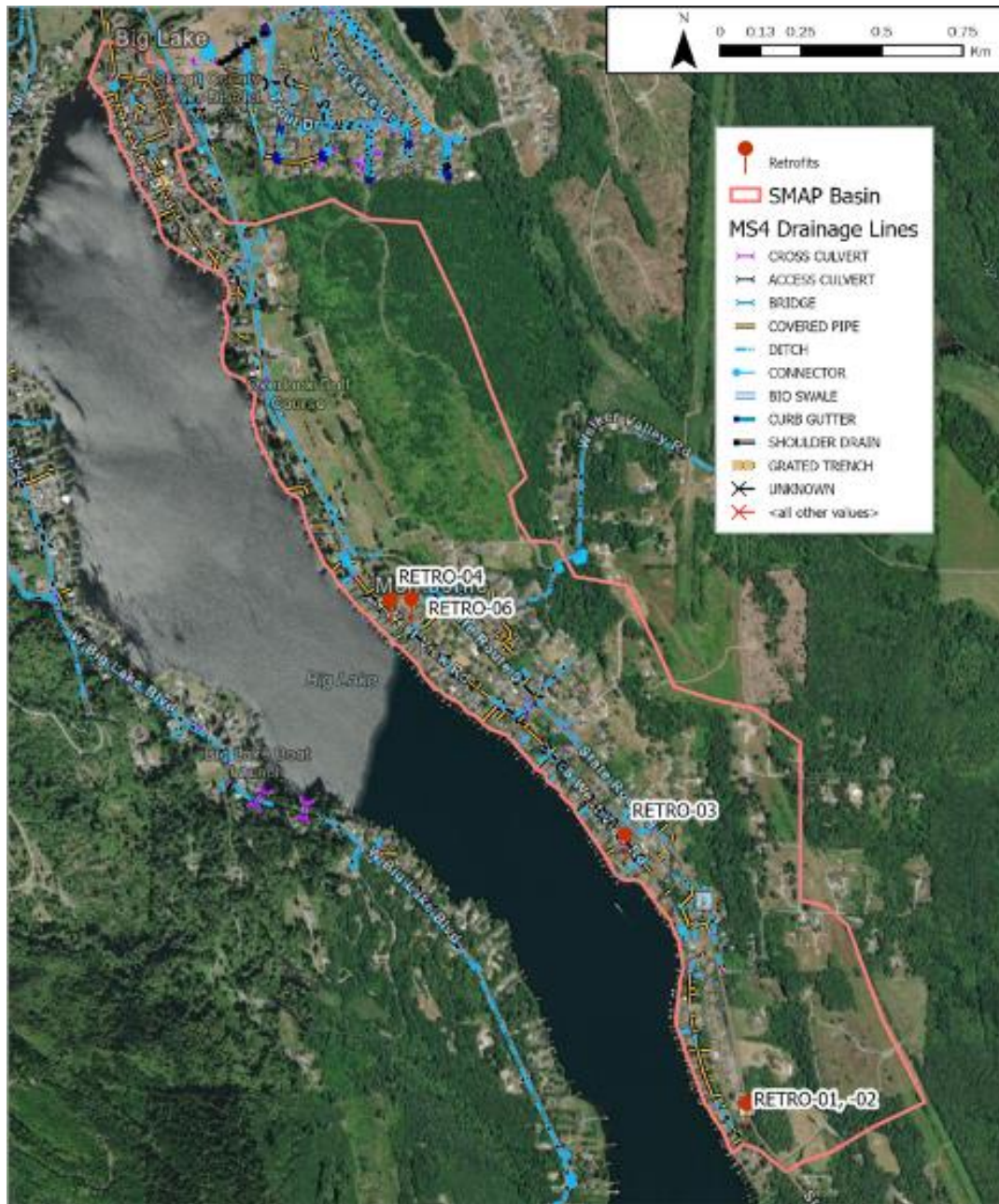
The County identified six retrofit projects designed to address stormwater issues within the Big Lake catchment and improve water quality. Projects for RETRO-01 through -04 were taken from the 2007 Big Lake Drainage Management Plan. RETRO-05 and RETRO-06 were developed as part of the SMAP planning process.

Table 3-1 below presents a description of each retrofit project and its expected water quality benefit.

<b>Table 3-1. Retrofit Projects</b>			
<b>Project ID</b>	<b>Name</b>	<b>Description <sup>a</sup></b>	<b>Water Quality Benefit</b>
RETRO-01	Big Lake BL25 #1	Replaces an 18-inch culvert under State Route (SR) 9 with a 36-inch culvert and installs a rock-lined outfall pad to stabilize the outlet and minimize erosion.	Reduced sediment load from channel erosion
RETRO-02	Big Lake BL25 #2	Replaces a 12-inch culvert with a 24-inch culvert and installs a rock-lined outfall pad to stabilize the outlet and minimize erosion.	Reduced sediment load from channel erosion
RETRO-03	Big Lake BL28	Includes (1) installing a new 36-inch drainpipe between SR 9 and South Westview Road, (2) installing a new 24-inch pipe to the north drainage system, and (3) installing new 18-inch interceptor drain to replace previously removed roadside ditches.	Reduced sediment load from channel erosion
RETRO-04	Big Lake BL31	Includes (1) installing a new 36-inch drainage pipe and rock-lined (or otherwise stabilized) open channel segments between Walker Valley Road and North Westview Road, (2) replacing a damaged 12-inch culvert under North Westview Road, and (3) installing a 12-inch interceptor to collect water from constructed parking areas.	Reduced sediment load from channel erosion
RETRO-05	Basic/Phosphorus Treatment Pilot Program	Involves County development of a pilot program to install Ecology-approved treatment systems to reduce phosphorus and total suspended solids (TSS) levels in Big Lake.	Reduced phosphorus and TSS loads to Big Lake
RETRO-06	Stormwater Pond Retrofit Assessment	Assesses the potential to retrofit a pond to enhance removal of sediment and nutrients.	Potential reductions in nutrient and sediment loads

a. Facility sizing will be revisited and may be revised during design.

Figure 3-1 shows the general location of each of the stormwater retrofits listed in Table 3-1. Appendix D provides detailed fact sheets for RETRO-01 and -02, RETRO-03, RETRO-04 and RETRO-06.



**Figure 3-1. Retrofit locations**

The first four retrofits are primarily conveyance improvements. Within the catchment, the County has received public drainage incident reports and staff have observed erosion and degradation of County-owned ditches as well as localized flooding. Channel erosion due to failing or undersized stormwater conveyance systems can contribute sediment and nutrients to receiving waterbodies. Flooding caused by undersized storm conveyances can cause erosion and entrain pollutants from the flooded surfaces. The County expects these retrofits to reduce sediment loads (and their associated pollutants) in Big Lake.

RETRO-05 originated from the County’s desire to reduce phosphorus and TSS loads in Big Lake, resulting from the east catchment area (see Figure 3-1). For this project, the County will begin by identifying a representative location for the design. Next, they will construct the new structure,



monitor its performance, and evaluate the retrofit for any O&M needs. The lessons learned from the pilot program may help the County identify and design effective retrofit facilities elsewhere in the Big Lake catchment area.

The County recently discovered an old stormwater pond (installation date unknown) on private property in Big Lake. Through RETRO-06, the County would assess this pond for potential water quality treatment retrofitting and add it to its asset inventory to ensure proper maintenance.

### 3.2 Land Management Strategies

The County’s Interdisciplinary Team (IDT) identified two land management and development strategies within the catchment to protect water quality and fish habitat. These actions are intended to protect water quality by improving the compliance rate with existing standards or by implementing specific standards for the catchment. Table 3-2 presents each strategy and its water quality benefit.

Table 3-2. Land Management/Development Strategies			
Strategy ID	Name	Description	Water Quality Benefit
LM-01	Stormwater Design Standards for In-fill Projects	This strategy would explore the development of more stringent stormwater standards for in-fill projects in the Big Lake catchment.	Mitigates impact of increased development and densification on water quality and habitat in Big Lake and aims to ensure Big Lake remains fishable and swimmable and can support aquatic habitat.
LM-02	Update Development Review Process	This strategy would review the County’s development review process to make issuing building permits more efficient and improve communication and education to builders regarding meeting stormwater standards	Protects water quality by streamlining the permitting process through assistance and education while continuing to ensure proper implementation of standards

Most developments in the catchment (and the Big Lake community in general) are in-fill projects. Some of these projects are technically redevelopments that might not trigger some of the minimum Permit requirements for water quality and flow control. With LM-01, the County would review current standards for in-fill projects in the Big Lake catchment to mitigate impacts of increased densification and impervious area, and to ensure appropriate water quality treatment is provided.

LM-02 is expected to continue ensuring stormwater standards are being met as well as streamline conditions for building permit approval. LM-02 would involve an evaluation of the development review process to identify ways to simplify implementation for construction permit application reviewers and to educate applicants on the proper use and installation of water quality BMPs, all while making the review process more efficient.

### 3.3 Customized Implementation of the SWMP

The County’s IDT customized Stormwater Management Program (SWMP) actions from Special Conditions S5.C.1, S5.C.2, S5.C.7 and S5.C.8 of the Permit for implementation within the Big Lake catchment. The customized SWMP implementation actions are summarized in Table 3-3 and detailed in Sections 3.3.1 through 3.3.4.

Table 3-3. Customized SWMP Implementation Actions				
Action ID	Name	Relevant Subsection	Description	Water Quality Benefit
CUST-01	Interdepartmental Coordination	S5.C.1 Stormwater Planning	Includes continued meetings of the County's Interdisciplinary Team as needed and yearly at least.	Facilitates coordination and collaboration between County departments to maximize water quality benefits
CUST-02	Residential Leaf Collection Outreach Program	S5.C.2 Public Education and Outreach	Includes the development of a residential leaf collection campaign to encourage residents to collect leaves in the fall.	Raises awareness, change residents' behavior, reduce nutrient loadings
CUST-03	Illegal Dumping Education Campaign		Includes the development of a campaign to raise education the public on proper disposal of waste.	Raises awareness, change behavior, reduce risk
CUST-04	Street Sweeping Program	S5.C.7 Operations and Maintenance	Includes the development of a street sweeping program specific to Big Lake catchment, to remove leaves in the fall and after large storm events. Additional street sweeping will also decrease TSS loading into the lake resulting from the east catchment.	Reduces nutrient and TSS loadings due to leaves and sediment
CUST-05	Ditch BMP Retrofit Plan		Includes development of BMPs and their locations to maintain and repair ditch infrastructure.	Reduces TSS and erosion
CUST-06	Ditch Maintenance Program		Includes a review of the ditch infrastructure within Big Lake East catchment, and development of a maintenance program to ensure capacity, minimize erosion, and address private drainage complaints.	Reduces TSS and erosion
CUST-07	Golf Course Management	S5.C.8 Source Control Program for Existing Development	Continues communication and coordination with the golf course on its fertilizer practices and prioritizes the site for Source Control inspections.	Reduces risk of illicit discharges, protect water quality

### 3.3.1 Stormwater Planning Customizations (S5.C.1)

CUST-01 implementation action proposes continued yearly meetings of the Interdisciplinary Team, with additional meetings as needed, to maximize water quality benefits for Big Lake. This customized action will ensure that interdepartmental coordination continues, and any future planning efforts will take stormwater into account, both County-wide and within the Big Lake East catchment.

### 3.3.2 Education and Outreach Customizations (S5.C.2)

CUST-02 and -03 implementation actions involve developing a campaign in collaboration with the County's outreach and education staff. The County typically receives several reports or complaints each year from residents within the catchment (and the Big Lake community in general) regarding illegal dumping or littering. CUST-03 will aim to raise awareness and affect behavior change through the distribution of pamphlets, mail inserts, or other means.

A recent United States Geological Survey (USGS) study found nearly 60% of the annual phosphorus loading in urban runoff can be traced to seasonal leaf litter (USGS, 2019). CUST-02 (and CUST-04) target this large proportion of the annual phosphorus load and will attempt to affect behavior change through the distribution of educational materials, compostable leaf collection bags, or other leaf removal services.

### 3.3.3 Operations and Maintenance Customizations (S5.C.7)

CUST-04 through -06 are customizations of the County’s O&M activities. CUST-05 and CUST-06 aim to develop clear guidelines for the maintenance of ditches and establish criteria for assessing them. The ditch retrofit guidelines will complete a review of ditch infrastructure within the Big Lake East catchment and document the current condition of each, as well as identify retrofit opportunities. The ditch maintenance program will become an ongoing maintenance and inspection effort. The County has over 3 miles of ditches within the selected catchment area, which CUST-05 and CUST-06 will help manage. See Figure 3-2 to see the ditch drainage infrastructure within the catchment area.

CUST-04 is a customized street-sweeping program for the catchment. This action is intended to dovetail with expected requirements of the upcoming Permit, currently scheduled to be issued in July 2024. The County will review upcoming Permit requirements and ensure current activities meet the new requirement and conduct seasonal street sweeping to reduce nutrient loads from leaf litter and sediment.

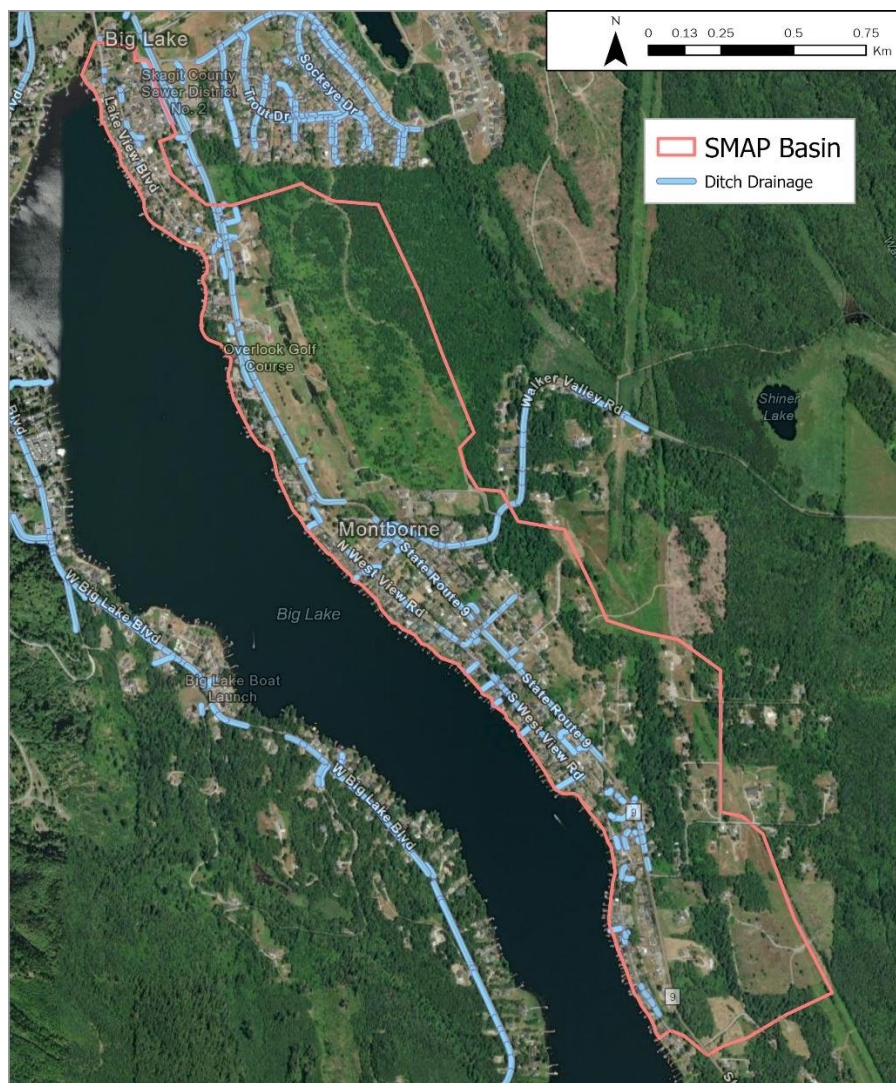


Figure 3-2. Ditch drainage infrastructure

### **3.3.4 Source Control Customizations (S5.C.8)**

Throughout the development of the SMAP, County staff have been communicating with the Overlook Golf Course regarding its use of fertilizer and other chemicals for invasive plants and/or animal control. CUST-07 will continue this coordination by prioritizing the golf course inspections for the newly implemented Regional Source Control program.

## Section 4

# SMAP Implementation

Section 4 identifies a targeted implementation schedule for the proposed actions from Section 3 (i.e., Retrofits, Land Management Strategies, and Customized Actions). The schedule is based on Skagit County's (County) best knowledge of available resources including staff, funding, and existing programs.

### 4.1 Incorporation into Long-Range Planning

The County established an Interdisciplinary Team (IDT) to discuss requirements of the Phase II Stormwater Permit, including the Stormwater Management Action Plan (SMAP), on a recurring basis. The team consists of staff from the Planning & Development Services Department (PDS), Surface Water and Habitat Programs, Engineering, the Geographic Information System (GIS) Program, Equipment Rental & Revolving Fund Division (ER&R), and the Operations Division. The Stormwater Program will continue to coordinate with the IDT, namely Long-Range Planning staff in PDS, to ensure stormwater is considered in all County planning efforts. To meet this goal, Stormwater staff will continue to communicate proposals and goals of the SMAP, provide updates on the progress of SMAP implementation, and ensure that the entire SMAP process will inform updates to the current County Comprehensive Plan during the next phase of updates and thereafter.

### 4.2 Proposed Short- and Long-Term Implementation

Short-term actions are defined as actions to be accomplished within six years, and long-term actions are to be accomplished within seven to twenty years (Ecology, 2019). Tables 4-1 and 4-2 identify the short- and long-term implementation goals, respectively, for each proposed action from Section 3. For each SMAP proposal, the tables provide progressive action steps, departments/programs involved, a tentative implementation schedule, and the anticipated budget source(s). The budget sources are subject to change as the County engages discussions with the IDT throughout the SMAP implementation process.

Table 4-1. Short-Term Actions (0-6 years)					
Initiative ID	Title	Action	Responsibility	Schedule	Funding Source
RETRO-01	Big Lake BL25 #1	Work with Operations to create a work order.	<ul style="list-style-type: none"> <li>• SWMP <sup>b</sup></li> <li>• Operations</li> <li>• PDS <sup>c</sup></li> </ul>	2024	Future CIP <sup>a</sup> allocations
		Replace 18" culvert with 36".		2025	
		Maintain and monitor for effectiveness.		Ongoing	
RETRO-02	Big Lake BL25 #2	Work with Operations to create a work order.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> </ul>	2024	Future CIP allocations
		Replace 12" culvert with 24".		2025	
		Maintain and monitor for effectiveness.		Ongoing	
RETRO-03	Big Lake BL28	Work with Operations to create a work order.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> </ul>	2026	Future CIP allocations
		Install a new 36-inch drainpipe between SR 9 and South Westview Road, (2) Install a new 24-inch pipe to the north drainage system, and (3) install a new 18-inch interceptor drain to replace previously removed roadside ditches.		2027	
		Maintain and monitor for effectiveness.		Ongoing	
RETRO-04	Big Lake BL31	Work with Operations to create a work order.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> </ul>	2023	Future CIP allocations, Roads budget
		(1) Install a new 36-inch drainage pipe and rock-lined (or otherwise stabilized) open channel segments between Walker Valley Road and North Westview Road, (2) Replace a damaged 12-inch culvert under North Westview Road, and (3) install a 12-inch interceptor to collect water from constructed parking areas.		2023-2024	
		Maintain and monitor for effectiveness.		Ongoing	
RETRO-05	Basic/Phosphorus Treatment Pilot Program	Develop program (modeling phase).	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> </ul>	2027	Future CIP allocations, Drainage Utility budget
		Implement program (installation phase).		2028	
		Maintain and monitor for effectiveness.		Ongoing	
RETRO-06	Stormwater Pond Retrofit Assessment	Work with WSDOT <sup>d</sup> , PDS, and Operations to develop a plan to assess pond.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> </ul>	2025	Future CIP allocations, Drainage Utility budget
		Determine if retrofit would benefit the system and discuss next steps.		2026	
LM-01	Stormwater Design Standards for In-fill Projects	Work with PDS to develop design standards.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• PDS</li> </ul>	2025	Future Planning funding allocations (i.e. NPDES Permit Implementation Funds)
		Follow steps to implement.		2028	
LM-02	Update Development Review Process	Work with PDS to determine needs.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• PDS</li> </ul>	2024	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
		Develop and implement work plan.		2024	
		Work with Permit Counter staff and other relevant staff to ensure targets were met.		2025	
CUST-01	Interdepartmental Coordination	Continue to use the Stormwater Planning Interdisciplinary Team to engage in interdepartmental coordination. Meet at least once annually and on an as-needed basis.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> </ul>	Ongoing	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)

Table 4-1. Short-Term Actions (0-6 years)					
Initiative ID	Title	Action	Responsibility	Schedule	Funding Source
CUST-02	Residential Leaf Collection Outreach Program	Develop program – consider working with partners.	• SWMP	2024	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
		Implement program.		2025	
		Assess status and effectiveness of program. Revise or end program as deemed appropriate.		Ongoing	
CUST-03	Illegal Dumping Education Campaign	Develop campaign with PDS.	• SWMP • PDS	2028	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
		Implement campaign.		2029	
		Assess status and effectiveness of campaign. Revise or end program as deemed appropriate.		Ongoing	
CUST-04	Street Sweeping Program	Evaluate existing street sweeping program and update to focus on frequency in the Big Lake East catchment.	• SWMP • Operations • GIS <sup>e</sup>	2024	Operations/Roads budget
		Implement program.		2024-2025	
		Employ adaptive management processes to insure program's ongoing success.		Ongoing	
CUST-05	Ditch BMP Retrofit Plan	Develop plan with Operations, PDS, and GIS.	• SWMP • Operations • PDS • GIS	2025	Future NPDES Permit implementation funds (i.e. Drainage Utility Fund or Grant Funds)
		Work with Operations, PDS, and GIS to implement plan.		2026	
		Employ adaptive management processes to insure program's ongoing success.		Ongoing	
CUST-06	Ditch Maintenance Program	Work with Operations and PDS to review ditch infrastructure within Big Lake East catchment and develop a maintenance program.	• SWMP • Operations • PDS	2028	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
		Implement program.		2029	
		Maintain and monitor for effectiveness.		Ongoing	
CUST-07	Golf Course Management	Work with Skagit Conservation District to develop a plan for the golf course regarding fertilizer use. Or, if the status quo is effective, ensure standards are in place for application and recordkeeping. Continue to prioritize for Source Control inspections.	• SWMP • Skagit Conservation District	2023	Existing Regional Source Control budget (from the Drainage Utility Fund)
		Propose education plan to golf course management.		2024	
		Monitor for effectiveness and employ adaptive management for long term success.		Ongoing	

- a. Capital Improvement Program
- b. Stormwater Management Program
- c. Planning & Development Services Department
- d. Washington Department of Transportation
- e. Geographic Information System Services

Table 4-2. Long-Term Actions (7+ years)					
Initiative ID	Title	Action	Responsibility	Schedule	Funding Source
RETRO-01	Big Lake BL25 #1	Monitor for effectiveness. Consider formalizing an inspection program. Work with Operations to conduct required maintenance.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> </ul>	Ongoing	Future CIP allocations
RETRO-02	Big Lake BL25 #2	Monitor for effectiveness. Consider formalizing an inspection program. Work with Operations to conduct required maintenance.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> </ul>	Ongoing	Future CIP allocations
RETRO-03	Big Lake BL28	Monitor for effectiveness. Consider formalizing an inspection program. Work with Operations to conduct required maintenance.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> </ul>	Ongoing	Future CIP allocations
RETRO-04	Big Lake BL31	Monitor for effectiveness. Consider formalizing an inspection program. Work with Operations to conduct required maintenance.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> </ul>	Ongoing	Future CIP allocations, Operations/Roads budget
RETRO-05	Basic/Phosphorus Treatment Pilot Program	Sample and monitor for effectiveness. Maintain and replace as needed. Employ adaptive management as needed. Consider expanding treatment systems.	<ul style="list-style-type: none"> <li>• SWMP</li> </ul>	Ongoing	Future CIP allocations, Drainage Utility budget
RETRO-06	Stormwater Pond Retrofit Assessment	If retrofitted, monitor for effectiveness. Maintain through O&M program.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> </ul>	Ongoing if implemented	Future CIP allocations, Drainage Utility budget
LM-01	Stormwater Design Standards for In-fill Projects	Monitor for effectiveness. Ensure compliance with most current stormwater standards. Employ adaptive management as needed.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• PDS</li> </ul>	Ongoing	Future Planning funding allocations (i.e. NPDES Permit Implementation Funds)
LM-02	Update Development Review Process	Ensure compliance with most current stormwater standards. Continue to make issuing construction permits more efficient and improve communication and education to future permit applicants.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• PDS</li> </ul>	Ongoing	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
CUST-01	Interdepartmental Coordination	Ongoing meetings of the Stormwater Planning Interdisciplinary Team regarding the Big Lake SMAP. Meet once a year at minimum.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• PDS</li> <li>• Operations</li> <li>• GIS</li> <li>• Engineering</li> </ul>	Ongoing	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
CUST-02	Residential Leaf Collection Outreach Program	Monitor for effectiveness. Employ adaptive management as needed.	<ul style="list-style-type: none"> <li>• SWMP</li> </ul>	Ongoing	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
CUST-03	Illegal Dumping Education Campaign	Monitor for effectiveness. Employ adaptive management as needed.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• PDS</li> </ul>	Ongoing	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
CUST-04	Street Sweeping Program	Continue to document and monitor for effectiveness. Employ adaptive management as needed.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• GIS</li> </ul>	Ongoing	Roads budget



Table 4-2. Long-Term Actions (7+ years)					
Initiative ID	Title	Action	Responsibility	Schedule	Funding Source
CUST-05	Ditch BMP Retrofit Plan	Maintain and monitor existing retrofits for effectiveness. Employ adaptive management as needed. Consider expanding retrofits.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> <li>• GIS</li> </ul>	Ongoing	Future NPDES Permit implementation funds (i.e. NPDES Permit Implementation Funds)
CUST-06	Ditch Maintenance Program	Continue to coordinate with Operations and PDS. Maintain and monitor for effectiveness. Employ adaptive management as needed.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Operations</li> <li>• PDS</li> </ul>	Ongoing	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)
CUST-07	Golf Course Management	Continue to provide education on fertilizer use and prioritize for Source Control inspections. Create new education campaigns as necessary.	<ul style="list-style-type: none"> <li>• SWMP</li> <li>• Skagit Conservation District</li> </ul>	Ongoing	Existing Regional Source Control budget (from the Drainage Utility Fund)
PLAN-01	Interdepartmental Coordination	Meet and coordinate with County departments (beyond Interdisciplinary Team) as necessary to address issues or discuss opportunities around SMAP.	<ul style="list-style-type: none"> <li>• Various</li> </ul>	Ongoing	Existing County budget (i.e. Road Fund, Drainage Utility Fund, or the General Fund)

### 4.3 Adaptive Management

To document the progress of meeting SMAP goals, the County will exercise adaptive management throughout the implementation process. The County will be open to changing or modifying each action item over time to accommodate improvement opportunities or to address challenges that arise. For example, future data from improved mapping and monitoring may influence the County's decision on whether to implement a specific action item or modify the specifications of an action item. Any resulting modifications to the SMAP will be documented and reviewed by the County's IDT.

The adaptive management timeline will correspond with the implementation schedule. At the latest, each action item will be assessed in the calendar year preceding the implementation year (e.g., RETRO-01 will be assessed in 2024). The assessment will consist of a current-status evaluation, discussions among the IDT, funding review, and overall feasibility of the action item. Assessments may result in extending the implementation schedule if deemed necessary by the IDT.

## Section 5

# Public Involvement

To involve and gather public opinion on the Stormwater Management Action Plan (SMAP), Skagit County (County) conducted presentations in various forms and provided diverse avenues for input. Public involvement and participation are valued by the County and support Permit Special Condition S5.C.3, which states:

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

*The minimum performance measures are:*

*a. Permittees shall create opportunities for the public, including overburdened communities, to participate in the decision-making processes involving the development, implementation and update of the Permittee’s SMAP and SWMP.*

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

Two televised presentations were delivered to County commissioners and to the general public regarding the SMAP requirements and process. In the fall of 2019, further public notification was communicated through a local radio station, KSVR, following the release of the current Permit (2019-2024). An exhaustive list of stakeholders, including non-profits and community groups, were contacted, and made aware of the SMAP project. This included notification to provide input at any point during the SMAP process. Outreach was also made to all federally recognized tribes whose reservation land borders the United States within Skagit County's political boundaries. Additionally, since 2020, the SMAP has been included in the Stormwater Management Program (SWMP) Plan, an annually updated report which offers public-comment opportunities. Lastly, as mentioned in Section 2, in the summer of 2022 a survey was submitted to various groups seeking input on prioritizations for water quality. The results of this survey are found in Appendix E.

Following completion of this report, a summary of the SMAP process and proposals will be presented to the Skagit County Board of County Commissioners. The presentation will be televised and recorded for the public, a copy of which will be posted on the internet along with this report.



## Section 6

# Conclusion

This document constitutes the Stormwater Management Action Plan (SMAP) for the Big Lake catchment, created in accordance with the National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) Phase II Permit (Permit) and the Washington State Department of Ecology's (Ecology) SMAP Guidance document. This SMAP will be reviewed annually and updated as needed to address new Skagit County (County) stormwater management needs and opportunities to improve water quality, habitat, and drainage in the catchment. The County will revise the SMAP actions based on public feedback, input from the County Interdisciplinary Team (IDT), direction from the Planning Commission and Board of County Commissioners, available budget, and/or new regulatory requirements.

## Section 7

# References

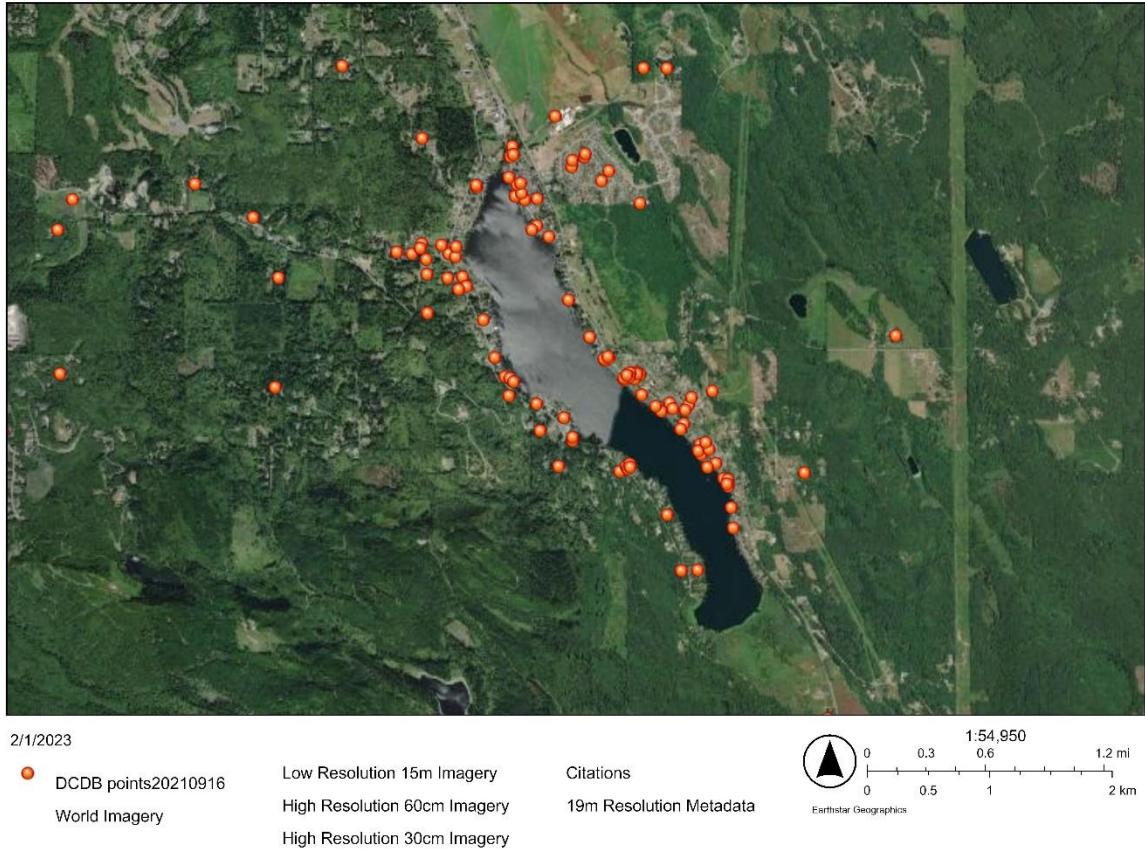
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## **Appendix A: Big Lake Drainage Complaints**

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Locations of drainage complaints received through September 2021 are presented below. Some documented complaints date back to 1999, while the majority occurred between 2001 and 2017. Drainage complaints commonly occur throughout entire shoreline of Big Lake, with slightly more complaints along the east shore where development is most prevalent. Complaints tend to be related to sediment accumulation at culvert openings, overflowing culverts due to blockage, runoff from uphill developments onto downhill properties, land and ditch erosion, siltation on properties from runoff, overflowing creeks, and unintended pond formations.



**Figure A-1. Big Lake drainage complaints (through September 2021)**



## **Appendix B: Receiving Water Conditions Assessment**

Figure B-1 lists 78 receiving waters and their associated AUs, all of which were assessed and determined to be of low, medium, or high priority for the SMAP. Prioritization and area calculations could not be determined for some receiving waters due to a lack of information. Figure B-2 lists 27 other criteria evaluated for each receiving water as part of the conditions assessment. Figure B-3 shows the locations for all 78 receiving waters included in the conditions assessment. For a complete table showing details of each criterion evaluated in Figure B-2, please contact Skagit County's Stormwater Management Program at (360) 416-1400.

<b>Receiving Water Conditions Assessment</b>					
<b>Skagit County SMAP 2023</b>					
	<b>Sub-basin Name</b>	<b>AU ID</b>	<b>Stormwater Management Influence (See pg 7-8 of Guidance Document)</b>	<b>Total Watershed Area (sq mi)</b>	<b>% Watershed in Permit Area</b>
1	Bayview	3363	High	1.3	0.0%
2	Big Ditch - Conway	3303	Low	3.5	0.0%
3	<b>Big Lake</b>	<b>3292</b>	<b>High</b>	<b>5.2</b>	<b>21.0%</b>
4	Brickyard Creek	3284	Low	2.5	4.6%
5	Britt Slough	3298	Medium	4.1	6.8%
6	Bulson Creek	3301	Low	5.4	0.0%
7	Cascade Ridge	3300	Medium	9.3	4.4%
8	Clear Lake	3288	Medium	4.3	7.1%
9	Coal Creek	3281	Low	5.4	0.0%
10	Concrete East	3273	Low	4.7	0.0%
11	Concrete West	3275	Undetermined	6.3	0.0%
12	Conway West	3306	Low	6.5	0.0%
13	Cook Road	3324	Medium	5.1	0.0%
14	Cougar Gap	3385	Low	0.9	0.0%
15	Day Creek-Lyman West	3278	Low	7.0	0.0%
16	Deception Shores	3387	Medium	0.7	0.0%
17	Delvan Hill Bridgewater	3318	Low		
18	Dunbar	3334	Low	5.2	5.0%
19	E. Fork Nookachamps - Turner Creek	3287	Low	5.5	9.8%
20	Edison Marine	3358	Low	0.5	0.0%
21	Edison Slough	3322	Medium	5.8	0.0%
22	Fern Hill	3370	Medium	1.7	0.0%
23	Gages Slough	3296	Medium	3.5	23.4%
24	Gibraltar	3388	Medium	1.1	0.0%
25	Hamilton East	3355	Low	5.5	0.0%
26	Hamilton West	3356	Low	6.9	0.0%
27	Hansen Creek	3282	Medium	6.5	16.0%
28	Havekost Road	3382	Low	1.2	0.0%
29	Hill Ditch and Fisher Creek	3305	Low	4.7	0.0%
30	Joe Leary Marine	3362	Low	0.8	0.0%
31	Kulshan Creek	3297	Low	4.1	8.4%
32	LaConner NE	3336	Low	1.4	0.0%
33	LaConner SE	3397	Low	1.3	0.0%
34	LaConner West	3345	Low	5.3	0.0%
35	Lafayette - Lower Nookachamps - Mud Lake	3289	Low	5.7	24.7%

36	Lake Campbell	3343	Medium	6.5	0.0%
37	Lake McMurray	3290	Medium	9.5	0.0%
38	Lake Samish	3314	Undetermined		
39	Little Indian and Lower Big Indian Slough	3340	Medium	2.9	24.3%
40	Lower Joe Leary Slough	3327	Low	5.5	0.0%
41	Lower Samish	3321	Low	5.5	0.0%
42	Maddox Creek	3299	Medium	3.7	19.4%
43	Maddox Creek/Upper Big Ditch	3302	Low	3.4	3.8%
44	Mclean Road	3331	Low	3.6	0.0%
45	Middle Big Indian Slough	3329	High	5.3	61.8%
46	Middle Samish	3311	Undetermined		
47	No Name Slough-Creek	3338	High	3.8	26.3%
48	Nookachamps- Barney Lake	3294	Medium	3.1	11.2%
49	Otter Pond	3293	High	4.2	44.5%
50	Padilla Heights	3365	High	0.6	0.0%
51	Park Ridge Lane	3267	Low		
52	Pass Lake	3386	Low	1.1	0.0%
53	Reservation Road	3390	Low	1.0	0.0%
54	S Branch Joe Leary Slough	3326	Medium	4.9	19.9%
55	Samish River - Cook Road	3320	Low	4.7	0.0%
56	Satterlee Road	3369	Low	0.9	0.0%
57	SE Anacortes	3372	Medium	1.5	0.0%
58	Seaview	3383	Medium	0.7	0.0%
59	Sharpe Park	3384	Low	0.5	0.0%
60	Similk	3389	Medium	0.9	0.0%
61	South Avon	3330	Low	2.5	8.5%
62	South Burlington	3295	Medium	3.7	10.9%
63	South Edison Sloughs	3323	Low	4.5	0.0%
64	South Friday Creek	3316	Low		
65	Sterling	3285	Low	4.8	52.3%
66	SW Anacortes	3381	Medium	0.9	0.0%
67	Swede Creek	3312	Low		
68	Thomas Creek	3319	Low		
69	Trumpeter Creek	3268	Low	3.1	0.9%
70	Upper Big Indian Slough - Bayhill	3328	High	2.3	32.0%
71	Upper Big Lake	3291	Medium	4.7	1.2%
72	Upper Friday Creek	3315	Undetermined		
73	Upper Joe Leary Slough	3325	High	4.3	3.8%
74	Upper Samish	3350	Undetermined		
75	Walker Creek	3286	Low	9.3	0.0%
76	West Fildalgo Bay	3371	Low	1.1	0.0%
77	Willard Creek	3317	Medium	2.6	11.5%
78	Wiseman Creek	3280	Low	7.2	0.0%

Figure B-1. Receiving waters with their associated AUs

1.	Relative Conditions and Contributions
2.	PS WCP Water Flow Overall Protection & Restoration
3.	PS WCP Water Flow Surface Storage - Protection & Restoration
4.	Receiving Water for MS4 in this Basin
5.	Percentage of Impervious Surface
6.	Comprehensive Plan Designation
7.	Estimated Percentage of Buildout
8.	Oncorhynchus fish spp. plus Dolly Varden represented (total spp. and runs)
9.	Flow Control Exempt Receiving Waters (yes/no)
10.	Estimated Area (sq mi) served in basin by SC MS4 (Permit and non-Permit)
11.	% Area served by SC MS4 (Permit and non-Permit)
12.	Estimated Area (sq mi) in County Jurisdiction (Permit and non-Permit Area)
13.	% Area in County Jurisdiction (Permit and non-Permit Area)
14.	Estimated Tree Canopy Cover (acres)
15.	Estimated Percentage of Tree Canopy Cover
16.	Tree Canopy Cover Notes
17.	WQX Sites
18.	Ambient Sites
19.	Predominant Land Cover Type
20.	Receiving Water 303(d) listings
21.	Overall Environmental Health Disparity Ranking, DOH, 1-10. Based on largest intersect with WAU and DOH polygon
22.	Overall Socioeconomic Factors Ranking, DOH, 1-10. Based on largest intersect with WAU and DOH polygon
23.	Population Living in Poverty Ranking, DOH, 1-10. Based on largest intersect with WAU and DOH polygon
24.	Drift Cell- MS4 Outfalls to Marine Waters Only
25.	Primary Road(s)
26.	Average Daily Traffic (2020)
27.	Development Plans (Ltd to 8 selected basins)

Figure B-2. 27 other criteria evaluated for the receiving water conditions assessment

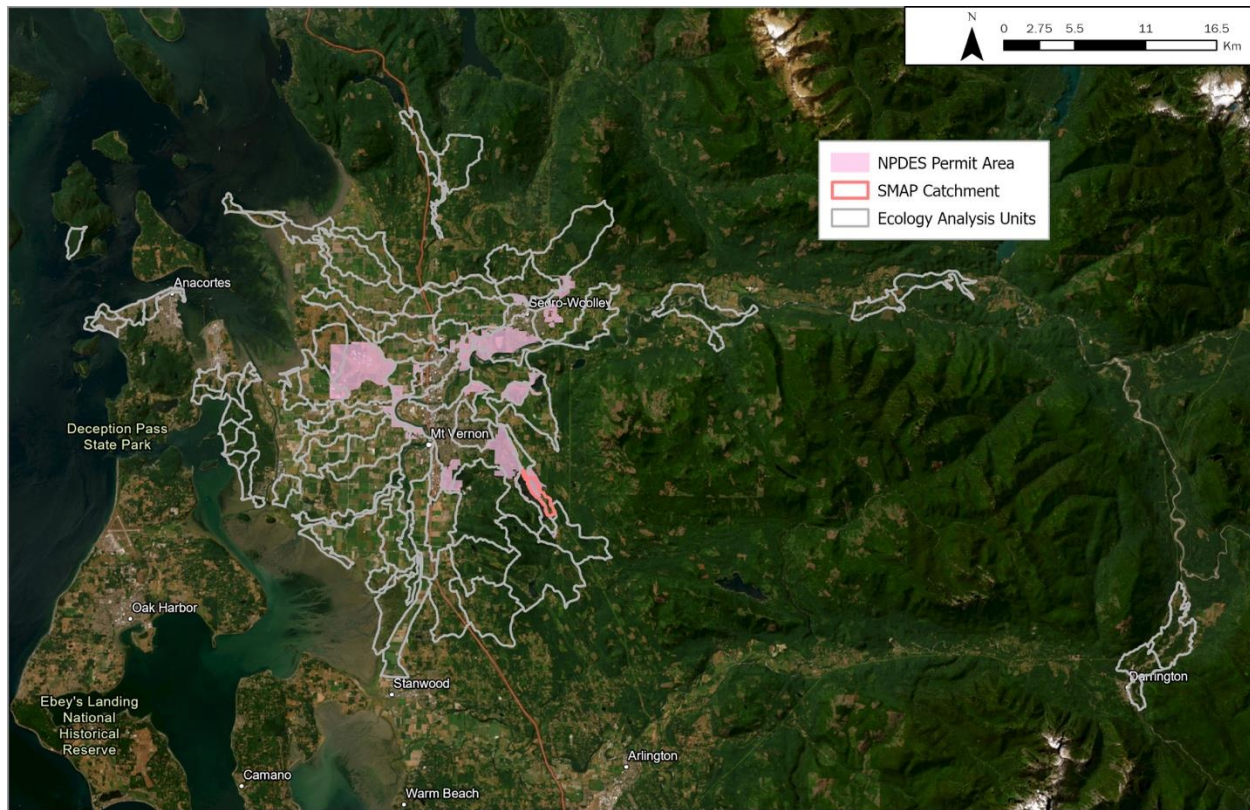


Figure B-3. Locations of 78 assessment units (AUs) included in the receiving water conditions assessment

## **Appendix C: Receiving Water Prioritization**

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The eight receiving waters (with associated AUs) displayed below were assigned a “high” priority after completing the conditions assessment. Big Lake (AU 3292) was selected for the SMAP based on the rankings presented below along with other evaluations discussed in Section 2.

Receiving Waters Assessment: Priority AUs Skagit County SMAP 2023										Environmental Factors from Washington State Department of Health: Health Disparities Map. 1-10 Rating assigned based on largest intersect between DOH spatial data and SMAP sub-basin		
County Ranking	Sub-basin Name	AU ID	Total Watershed Area (sq mi)	Receiving Water for MS4 in this Basin	% Watershed in Permit Area	Relative Conditions and Contributions	Receiving Water 303(d) listings	Overall Prioritization	SMAP Influence Findings	Environmental Health Disparity	Socioeconomic Factors	Population Living In Poverty
1	Big Lake	3292	5.2	Big Lake	21.0%	Basin includes development that is largely residential/light commercial and contains no existing flow control or treatment structures. Typical MS4-related issues such as sediment, erosion, and degraded salmon streams impact this basin. A drainage report with proposed capital improvements is in place.	Cat 2: Total Phosphorus & 2,3,7,8-TCDD TEQ, Cat 4C: Invasive spp., Cat 5: Hexachlorobenzene, Dioxin, &PCBs.	High	High	1	4	2
2	Middle Big Indian Slough	3329	5.3	Middle Big Indian Slough - Port of Skagit	61.8%	Includes MS4 -served residential areas. Some newer development has flow controls older neighborhoods do not have flow control.	Cat 5: DO, Temp, Cat4A: Bacteria, Cat 2: pH	High	High	1	1	3
3	Upper Big Indian Slough - Bayhill	3328	2.3	Upper Big Indian Slough - Bayhill MS4	32.0%	Some residential areas drain to this receiving water. ag influenced. Unknown influence of MS4 served residential areas.	No Listings	High	High	1	1	3
4	Bayview	3363	1.3	Padilla Bay	0.0%	Known fecal coliform issues in the MS4, Flow control exempt water. Shellfish and recreation threats from FC.	Cat 5: Bacteria	High	High	1	1	3
5	Padilla Heights	3365	0.6	Padilla Bay	0.0%	Industrial input to MS4, Opportunities for enhanced source control measures to prevent inputs of pollutants to MS4.	No Listings	High	High	2	3	6
6	Otter Pond	3293	4.2	Otter Creek, Nookachamps Creek, Gribble Creek	44.5%	Basin includes development that is largely rural/rural residential and contains no existing flow control or treatment structures. Typical MS4-related issues such as sediment, erosion, and degraded salmon streams impact this basin. A drainage report with proposed capital improvements is in place.	Nookachamps: Cat 5: DO, Cat 4A: Temp & Bacteria, Cat1: pH. Otter Creek: Cat 4A: Temp & Bacteria, Cat 2: DO.	Medium	High	1	4	2
7	No Name Slough-Creek	3338	3.8	No Name Slough/Creek	26.3%	Bacteria issues from rural residential and ag. Continue to protect and restore per PIC and NRSP, development pressure in headwater area provides nexus with MS4nexus with MS4	Cat 5: DO, Temp, pH, Cat4A: Bacteria	Medium	High	1	1	3
8	Upper Joe Leary Slough	3325	4.3	Upper Joe Leary Slough	3.8%	Water quality issues, mostly ag DD related. Currently addressed by PIC. Further action would likely only be useful if planning in coordination with COB.	Cat 5: DO, Cat 4A: Bacteria	Medium	High	1	1	3

Figure C-1. High priority receiving waters

## **Appendix D: Retrofit Fact Sheets**

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Figure D-1. Retrofit opportunity 1



Table D-1. Retrofit Opportunity 1	
Project ID: RETRO-01, -02, BL25*	BL-25 #1 and #2
Location:	19100 SR-9, cross culverts under a private driveway and SR-9
Objective(s) Addressed:	Improved Conveyance Capacity, Flood Management, Sediment Management, Protect Water Quality
<p>Issue Description: Hydraulic capacity analysis of the BL25 Outfall drainage system conducted in 2007 indicated that the State Route 9 culvert (existing 18-inch) was undersized to convey the 25-year peak flow estimate. The downstream culvert under Four Jay Lane is 24-inch diameter, and was confirmed as having adequate capacity to convey required design event peak flows. Overland flows due to an undersized culvert can lead to erosion control issues and accumulated sediment that can result in water quality contamination.</p>	<p>Retrofit Description: It is recommended that the SR 9 culvert be replaced with a larger 36-inch culvert (with rock outfall pad). An upstream 12-inch culvert (parallel to SR 9) at an unnamed local access road does not have adequate hydraulic capacity and is in need of upgrade to an 24-inch diameter replacement culvert. This retrofit will provide a level of service to manage the 100-year storm event.</p> <p>This project can be designed to decrease capacity exceedances over time, including addressing anticipated climate change and change in rainfall intensities. This project could also add soil stabilizing vegetation, as well as potential shade to decrease thermal pollution.</p>
<p><b>Engineering and Design Considerations:</b></p> <ul style="list-style-type: none"> <li>• Coordination with the Washington Department of Transportation would be required.</li> <li>• Updated modeling of these crossings required for design.</li> </ul>	

Cost Estimate (Level 5)	
Capital Expense Total (Previous Study Estimate)	\$51,500
<b>Capital Project Implementation Cost Total (CPI adjusted, 2023)**</b>	<b>\$73,130</b>

\*BL31 is from the Montgomery Water Group, Inc. (MWG), *Big Lake Drainage Management Plan*, Skagit County Public Works, 2007

\*\*Present day cost was calculated using the Federal Bureau of Labor Statistics CPI calculator from November 2007 dollars to January 2023 dollars, which was effectively a factor of 1.42. No additional cost calculations were completed.



Figure D-2. Retrofit opportunity 2

Table D-2. Retrofit Opportunity 2	
Project ID: RETRO-03, BL2*	BL-28
Location:	SR-9 and S West View Road , cross culverts under a private driveway and SR-9
Objective(s) Addressed:	Improved Conveyance Capacity, Flood Management, Sediment Management, Protect Water Quality
<p>Issue Description: The Outfall BL28 drainage system has multiple drainage complaints filed in the County’s records (Nos. 3, 61, 466). These complaints are associated with inadequate drainage collection conditions along South Westview Road (a lateral drainage system to the major drainage system). These drainage problems appears to have been caused by modifications in the roadside drainage systems associated with parking areas constructed on the east side of the road. Also, review of the upslope major drainage system and tributary subbasins (BL24c and BL24d) showed that some re-routing of drainage patterns on the east side of SR-9 has likely occurred over time due to upslope road construction, and that the majority of runoff now flows to the SR-9 12-inch culvert (subbasin BL24d) rather than to the larger 24-inch cross-culvert (subbasin BL24c) to the north.</p>	<p>Retrofit Description: In consideration of the existing undersized culverts and storm drains at SR 9 and downstream, a 36-inch storm drain system improvement extending between SR 9 and South Westview Road is recommended with a 24-inch tie to the north lateral section of the drainage system (replacing a section of 18-inch storm drain). This will improve collection and conveyance of the major drainage system runoff upstream of South Westview Road and should reduce groundwater seepage affecting downslope residences along South Westview Road. In addition, drainage conveyance along that road (in the area of the drainage complaints) is recommended to be improved by installation of sections of 18” interceptor drains with associated inlets since the prior roadside ditches have been eliminated.</p>
<p>Engineering and Design Considerations:</p> <ul style="list-style-type: none"> <li>• Coordination with the Washington Department of Transportation would be required.</li> <li>• Updated modeling of these crossings required for design.</li> <li>• Work in proximity to residential homes would be required.</li> </ul>	
Cost Estimate (Level 5)	
Capital Expense Total (Previous Study Estimate)	\$365,200
Capital Project Implementation Cost Total (CPI adjusted, 2023)**	<b>\$518,584</b>

\*\*BL31 is from the Montgomery Water Group, Inc. (MWG), *Big Lake Drainage Management Plan*, Skagit County Public Works, 2007

\*Present day cost was calculated using the Federal Bureau of Labor Statistics CPI calculator from November 2007 dollars to January 2023 dollars, which was effectively a factor of 1.42. No additional cost calculations were completed.



Figure D-3. Retrofit opportunity 3

Table D-3. Retrofit Opportunity 3	
<b>Project ID: RETRO-04, BL31*</b>	<b>BL-31</b>
<b>Location:</b>	<b>SR 9 and North West View Road</b>
<b>Objective(s) Addressed:</b>	<b>Improved Conveyance Capacity, Flood Management, Sediment Management, Protect Water Quality</b>
<p><b>Issue Description:</b> The Outfall BL31 drainage system collects runoff from subbasin BL26 (ponds along golf course) and a smaller subbasin BL26b to the south. This is a sizeable drainage (total acreage to be determined in the project design) with 100-year routed flows in excess of 30 cfs. Drainage from this system combines at the SR 9 –Walker Valley Road intersection, crosses Walker Valley Road and SR-9 (downstream) in an 18-inch culvert, and continues downstream through an open drainage channel to North Westview Road. Drainage complaints (Nos. 566 and 583) exist at that location. Overland flows due to an undersized culvert can lead to erosion control issues and accumulated sediment that can result in water quality contamination.</p>	<p><b>Retrofit Description:</b> Runoff is conveyed under N West View Road in a 24-inch culvert (and a 12-inch parallel culvert for localized runoff), and combined flows enter a 36-inch storm drain with outfall to the lake. The drainage complaints at North Westview Road appear to be associated with the damaged (obstructed) condition of the 12-inch culvert adjacent to the major drainage system. Based on review of existing hydraulic capacities of the major drainage system, the magnitude of design event peak flows, and considering erosion potential within the existing moderately steep open drainage system, the recommended drainage improvement consists of a system of a 24-inch storm drain with some rock-lined open channel segments between Walker Valley Road and North Westview Road. The improved drainage system would have adequate capacity to convey 100-year (future) peak flows. In addition, the damaged 12-inch culvert under North Westview Road requires replacement to improve local drainage and associated problems reported by residents along the west side of the road. A 12-inch interceptor lateral drain is also recommended along a section of the east side of the road where constructed parking areas have modified the drainage collection system.</p>
<p><b>Engineering and Design Considerations:</b></p> <ul style="list-style-type: none"> <li>• Coordination with the Washington Department of Transportation would be required.</li> <li>• Updated modeling of these crossings required for design.</li> <li>• Work in proximity to residential homes would be required.</li> </ul>	
<b>Cost Estimate (Level 5)</b>	
<b>Capital Expense Total (Previous Study Estimate)</b>	<b>\$326,200</b>
<b>Capital Project Implementation Cost Total (CPI adjusted, 2023)**</b>	<b>\$464,204</b>

\*BL31 is from the Montgomery Water Group, Inc. (MWG), *Big Lake Drainage Management Plan*, Skagit County Public Works, 2007

\*\*Present day cost was calculated using the Federal Bureau of Labor Statistics CPI calculator from November 2007 dollars to January 2023 dollars, which was effectively a factor of 1.42. No additional cost calculations were completed.

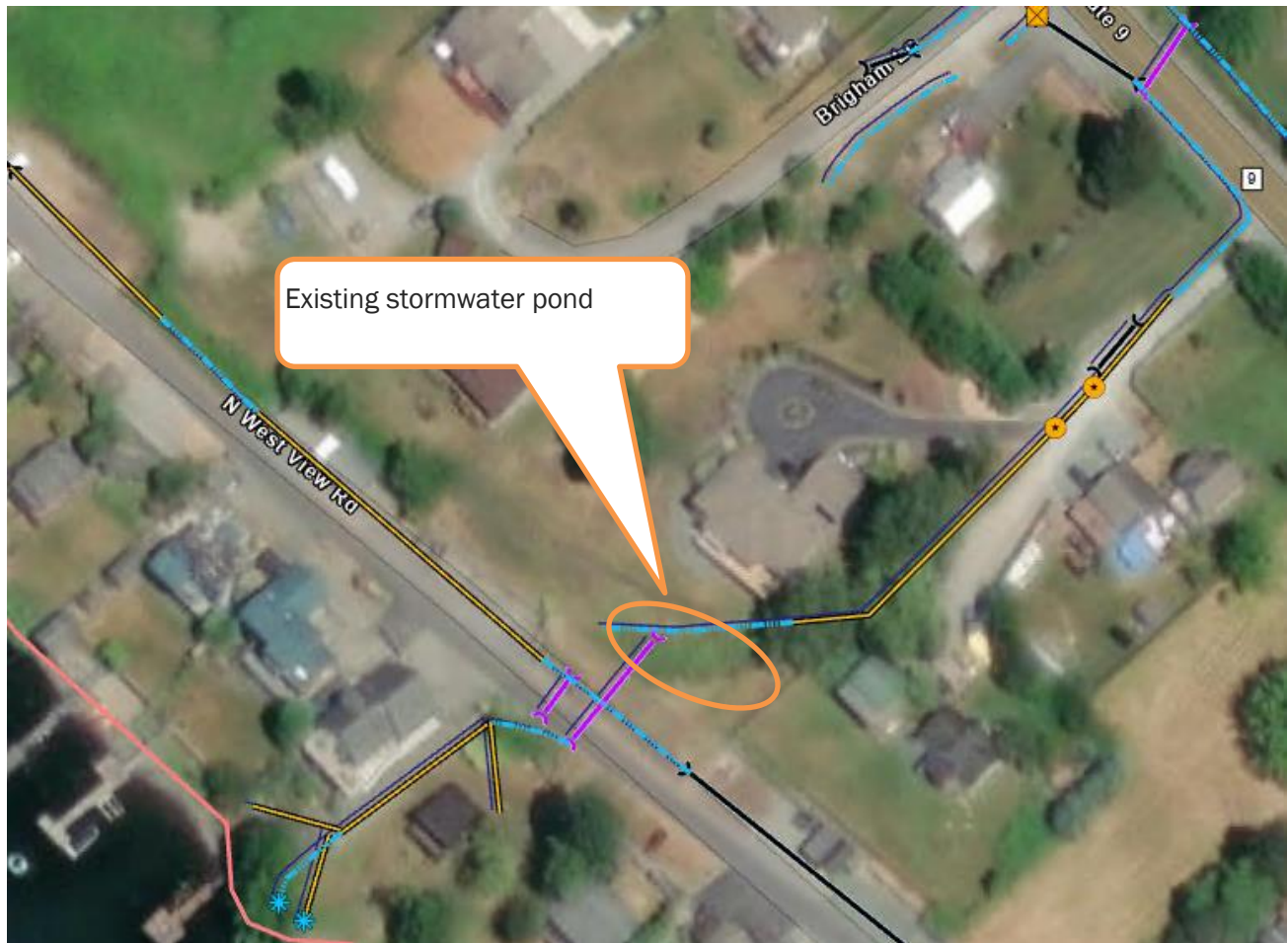


Figure D-4. Retrofit opportunity 4

Table D-4. Retrofit Opportunity 4	
<b>Project ID: RETRO-06</b>	<b>Stormwater Pond Retrofit Assessment</b>
<b>Location:</b>	<b>18066 SR 09</b>
<b>Objective(s) Addressed:</b>	<b>Protect Water Quality</b>
<b>Issue Description:</b>	
A legacy stormwater pond is located on private property. The current pond does not pose any immediate issues.	
<b>Retrofit Description:</b>	
The proposed project would analyze the tributary area to this pond and assess the feasibility of retrofitting this pond for further water quality improvements including reduced nutrient and sediment loads.	
<b>Engineering and Design Considerations:</b>	
<ul style="list-style-type: none"> <li>• Construction activity would be required on private property – agreements for site access and future access for maintenance would be required.</li> <li>• Hydrologic and Hydraulic study required for design.</li> </ul>	
Cost Estimate (Level 5)	
<b>Capital Expense Total (includes contingency)</b>	<b>TBD</b>
<b>Capital Project Implementation Cost Total</b>	<b>TBD</b>

## **Appendix E: Public Involvement Materials**

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Appendix E shows responses to Skagit County’s survey, which was sent to Tribes and other government entities in the summer of 2022. The survey asked the audience for the most important factors to consider for water quality projects, such as the SMAP. Figure E-1 shows responses to six questions, where the most important factor ranked by respondents is at the top. Figure E-2 shows results after being asked to select the three most important factors to consider.

The following is a list of factors that we are considering as part of our ranking. Please rate how important you think each of these factors is when we're looking to choose a basin to work in.

	<b>1 - Not important at all</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5 - Very important</b>	<b>No opinion/don't know</b>
The presence of high quality water bodies that need protection	- 1 - Not important at all	- 2	- 3	18% 4	82% 5 - Very important	- No opinion/don't know
The presence of waterbodies that are degraded and need restoring	- 1 - Not important at all	- 2	18% 3	36% 4	45% 5 - Very important	- No opinion/don't know
How much of the area is impervious surface (where rainfall cannot soak into the ground)	- 1 - Not important at all	- 2	27% 3	36% 4	36% 5 - Very important	- No opinion/don't know
How much of the existing drainage infrastructure is too small or old to handle current or future storm flows	- 1 - Not important at all	- 2	- 3	55% 4	45% 5 - Very important	- No opinion/don't know
The number of public drainage concerns the county receives from the area	- 1 - Not important at all	27% 2	27% 3	27% 4	18% 5 - Very important	- No opinion/don't know
The primary land use type (i.e. residential, commercial, agricultural)	- 1 - Not important at all	18% 2	55% 3	9% 4	18% 5 - Very important	- No opinion/don't know

Figure E-1. Ranked responses from 2022 survey – scale of 1 to 5



Please choose the top three factors that you consider most important.

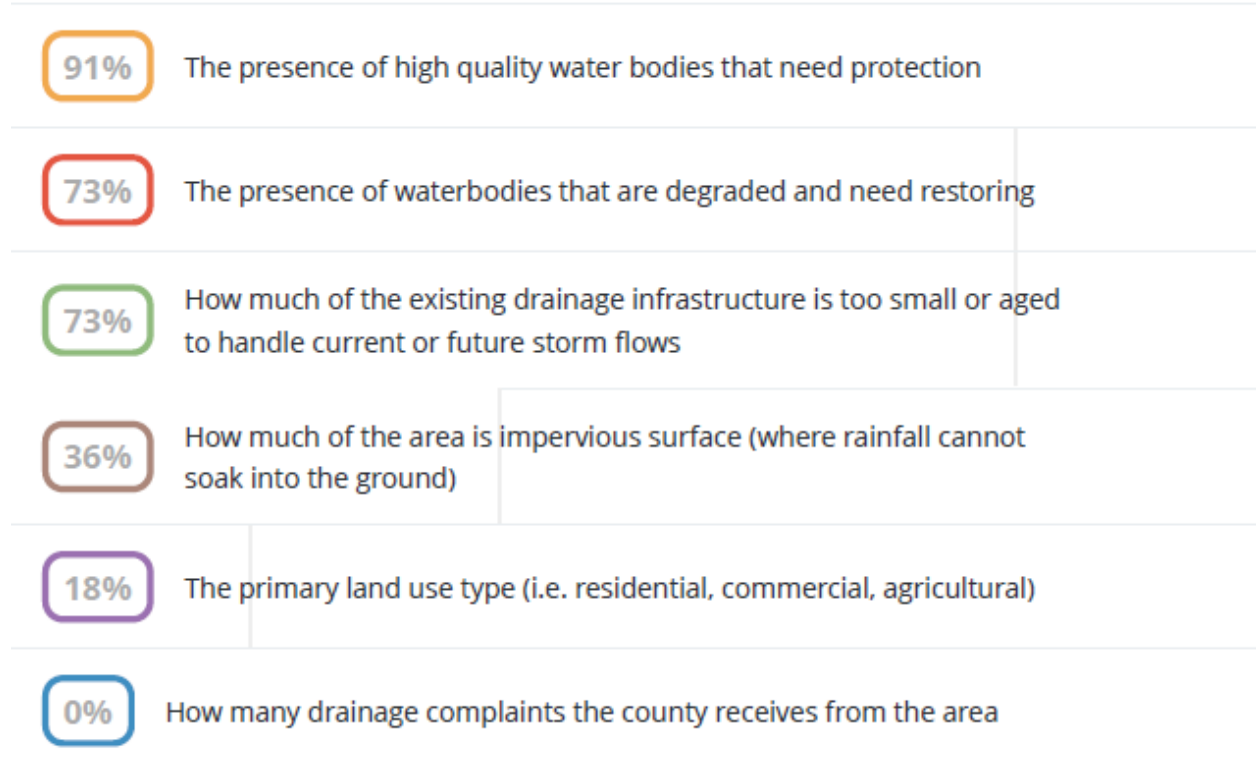


Figure E-2. Ranked responses from 2022 survey – top three most important factors