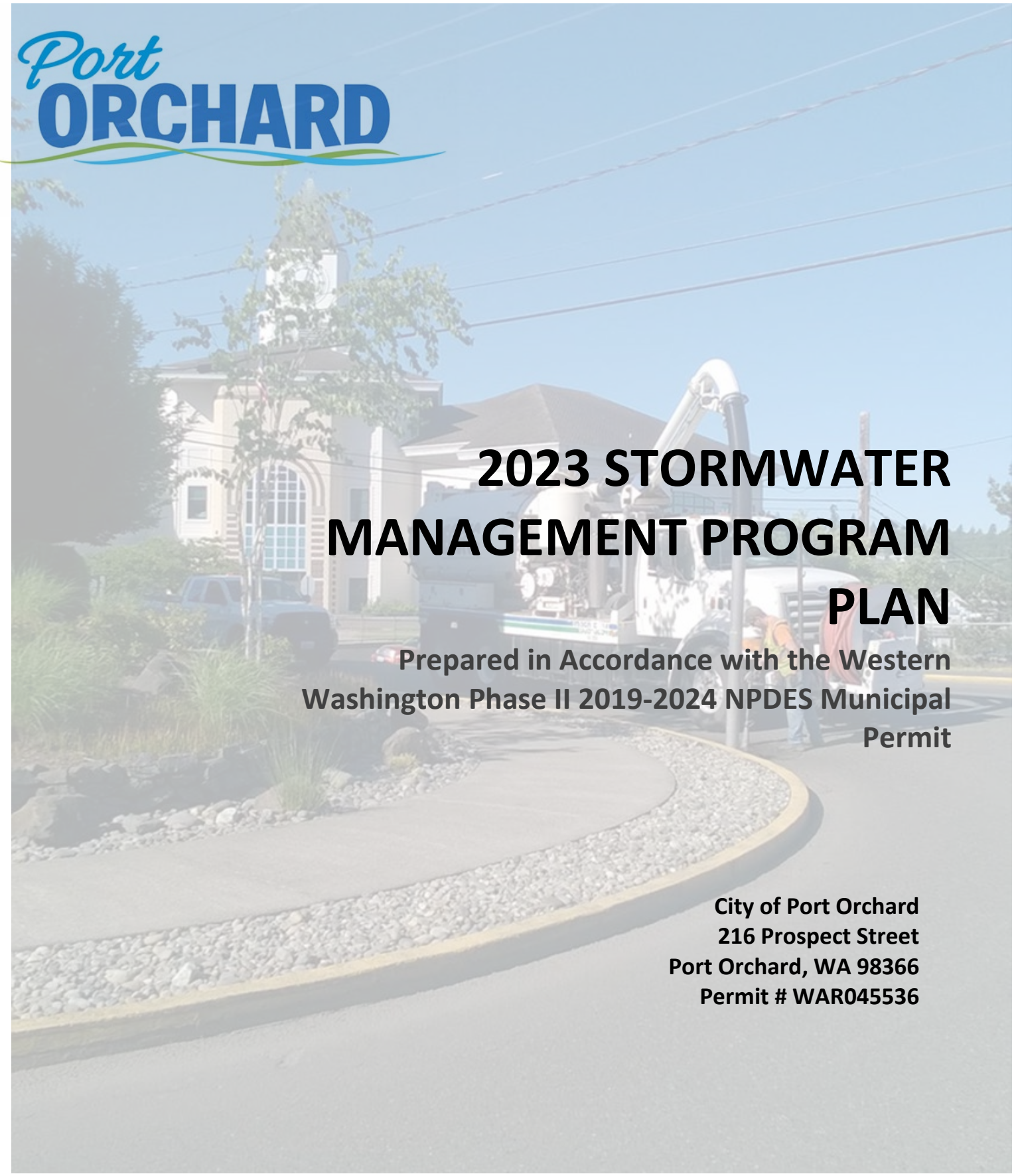

2023 STORMWATER MANAGEMENT PROGRAM PLAN

Prepared in Accordance with the Western Washington Phase II 2019-2024 NPDES Municipal Permit

City of Port Orchard
216 Prospect Street
Port Orchard, WA 98366
Permit # WAR045536

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Introduction

1.1 Purpose

The Stormwater Management Program (SWMP) Plan for the City of Port Orchard is intended to assist in planning, funding, and implementing a comprehensive program for addressing current and future regulatory requirements relating to surface and stormwater management. The SWMP Plan acts as a subsequent document to the City's Stormwater and Watersheds Comprehensive Plan and is focused on addressing specific regulatory requirements. In addition, the SWMP Plan is useful for influencing City policies related to public safety, stormwater management, water quality, climate change and natural resources management within the City.

The SWMP Plan is an evolving document as specified in the City's Phase II Municipal NPDES Permit (Permit) and is updated annually. The City of Port Orchard is committed to maintaining full compliance with the Permit. Due to limited resources, the City has been and will continue to prioritize program elements with the most imminent deadline in order to maintain Permit compliance and implementation of the tenets of the SWMP Plan.

1.2 Background

The federal Clean Water Act (CWA) of 1972 established water quality goals for the surface waters of the United States. In 1987, Congress amended the CWA to address stormwater. One of the mechanisms for achieving the goals of the act is the National Pollutant Discharge Elimination System (NPDES) permit program, which is administered by the Environmental Protection Agency (EPA). The EPA has delegated responsibilities and administration of the NPDES permit program to many states, including the State of Washington via the Department of Ecology (Ecology).

For municipalities, the CWA established a two-phase permit program. Phase I covered large and medium-sized municipalities and counties, construction sites ≥ 5 acres, and major industrial sources. Later, Phase II was enacted to cover smaller jurisdictions. Ecology also manages permit programs for construction sites ≥ 1 acre, and certain other types of industrial runoff. In 2000, the Environmental Protection Agency finalized the NPDES Phase II rules regulating "small" Municipal Separate Stormwater Sewer Systems (MS4's). The Phase II jurisdictions, such as Port Orchard, are those with populations less than 100,000 located within, or partially within, an urbanized area and that operate a Municipal Separate

Storm Sewer System (MS4) which discharges to waters of Washington State.

The 1990 Phase I regulation requires medium and large cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges. The 1999 Phase II regulation requires small MS4s in U.S. Census Bureau defined urbanized areas, as well as MS4s designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges.

In Washington, the Phase I permit was issued in 1995 to the cities of Seattle and Tacoma, as well as King, Pierce, Snohomish and Clark (in 1999) counties. On August 1, 2012, the Department of Ecology issued a new Phase I permit and two new Phase II permits, one each for Western and Eastern Washington.

The current Phase II Municipal Permit became effective on August 1, 2019. Implementation of the program requirements is phased over the 5-year term of the permit. The reporting requirements of the permit cover activities within a calendar year from January 1 to December 31.

The intent of the Permit process is to set jurisdictional standards for municipalities in order to reduce the impacts from both point source and non-point source pollution carried by stormwater to waters of the state. The Permit is also intended to promote public education and awareness regarding the proper management and reporting of pollutant generating activities.

1.3 Program Administration

The Permit outlines stormwater program activities and implementation milestones that permittees must follow to comply with the federal Clean Water Act. Permittees must:

- Develop a SWMP Plan that includes all the required activities in the permit and is designed to reduce the discharge of pollutants to the maximum extent possible.
- Implement those activities within the required timeframes of the permit term; and
- Submit annual reports to the Department of Ecology by March 31st of each year to document progress toward complete program implementation in the previous calendar year. The SWMP Plan is submitted to Ecology and posted on the City website for public viewing and comments annually. Each revised SWMP Plan will be an update of the previous year's program and will provide a look forward to the next year's activities. The SWMP Plan must be fully developed and implemented for the upcoming year no later than March 31. For 2023 the City will continue to track costs, trainings, inspections, enforcement actions and public education activities, as well as coordinate with other jurisdictions.

1.4 Responsibilities and Coordination

The City of Port Orchard Public Works Department is responsible for permit implementation and permit compliance within City jurisdiction and watersheds that intersect or drain to the City. The Public Works Department will coordinate the City's efforts within the impacted departments each year to ensure ongoing and planned activities meet permit requirements through the Stormwater Permit Coordination Group and the Stormwater Planning Program. Port Orchard is also committed to support and continue seeking support from regional partners and neighboring jurisdictions as opportunities are presented.

Current cooperation includes an education and outreach partnership with the West Sound Stormwater Outreach Group (WSSOG), Participation in the West Sound Stormwater Manager's Group (WSSMaG), the Stormwater Work Group (SWG), the West Sound Partners for Ecosystem Recovery (WSPER) and collaboration with the WRIA 15 Watershed Restoration and Enhancement Committee. Additional cooperative efforts include corresponding with local builders' associations and interested third parties with decision making relating to stormwater code revisions. The City is also continuing developing a partnership with the South Kitsap School District (SKSD) that broadly addresses stormwater issues including TMDL monitoring and education/outreach. The COVID-19 pandemic had significant impacts toward progress with our City/SKSD partnership. The City will be revisiting partnership opportunities with SKSD during the 2023 reporting period.

1.5 Document Organization

This document is organized to correspond with the sequence of the Permit elements that must be addressed in the SWMP Plan. Each element is identified by title and the permit element number, followed by the Permit requirements and the City's current and planned activities.

1.6 SWMP Elements

The Permit regulates how municipalities discharge stormwater to waters of the state. Waters of the state include rivers, lakes, streams, wetlands and Puget Sound. Discharge to these waters is only allowed if regulatory municipal programs are implemented to reduce pollution generating activities that impact stormwater within the following disciplines:

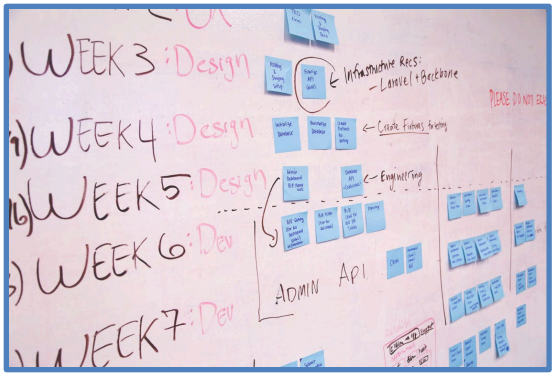
- Stormwater Planning
- Public Education and Outreach
- Public Involvement and Participation
- MS4 Mapping and Documentation
- Illicit Discharge Detection and Elimination
- Controlling Runoff from New Development, Redevelopment, and Construction Sites

- Operations and Maintenance
- Source Control Program for Existing Development
- Monitoring
- Total Maximum Daily Load (TMDL)

Stormwater Planning

Permit Requirement S5.C1

2



2.1 Permit Requirements

- Implement a Stormwater Planning Program to inform and assist in development of policies and strategies as water quality management tools to protect receiving waters
- Convene an interdisciplinary team to inform and assist in the development, progress, and influence of the program
- Coordinate with long range plan updates
- Low Impact Development code-related updates and revisions
- Complete receiving water assessment and watershed inventory by March 31, 2022
- Rank and prioritize receiving waters within city jurisdiction by June 30, 2022
- Complete first Stormwater Management Action Plan (SMAP) by March 31, 2023
- Summarize activities in the Annual Report

2.2 Current Activities

In 2022 the City continued implementation of the Stormwater Planning Program through our interdisciplinary team representing planning, engineering and science. The team is coordinating the program to coalesce with the City's Master Comprehensive Plan and its supporting documents. The interdisciplinary team is overseeing development of a City Stormwater and Watersheds Comprehensive Plan which will direct planning and policy development, maintenance activities, plan for capital improvements/retrofits, develop SMAP tenets for our watersheds, revamp our financial plan and finalize our asset management system for the City. The final Stormwater and Watersheds Comprehensive Plan was completed in December of 2022 and is currently out for public comment in early 2023. This plan supports the City's Master Comprehensive Plan, focusing specifically on regulatory compliance, watershed scale planning and capital improvements. Relevant sections of municipal code were also reviewed in 2022. Updates were made to the code to include Business Inspection and Source Control enforcement mechanisms. The City completed our receiving water assessment, watershed inventory and its SMAP watershed prioritization report ahead of their 2022 deadlines and have developed our first SMAP based upon the results of the prioritization. Refer to Appendix A for SMAP, SMAP related documents and the City's annual report submittal for S5.C.1.b.i.b.

2.3 Planned Activities

The interdisciplinary team will continue meeting regularly throughout 2023 to direct planning, implement the City's first Stormwater and Watersheds Comprehensive Plan, implement the City's first SMAP, and continue with SMAP development within the next priority watershed. The City's interdisciplinary team will also continue to review and update LID code as needed.

Aerial image of Port Orchard Downtown

https://marinas.com/view/harbor/vwtnve_Port_Orchard_Harbor_Port_Orchard_WA_United_States

Public Education and Outreach

Permit Requirement S5.C2

3

3.1 Permit Requirements

- Develop a general awareness education and outreach program that is designed to reduce or eliminate behaviors and practices that contribute to or cause adverse stormwater impacts.
- Effect behavior change to reduce or eliminate behaviors and practices that cause or contribute to adverse stormwater impacts
- Create stewardship opportunities that encourage community engagement in addressing impacts from stormwater runoff.
- Evaluate effectiveness of ongoing behavior change campaign by July 1, 2020
- By February 1, 2021 – develop new campaign
- By April 1, 2021 – Implement new campaign strategy
- By March 31, 2024 – Evaluate and report on new campaign
- Summarize activities in the Annual Report.

3.2 Current Activities

General Awareness:

In 2022 the City participated in the PSSH vehicle maintenance behavior campaign. This year's campaign focused on vehicle maintenance behaviors. The digital campaign's goals were to drive people to the PSSH website landing page and encourage them to fill out a form to receive a free car wash coupon. 350 people throughout the region requested car wash coupons. The website provided actions that individuals can take to reduce stormwater pollution from their cars including inflating tires, using commercial car washes, and fixing leaks. The campaign's audience were adults aged 18-64 in the Puget Sound region. The ads were run in English, Spanish, Korean and Vietnamese. A portion of the ad budget was allocated towards targeting overburdened communities using factors such as income, education, people of color and/or those who speak limited English. The City was able to make 27,370 impressions (impressions are the number of times the ad was viewed, either via website, Facebook, YouTube, etc.) with 350 requests regionally for car was coupons.

In addition, the City participated in PSSH month by distributing PSSH coffee sleeves and pet waste leash bag dispensers. In September 2022, the City distributed 2600 coffee sleeves and 81 leash bag dispensers for a total of 2,681 impressions. For further information on the City's efforts, please refer to the 2022 WSSOG

Activities Report in appendix B of this Plan.

Education and Outreach Accomplishments Through WSSOG in 2022

The City of Port Orchard will continue its partnership with the West Sound Stormwater Outreach Group (WSSOG). WSSOG is coordinated by Kitsap County and includes the cities of Bremerton, Bainbridge Island, Poulsbo, Port Orchard, Port Angeles, the U.S. Navy and Gig Harbor. WSSOG is funded by each participant through an Inter-Local Agreement (ILA). The ILA provides a mechanism for the members to pool resources for the development, implementation and funding of stormwater education and outreach. Coordination among permittees with adjoining or shared geographic areas is encouraged by Ecology and enhances access to federal, state and other financial and technical support. Kitsap peninsula residents share media sources and would benefit from consistent messaging across city and county boundaries. The ILA allows an increase in municipal resource efficiency and cost savings through the sharing of expertise, expenses and staff time to gain economies of scale and avoid duplication of efforts.

The 2022 WSSOG Annual report is located in Appendix B of this SWMP Plan. Please refer to this report for detailed descriptions of current and planned WSSOG activities. Before the February 1, 2021 permit deadline WSSOG developed our natural yard care (NYC) campaign and by April 1, 2021 began implementing the strategy.

Stewardship Accomplishments in 2022

The City of Port Orchard promotes environmental stewardship in its jurisdiction by hosting and/or promoting springtime shoreline cleanup and beach education activities each year. In addition, the City continues providing outreach opportunities to assist with stormwater, stream and habitat education at South Kitsap High School and partnering with Kitsap Conservation District via an Interlocal Agreement to promote the installation of rain gardens within the City. During the COVID-19 pandemic, these activities were greatly reduced in order to promote safety and continue to reduce spreading the virus. City staff were advised to cease participation in career fairs at local schools describing stormwater management, environmental stewardship and how the NPDES permit system integrates into local municipalities due to the pandemic. We revisited these activities in 2022 when mask mandates were reduced and the spread of the pandemic reduced.

In 2022, the City actively participated in the West Sound Partners for Ecosystem Recovery Lead Entity for WRIA 15 and the Watershed Restoration and Enhancement Committee for WRIA 15, connecting and engaging citizens and stakeholders in watershed level discussions and actions relating to water quality, salmon enhancement and stormwater. In addition, partnering with Kitsap County, the City participated in an overburdened communities assessment in 2021. The study occurred within City and County jurisdiction to better understand spatial, economic and wellbeing distribution, areas where improvement is needed, and methods of outreach to better incorporate these communities into driving the local decision-making process. Working within WSSOG, the City was also a participant as a panelist in the WSSOG natural yard care outreach trainings in 2022.

3.3 Planned General Awareness Activities

The City will continue its engagement with WSSOG and PSSH in 2023, participating in PSSH general awareness campaigns and distributing PSSH 'swag' to citizens and businesses within City limits. In addition, the City will be adding another target audience to the general awareness campaign, reaching out to contractors, engineers and developers regarding technical standards, LID principles and treatment/flow control BMPs.

3.4 Planned Education and Outreach Activities

In 2023 WSSOG will continue implementing our natural lawn care social marketing campaign as a behavior enhancement to reduce the use of chemical lawn treatments that impact the environment. WSSOG will continue its existing Mutt Mitt, Spills Happen, and Puget Sound Starts Here programs in 2023. Please refer to Appendix B for further details regarding WSSOG planned activities in 2023.

3.5 Planned Stewardship Opportunities through Education and Outreach

Looking forward to 2023

The City plans to continue implementing and expanding each of the stewardship opportunities listed above and plans to research further opportunities for broadening to other disciplines. Opportunities being considered include creating a volunteer stream team for Port Orchard that would be trained on monitoring activities such as stream gaging, BIBI sampling and habitat/invasive species monitoring and management.

4 Public Involvement and Participation

Permit Requirement S5.C.3

4.1 Permit Requirements

- Create opportunities for public involvement through advisory councils, public hearings, watershed committees, participation in developing rate structures, stewardship programs, environmental activities, or other similar activities. The public must be provided with opportunities to participate in the decision-making processes involving the development, implementation, and update of the SMAP and the SWMP.
- Make the SWMP, SMAP and Annual Report available to the public, including posting on the City's website.
- Summarize activities in the Annual Report.

4.2 Current Activities

- Public hearings are held for any proposed stormwater utility rate structure revisions.
- Multiple opportunities for public comment at Planning Commission and City Council meetings are available during the approval process for the City's Comprehensive Land Use Plan (which includes a stormwater component). Public comments can also be submitted through the City's website.
- Opportunities for citizen comments are available at Regular City Council meetings during the Public Comment Agenda Item or during scheduled Public Hearings pertaining to those topics.
- The City's Mutt Mitt program provides an opportunity for neighborhood groups, condominium/homeowner associations, and apartment complexes to provide education to pet owners and reduce pet waste pollution.
- Activities are summarized in the Annual Report.
- The Annual Report, SWMP, SMAP and Comprehensive Plans are posted on the City's website and undergo public comment via hearing, public meeting or SEPA process if significant changes or additions are proposed.
- The City actively participates in the West Sound Partners for Ecosystem Recovery Lead Entity for WRIA 15 and the Watershed Restoration and Enhancement Committee for WRIA 15, connecting and engaging citizens and stakeholders in watershed level discussions and actions relating to water quality, salmon enhancement and stormwater.
- Partnering with Kitsap County in 2020, an overburdened communities assessment was conducted to better understand spatial, economic and wellbeing distribution, areas where improvement is needed, and methods of outreach to better incorporate these communities into driving the local decision-making

process. Results of this study have been used to better target outreach and involvement from these areas that have unique challenges for engagement.

4.3 Planned Activities

The City will continue it current public involvement and participation strategies and is planning to include the following components to continue meeting permit requirements:

- Solicit public comment on stormwater issues on the City website.
- Continue participation in WSPER, WREC, WSSOG and expanding ways to reach and involve overburdened communities.
- Develop additional public involvement and participating opportunities to comment on new permit requirements and review plans and documents such as SMAP, SWMP Plan, Comprehensive Plans, etc.
- Continue collaborations with local builders' associations to help them stay informed of stormwater issues and upcoming changes to the Permit and regulatory requirements.

5

MS4 Mapping & Documentation

Permit Requirement S5.C.4

5.1 Permit Requirements

Continue maintaining an ongoing program for mapping and documenting the MS4 through:

- Continuation of existing mapping efforts
- New mapping efforts to include:
  - Outfall size and material (start Jan. 2020)
  - Complete mapping of private connections to MS4 (Aug. 2023)
  - Implement an electronic mapping format (GIS, CADD, etc.) by Aug. 2021.

5.2 Current Activities

The City continues investigating and updating its features inventory database annually while conducting screening and performing maintenance activities. Currently, the City has mapped all receiving waters, City owned stormwater treatment and flow control BMPs, geographic areas that do not discharge to surface waters and known outfalls and discharge points that are 24" in diameter or larger. The City began mapping smaller features (under 24" diameter) in 2018 in anticipation of the new permit requirements, requiring all known outfalls to be mapped, documenting size, materials and maintenance condition in our GIS database.

5.3 Planned Activities

The City plans to continue implementing S5.C.4 requirements and plans to meet the deadlines specified in this section of the permit. The City has already implemented an electronic mapping format (GIS) for features inventory and will continue characterizing all known outfalls upon inspection/investigation. We are also on-track to meet the 2023 deadline for mapping all known private connections from the MS4 that receive stormwater runoff from the public MS4.

6

Illicit Discharge Detection and Elimination (IDDE)

Permit Requirement S5.C.5

6.1 Permit Requirements

- Develop an ongoing program to prevent, detect, characterize, trace and eliminate illicit connections, illicit discharges and improper disposal including spills into the municipal stormwater system.
- Develop a municipal storm sewer map that includes attributes for known stormwater outfalls, notes receiving waters other than ground water, stormwater treatment and flow control Best Management Practices (BMPs)/facilities owned or operated by the Permittees.
- Adopt and implement an updated ordinance to prohibit non-stormwater discharges, spills, illicit connections, and illegal dumping into stormwater systems.
- Procedures for conducting investigations of the stormwater system including field screening and methods for identifying potential sources.
- Inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste and publicize a hotline phone number for the public to report spills, dumping, and illicit discharges.
- Adopt and implement procedures for program evaluation and assessment which includes spill tracking, inspection tracking, and feedback from public education efforts.
- Provide training for municipal field staff, which during normal job duties may come into contact with or observe illicit discharges and/or connections, on the identification and reporting of illicit discharges and/or connections in the stormwater system.
- Summarize activities in the Annual Report.

6.2 Current Activities

The City has an existing comprehensive map of its stormwater infrastructure. To maintain compliance with the permit, infrastructure mapping must be updated to include newer development and any newly identified features or structures within the City. Activities in support of this requirement began in 2009 and are ongoing.

- A spill hotline continues to be active and advertised via Kitsap One (360-337-5777).
- A spill documentation and tracking system has been initiated and continues to be utilized.

- Employee training for identification and reporting of illicit discharges and connections has been instituted. This training is updated annually for City staff.
- Updated the IDDE ordinance that was enacted in 2009 in accordance with S5.C.3.b before February 2, 2016. Review code annually and update as needed.
- Conducted field screenings to identify illicit connections and unauthorized interties to City MS4. We successfully screened more than 12% of our MS4 as required for illicit connections and corrected deficiencies as they were identified.
- Transitioned from current method of IDDE reporting to the new WQwebIDDE portal in 2019.
- The City is keeping a running tally for total percentage of MS4 screened for illicit connection/illicit discharges between 2019 and 2024.
- Activities are summarized in the Annual Report.

6.3 Planned Activities

- The program is planning to include the following components to continue meeting permit requirements: Continue refining existing public education materials and disseminate to public, including additional hotline outreach/advertisements relating to stormwater and pollution.
- Continue working to improve existing compliance strategies for IDDE implementation.
- Continue to meet requirements of S5.C.5.d.i.(a) by screening no less than an additional 12% of our MS4 for illicit connections each year.
- Expand on existing employee training and education relating to spill response, IDDE, screening and stormwater management.
- The City is keeping a running tally for total percentage of MS4 screened for illicit connection/illicit discharges between 2019 and 2024
- Monitor enforcement policies, regulatory mechanisms and procedures for effectiveness, revise as needed.
- Summarize activities in the Annual Report.

7 Controlling Runoff from New Development, Redevelopment and Construction Sites

Permit Requirement S5.C.6

7.1 Permit Requirements

- Adopt an ordinance that addresses runoff from new developments, redevelopment and construction sites which includes the following:
  - Effective January 1, 2017 for all new permit applications and all construction projects which have not started construction by January 1, 2022, minimum stormwater design standards that are equivalent to the Department of Ecology's *2012 Stormwater Management Manual for Western Washington (as amended in 2014)* shall be applied to all site development applications.
  - A site planning process and Best Management Practice (BMP) selection and design criteria that protects water quality, reduces pollutant discharges to the maximum extent practicable, and applies all known, available, and reasonable methods of prevention, control and treatment prior to discharge.
  - The legal authority, through the approval process for new development, to inspect private stormwater facilities that discharge to the City's stormwater system.
  - Provisions to require non-structural preventative actions and source reduction practices such as Low Impact Development (LID) techniques, measures to minimize the creation of impervious surfaces, and measures to minimize the disturbance of native soils and vegetation as the preferred and commonly-used approach.
- Implement a program to review plans, inspect construction sites, and take enforcement action against those failing to meet the required standards.
- Adopt an ordinance that addresses maintenance responsibility, maintenance standards, inspection requirements and procedures, and enforcement provisions to ensure the long-term operation and maintenance of permanent stormwater control facilities constructed after the effective date of the ordinance.
- Develop a centralized record-keeping system of inspection, enforcement, and maintenance activities associated with new development, redevelopment and construction sites.
- The program shall make copies of the "Notice of Intent for Construction Activity" and "Notice of Intent for Industrial Activity" available to representatives of proposed new development and redevelopment.
- Continue to enforce local ordinances controlling runoff from sites that are also covered by stormwater permits issued by the Department of

Ecology.

- Provide training for staff on new and revised regulations, standards, processes and procedures.
- Summarize activities in the Annual Report.

7.2 Current Activities

- The City is responsible for managing stormwater runoff entering its MS4's from new development, redevelopment, and construction sites. To ensure proper management of stormwater, the City requires developers to meet the criteria specified in the Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2019 (SMMWW, 2019) for all development and redevelopment.
- NPDES permit compliance in 2017 for S5.C.4 was achieved by the revision and implementation of ordinances relating to:
  - Controlling runoff from new development, redevelopment and construction sites.
  - Refining permitting processes to reflect new plan review, inspection and enforcement criteria.
  - Ensuring long-term O&M of facilities by refining existing maintenance standards to reflect new policies and procedures as specified in SMMWW, 2019.
  - Continuing adherence to the minimum requirements, technical thresholds, and definitions in Appendix 1 of the permit.
  - Making LID principles and BMPs preferred, and assessment for LID feasibility mandatory for all new development or redevelopment after January 1, 2017.
- The City's existing permitting process includes plan review, inspection, and enforcement activities. In order to update these processes and procedures to meet S5.C.4 requirements on schedule, City ordinances, municipal code and guidance documents were reviewed and revised in 2016 to align with permit requirements. These revisions were completed and adopted by the December 31, 2016 deadline. All revisions were implemented and enforced by January 1, 2017.
- The City maintains records of inspection, enforcement, and maintenance activities. Record-keeping procedures are being evaluated and revised as necessary to maintain compliance with permit requirements.
- Copies of the "Notice of Intent for Construction Activity" and "Notice of Intent for Industrial Activity" are available to representatives of proposed new development and redevelopment at the City's Department of Community Development Permit Center. The requirement for the permit and its availability are also made known to applicants via pre-application summary letters and in the stormwater chapter of the City's published Development Guidelines.
- Revised the City Municipal Code (POMC) to adopt the new SWMMWW, 2019 and retired the 2014 manual before the deadline of June 30, 2022.
- Continued providing access to the Ecology CSWGP, ISGP and their respective

NOI documentation for applicable developments within City limits.

- All appropriate staff members have training on erosion control, construction inspections, low impact development techniques, and stormwater design standards and practices. Training has occurred via internal informal training and external classes.
- The City provides guidance to applicants and project proponents regarding access to the Ecology Construction Stormwater General Permit if applicable.
- Summarize activities in the Annual Report.

7.3 Planned Activities

The program is planning to include the following components to continue meeting permit requirements:

- Update guidance documents as needed to include new procedures and requirements.
- Update the staff training plan as needed to incorporate new additions to permit requirements and revisions to procedural documents.
- Develop an education and outreach plan for commercial and private facility owners to better educate them on LID principles and practices.
- Continue inspections before, during and after active construction occurs for sites that trigger inspection.
- Continue implementation of our drone inspection program.
- Summarize activities in the Annual Report.

8 Operations and Maintenance

Permit Requirement S5.C.7.

8.1 Permit Requirements

- Establish maintenance standards that are as protective, or more protective, of facility function as those specified in Chapter 4 of Volume V of the *SMMWW, 2019* by June 30, 2022.
- Perform annual inspections of all municipally owned or operated permanent stormwater treatment and flow control BMPs/facilities, taking appropriate maintenance actions in accordance with adopted maintenance standards.
- Perform spot checks of potentially damaged permanent stormwater treatment and flow control BMPs/facilities after major storm events and inspect all facilities if widespread damage/maintenance is found.
- Inspect all catch basins and inlets owned and operated by the Permittee, clean as needed, at least once no later than August 1, 2017 and every two years thereafter.
- Establish and implement practices to reduce stormwater impacts associated with runoff from municipally owned or maintained streets and parking lots and from street maintenance activities.
- Establish and implement practices to reduce pollutants in runoff from all lands owned and maintained by the City.
- Develop a program to inspect all non-municipal stormwater facilities to ensure they are functioning and maintained as designed
- Develop and implement an on-going training program for City staff whose job functions may impact stormwater quality.
- Develop and implement a Stormwater Pollution Prevention Plan (SWPPP) for all heavy equipment maintenance or storage yards and material storage and material storage facilities owned or operated by the City.
- Maintain records of inspections and maintenance or repair activities.

8.2 Current Activities

- The City's Operations and Maintenance Program takes steps to minimize pollutants in runoff from City activities as prescribed in the Endangered Species Act (ESA) Regional Road Maintenance Program guidelines and the NPDES permit.
- Water quality treatment and flow control facilities are inspected annually, cleaned, and repaired as necessary.
- Privately owned treatment and flow control facilities built after June, 2009 are inspected by qualified third party vendors annually and maintained as needed.

- Frequent, routine street sweeping is performed to minimize pollutants on roadways.
- An annual catch basin inspection and cleaning program is in place, with every City catch basin being inspected and cleaned (at a minimum) once every other year. Catch basins and pipes located within the City TMDL areas are inspected more frequently and cleaned at a minimum annually or as needed if catch basin sumps show signs of buildup.
- The City implemented practices and procedures to meet the requirements of S5.C.7.d before December 2022 by creating a series of SOPs for each of the activities specified in this section of the permit.
- Currently, City maintenance standards meet or exceed SWMMWW, 2019 standards.
- Summarize activities in the Annual Report.

8.3 Planned Activities

- Revise our adopted maintenance standards as needed
- Review current inspection, maintenance, and record keeping practices and revise and enhance the program as necessary for compliance.
- Incorporate an asset management database for scheduling and tracking maintenance and condition of MS4.
- Evaluate lands owned or maintained by the City for their contribution to pollution in runoff and establish and implement reduction practices.
- Refine the on-going training program for City staff whose job functions may impact stormwater quality.
- Review and as needed, revise the Stormwater Pollution Prevention Plan (SWPPP) for all heavy equipment maintenance or storage yards and material storage and material storage facilities owned or operated by the City as needed.
- Review record keeping practices for inspections, maintenance, and repair activities and revise as necessary for permit compliance.
- The City will continue to implement its O&M Program
- The City will update its maintenance standards (as needed) to meet the requirements of the permit.
- The O&M Program will be updated to include inspection of all facilities regulated by the City under S5.C.7.b of the new permit, verifying long term O&M of any stormwater facility built after June 2009.
- The City's enforcement mechanism will be updated to reflect any changes in the new permit.
- If work is conducted by non-city personnel a memo will be generated as per Section S1.D.3.c of the draft permit.
- Summarize activities in the Annual Report.

9

Source Control for Existing Development

Permit Requirement S5.C.8.

9.1 Permit Requirements

- Implement a program to prevent and reduce pollutants in runoff from areas that discharge to the MS4.
- Make effective an ordinance or other enforceable document requiring the application of source control BMPs associated with existing land uses and activities. Due August 1, 2022.
- Inventory sites within City jurisdiction that have the potential to generate pollutants to the MS4. Due date August 1, 2022.
- Implement an inspection and enforcement program for all identified sites within City jurisdiction. Due January 1, 2023.
- Implement a training program for all staff conducting these activities.

9.2 Current Activities

- The City has implemented a source control program for businesses and private properties that includes an inspection and enforcement component as specified in the permit.
- Ordinances were adopted for enforcement of this requirement in 2022.
- The City inventoried all businesses within its jurisdiction in 2022.
- The City developed informational materials regarding pollution control and BMP implementation/maintenance, including good housekeeping practices and pollution prevention.
- The City developed and implemented the inspection program and its progressive enforcement policies before the permit deadline of December, 2022.

9.3 Planned Activities

- The City plans to annually complete inspection for a minimum of 20% of the sites listed in its business inventory and 100% of sites identified via credible complaints.

10 Total Maximum Daily Load (TMDL)

Permit Requirement S7

10.1 Permit Requirements

- The City is required to comply with the Sinclair and Dyes Inlets Fecal Coliform Bacteria TMDL and Water Quality improvement Plan requirements as approved by Ecology and the EPA.
  - ◊ Designate areas discharging to Sinclair Inlet via Blackjack, Annapolis, and Karcher Creek and to shorelines along Sinclair Inlet as highest priority areas for illicit discharge detection and elimination routine screening.
  - ◊ Evaluate frequency of catch basin inspections and cleaning that contribute stormwater to the priority TMDL areas and increase cleaning frequency as necessary.
  - ◊ Install and maintain pet waste education and collection stations at municipal parks and other City owned and operated lands adjacent to stream and marine shorelines.
  - ◊ Screen for bacteria sources in TMDL areas.
- The City is required to keep records of all actions relevant to TMDL activities.
- Summarize activities in the Annual Report.

10.2 Current Activities

- The City has mapped the areas of concern under the previous permit.
- The City conducts annual clean-up of city parks, walkways and properties, focusing great detail on shoreline areas. City staff routinely work to identify additional areas to be cleaned or maintained within City limits.
- City staff respond to illicit discharge, illicit connection and spill reports as they occur in nearshore areas and on City properties.
- Ensure Mutt Mitt dispensers are located in all City parks and pedestrian areas.
- Participate in pollution prevention promotional activities through outreach to local businesses and citizen groups.
- Provide charity car wash kits upon request in order to prevent wash water from entering MS4s and waters of the state.
- Sponsor four watershed education sessions for local elementary schools.
- Conduct screening of bacteria sources within MS4.

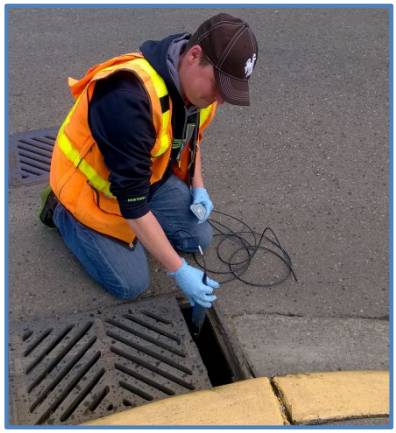
10.3 Planned Activities

The program is planning to include the following components to continue meeting permit requirements:

- Continue catch basin cleaning to include all shoreline areas annually.
- Continue the routine screening program to identify areas of greater concern.
- Continue working with the Port of Bremerton and City Parks Department staff to ensure Mutt Mitt dispensers are located along the shoreline and maintained.
- Continue to map City regions of the TMDL as new areas of concern arise.
- Determine areas of greatest concern for TMDL implementation and then explore options for outreach efforts that will raise awareness of fecal coliform concerns and provide citizens and homeowners along the shoreline with simple solutions.
- City of Port Orchard will work with the Kitsap Health District to determine the number of on-site septic systems that are located within the city limits and determine how many have been identified as older, potentially failing or failing systems.
- Internal staff training for staff on Illicit Discharge Detection and Elimination, Spill Response and Water Quality Best Management Practices.
- Participating in the West Sound Stormwater Outreach Group (WSSOG) and STORM. Participate in local Pollution Prevention campaigns when appropriate and manageable with limited staff time and funding.
- To be proactive regarding TMDL allocation, the City is still continuing the process of developing a Pollution Control Program, guided by a Pollution Control Program Plan (QAPP equivalent) to monitor the status of streams and watersheds within City limits. This program will monitor stream health and provide water quality status updates, as well as key out sources of impairment within the watershed. This program should be finalized and in place by the end of 2023 pending staff availability and funding. Monitoring results will be reported within the annual report.
- Continue designating any previously unscreened areas discharging via the MS4 to the TMDL area as highest priority for IC/IDDE screening, focusing specifically on screening for bacteria sources.
- Expand the Mutt-Mitt program in TMDL areas and near waterbodies, focusing specifically on walkways and areas where people walk their pets.

11 Monitoring

Permit Requirement S8



11.1Permit Requirements

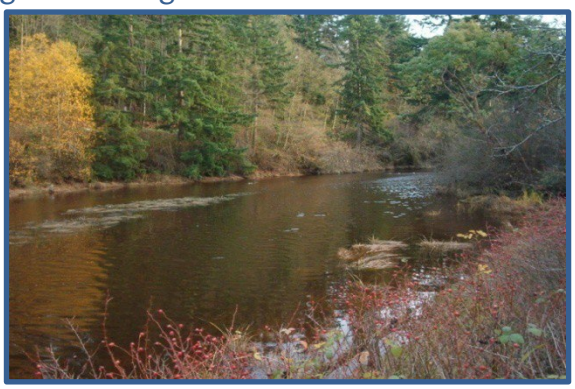
- Permittees are required to report on any stormwater monitoring or Stormwater related studies conducted during this permit term.
- Permittees are required to participate in or create a program of equal level to stormwater monitoring and targeted Stormwater Management Plan (SWMP) effectiveness monitoring, known as the Stormwater Action Monitoring (SAM) Program.
- Permittees are required to participate in the SAM Source Identification Repository.

11.2 Current Activities

- Monitoring for illicit discharges and screening for illicit connections has been undertaken throughout the City and will continue as needed to provide further characterization.
- The City has opted to pay Ecology the required fees to support the Stormwater Action Monitoring program, which fulfills our S8 requirements.
- Kitsap County does yearly monitoring of four freshwater and seven marine stations in the City of Port Orchard Watersheds through their PIC Program.

11.3 Planned Activities

- Seek opportunities to participate with Kitsap County and other local jurisdictions in an integrated and coordinated monitoring and assessment program.
- To be proactive regarding TMDL allocation, the City is in the process of developing a Pollution Control Program, guided by a Pollution Control Program Plan (QAPP equivalent) to monitor the status of streams and watersheds within City limits. This program will monitor stream health and provide water quality status updates, as well as key-out sources of impairment within the watershed. Currently, implementation of this program has been delayed due to limited resources. The program is intended to be finalized and in place by the end of 2023 pending staff availability and funding. Monitoring results will be reported within the annual report.
- In 2011 Kitsap County Health District completed an Illicit Discharge Detection and Elimination (IDDE) Inventory that included the City of Port Orchard. The City will continue working with the Health District to determine the status of deficient systems identified in the IDDE inventory and explore options for correcting any that have not been completed.



12 Conclusion

12.1 Summary

The City of Port Orchard 2023 SWMP Plan has been prepared to demonstrate compliance with the requirements of the Municipal NPDES Phase II Permit. In conformance with the Permit, the SWMP Plan will be updated annually to reflect progress with implementing the stormwater management program components required for compliance with the Phase II Permit.

12.2 Resources

Links to the current Annual Report, Stormwater Management Program, and Municipal NPDES Phase II permit can be found on the City's website at: www.cityofportorchard.us. Printed copies are available for a per-page cost and may be requested by calling the Public Works office.

12.3 Request for Comments

The public is encouraged to participate in the development of the SWMP Plan. Please contact the Public Works Department with questions, comments, or suggestions.

12.4 Contact Information

Mail: City of Port Orchard Public Works 216 Prospect Street
Port Orchard, WA 98366

Phone: 360-876-4991
Email: publicworks@cityofportorchard.us
Website: www.cityofportorchard.us

Appendix A
SMAP, SMAP Documents, and Report to Ecology for Coordination with Long-Range Plan Updates

CITY OF PORT ORCHARD
STORMWATER MANAGEMENT ACTION PLAN

Prepared for
City of Port Orchard

Prepared by
Herrera Environmental Consultants, Inc.

HERRERA

Note:
Some pages in this document have been purposely skipped or blank pages inserted so that this document will print correctly when duplexed.

CITY OF PORT ORCHARD
STORMWATER MANAGEMENT ACTION PLAN

Prepared for
Zack Holt
City of Port Orchard
216 Prospect Street
Port Orchard, Washington 98366

Prepared by
Herrera Environmental Consultants, Inc.
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Seattle, Washington 98121
Telephone: 206-441-9080

October 24, 2022

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PURPOSE

The City of Port Orchard (City) Stormwater Management Action Plan (SMAP) is prepared pursuant to requirements of S5.C.1.d.iii of the 2019 -2024 Western Washington Phase II National Pollutant Discharge Elimination System (NPDES) Stormwater Permit issued by the Washington Department of Ecology (Ecology).

The Plan is organized according to the permit language and identifies the following for the high priority catchment located in the Lower Blackjack Creek watershed:

A description of the stormwater facility retrofits needed for the area, including the best management practice (BMP) types and preferred locations.

Land management/development strategies and/or actions identified for water quality management.

Targeted, enhanced, or customized implementation of stormwater management actions related to permit sections within S5, including:

Illicit discharge detection and elimination (IDDE) field screening,

Prioritization of Source Control inspections,

Operations and Maintenance (O&M) inspections or enhanced maintenance, or

Public Education and Outreach behavior change programs.

If applicable, identification of changes needed to local long-range plans, to address SMAP priorities.

A proposed implementation schedule and budget sources for:

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

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

A process and schedule to provide future assessment and feedback to improve the planning process and implementation of procedures or projects.

BACKGROUND

The City completed the "City of Port Orchard Watershed Inventory and Assessment" March 21, 2022 (Herrera 2022a) and the "City of Port Orchard Watershed Prioritization" June 22, 2022 (Herrera 2022b). Additionally, the City is in the process of developing their "Stormwater and Watersheds Comprehensive Plan", anticipated in 2023. This SMAP will be incorporated within the stormwater comprehensive planning process when developing programmatic and capital improvement programs. Additionally, much of the watershed data and analysis conducted for meeting the SMAP permit requirements will serve to better understand stormwater pressures upon water resources on a watershed basis.

WATERSHED PRIORITIZATION SUMMARY

Eighteen watersheds were originally identified during the first step of the City's watershed inventory. Thirteen watersheds were removed from the prioritization process due to low or no City stormwater influence or because the watershed was smaller than the 400 acre size threshold identified by Ecology in their SMAP guidance (Ecology 2019). The remaining five candidate watersheds were subjected to a prioritization and scoring process. The prioritization process resulted in selection of Lower Blackjack Creek watershed as the highest priority watershed based on the following characteristics:

High receiving water use support

Moderate level of development and future growth

Good water and habitat condition

Highest jurisdiction control

Promotes other plans and projects, most notably the Blackjack Creek Watershed Assessment Plan and Protection and Restoration Plan (ESA 2017).

LOWER BLACKJACK CREEK WATERSHED FUNCTION

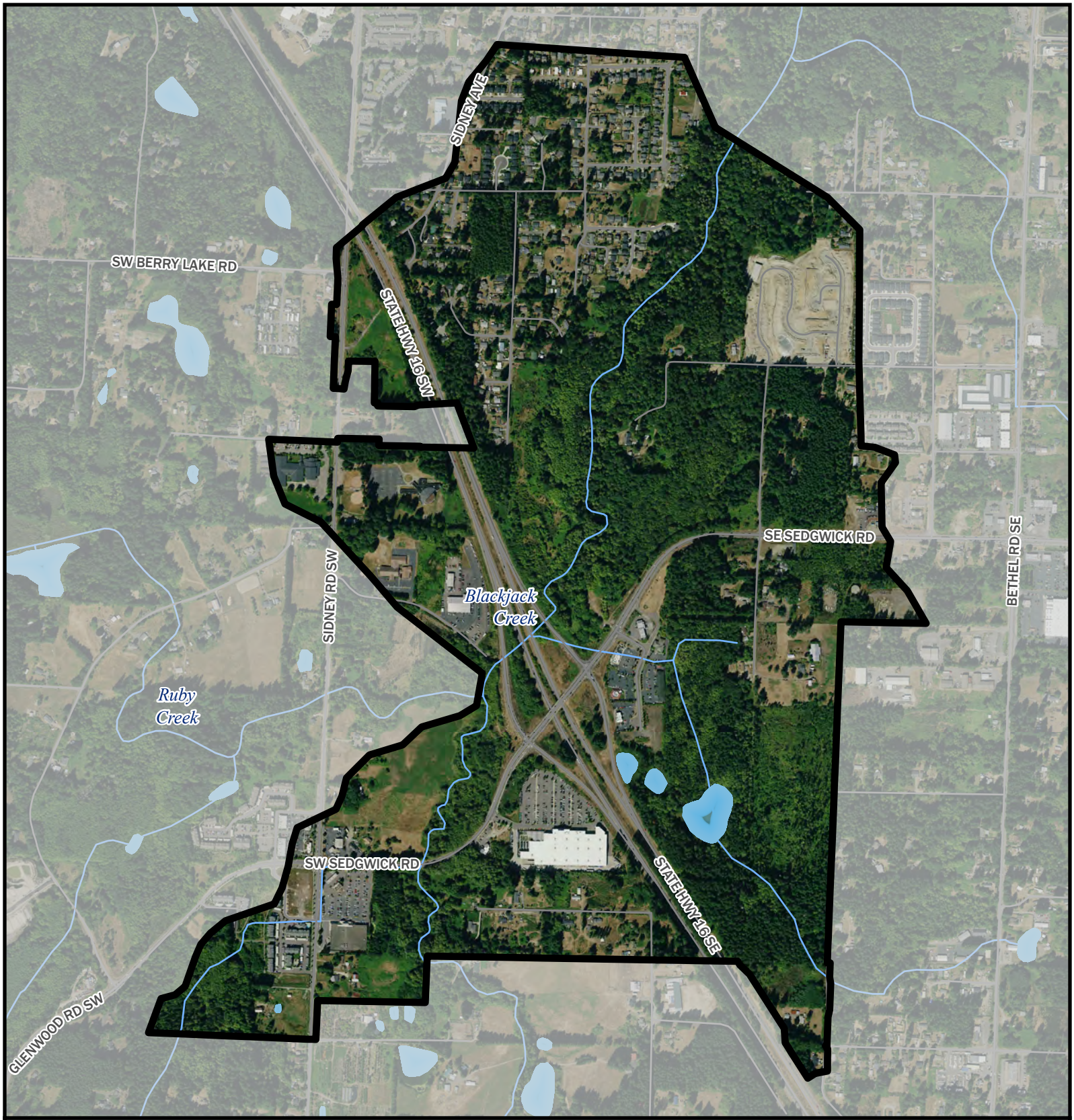
Lower Blackjack Creek watershed processes are considered "functioning" for hydrologic regime, sediment regime, riparian areas and wetlands, nutrient supply, floodplain channel interactions, habitat connectivity, fish passage and water quality (ESA 2017). Organic matter input is rated "Moderately Impaired" However, elevated summer stream temperatures and low dissolved oxygen levels are a concern.

Lower Blackjack Creek supports an abundance of salmonid species. The creek supports spawning and rearing activity for fall and summer chum and coastal cutthroat trout. The stream corridor supports migration of coho salmon to extensive upper watershed areas for spawning and rearing. Blackjack Creek is included in the area for endangered species for fall chinook and winter steelhead.

Lower Blackjack Creek stream health is good based upon aquatic insect scores. Aquatic insect diversity is monitored at multiple locations within the Lower Blackjack Creek watershed. This benthic index of biotic integrity (B-IBI) and many of the sub-indexes are strongly correlated with stormwater impacts (both erosive flows and water quality). Station KCSSWM-035 (Blackjack Middle) was monitored for 7 years between 2011 to 2021 with an average score of 52 and a standard deviation of 12. Scores range from 33 (2014) to 76 (2019). Overall, the stream aquatic

insect community index is classified as "Fair", where some years the score classifies as "Poor" and other years as "Good" (Puget Sound Benthos Database, 2022).

The watershed was subdivided into three catchments, A, B and C, and Catchment A was selected for development of the SMAP. This catchment has a greater concentration of older development for retrofit opportunities. Catchment A is depicted in Figure 1.



Legend

- Port Orchard City Limits
- Lower Blackjack Creek Watershed
- Catchment Boundary
- Waterbody
- City Roads
- Stream

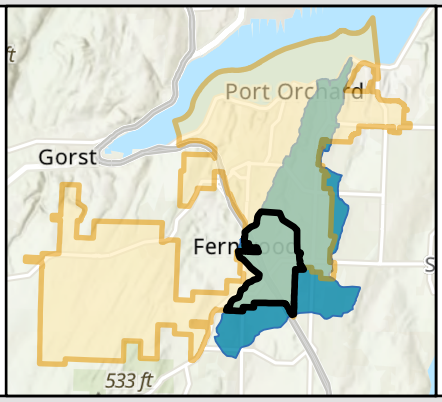


Figure 1. Lower Blackjack Creek Catchment A Overview Map.

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Kitsap County, 2020

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CATCHMENT CONDITIONS

Below is a brief description of the catchment for land use, growth and City stormwater influence. This information provides background about Catchment A existing characteristics and potential future conditions considered during development of the SMAP.

Land Use and Future Growth

Catchment A is 615 acres. Land use is diverse and comprised of commercial, single-family residential, multi-family residential, high use state highways and City roads. Vacant lands are targeted for development and the watershed within the City limits is developing rapidly. The City of Port Orchard, due to its proximity to the urban centers of Bremerton and Tacoma and connection to Seattle via ferry transportation, is designated as a "high capacity transit community" by the Puget Sound Regional Council (Puget Sound Regional Coordination Council, 2020). The City is expected to grow as much as 36% by 2044 (Kitsap Regional Coordinating Council, 2022).

Stormwater Influence

The City has four major stormwater outfalls (greater than 24" diameter) within Catchment A , and multiple smaller outfalls. Washington State Department of Transportation also discharges runoff within the catchment. Fourteen public and private stormwater ponds are located within the catchment.

STORMWATER MANAGEMENT ACTIONS

PROCESS TO IDENTIFY STORMWATER MANAGEMENT ACTIONS

The process to identity stormwater management actions included a detailed evaluation of landscape characteristics and the existing stormwater system. Landscape characteristics reviewed included zoning, vacant lands, stream buffers, wetlands, geohazard areas and roadways . In general, actions potentially effective to protect the receiving water of Lower Blackjack Creek were identified. All retrofit projects are one-time actions. However, programmatic and land management strategy actions can be conducted one time, annually during the term, or conducted during a three-year pilot project. Annual and pilot projects are evaluated to determine if it is beneficial to continue the action or to end the action due to completion, or if the action is determined to be ineffective.

The assessment of the stormwater system included identifying stormwater ponds (both City and private) and stormwater outfalls. Stormwater pond owners were identified and the year the pond built determined to assess the level of water quality and or flow control according to the design requirements of the era it was designed. For all roadways the owners (City or State) were identified. Current capital improvement projects (CIPs) that improve stormwater quality and/or flow control or floodplain reconnection were identified including the location, drainage area, and best management practice (BMP) type. Existing and future potential partnerships with local agencies were also reviewed.

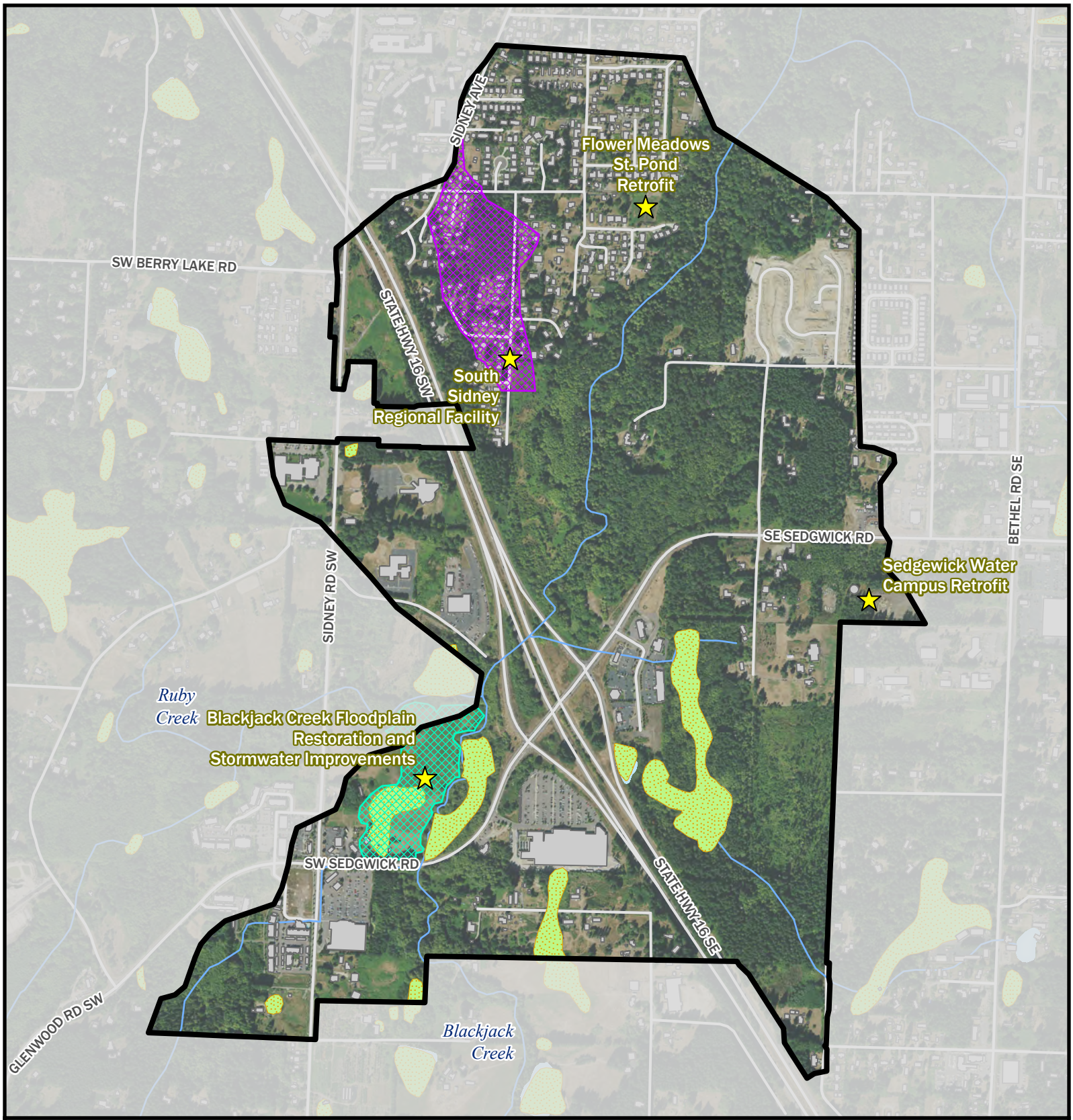
Based on this information a series of 'actions' were identified to further protect and/or enhance ecosystem function of Catchment A. The actions cover three categories: strategic retrofits, land management strategies and stormwater program enhancements. These actions were presented to internal City and local stormwater and natural resource stakeholders prior to conducting two workshops in August 2022. General cost estimates were provided for each action and stakeholders provided their input on selection of Catchment A and prioritization of actions. Stakeholder feedback was incorporated into this plan.

STRATEGIC STORMWATER RETROFIT PROJECTS

The potential benefits of stormwater retrofit implementation opportunities were examined based on factors including location, degree of existing water quality or flow control, ownership (more challenging to implement for private ownership versus City ownership), and likelihood to succeed.

Three retrofit projects were identified in Lower Blackjack Creek Catchment A. The projects are the South Sidney Regional Facility, Flowers Meadows St. Pond Retrofit and Naturalization, and

the Sedgewick Water Campus Pond Naturalization. The locations of the three projects and preliminary drainage areas are depicted in Figure 2. The projects and BMP types are described in Table 1. The project summary sheet for the South Sidney Regional Facility project is included in Appendix A.



Legend

- Stormwater Retrofits
- Catchment Boundary
- Preliminary South Sidney Regional Facility Drainage Area
- Preliminary Blackjack Creek Floodplain Restoration Project Area
- Wetlands
- Waterbody
- Stream

Figure 2. Lower Blackjack Creek Catchment A Stormwater Projects.

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Kitsap County, 2020

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Table 1. City of Port Orchard Lower Blackjack Creek Catchment A Stormwater Retrofit Projects.		
Action	**Best Management Practice(s) to Be Considered[a]**	**Cost**
South Sidney Regional Facility	Constructed wetlands Biofiltration Infiltration ponds	Design: $1,400,000 Construction: $2,100,000
Flower Meadows St. Pond Retrofit and Naturalization	Enhance flow control and water quality Naturalize pond	$45,000
Sedgewick Water Campus Pond Naturalization	Naturalize pond	$45,000
	Total Cost	$3,590,000

[a] These projects are still in early design phase and the specific BMP that will be implemented may change.

LAND MANAGEMENT STRATEGIES

The potential benefits of land management strategies were examined based on factors including but not limited to the age of existing development, potential future land use, and opportunities to enhance stream function. These were evaluated for opportunities to leverage and mitigate future development to improve watershed health and reduce negative impacts from development. As a result of this evaluation, three land management strategies were identified to help protect or enhance ecosystem functions in Lower Blackjack Creek Catchment A (Table 2). The strategies are the South Blackjack Creek Floodplain Restoration project, a pilot rain garden and low impact development cost share program and regular review of stormwater standards for new development and re-development. The project summary sheet for the South Blackjack Creek Floodplain Restoration project is included as Appendix B.

Table 2. City of Port Orchard Lower Blackjack Creek Catchment A Land Management Strategies.		
Action	**Description**	**Cost**
South Blackjack Creek Floodplain Restoration	Increase floodplain connectivity creating alluvial streambeds for off channel habitat with depressional water storage, plant coniferous trees and riparian buffer areas, and add large woody debris	Design: $1,000,000 Construction: $5,000,000
Rain Garden and Low Impact Development Cost Share Pilot Program	Implement a pilot private property rain garden or other low impact retrofit program with cost-share from the City	$60,000
Regular Review of Stormwater Standards	Annual meeting of stormwater review staff to identify process improvements in review, inspection and enforcement of new development projects	$5,000
	Total Cost	$6,065,000

Stormwater Program Enhancements

The City conducts a number of activities for compliance with the 2019–2024 Western Washington Phase II NPDES Stormwater Permit (permit). These include activities associated with Illicit Discharge Detection and Elimination, Source Control , Operations and Maintenance, and Public Education and Outreach.

The City's existing procedures for implementing these activities were reviewed to consider what enhancements would be beneficial for accelerating water quality and habitat improvements in the Catchment A. This section describes the enhancements implemented within Catchment A that will exceed NPDES permit required actions. Table 3 summarizes stormwater program enhancement actions.

Illicit Discharge Detection and Elimination Field Screening

The City is required to inspect 12 percent of stormwater outfalls annually. The City will conduct the following additional actions in Lower Blackjack Creek Catchment A:

Locate and map additional outfalls.

Visit and inspect stormwater outfalls annually.

Source Control Program for Existing Development

The City is required to implement an inspection program January 1, 2023. Twenty percent of the inventory list is to be inspected annually with provisions for response to complaints and re-inspection visits. The City will conduct the following additional actions in Lower Blackjack Creek Catchment A:

Prioritize businesses for inspections the first year of the Source Control Program.

Revisit Source Control Program sites that require additional attention to promote better use of BMPS to reduce pollution sources entering the storm drainage system.

Add multi-family properties to the Source Control Business Inspection inventory list.

Operations and Maintenance

The City is required to clean catch basins every two years, with provisions for reduced cleaning based upon inspection. The City will conduct the following additional actions in Lower Blackjack Creek Catchment A:

Clean City catch basins where inspection shows areas which accumulate sediment at higher rates annually.

Public Education and Outreach

The City is required to implement public education and outreach programs to build awareness, foster behavior change, and provide stewardship opportunities all related to water resource protection. The City will conduct the following additional actions in Lower Blackjack Creek Catchment A:

Identify new locations and add Mutt Mitt pet waste stations to key pet walking areas.

Conduct a one-time targeted public education effort to property owners to build awareness about stormwater impacts to surface waters and best management practices, including car washing, pet waste pickup, and other practices to reduce pollution.

Develop and distribute education materials to property owners about tree preservation and wetland buffer best management practices.

Implement a three year pilot program for education and public participation in a citizen volunteer stream team.

Implement a three year pilot program for technical assistance to property owners to improve or establish riparian plantings.

Table 3. City of Port Orchard Lower Blackjack Creek Catchment A Stormwater Program Enhancements.

Permit Section	Action	Cost
Illicit Discharge Detection and Elimination S.5.C.5	Locate and map additional outfalls one time	$1,200
	Inspect City stormwater outfalls annually	$7,200
Source Control Program for Existing Development S.5.C.8	Inspect businesses the first year of the program	$0
	Conduct enhanced technical assistance	$7,200
	Include and inspect multi-family properties	$0
Operations and Maintenance S.5.C.7	Clean targeted City catch basins annually	$25,000
Public Education and Outreach S.5.C.2	Add Mutt Mitt pet waste pick up stations	$4,000
	Conduct one time public education to build awareness about stormwater impacts to surface waters and best management practices	$6,000
	Conduct one time education about tree preservation and wetland buffer best management practices	$12,000
	Implement a citizen stream team pilot program	$60,000
	Implement a stream riparian planting pilot program	$60,000
	Total Cost	$182,600

CHANGES TO LONG RANGE PLANS

The SMAP will be incorporated into the City 2024 Comprehensive Plan Periodic Update by reference.

BUDGET AND SCHEDULE

Cost estimates for each SMAP action were developed and identified for either short-term (2024–2030) or long-term(2031–2044) implementation. These costs may be mitigated by grant funding programs; the retrofit projects, the floodplain project and some of the education projects may be grant eligible. For the purpose of this document, no assumptions have been included about grant funds.

Some actions are implemented annually while others are a one-time project implemented as a 3-year pilot (see Table 4). The schedule does not assume continuation of programs identified as "short-term" or "pilot" projects beyond the minimum time frame, either 2024–2030 or three year pilot.

The total estimated cost for short-term actions is $1,467,600. The total estimated cost for long-term actions is $8,370,000.

A summary of short-term and long-term actions costs are shown in Table 4.

Table 4. Lower Blackjack Creek Catchment A Stormwater Management Actions Schedule and Cost Summary.

Action	Schedule		Cost
	Short- or Long-Term[a]	Duration	
Design South Sidney Regional Facility	Short	One time	$1,400,000
Construct South Sidney Regional Facility	Long	One time	$2,100,000
Design and Construct Flower Meadows St. Pond Retrofit and Naturalization	Long	One time	$45,000
Design and Construct Sedgewick Water Campus Pond Naturalization	Long	One time	$45,000
Design South Blackjack Creek Floodplain Restoration	Long	One time	$1,000,000
Construct South Blackjack Creek Floodplain Restoration	Long	One time	$5,000,000
Conduct private property rain garden & LID retrofit program	Long	Annual for 3 year pilot	$60,000 (over 3 years)
Conduct review of stormwater standards	Short	Annual	$5,000 (over 5 years)
Locate and map additional outfalls	Short	One time	$1,200
Inspect City outfalls	Short	One time	$7,200
Inspect businesses the first year of the program	Short	One time	$0
Conduct enhanced Business Source Control technical assistance	Short	Annual	$7,200 (over 5 years)
Include and inspect multi-family properties in Business Source Control Program	Short	One time	$0
Clean targeted City catch basins	Short	Annual	$25,000
Add Mutt Mitt pet waste pick up stations	Short	One time	$4,000
Conduct private property stormwater impacts & practices outreach	Short	One time	$6,000
Conduct private property tree preservation and wetland buffer Outreach Program	Short	Annual for 3 year pilot	$12,000
Implement a citizen stream team pilot program	Long	Annual for- 3 year pilot	$60,000
Implement a stream riparian planting pilot program	Long	Annual for 3 year pilot	$60,000
		Total Short-Term Costs	$1,467,600
		Total Long-Term Costs	$9,837,600

Note=Cost estimates are in 2022 dollars. Inflation and escalation of costs were not incorporated into cost estimates.

[a] Short-term = implementation between 2024 to 2030

Long-term = implementation between 2031 and 2044

LID= low impact development

FUTURE ASSESSMENT AND FEEDBACK

The purpose of the SMAP is to conduct actions in Catchment A to protect or enhance the receiving water of Lower Blackjack Creek. The SMAP is comprised of retrofit projects, land management strategies and enhanced programmatic activities. The City will assess implementation by tracking project implementation, effectiveness and demand for programs, and environmental monitoring data. This tracking will provide feedback to the City about SMAP implementation.

Projects are typically reviewed and tracked as part of capital project planning and budgeting. More detailed program analysis, financial assessment and capital project planning occurs on a 6- to 7-year cycle as part of comprehensive planning and provides an additional opportunity for tracking. Projects (those shown in Figure 2) will be tracked for implementation. Design, construction, and potential grant oversight will require City staff time. Staff capacity or lack of grant funding may be limiting factors for implementation.

Programs are typically reviewed annually for NPDES permit reporting The City desires to implement programs that are effective, in demand, and worthwhile continuing. Programs will be evaluated to determine if they are not effective (due to lack of response or engagement) or no longer effective (catch basin cleaning, business source control assistance). Successful programs may be continued through the long term depending upon staff capacity and funding.

Environmental data collection also occurs annually as part of routine monitoring for stream flow and benthic macroinvertebrates. These data may be useful in assessing trends of stream health over time. B-IBI data will be evaluated for long-term trends and stream flow metrics related to stormwater impacts will be evaluated.

REFERENCES

Ecology. 2019. Stormwater Management Action Planning Guidance. Washington Department of Ecology-Water Quality Program. Publication Number 19-10-010.

ESA. 2017. Blackjack Creek Watershed Restoration Assessment and Protection and Restoration Plan. Prepared for Suquamish Tribe and Washington Department of Ecology, by ESA Consultants, Seattle, Washington.

Herrera. 2022a. City of Port Orchard Watershed Inventory and Assessment – Technical Memorandum. Prepared for the City of Port Orchard by Herrera Environmental Consultants, Seattle, Washington. March 21.<https://portorchardwa.gov/documents/port-orchard-watershed-inventory/>

Herrera. 2022b. City of Port Orchard Watershed Prioritization – Technical Memorandum. Prepared for the City of Port Orchard by Herrera Environmental Consultants, Seattle, Washington. June 22. <https://portorchardwa.gov/documents/port-orchard-watershed-prioritization/>

Kitsap Regional Coordination Council. 2022. Land Use Planning Policy Committee Meeting. February 15. <https://static1.squarespace.com/static/5660ba88e4b0e83ffe8032fc/t/6205b0f793b6a1302e7c8f41/1644540153978/KRCC+PlanPOL+Feb+15+2022+Meeting+Packet.pdf. >

Puget Sound Benthos Database. 2022. Accessed August 1, 2022. <https://pugetsoundstreambenthos.org/>

Puget Sound Regional Council. 2020. Vision 2050 A Plan for the Central Puget Sound Region. Puget Sound Regional Council, Seattle, Washington.

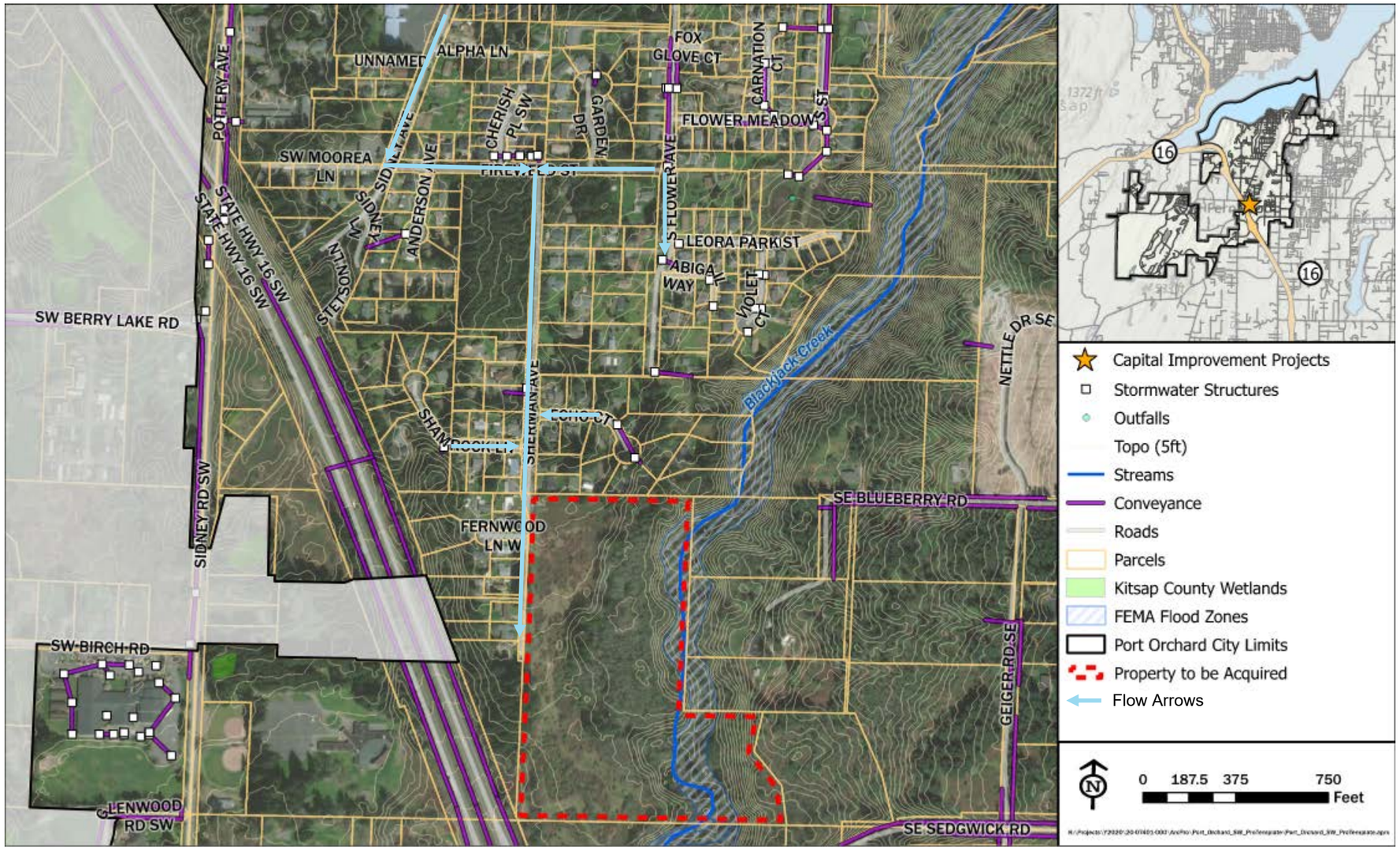
APPENDIX A

Project Summary Sheet: South Sidney Regional Facility

City of Port Orchard Stormwater and Watersheds Comprehensive Plan – Capital Improvement Projects

SOUTH SIDNEY REGIONAL FACILITY

Existing Site Plan



Problem Description

Old and undersized stormwater infrastructure is resulting in frequent flooding on Sherman Avenue and private property in nearby cul-de-sacs. There is no visible stormwater conveyance system nearby. Stormwater runoff currently discharges untreated to Blackjack Creek negatively affecting aquatic organisms.

Existing Conditions

Undeveloped Parcel at the South End of Sherman Avenue
(Photos Courtesy of Google Earth)

Site Characteristics and Constraints

Basin	Available Space	Grades and Elevations	Soils and Groundwater	Critical Areas	Utilities
• Lower Blackjack Creek	• No available space without property acquisition	• Steeper slopes on eastern and southern sides of the property	• Mostly Kitsap Silt Loam (Hydrologic Soil Group A)	• Stream buffer located on the east side of the property	• No known utility conflicts on the property • Multiple ROW utilities (e.g., overhead power, gas, water, sewer) are present

City of Port Orchard Stormwater and Watersheds Comprehensive Plan – Capital Improvement Projects

SOUTH SIDNEY REGIONAL FACILITY

Project Description

Build a new regional stormwater facility on the parcel southeast of Sherman Avenue. The facility will provide centralized flow control and treatment of an approximately 30-acre upstream drainage area extending from Sidney Avenue to Sherman Avenue. The facility could incorporate elements from constructed wetlands, bioretention, and infiltration ponds. The facility will serve as a neighborhood amenity and will enhance aesthetics, biodiversity, and habitat. A combination of surface (swale) and subsurface (piped) stormwater conveyance will be constructed to convey flow to the facility. This project will require property acquisition.

Design Precedent

Whispering Firs Stormwater Park Example (Photo Courtesy of Contech Engineered Solutions, LLC)

Permits Required

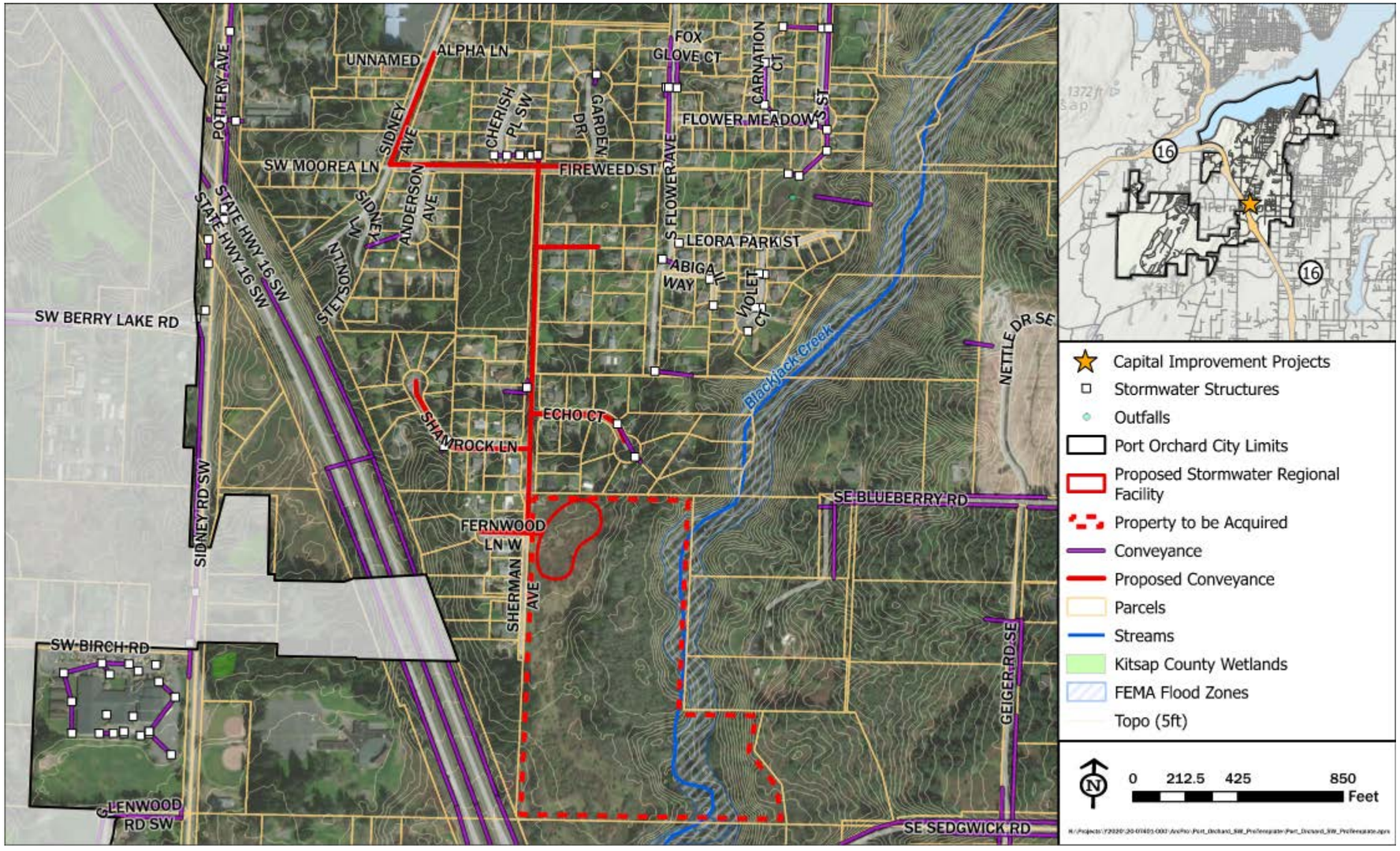
Hydraulic Project Approval (WDFW)
USACE Section 404 Permit
SEPA DNS

Estimated Costs

Total design + permitting + construction cost does not include property acquisition.

Total Design + Permitting + Construction Cost (2022)
$3,500,000

Concept Site Plan



Prioritization Matrix

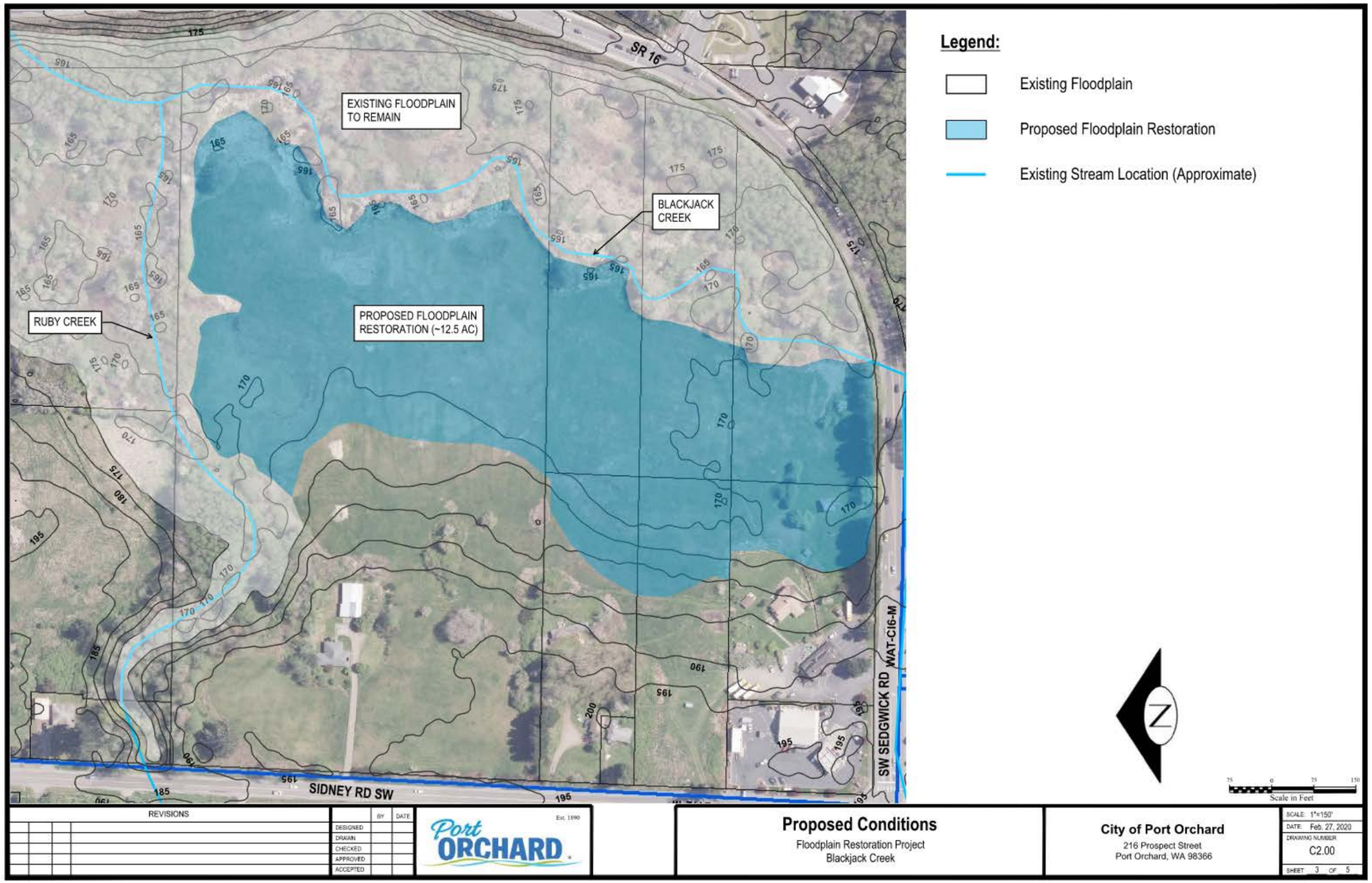
Program Elements (0 - 15 Scale)							
Flood Reduction	Groundwater and Surface Water Quality	Groundwater and Surface Water Quantity	Habitat Enhancement	Infrastructure Operations and Maintenance	Public Participation (Education, Outreach, and Involvement)	Comprehensive Planning, Administration, and Funding	Total
5	15	10	10	0	15	15	70

APPENDIX B

Project Summary Sheet: South Blackjack Floodplain Reconnection Project

SOUTH BLACKJACK CREEK FLOODPLAIN RESTORATION

Existing Site Plan



Problem Description

Existing reach of Blackjack Creek is confined along eastern edge of the open space with minimal floodplain and wetland connectivity. While the stream channel has good riparian cover, vegetation throughout the property is a mix of native and invasive species. A rock dam located approximately 50 feet upstream from the confluence with Ruby Creek likely contributes to the observed backwatered conditions and supports established wetlands within the floodplain.

Existing Conditions

Good riparian cover over stream

Adjacent floodplain and wetland habitat

Placed rock dam immediately downstream of confluence with Ruby Creek

Site Characteristics and Constraints

Basin	Available Space	Grades and Elevations	Soils and Groundwater	Critical Areas	Utilities
• Stream with good fish habitat, but limited floodplain and wetland connectivity.	• Floodplain and wetland habitat, designated FEMA Flood Zone west of Blackjack Creek.	• Shallow gradient throughout open space, with slope upward towards Sidney Road SW.	• Soils in the flood zone are dominated by Kitsap silt loam and Bellingham silty clay loam.	• Freshwater emergent wetlands; Chinook and chum salmon and steelhead stream use; and FEMA flood zone.	• Existing water main along SW Sedgwick Road.

Port ORCHARD · HERRERA · ReidMiddleton · GeoEngineers

SOUTH BLACKJACK CREEK FLOODPLAIN RESTORATION

Project Description

The main objective of the project is to increase floodplain connectivity. The project includes creating alluvial streambeds for off channel habitat with depressional water storage and placing large woody debris on Blackjack and Ruby Creeks. A mix of coniferous trees and riparian understory will be planted to create a wetland forest complex. This project was designed by the City of Port Orchard. It may be impacted by upcoming work by the Washington Department of Transportation and Kitsap Transit on State Road (SR) 16 and SR 16 Park and Ride, respectively.

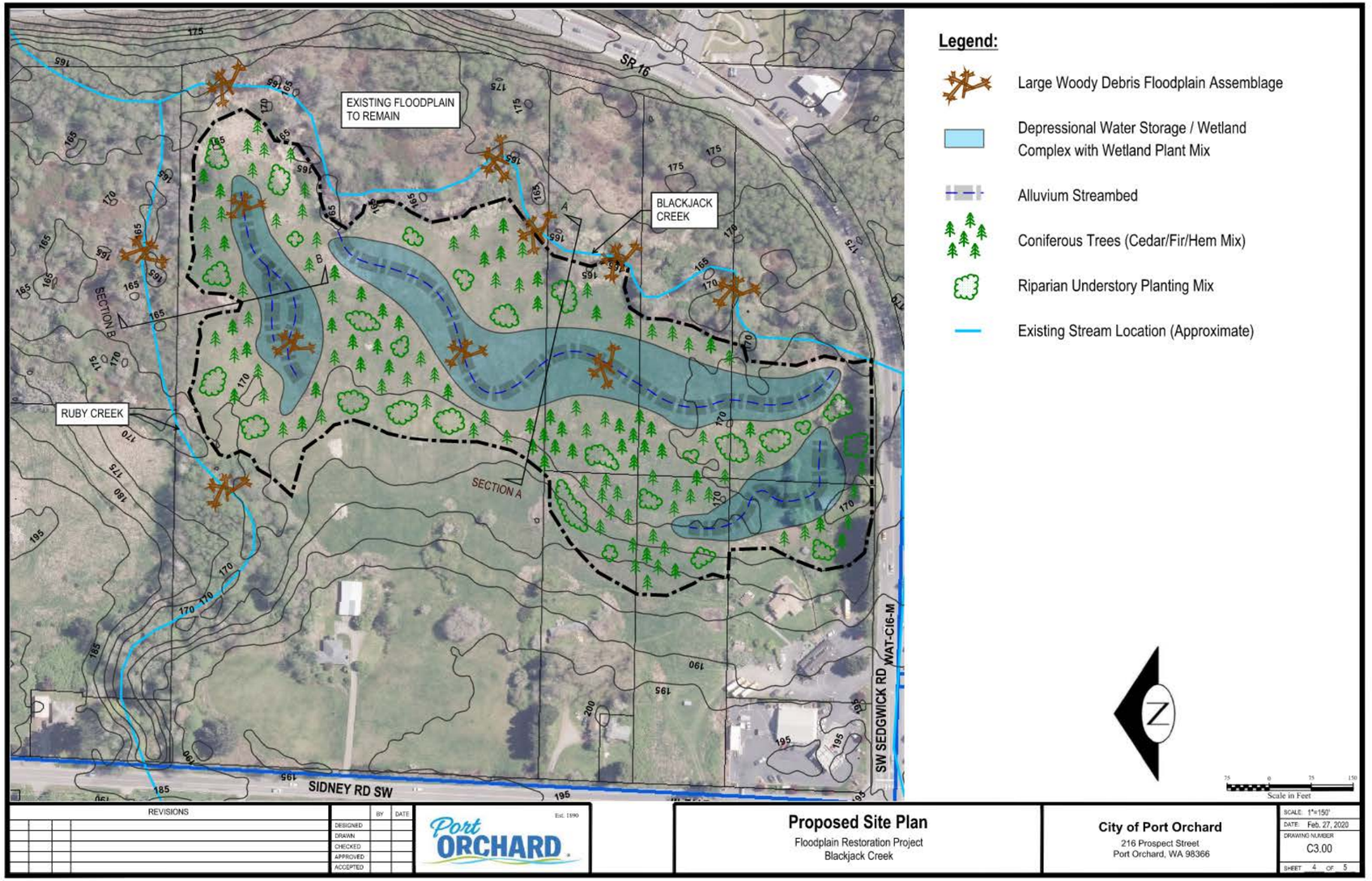
Permits Required

Section 7 ESA Consultation and Magnuson-Stevens Fishery and Conservation Act
Section 106 Review
SEPA DNS
Hydraulic Project Approval (WDFW)
USACE Section 404 Permit
Critical Areas Documentation

Estimated Costs

Total Cost (2022)
Planning, Design, and Permitting: $1,000,000 Construction: $5,000,000 **Total Project Cost: $6,000,000**

Concept Site Plan



Prioritization Matrix

Program Elements (0 - 15 Scale)							
Flood Reduction	Groundwater and Surface Water Quality	Groundwater and Surface Water Quantity	Habitat Enhancement	Infrastructure Operations and Maintenance	Public Participation (Education, Outreach, and Involvement)	Comprehensive Planning, Administration, and Funding	Total
15	0	15	15	0	5	5	55

Stormwater Planning Report 2022

Stormwater Planning Report
In Response to Permit Section S5C1bi:

Q6. List of Relevant land use planning efforts in Port Orchard:
These documents, code revisions and policies describe the planning efforts the City has implemented in recent years to accommodate growth, stormwater management and transportation needs.
2018 Port Orchard Master Comprehensive Plan
Buildable Lands Report (2021)
Stormwater and Watersheds Comprehensive Plan (final in 2023)
Ruby Creek Subarea Plan (2022)
McCormick Village Subarea Plan (2021)
Sedgewick/Bethel Corridor Plan (2018)
Bethel Subarea Plan (final in 2024)
McCormick Village Overlay District Regulations (2021)
Downtown Subarea Plan/EIS (2021)
Downtown Basin Stormwater Plan (2022)
Housing Action Plan (final in 2023)
Port Orchard Master Comprehensive Plan Updates (final in 2024)
Transportation Concurrency Model updates (final in 2023)
Blackjack Creek Watershed Assessment and Protection and Restoration Plan, Suquamish Tribe, (2017).
Development Agreement for Transportation Improvements, McCormick Woods, rec# 202102190203 (2021)
Code amendments and housekeeping to POMC 20.00 and 15.30 and changed definition of “wetland isolated” to better protect isolated wetlands. Design standard updates, cellular tower standards and regulations were also updated and adopted to reflect changes in growth and development.

Q7. Stormwater capital projects in order of priority in Stormwater and Watersheds Comp Plan:
South Sidney Regional Facility
Johnson Creek Estuary Restoration
Downtown Stormwater Basin Upgrades
South Blackjack Creek Floodplain Restoration
Central Sidney Basin Stormwater Improvements
Annapolis Creek Culvert Replacement
SE Salmonberry Rd, Lower Blackjack Creek Culvert Replacement
Ruby Creek Culvert Replacement
South Blackjack Creek Culvert Removal/Bridge Installation
Anderson Creek Culvert Replacement
All of the projects address stormwater treatment, flow control and/or flood management climate change resiliency. Refer to the Stormwater and Watersheds Comprehensive Plan for 2023 for specific details.

Q8. Watershed Protection measures in Port Orchard:
These documents and policies describe the measures taken by the City to protect receiving waters, watersheds and natural resources in Port Orchard.
Watershed Inventory and Assessment for SMAP (2022)
Stormwater Management Action Plan – Lower Blackjack Creek subbasin (2022)
Puget Sound Steelhead East Kitsap DIP Recovery Plan, Suquamish Tribe, (2020)

Blackjack Creek Watershed Assessment and Protection and Restoration Plan, Suquamish Tribe, (2017)
Rezoning of Blackjack Creek for greenbelt protection, critical areas and shoreline protection (2017)
Downtown Basin Stormwater Plan (2022)
Updating of CIPs for City (2022)

Q9. Were land acquisitions to accommodate growth and serve existing areas identified?
Yes.
Q9a. The City acquired a parcel in the South Sidney Basin for development of a regional stormwater management facility/park/greenspace area and multiple parcels in the Bethel corridor for regional stormwater management.

Q10.
ID corrective actions in addition to Permit
City code meets the criteria in the permit for limits to impervious cover, regional facility planning and minimization of vegetation loss. No additional corrective actions identified.
Q11. Were there updates to goals and policies relating to investment in stormwater management facilities/BMPs?
Yes.
Q11a.
The City's Interdisciplinary Stormwater Planning Team determined in 2020 that the best way to address impacts on water quality from urbanization is to compile a Stormwater and Watersheds Comprehensive Plan (Plan). This Plan will guide City activities relating to stormwater management, habitat protection, water quality, and pollution reduction. In December 2022 a draft Plan was completed. In January 2023 this draft Plan will be distributed via SEPA for state and regional review. The City will adopt the Plan by resolution after the comment period has passed and comments are addressed. When adopted, this Plan will act as a standalone, subsequent document intended to accompany the City's Master Comprehensive Plan.

Q12. Does the long-range plan identify location and capacity of existing stormwater facilities? Does the plan identify any unused capacity in facilities?
Yes, the Plan identified location and capacity of existing facilities, but also identified limited to no additional capacity in existing facilities without retrofits.
Q12a.
No. existing facilities are at or very near capacity. Many of these facilities are older and built to inferior design standards. New facilities are anticipated to accommodate new development. Existing facilities cannot accommodate additional inputs without retrofits.
Q12b.
Yes. Many of the City's older neighborhoods require facility retrofits or construction of larger regional facilities to accommodate climate change and technological advancements in engineering. The first round of prioritized retrofits/regional facilities are identified in the Stormwater and Watersheds Comprehensive Plan. Following versions of this plan will address the remainder of the neighborhoods and urban areas for retrofit.
Q12c.
Yes. The City has identified in the SW Comp Plan critical new locations for regional stormwater treatment and flood management, including the South Sidney regional facility, Central Sidney regional facility, South Blackjack floodplain restoration, etc. Please refer to the plan for specific details regarding these projects.

Q13. Describe how stormwater impacts are forecasted for the City based upon population density and distribution. Explain how/if stormwater management is influencing distribution of growth.
In the planning process for subareas and basins within the City, stormwater is considered in tandem with development. The City's interdisciplinary planning team considers stormwater impacts from growth for each subarea and watershed and incorporates the impacts to these areas from increased addition of impervious area into the subarea layout and subbasin distribution of hard

surfaces. The requirements in the SWMMWW are considered for each subarea and are integrated into any proposed development. These decisions are influenced by the Buildable Lands Report, which is informed by PSRC and KRCC.

Q14. Yes, the City submitted a report before January 1, 2023, but the report we submitted was incomplete and failed to answer each question in Appendix 3 of the permit. This submittal will replace the previous submittal as a final response to the permit requirements.

HERRERA

TECHNICAL MEMORANDUM

Date: March 21, 2022

To: Zack Holt, City of Port Orchard

Copy to: Matt Fontaine, Herrera Environmental Consultants, Inc.

From: Mindy Fohn and Katie Wingrove, Herrera Environmental Consultants, Inc.

Subject: City of Port Orchard Watershed Inventory and Assessment

CONTENTS

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APPENDICES

TABLES

FIGURES

BACKGROUND

The purpose of this technical memorandum is to document the process used to prepare a receiving water conditions assessment and identify candidate watersheds for prioritization for the City of Port Orchard (City). This is a requirement of S5.C.1.d.i of the Western Washington Phase II National Pollutant Discharge Elimination System Municipal Stormwater Permit (NPDES Phase II permit). The approach taken to complete this inventory and preliminary assessment generally follows Ecology's Stormwater Management Action Plan (SMAP) guidance (Ecology 2019) with modifications that reflect the specific needs of the City, water resources and the landscape.

The receiving water conditions assessment presents the watershed inventory for three major categories:

1. Watershed Delineation and Jurisdiction Control
2. Receiving Water Conditions and Water Resource Uses
3. Stormwater Management Influence

Watershed metrics are described, and selected metrics are used for assessment. The assessment identifies candidate watersheds to carry forward to SMAP prioritization.

Appendix A is the Detailed Watershed Inventory. Appendix B is the Nearshore and Salmonid Habitat Conditions Life History Support Methodology and Results.

This technical memorandum along with Appendix A Excel file, will be submitted to Ecology with the City's annual report on March 31, 2022, as required by the NPDES Phase II permit.

WATERSHED INVENTORY

Watershed Delineation and Jurisdiction Control

The number of watersheds delineated is dependent upon the scale used and needs appropriate for supporting the inventory and planning effort. Ecology's Stormwater Management Action Plan (SMAP) guidance (Ecology 2019) recommends a scale of 1 to 20 square miles. The City's watersheds were delineated by receiving waters and the basin boundaries adjusted as described below, and watershed jurisdiction control was calculated.

Receiving waters were identified upon review of available stream and water body mapping from the National Hydrography Dataset (NHD), Department of Natural Resources (DNR) mapping, and Wild Fish Conservancy (WFC) web tool. To maintain available stream type designations, the DNR stream layer was used as the base layer for receiving water identification. In the Lower

Blackjack watershed more detailed WFC mapping was used to supplement the DNR mapping to improve accuracy of stream alignment. In areas where stream names were missing from the GIS data, City staff supplied historical information to assign names.

A topographic basin delineation was provided by the City in feature class format (file name: Water_Shed_by_Creek) and used to identify watersheds containing lands located entirely or partly within the city limits.

A high-level review of watershed boundaries was conducted to adjust boundaries where warranted based on the City's stormwater infrastructure, contour data, and discussions with City staff. As a result, some watershed boundaries were adjusted:

- The City's shoreline areas, which are flow-control exempt and discharge directly to Sinclair Inlet, were excluded from the original topographic stream watersheds. These areas were reviewed individually and folded into adjacent stream watersheds based on topography and stormwater infrastructure.

- The Downtown-County Campus watershed was subdivided from the Johnson Creek watershed to coordinate with the ongoing analysis and planning study for the downtown area.

- The Blackjack Creek watershed was subdivided into five subbasins to align with the "Blackjack Creek Restoration Plan" (Lower Blackjack, Middle Blackjack, Upper Blackjack, Ruby Creek, and Square Creek).

- Minor topographic adjustments based on City contours (applies to several watersheds)

Table 1 lists the 18 watersheds. Detailed information regarding each watershed is provided in Table A-1 of Appendix A.

Seven of the eighteen watersheds are less than the 1 square mile recommended size for SMAP evaluation: Annapolis Creek, Johnson Creek, Sacco/Sullivan Creek, Downtown-County Campus, Melcher Creek, Caseco Creek, and Stream 270.

Table 1. City of Port Orchard Watersheds, Area and Receiving Waters.

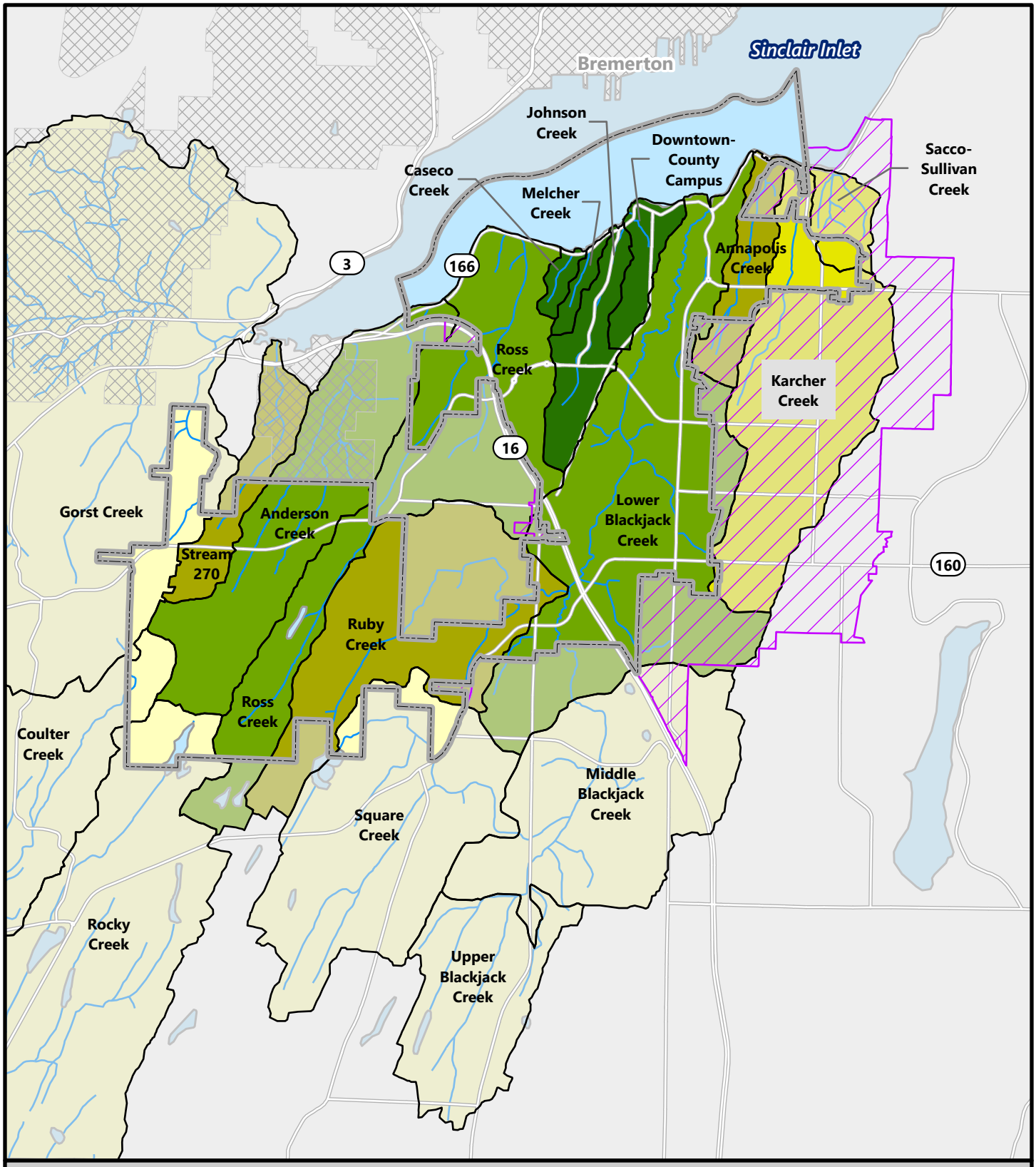
Watershed Name	Area (square miles)	Receiving Waters
Annapolis Creek	0.50	Annapolis Creek, Sinclair Inlet
Johnson Creek	0.51	Johnson Creek, Sinclair Inlet
Karcher Creek	2.24	Karcher Creek, Sinclair Inlet
Ross Creek	2.75	Ross Creek, PO_Strm2, Sinclair Inlet
Anderson Creek (Gorst)	2.01	Anderson Creek, Sinclair Inlet
Lower Blackjack	3.87	Lower Blackjack Creek, Silver Creek, Sinclair Inlet
Middle Blackjack	2.46	Middle Blackjack Creek, Lower Blackjack Creek, Sinclair Inlet
Upper Blackjack	1.33	Upper Blackjack Creek, Middle Blackjack Creek, Lower Blackjack Creek, Sinclair Inlet
Ruby Creek	2.20	Ruby Creek, Blackjack Creek, Lower Blackjack Creek, Sinclair Inlet
Square Creek	2.64	Square Creek, Ruby Creek, Lower Blackjack Creek, Sinclair Inlet
Coulter Creek	13.11	Coulter Creek, North Bay
Rocky Creek	18.32	Rocky Creek, Rocky Bay
Gorst Creek (Parish Creek in City portion)	9.58	Parish Creek, Gorst Creek, Sinclair Inlet
Sacco/Sullivan Creek	0.29	Sullivan Creek, Sinclair Inlet
Downtown-County Campus	0.28	PO_Strm1, Sinclair Inlet
Melcher Creek	0.10	Melcher, Creek, Sinclair Inlet
Caseco Creek	0.09	Caseco Creek, Sinclair Inlet
Stream 270	0.56	Stream 270, Sinclair Inlet

Watersheds extend beyond the city limits, and therefore multiple jurisdictions may have influence over the watershed. Other jurisdictions with influence over the City's watersheds include the City of Bremerton, unincorporated Kitsap County, Mason County, and Pierce County (Figure 1). No areas from Mason or Pierce Counties would be annexed by the City, so these counties are not included in the watershed calculations. In Table 2, watershed areas are expressed as percentage of basin within the different jurisdictions. Additionally, a separate basin calculation was performed including Urban Growth Areas (UGAs) that could be annexed into the City. The calculations estimate the potential future percentage of City control of these areas. The City currently has 30 percent or greater control in Annapolis Creek, Johnson Creek, Ross Creek, Anderson Creek, Lower Blackjack, Ruby Creek, Downtown-County Campus, Melcher Creek, Caseco Creek, and Stream 270.

Jurisdictional control by the City is increased substantially (see far right column in Table 2, Percent City + UGA) in the following watersheds if annexation is completed: Annapolis Creek, Karcher Creek, and Sacco/Sullivan Creek.

Table 2. Percent of Watershed in Key Jurisdictions and Within UGA.

Watershed Name	Percent City	Percent City UGA	Percent Kitsap County	Percent City of Bremerton	Percent City + UGA
Annapolis Creek	54.6%	45.4%	0.0%	0.0%	100.0%
Johnson Creek	100.0%	0.0%	0.0%	0.0%	100.0%
Karcher Creek	11.4%	88.6%	0.0%	0.0%	100.0%
Ross Creek	64.7%	1.7%	33.6%	0.0%	66.4%
Anderson Creek (Gorst)	59.4%	0.4%	18.0%	22.1%	59.9%
Lower Blackjack	67.9%	18.7%	13.4%	0.0%	86.6%
Middle Blackjack	0.0%	5.8%	94.2%	0.0%	5.8%
Upper Blackjack	0.0%	0.0%	100.0%	0.0%	0.0%
Ruby Creek	53.5%	1.0%	45.5%	0.0%	54.5%
Square Creek	7.4%	0.002%	92.6%	0.0%	7.4%
Coulter Creek	1.2%	0.0%	86.0%	12.8%	1.2%
Rocky Creek	1.3%	0.0%	98.7%	0.0%	1.3%
Gorst Creek (Parish Creek in City portion)	5.0%	0.0%	36.7%	58.3%	5.0%
Sacco/Sullivan Creek	21.8%	78.2%	0.0%	0.0%	100.0%
Downtown-County Campus	100.0%	0.0%	0.0%	0.0%	100.0%
Melcher Creek	100.0%	0.0%	0.0%	0.0%	100.0%
Caseco Creek	100.0%	0.0%	0.0%	0.0%	100.0%
Stream 270	44.9%	0.0%	20.7%	34.4%	44.9%



Legend

- Port Orchard City Limits
- Port Orchard UGA
- Watersheds
- Bremerton
- Waterbodies
- Streams
- Roads

Percent PO Control

- 0% - 10%
- >10% - 30%
- >30% - 55%
- >55% - 75%
- >75% - 100%

Figure 1.
City of Port Orchard Watersheds and Jurisdiction Control.

N

0 0.5 1 2 Miles

HERRERA

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Receiving Water Conditions and Water Resource Uses

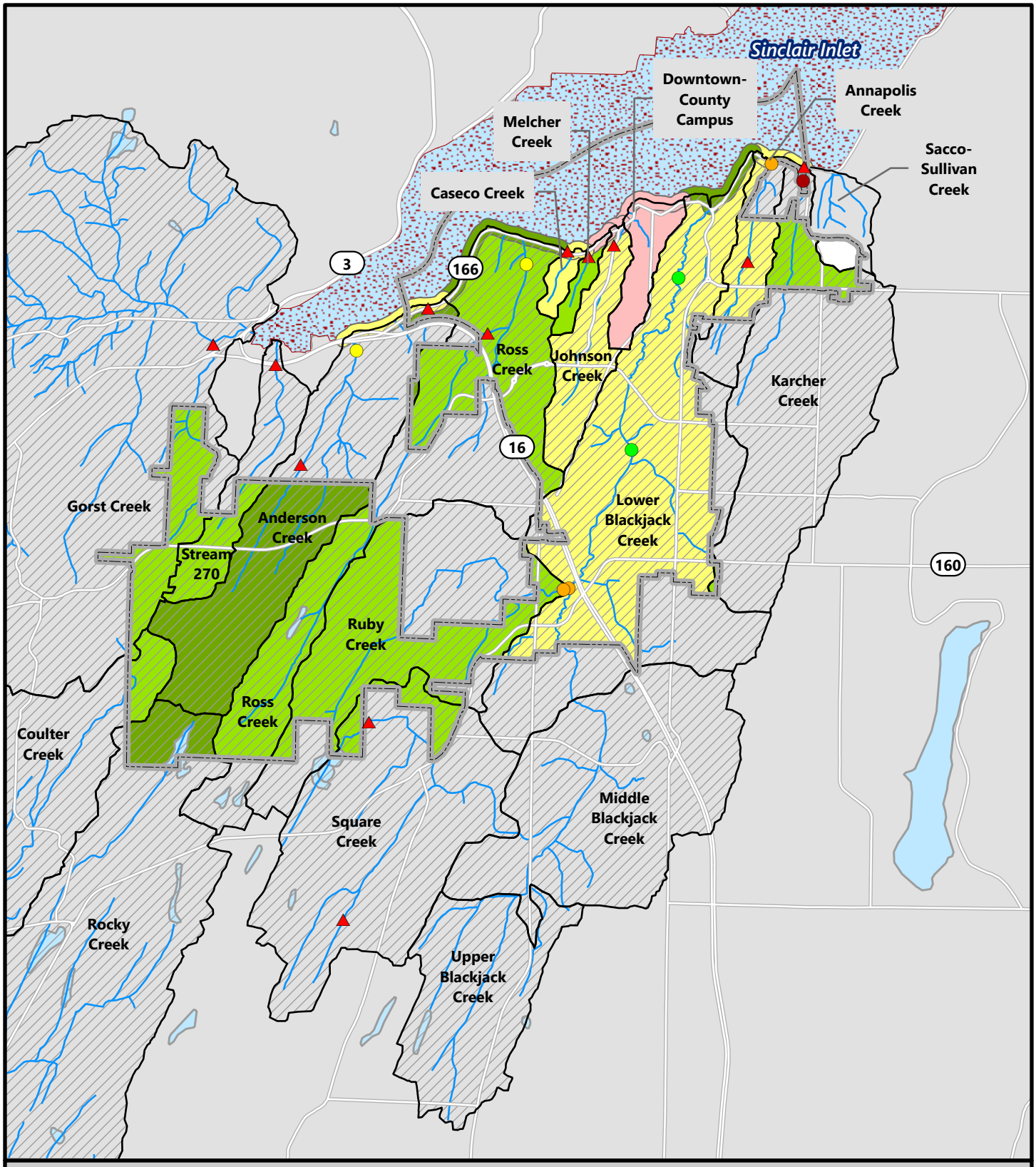
Water quality, habitat conditions, and water resource uses were inventoried. City watersheds are categorized as either freshwater streams only, or a combination of freshwater streams and nearshore marine areas. The six watersheds categorized as freshwater streams only are: Middle Blackjack, Ruby Creek, Upper Blackjack, Coulter Creek, and Rocky Creek. The remaining 12 watersheds have a nearshore marine component. One challenge during SMAP prioritization will be balancing scoring and ranking criteria between these two different watershed types.

Not all watersheds have water quality data; therefore, a balanced and non-biased approach for criteria, scoring, and ranking will be considered during the prioritization phase of SMAP. Water quality data was available for benthic index of biotic integrity (B-IBI) for 10 of 18 watersheds, nearshore bacteria marine water quality for 11 of 12 watersheds that have a marine component, stream bacteria water quality for 8 of 18 watersheds, and 303(d) listed waters were present in 8 of 18 watersheds.

Due to the extensive use of City watersheds by salmonids, a detailed assessment of marine nearshore and freshwater system habitat conditions was conducted and is summarized in Appendix B. Current habitat conditions were assessed using existing data and only for areas within city limits. For freshwater stream systems, rearing, spawning, migration, and refuge/riparian function were each scored separately. For both marine nearshore and freshwater system scores, the higher the points, the better condition of habitat.

City water resource uses by people and wildlife vary from nearshore marine areas to upland freshwater streams. Water resource use characterization metrics included forage fish and shoreline habitat, marine nearshore pocket estuary habitat, public recreation, salmonids, and shellfish. Shellfish harvest is not an identified use in any of the nearshore marine watersheds since they are closed to harvest due to the presence of multiple wastewater treatment plant outfalls.

Figure 2 shows results for selected water conditions and water resource use metrics: B-IBI score, shellfish closure zones, first total fish passage barrier, ESA listed species presence, salmonid refuge-riparian habitat rating by watershed, and marine nearshore habitat rating. Results, data sources, and notes are shown in Table A-2 of Appendix A.



Legend

- Port Orchard City Limits
- Watersheds
- Waterbodies
- Shellfish Harvest Closure Zone (WSDOH)
- Presence of ESA listed salmon habitat
- First Total Fish Passage Barrier
- Streams
- Roads

Refuge-Riparian Rating

- 0 - 0.1 (poor)
- >0.1 - 0.4 (moderate)
- >0.4 - 0.75 (good)
- >0.75 - 1 (excellent)

Nearshore Rating

- 0 - 1 (poor)
- >1 - 5 (moderate)
- >5 - 10 (good)
- >10 (excellent)

B-IBI Samples

- Very Poor
- Poor
- Fair
- Good

Figure 2.
Selected Metrics of Water Conditions and Water Resource Uses.

N

0 0.5 1 2 Miles

HERRERA

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Stormwater Management Influence

Metrics describing the City MS4 (municipal separate storm sewer system) impacts to marine nearshore and freshwater ecosystems were developed. Also, metrics describing equity related to overburdened communities were developed. Detailed data sources, results, and notes included in Tables A-3 and A-4 of Appendix A.

Metrics specific to marine nearshore ecosystems are percent flow control exempt areas and number of outfalls to marine shoreline. Metrics specific to stream ecosystems are percent impervious surface, road density, fish passage barriers, feet of stream to first full barrier, percent impervious in riparian zone, and number of outfalls to streams.

Future growth was considered in the assessment. Two metrics assess future growth: percent of basin area with vacant/partially utilized/underutilized lands, and percent of basin area with projected population growth.

Five equity metrics were calculated: combined environmental health disparities rank, environmental exposures, environmental effects, socioeconomic factors, and sensitive populations. The results will be incorporated into the criteria, scoring, and ranking prioritization process.

Selected metrics were evaluated for stormwater management influence during this initial SMAP inventory phase, while others will be utilized during SMAP prioritization. Summarizing key metrics shows that 12 of the 18 watersheds contribute high or moderate stormwater impacts to nearshore and/or stream receiving waters from the City MS4 (Table 3). Impacts of City stormwater and infrastructure include contribution of pollutants, uncontrolled flows, and fragmented stream habitat. Six watersheds have low or no levels of City MS4 outfalls to surface waters. Detailed data sources, results, and notes are in Table A-3 of Appendix A.

Table 3. Selected Metrics for City Stormwater Influence on Receiving Waters.

Watershed	Percent Impervious Area	Road Crossings Per Stream Mile	Outfalls to Stream	Outfalls to Marine	Level of Stormwater Impact
Annapolis Creek	30.1%	5.3	1	4	High
Johnson Creek	28.8%	9.5	2	2	High
Karcher Creek	27.7%	3.7	3	0	High
Ross Creek	13.3%	2.1	10	13	Moderate
Anderson Creek (Gorst)	8.9%	3.7	4	5	Moderate
Lower Blackjack	22.3%	1.9	10	12	Moderate
Ruby Creek	5.3%	1.1	6	Not applicable	Moderate
Sacco/Sullivan Creek	18.1%	1.2	0	0	High
Downtown-County Campus	50.2%	8.8	0	10	High
Melcher Creek	12.2%	4.4	0	3	Moderate

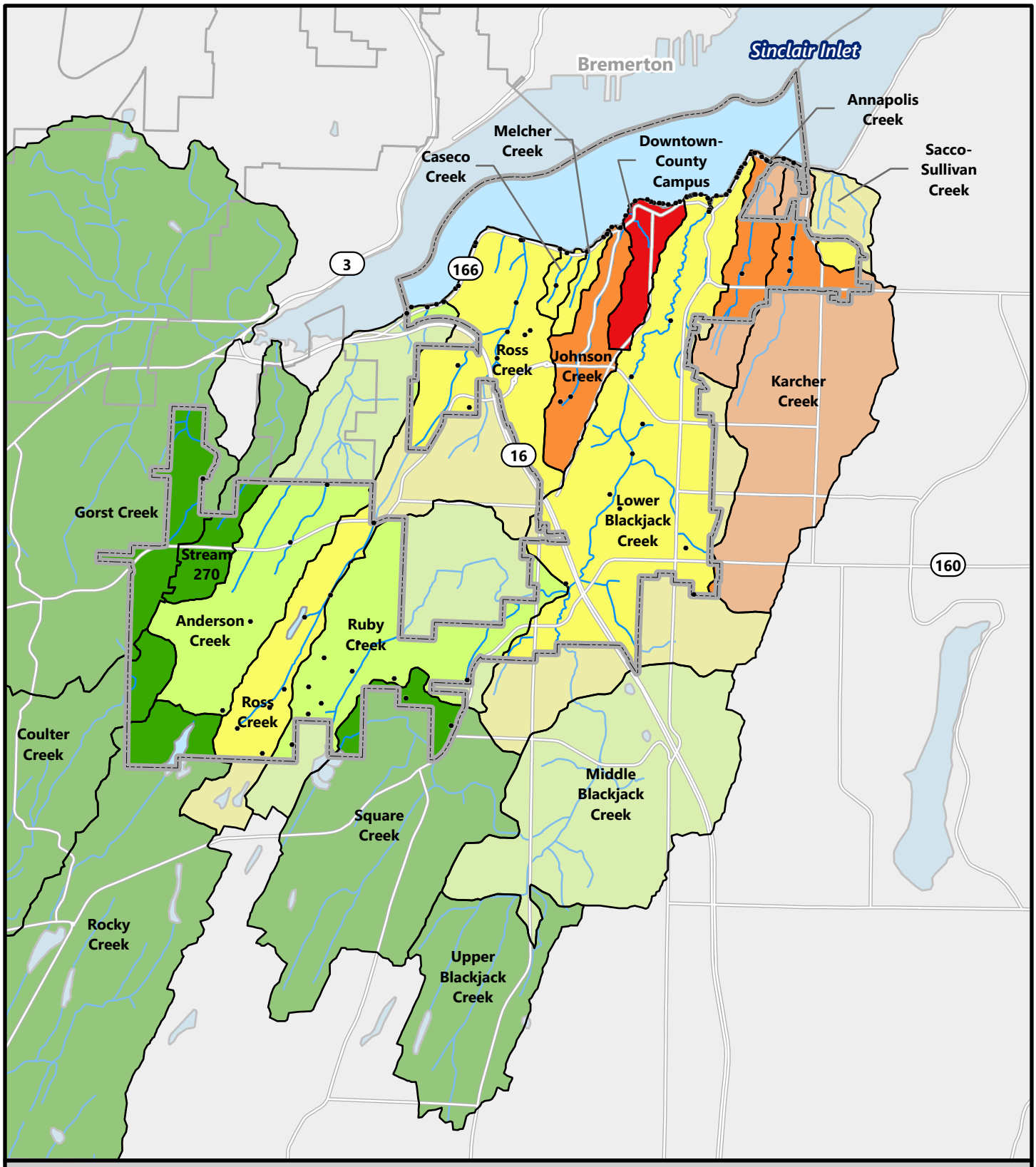
Table 3 (continued). Selected Metrics for City Stormwater Influence on Receiving Waters.

Watershed	Percent Impervious Area	Road Crossings Per Stream Mile	Outfalls to Stream	Outfalls to Marine	Level of Stormwater Impact
Caseco Creek	11.9%	4.7	1	1	Moderate
Stream 270	44.9%	1.1	0	Not applicable	Moderate
Middle Blackjack	9.2%	0.7	0	Not applicable	Low
Upper Blackjack	3.8%	1.6	0	Not applicable	Low
Square Creek	3.6%	1.2	1	Not applicable	Low
Coulter Creek	0.4%	0.3	0	Not applicable	Low
Rocky Creek	1.7%	0.6	0	Not applicable	Low
Gorst Creek	4.1%	1.2	1	Not applicable	Low

Watersheds with 5 percent or less current or future potential City jurisdictional control are also designated as "low stormwater management influence." Watersheds with 5 percent or less City jurisdictional control are Middle Blackjack, Upper Blackjack, Square Creek, Coulter Creek, Rocky Creek, and Gorst Creek. These six watersheds will not be considered for further analysis.

A summary of major stormwater impacts, potential restoration/protection goals, potential management actions, and existing plans or projects were inventoried. Existing projects or plans are present in 7 of the 12 candidate watersheds: Annapolis Creek, Johnson Creek, Ross Creek, Anderson Creek, Lower Blackjack, Ruby Creek, and Downtown-County Campus. The inventory and assessment results are in Table A-5 of Appendix A.

Figure 3 shows results from three key metrics used for stormwater influence: percent watershed impervious and stream and marine city stormwater outfalls.



Legend

- MS4 Outfalls to Stream, Lake, Wetland or Marine Shoreline
- Port Orchard (PO) City Limits
- Watersheds
- Bremerton
- Waterbodies
- Streams
- Roads

Total Watershed Percentage Impervious Surface Area

- 0% - 5%
- >5% - 10%
- >10% - 25%
- >25% - 50%
- >50% - 100%

Figure 3.
Selected Metrics of Stormwater Influence.

N

0 0.5 1 2 Miles

HERRERA

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CANDIDATE WATERSHEDS FOR PRIORITIZATION

Twelve of the eighteen watersheds will be moved forward for SMAP prioritization. Key characteristics of the watersheds retained for the prioritization phase along with a description of current storm and stream improvement projects from the City draft Capital Stormwater Improvements Project list are provided below.

Anderson Creek

Summary: Anderson Creek watershed is 2.01 square miles (1,285 acres); 59 percent of the basin is located within the city limits. The watershed is 9 percent impervious surface; that includes 6 percent impervious surface in the riparian zone. The watershed has 59 linear feet (lf) of roads per acre. Documented aquatic species habitat is present for coho, fall chum, winter steelhead, and resident trout. No habitat is present for forage fish in the marine shoreline area of this watershed. There are 4.1 fish passage barriers per stream mile. The City MS4 includes four outfalls to the stream and five outfalls to the marine shoreline.

Projects: Potential projects are the Anderson Creek Culvert Retrofits and McCormick Woods Drive Culvert Barrier Replacement.

Annapolis Creek

Summary: Annapolis Creek watershed is 0.50 square mile (318 acres), and 55 percent of the basin is located within the city limits. The watershed is 30 percent impervious surface; that includes 20 percent impervious surfaces in the riparian zone. The watershed has 59 lf of roads per acre. Documented aquatic species habitat is present for coho, fall chum, and resident trout. No habitat is identified for forage fish in the marine shoreline area of this watershed. There are 4.9 fish passage barriers per stream mile. The City MS4 includes one outfall to the stream and four outfalls to the marine shoreline.

Projects: One potential project is the Annapolis Creek Culvert Replacement.

Downtown-County Campus

Summary: Downtown County Campus watershed is 0.28 square mile (178 acres); 100 percent of the basin is located within the city limits. The watershed is 50 percent impervious surface; that includes 56 percent impervious surfaces in the riparian zone. The watershed has 201 lf of roads per acre. There are no documented salmonid or forage fish species habitat. There are no fish passage barriers. The City MS4 has no outfalls to the stream and 10 outfalls to the marine shoreline.

Projects: Potential projects are the Central Sidney Stormwater Improvements and Downtown Basin Stormwater Upgrades.

Johnson Creek

Summary: Johnson Creek watershed is 0.51 square mile (326 acres); 100 percent of the basin is located within the city limits. The watershed is 29 percent impervious surface; that includes 19 percent impervious surface in the riparian zone. The watershed has 111 lf of roads per acre. Documented aquatic species habitat is present for resident trout, and surf smelt. There are 12.3 fish passage barriers per stream mile. The City MS4 has two outfalls to the stream and two outfalls to the marine shoreline.

Projects: Potential projects are the Johnson Creek Stream Realignment and Johnson Creek Estuary Restoration.

Karcher Creek

Summary: Karcher Creek watershed is 2.24 square miles (1,433 acres); 11 percent of the basin is located within the city limits. If all UGA is annexed, City control would increase to 100 percent of the watershed area. The watershed is 28 percent impervious surface; that includes 13 percent impervious surface in the riparian zone. The watershed has 107 lf of roads per acre. Documented aquatic species habitat is present for coho, resident trout, fall chum, sand lance, and surf smelt. There are 3.7 fish passage barriers per stream mile. The City MS4 has three outfalls to the stream and no outfalls to the marine shoreline.

Projects: No projects are currently identified in the Karcher Creek watershed.

Lower Blackjack

Summary: Lower Blackjack Creek watershed is 3.87 square miles (2,479 acres); 68 percent of the basin located within the city limits. If all UGA is annexed, City control would increase to 88 percent of the watershed area. The watershed is 22 percent impervious surface; that includes 15 percent impervious surfaces in the riparian zone. The watershed has 81 lf of roads per acre. Documented aquatic species habitat is present for coho, fall chum, winter steelhead, resident trout, fall Chinook, summer chum, sand lance, and surf smelt. There are 2.0 fish passage barriers per stream mile. The City MS4 has 10 outfalls to the stream and 12 outfalls to the marine shoreline.

Projects: Potential projects and plans are the South East Salmonberry Road Lower Blackjack Creek Culvert Replacement, Blackjack Creek Floodplain Restoration and Stormwater Management Plan, Port Orchard East Shoreline Acquisition and Easement Right, Rockwell Area Stormwater Improvements, Silver Creek Rehabilitation, South Blackjack Creek Culvert Removal and Bridge Installation, Blackjack Creek Storm Outfall Assessment and Retrofit Analysis, South Sidney Regional Facility, and Westbay Stormwater Improvements.

Ross Creek

Summary: Ross Creek watershed is 2.75 square miles (1,759 acres); 59 percent of the basin is located within the city limits. The watershed is 13 percent impervious surface; that includes 10 percent impervious surfaces in the riparian zone. The watershed has 66 lf of roads per acre. Documented aquatic species habitat is present for coho, fall chum, winter steelhead, resident trout, sand lance, and surf smelt. There are 3.6 fish passage barriers per stream mile. The City MS4 has 10 outfalls to the stream and 13 outfalls to the marine shoreline.

Projects: Potential projects are Ross Creek Beaver Dam Analogs Installation and Ross Creek Estuary Restoration and Beach Recreation Area.

Ruby Creek

Summary: Ruby Creek watershed flows into Lower Blackjack watershed and is 2.20 square miles (1,405 acres); 54 percent of the basin is located within the city limits. The watershed is 5 percent impervious surface; that includes 6 percent impervious surfaces in the riparian zone. The watershed has 41 lf of roads per acre. Documented aquatic species habitat is present for coho, fall chum, resident trout, and summer chum. There are 9.2 fish passage barriers per stream mile. The City MS4 has six outfalls to the stream and no marine nearshore area.

Projects: One potential project is the Glenwood Road Ruby Creek Culvert Replacement.

Sacco/Sullivan Creek

Summary: Sacco/Sullivan Creek watershed is 0.29 square mile (186 acres); 22 percent of the basin is located within the city limits. If all UGA is annexed, City control would increase to 100 percent of the watershed area. The watershed is 18 percent impervious surface; that includes 4 percent impervious surfaces in the riparian zone. The watershed has 92 lf of roads per acre. Documented aquatic species habitat is present for resident trout, fall chum, and surf smelt. There are no fish passage barriers. The City MS4 has no outfalls to the stream or marine shoreline.

Projects: No projects have been identified in the Sacco/Sullivan Creek watershed.

Stream 270

Summary: Stream 270 watershed is 0.56 square mile (361 acres); 45 percent of the basin is located within the city limits. The watershed is 3 percent impervious surface; that includes 4 percent impervious surfaces in the riparian zone. The watershed has 35 lf of roads per acre. Documented aquatic species habitat is present for coho, fall chum, and resident trout. There are 3.0 fish passage barriers. The City MS4 has no outfalls to the stream or marine shoreline.

Projects: No projects have been identified in the Stream 270 watershed.

SUMMARY

All watersheds were characterized for basin size, jurisdictional control, water conditions, water resource uses, stormwater management influence, future growth, and equity. Watersheds were assessed for major stormwater impacts, potential management actions, and existing plans or projects documented. All inventory results, data sources, and notes are in Appendix A, Tables A-1 through A-5.

Table 4 summarizes watershed level of stormwater influence and rationale for either retaining for SMAP prioritization and or setting aside from the prioritization process.

Table 4. Stormwater Management Influence and Candidate Watersheds for Prioritization.

Watershed	Level of Stormwater Influence	Rationale for Retaining or Setting Aside for Prioritization	Result
Downtown-County Campus	High	50 percent watershed impervious surface, highest riparian impervious (56 percent)	Retain for prioritization
Annapolis Creek	High	30 percent watershed impervious, second highest riparian impervious (20 percent), increased City control if annexation occurs	
Johnson Creek	High	29 percent watershed impervious, highest stream barriers per mile (12.3)	
Karcher Creek	High	28 percent watershed impervious, increased City control if annexation occurs	
Sacco/Sullivan Creek	High	18 percent watershed impervious surface, increased City control if annexation occurs	
Ross Creek	Moderate	13 percent watershed impervious surface	
Melcher Creek	Moderate	12 percent watershed impervious surface	
Caseco Creek	Moderate	12 percent watershed impervious surface	
Lower Blackjack	Moderate	11 percent watershed impervious surface	
Anderson Creek (Gorst)	Moderate	9 percent watershed impervious surface	
Ruby Creek	Moderate	5 percent watershed impervious surface,	
Stream 270	Moderate	3 percent watershed impervious surface	
Gorst Creek	Low	5 percent City control	Set aside from prioritization process
Square Creek	Low	4 percent City control	
Rocky Creek	Low	1 percent City control	
Coulter Creek	Low	1 percent City control	
Upper Blackjack	Low	0 percent City control	
Middle Blackjack	Low	0 percent City control	

The next steps are to conduct the SMAP prioritization phase. Candidate watersheds will be further evaluated following the Ecology Guidance.

REFERENCES

Ecology. 2019. Stormwater Management Action Planning Guidance. Washington Department of Ecology-Water Quality Program. Publication Number 19-10-010.

ESA. 2017. Blackjack Creek Watershed Restoration Assessment and Protection and Restoration Plan. Prepared for Suquamish Tribe and Washington Department of Ecology, by ESA Consultants, Seattle, Washington.

APPENDIX A

Detailed Watershed Inventory

Table A-1. Delineate Basins and Identify Receiving Waters.

Metric Name	Basin Identification	Basin Area		Receiving Waters			Basin Jurisdiction Control					
	Basin	AREA (SQ MI)	AREA (Acres)	Streams	Lakes	Marine	% In City	% Outside City only	% in City UGA	% Kitsap County	% City of Bremerton	% in City Jurisdiction + Port Orchard UGA
	Annapolis Creek	0.50	318	Annapolis Creek	None	Sinclair Inlet	54.6%	45.4%	45.4%	0.0%	0.0%	100.0%
	Johnson Creek	0.51	326	Johnson Creek	None	Sinclair Inlet	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	Karcher Creek	2.24	1,433	Karcher Creek	None	Sinclair Inlet	11.4%	88.6%	88.6%	0.0%	0.0%	100.0%
	Ross Creek	2.75	1,759	Ross Creek, PO_Strm2	Berry Lakes, Nels Johnson Lakes, North Lake	Sinclair Inlet	64.7%	35.3%	1.7%	33.6%	0.0%	66.4%
	Anderson Creek (Gorst)	2.01	1,285	Anderson Creek	None	Sinclair Inlet	59.4%	40.6%	0.4%	18.0%	22.1%	59.9%
	Blackjack Creek all subwatersheds [1]	12.51	8,005	Blackjack Creek, Silver Creek	None	Sinclair Inlet	32.0%	68.0%	7.1%	60.9%	0.0%	39.1%
	Lower Blackjack	3.87	2,479	Lower Blackjack Creek, Silver Creek	None	Sinclair Inlet	67.9%	32.1%	18.7%	13.4%	0.0%	86.6%
	Middle Blackjack	2.46	1,576	Middle Blackjack Creek	Deep Lake	Not applicable	0.0%	100.0%	5.8%	94.2%	0.0%	5.8%
	Upper Blackjack	1.33	854	Upper Blackjack Creek	None	Not applicable	0.0%	100.0%	0.0%	100.0%	0.0%	0.0%
	Ruby Creek	2.20	1,405	Ruby Creek (Blackjack Creek)	Honey Lake, Square Lake; wetland complex with outfalls	Not applicable	53.5%	46.5%	1.0%	45.5%	0.0%	54.5%
	Square Creek	2.64	1,691	Square Creek (Blackjack Creek)	Matthews Lake, Square Lake	Not applicable	7.4%	92.6%	0.002%	92.6%	0.0%	7.4%
	Coulter Creek	13.11	8,388	Coulter Creek	Kriegler Lake	North Bay	1.2%	98.8%	0.0%	86.0%	12.8%	1.2%
	Rocky Creek	18.32	11,727	Rocky Creek	Bear Lake, Carney Lake, Fairview Lake, Helena Lake, Hidden Lake, Lake Koeneman, Sailor Lake, Wye Lake	Rocky Bay	1.3%	98.7%	0.0%	98.7%	0.0%	1.3%
	Gorst Creek (Parish in City portion)	9.58	6,133	Gorst Creek, Parish Creek, Heins Creek	Heins Lake, Jarstad Lake, Twin Lakes	Sinclair Inlet	5.0%	95.0%	0.0%	36.7%	58.3%	5.0%
	Sacco/Sullivan Creek	0.29	186	Sullivan Creek	None	Sinclair Inlet	21.8%	78.2%	78.2%	0.0%	0.0%	100.0%
	Downtown-County Campus	0.28	178	PO_Strm1	None	Sinclair Inlet	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	Melcher Creek	0.10	61	Melcher Creek	None	Sinclair Inlet	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	Caseco Creek	0.09	56	Caseco Creek	None	Sinclair Inlet	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	Stream 270	0.56	361	Strm270	None	Sinclair Inlet	44.9%	55.1%	0.0%	20.7%	34.4%	44.9%
Data Availability: City or Basin-wide?	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide	Basin wide

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	Table A-1. Delineate Basins and Identify Receiving Waters.											
	Basin Identification	**Basin Area**		**Receiving Waters**			**Basin Jurisdiction Control**					
Metric Name	**Basin**	**AREA (SQ MI)**	**AREA (Acres)**	**Streams**	**Lakes**	**Marine**	**% In City**	**% Outside City only**	**% in City UGA**	**% Kitsap County**	**% City of Bremerton**	**% in City Jurisdiction + Port Orchard UGA**
Data Sources	Compiled from DNR stream layer, supplemented with Wild Fish Conservancy (WFC) water typing data for Blackjack Watershed	GIS Calculation	GIS Calculation	Department of Natural Resources (DNR) stream layer and National Hydrography Dataset (NHD), supplemented with Wild Fish Conservancy (WFC) alignment and water typing for Lower Blackjack Basin	GIS (NHD layer)	GIS, Documents	"CityUGA2019Updated" layer from the Washington State Geospatial Open Data Portal					
Other Notes	1-20 square miles size recommended in Ecology Guidance. [1]Blackjack Creek watershed is subdivided into 5 subwatersheds. Common name, create name if no name, or use stream number						Exclude UGA Exclude County Exclude tribal lands; U&A lands Exclude federal lands		UGA Only, exclude City, county, tribal, federal	Includes other unincorporated UGAs (Bremerton, Belfair, Gorst, South Kitsap)		

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Table A-2. Assess Receiving Water Conditions.

Metric	Water Quality Conditions					Habitat Conditions				
	Stream Bacteria Quality	Nearshore Bacteria Marine Water Quality	Benthic Index of Biotic Integrity (B-IBI)		303(d) Listing – Water	Nearshore Marine Habitat Conditions	Salmonid Habitat – Life History Support			
	Result/Creek	Result/Station Identification	Result	Year(s) of Data Used	Parameter	Relative Acre Points Based on HEA Rapid Assessment	Rearing	Spawning	Migration	Refuge and Riparian Function
Annapolis Creek	Meets Part 1 and 2/ Annapolis Creek	Meets Part 1 and 2/ SN22	34	2003	Dissolved oxygen	4.2	0.67	1.00	0.26	0.27
Johnson Creek	No data	Meets Part 1 and Fails Part 2/ SN23	No data	Not applicable	No 303(d) Cat 5 Listing	0.2	0.73	0.97	0.03	0.34
Karcher Creek	Meets Part 1 and 2/ Karcher Creek	Meets Part 1 and Fails Part 2/ SN13	No data	Not applicable	No 303(d) Cat 5 Listing	2.4	1.00	1.00	Total barrier at mouth	0.42
Ross Creek	Meets Part 1 and 2/ Ross Creek	Meets Part 1 and 2/ SN24	49	2003	Dissolved oxygen	20.6	0.67	0.67	0.64	0.53
Anderson Creek (Gorst)	Meets Part 1 and 2/ Anderson Creek	Meets Part 1 and Fails Part 2/ SN05	58	Average 2017–2019	No 303(d) Cat 5 Listing	1.2	1.00	0.97	0.98	0.77
Lower Blackjack	Meets Part 1 and 2/ Blackjack Creek	Meets Part 1 and 2/ SN12	63	Average 2017–2019	Dissolved oxygen	Not applicable	0.88	1.00	2.31	0.38
Middle Blackjack	No data	Not applicable	61	Average 2017–2019	Dissolved oxygen	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Upper Blackjack	No data	Not applicable	No data	Not applicable	Dissolved oxygen	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Ruby Creek	No data	Not applicable	No data	Not applicable	Dissolved oxygen	Not applicable	0.15	0.67	0.83	0.53
Square Creek	No data	Not applicable	82	Average 2017–2019	No 303(d) Cat 5 Listing	Not applicable	0.17	1.00	0.39	0.69
Coulter Creek	Meets Part 1 and 2/ Coulter Creek	Not applicable	49	2003	Dissolved oxygen, pH	Not applicable	1.00	1.00	0.20	0.50
Rocky Creek	No data	Not applicable	74	2019	No 303(d) Cat 5 Listing	Not applicable	0.00	1.00	0.39	0.77
Gorst Creek	Meets Parts 1, Fails Part 2/ Gorst Creek	Meets Part 1 and Fails Part 2/ SN05	73	Average 2017–2019	Dissolved oxygen	Not applicable	0.81	0.95	0.62	0.46
Sacco/Sullivan Creek	Meets Part 1 and 2/ Sacco/Sullivan Creek	Meets Part 1 and 2/ SN15	10	2003	No 303(d) Cat 5 Listing	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

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	Table A-2. Assess Receiving Water Conditions.									
	Water Quality Conditions					**Habitat Conditions**				
Metric	**Stream Bacteria Quality**	**Nearshore Bacteria Marine Water Quality**	**Benthic Index of Biotic Integrity (B-IBI)**		**303(d) Listing – Water**	**Nearshore Marine Habitat Conditions**	**Salmonid Habitat – Life History Support**			
	Result/Creek	**Result/Station Identification**	**Result**	**Year(s) of Data Used**	**Parameter**	**Relative Acre Points Based on HEA Rapid Assessment**	**Rearing**	**Spawning**	**Migration**	**Refuge and Riparian Function**
Downtown-County Campus	No data	No data	No data	Not applicable	No 303(d) Cat 5 Listing	0.7	No data	No data	Total barrier at mouth	0.05
Melcher Creek	No data	Meets Part 1 and 2/ SN10	No data	Not applicable	No 303(d) Cat 5 Listing	0.3	1	1	0.02	0.45
Caseco Creek	No data	Meets Part 1 and 2/ SN10	No data	Not applicable	No 303(d) Cat 5 Listing	1.5	0.22	0.67	Total barrier at mouth	0.38
Strm270	No data	Meets Part 1 and Fails Part 2/ SN05	No data	Not applicable	No 303(d) Cat 5 Listing	Not applicable	1	0.67	0.32	0.50
GIS or Document Review, Other	**Document**	Document	Puget Sound Benthos Database	Puget Sound Benthos Database	Ecology Database	See Appendix B Methods and Results	See Appendix B Methods and Results	See Appendix B Methods and Results	See Appendix B Methods and Results	See Appendix B Methods and Results
Data Sources	Kitsap Public Health District, Annual Water Quality Report, 2020	Kitsap Public Health District, Annual Water Quality Report, 2017	Puget Sound Benthos Database	Puget Sound Benthos Database	*Washington State Department of Ecology Water Quality Assessment 303(d) List 2014. https://apps.ecology.wa.gov/ApprovedWQA/ApprovedPages/ApprovedSearch.aspx*	NOAA Nearshore Habitat Value Model	WDFW Habitat Survey Summary Files	WDFW Habitat Survey Summary Files	WDFW Barrier Database, Mapped Hydrology	Mapped Hydrology/Water Types, Kitsap Wetlands, ESRI Clarity Aerial Photography
Other Notes	Standard is WAC 173-201A, Most recent year of freshwater sampling	Standard is WAC 173-201A, Most recent year of nearshore marine water sampling	Standard rating applied to scores: Excellent (80–100), Good (60–80), Fair (40–60), Poor (20–40), Very Poor (<20);	Notation of BIBI date age and result	No 303(d) Cat 5 Listing is due to lack of data or data that meets standards.	NOAA Nearshore Habitat Value Model/Calculations	Average of Per–Reach WDFW Rearing Habitat Assessment Quality Modifier (0–1)	Average of Per–Reach WDFW Spawning Habitat Assessment Quality Modifier (0–1)	Length of Accessible Habitat Compared to Length of Potential Habitat (mile points)	Acre-points (unimpacted buffers and adjacent wetlands) per total buffer area
City or basin wide metric?	City	City	City	City	Basin	City	City	City	City	City

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	Table A-2 (continued). Assess Receiving Water Conditions.									
	Water Resource Uses									
Metric	**Forage Fish Habitat**	**Shoreline Habitat**	**Marine Nearshore Pocket Estuary**	**Public Health/ Recreation Contact**	**ESA Listed Salmon**	**Salmonid Use**			**Non-ESA Listed Salmon and Resident Fish**	**Shellfish**
				Public Health/ Recreation Contact	**Yes/No for Presence of Habitat**	**Presence**	**Rearing**	**Spawning**	**Coho, Chum, Resident Trout—Yes/No if any species habitat present**	**Approved, Conditionally Approved, Prohibited**
Annapolis Creek	None	None	None	None	Yes	Coho, fall chum, resident trout	None	None	Yes	Prohibited
Johnson Creek	Surf smelt spawning	None	None	None	Yes	Resident trout	None	None	Yes	Prohibited
Karcher Creek	Surf smelt spawning Sand lance spawning	None	None	Retsil Boat Launch	Yes	Coho, fall chum, resident trout	None	Coho	Yes	Prohibited
Ross Creek	Surf smelt spawning Sand lance spawning	Salt marsh	Pocket Estuary, PM13	Ross Creek Tidelands	Yes	Coho, fall chum, winter steelhead, resident trout	None	Coho, fall chum	Yes	Prohibited
Anderson Creek (Gorst)	None	Salt marsh	None	None	Yes	Coho, fall chum, winter steelhead, resident trout	None	Coho	Yes	Prohibited
Lower Blackjack	Surf smelt spawning Sand lance spawning	None	Pocket Estuary, PM 12	Park/beach next to Marlee Apts	Yes	Coho, fall chum, winter steelhead, resident trout, fall chinook, summer chum	Coho	Coho, fall chinook, fall chum, summer chum, winter steelhead	Yes	Prohibited
Middle Blackjack	Not applicable	Not applicable	Not applicable	None	Yes	Resident trout, winter steelhead	Coho	Fall chum, summer chum	Yes	Not applicable
Upper Blackjack	Not applicable	Not applicable	Not applicable	None	Yes	Resident trout, winter steelhead	Coho	None	Yes	Not applicable
Ruby Creek	Not applicable	Not applicable	Not applicable	None	Yes	Coho, fall chum, resident trout, summer chum	Coho	None	Yes	Not applicable
Square Creek	Not applicable	Not applicable	Not applicable	None	Yes	Coho, resident trout	Coho	Fall chum, summer chum	Yes	Not applicable
Coulter Creek	Not applicable	Not applicable	Not applicable	None	Yes	Coho, fall chum, winter steelhead, resident trout, fall chinook, largemouth bass, summer chum	None	Coho, fall chum, summer chum	Yes	Conditionally Approved
Rocky Creek	Not applicable	Not applicable	Not applicable	None	Yes	Coho, fall chum, winter steelhead, resident trout, summer chum, fall chinook	None	Coho, fall chum, summer chum	Yes	Conditionally Approved
Gorst Creek	None	Salt marsh	None	None	Yes	Coho, fall chum, winter steelhead, resident trout	Fall chinook	Coho, fall chinook, fall chum, winter steelhead	Yes	Prohibited
Sacco/Sullivan Creek	Surf smelt spawning	None	None	None	No	Fall chum, resident trout	None	None	Yes	Prohibited

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	Table A-2 (continued). Assess Receiving Water Conditions.									
	Water Resource Uses									
Metric	**Forage Fish Habitat**	**Shoreline Habitat**	**Marine Nearshore Pocket Estuary**	**Public Health/ Recreation Contact**	**ESA Listed Salmon**	**Salmonid Use**			**Non-ESA Listed Salmon and Resident Fish**	**Shellfish**
				Public Health/ Recreation Contact	**Yes/No for Presence of Habitat**	**Presence**	**Rearing**	**Spawning**	**Coho, Chum, Resident Trout—Yes/No if any species habitat present**	**Approved, Conditionally Approved, Prohibited**
~~**Downtown-County Campus**~~	None	None	None	Port Orchard Waterfront Park Boat Launch/Marina	No	None	None	None	No	Prohibited
Melcher Creek	Surf smelt spawning	None	None	Boat Launch/Marina	Yes	None	None	None	Yes	Prohibited
Caseco Creek	Surf smelt spawning	None	None	None	Yes	None	None	None	Yes	Prohibited
Strm270	None	None	None	None	Yes	Coho, fall chum, resident trout	None	None	Yes	Prohibited
GIS or Document Review, Other				Database	Database	Database	Database	Database	Database	GIS
Data Sources	*WDFW Forage Fish Habitat Mapping https://wdfw.maps.arcgis.com/home/webmap*	*Washington State Ecology Coastal Atlas Map https://apps.ecology.wa.gov/coastalatlas/tools/Map.aspx*	*Washington State Ecology Coastal Atlas Map https://apps.ecology.wa.gov/coastalatlas/tools/Map.aspx*	*Washington State Ecology Coastal Atlas Map https://apps.ecology.wa.gov/coastalatlas/tools/Map.aspx*	Statewide Integrated Fish Distribution (Northwest Indian Fisheries Commission & WDFW), NMFS West Coast Region Endangered Species Act critical habitat geodatabase (NOAA Fisheries), WA Dept of Fish and Wildlife Open Data downloaded from Washington Geospatial Open Data Portal (dated 5/21/2018)	Statewide Integrated Fish Distribution (Northwest Indian Fisheries Commission & WDFW)	Statewide Integrated Fish Distribution (Northwest Indian Fisheries Commission & WDFW)	Statewide Integrated Fish Distribution (Northwest Indian Fisheries Commission & WDFW)	Statewide Integrated Fish Distribution (Northwest Indian Fisheries Commission & WDFW), Wild Fish Conservancy, NMFS West Coast Region Endangered Species Act critical habitat geodatabase (NOAA Fisheries)	*WSDOH Commercial Growing Classification and Sanitary Survey Program*
Other Notes										
City or basin wide metric?	City	City	City	City	Basin	Basin	Basin	Basin	Basin	Basin

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Table A-3. Assess Stormwater Management Influence.

	Infrastructure								
	Percent TIA	**Road Density**	**Road Crossings**		**Mapped WDFW Fish Barriers Related to Road Crossings**		**Linear Feet of Stream Prior to First Upstream Full Barrier**	**Linear Feet of Stream Prior to First Upstream Full Barrier (data only)**	**Percent TIA in Riparian**
Metric Detail	**Percent Impervious Surface**	**Linear Feet of Road/Acre**	**Road Crossings per Stream Mile**	***Road Crossings in Watershed Used for Calculation***	**Barriers per Stream Mile**	***Barriers in Watershed used for Calculation***	**Identify First Full Barrier and Measure Downstream Linear Feet**	**Identify First Full Barrier and Measure Downstream Linear Feet**	**Percent TIA in Extended Riparian Zone (streams, lakes/ponds, wetlands)**
Annapolis Creek	30.1%	107.4	5.3	11	4.9	10	4,316	4,316	19.7%
Johnson Creek	28.8%	110.6	9.5	14	12.3	18	859	859	19.0%
Karcher Creek	27.7%	107.0	3.7	7	3.7	7	1	Full barrier at mouth	12.7%
Ross Creek	13.3%	66.0	2.1	15	3.6	25	4,502	4,502	9.6%
Anderson Creek (Gorst)	8.9%	58.6	3.7	18	4.1	20	5,797	5,797	5.8%
Blackjack Creek – Aggregate	10.8%	53.0	1.4	42	2.8	81	44,703	44,703	6.8%
Lower Blackjack	22.3%	81.1	1.9	19	2.0	20	Not applicable	Not applicable	15.3%
Middle Blackjack	9.2%	49.3	0.7	3	2.4	10	Not applicable	Not applicable	2.9%
Upper Blackjack	3.8%	33.2	1.6	8	1.2	6	Not applicable	Not applicable	2.3%
Ruby Creek	5.3%	41.4	1.1	4	9.2	33	16,203	16,203	6.1%
Square Creek	3.6%	34.6	1.2	8	1.8	12	4,609	4,609	2.0%
Coulter Creek	0.4%	4.1	0.3	11	0.6	27	Not applicable	Not applicable	0.4%
Rocky Creek	1.7%	12.1	0.6	32	0.6	34	Not applicable	Not applicable	1.5%
Gorst Creek (Parish in City portion)	4.1%	23.4	1.2	38	1.3	42	1,835	1,835	3.6%
Sacco/Sullivan Creek	18.1%	92.0	1.2	2	0.0	0	1,761	No full barriers mapped	3.5%
Downtown-County Campus	50.2%	200.8	8.8	3	0.0	0	1,798	No full barriers mapped	55.6%
Melcher Creek	12.2%	90.0	4.4	2	4.4	2	1	285	9.5%
Caseco Creek	11.9%	108.7	4.7	2	9.5	4	1	Full barrier at mouth	13.3%
Strm270	2.8%	35.0	1.1	2	1.7	3	949	949	3.7%
GIS or Document Review, Other	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis
Data Sources	2016 NLCD Impervious	Kitsap County GIS – Roads	Kitsap County GIS – Roads; DNR streams	Kitsap County GIS – Roads; DNR streams	WDFW Web Map Tool, extracted data; Kitsap County GIS – Roads	WDFW Web Map Tool, extracted data; Kitsap County GIS – Roads	WDFW Web Map Tool, extracted data; DNR streams	WDFW Web Map Tool, extracted data; DNR streams	2016 NLCD; Kitsap wetlands; DNR and NHD streams/water bodies
Purpose	TIA is most correlated with BIBI scores	Highly correlated with BIBI (MacNeale, 2019)	Measure of disconnected habitat and correlation with BIBI (MacNeale, 2019)	*Supporting information for Road Crossings per Stream Mile*	Check against road crossing data for comparison	*Supporting information for Road Crossings per Stream Mile*	Measure of stream habitat availability	Measure of stream habitat availability	Riparian condition measurement used previously for Port Angeles study, and modified.

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	Table A-3. Assess Stormwater Management Influence.								
	Infrastructure								
	Percent TIA	**Road Density**	**Road Crossings**		**Mapped WDFW Fish Barriers Related to Road Crossings**		**Linear Feet of Stream Prior to First Upstream Full Barrier**	**Linear Feet of Stream Prior to First Upstream Full Barrier (data only)**	**Percent TIA in Riparian**
Metric Detail	**Percent Impervious Surface**	**Linear Feet of Road/Acre**	**Road Crossings per Stream Mile**	***Road Crossings in Watershed Used for Calculation***	**Barriers per Stream Mile**	***Barriers in Watershed used for Calculation***	**Identify First Full Barrier and Measure Downstream Linear Feet**	**Identify First Full Barrier and Measure Downstream Linear Feet**	**Percent TIA in Extended Riparian Zone (streams, lakes/ponds, wetlands)**
Data Gaps	Lack of detailed impervious layer.		Stream lines do not exactly align with topography/ hillshade. Road crossings do not all correspond directly with mapped barriers. Mapping gaps may include forest roads, military roads, private roads, railroad crossings. Crossings may be overestimated in dense areas and underestimated in less dense areas.						Measuring % impervious in the buffer is a good approximation of disturbed areas, but may not account for other types of disruption. Would be valuable to compare to a canopy layer, if one becomes available.
Notes/Comments	See comment regarding %pollutant potential PGIS		Conducted high-level data review to remove immediate duplicates and re-add major WDFW mapped culvert barriers not otherwise captured.		Excluded barriers mapped as dams, diversion, natural, unknown – focused on road crossings	Excluded barriers mapped as dams, diversion, natural, unknown – focused on road crossings	Mainstem linear distance only to first full barrier, not a total inventory of currently accessible fish habitat	Mainstem linear distance only to first full barrier, not a total inventory of currently accessible fish habitat	Note – This may be skewing towards non-fish creeks; they have a smaller buffer so their % impervious of the riparian is higher. Keep in mind when comparing %s.
City or Basinwide Metric?	**Basin**	**Basin**	**Basin**	**Basin**	**Basin**	**Basin**	**Basin**	**Basin**	**Basin**

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Table A-3 (continued). Assess Stormwater Management Influence.

	Infrastructure (continued)					Future Development			
	Percent Flow Control Exempt Areas	Discharge to Lake or Wetland inside City Limits?	Outfalls to Streams	Discharge to marine shoreline?	Outfalls to Shoreline	Percent of Watershed Within City Limits that is Vacant, Under Utilized, or Partially Utilized (Buildable Lands Report)			Percent of Basin Area with Projected Population Growth Greater Than 1.9%
Metric Detail	**Acres of FC Exempt/Total Acres**	**Yes/No**	**Port Orchard MS4 Outfalls (or Mapped Discharge) in Extended Riparian Zone of Stream, Lake, or Wetland**	**Yes/No**	**Port Orchard MS4 Outfalls (or Mapped Discharge) to Shoreline**	**Partially Utilized**	**Under Utilized**	**Vacant**	**Area by Census Block Group with Projected Population Growth Greater than 1.9% from 2021–2026**
Annapolis Creek	3.3%	No	1	Yes	4	4.63%	2.89%	14.40%	0.00%
Johnson Creek	0.9%	Yes	2	Yes	2	11.52%	0.56%	11.18%	0.00%
Karcher Creek	0.5%	No	3	Yes	0	1.04%	6.24%	5.41%	0.00%
Ross Creek	4.7%	Yes	10	Yes	13	2.36%	0.96%	28.39%	61.19%
Anderson Creek (Gorst)	7.5%	Yes	4	Yes	5	4.69%	0.00%	35.19%	63.49%
Blackjack Creek – Aggregate	N/A	Yes	17	Yes	12	6.81%	6.66%	40.29%	24.65%
Lower Blackjack	2.0%	Yes	10	Yes	12	10.01%	8.91%	29.44%	20.76%
Middle Blackjack	0.0%	No	0	No	Not applicable (upstream basin)	Not applicable	Not applicable	Not applicable	14.98%
Upper Blackjack	0.0%	No	0	No	Not applicable (upstream basin)	Not applicable	Not applicable	Not applicable	0.00%
Ruby Creek	0.0%	Yes	6	No	Not applicable (upstream basin)	0.75%	2.74%	55.46%	82.83%
Square Creek	0.0%	Yes	1	No	Not applicable (upstream basin)	0.00%	0.00%	95.30%	3.46%
Coulter Creek	0.0%	No	0	No	Not applicable (no City shoreline)	0.00%	0.00%	100.00%	0.00%
Rocky Creek	0.0%	No	0	No	Not applicable (no City shoreline)	0.00%	0.00%	64.85%	0.00%
Gorst Creek (Parish in City portion)	0.0%	Yes	1	Yes	Not applicable (no City shoreline)	2.70%	0.00%	57.20%	42.12%
Sacco/Sullivan Creek	3.6%	No	0	Yes	Not applicable (no City shoreline)	10.40%	0.00%	8.21%	0.00%
Downtown-County Campus	10.1%	No	0	Yes	10	2.71%	5.02%	3.08%	0.00%
Melcher Creek	12.4%	No	0	Yes	3	25.34%	1.37%	26.03%	0.00%
Caseco Creek	12.4%	No	1	Yes	1	15.32%	0.00%	26.45%	0.00%
Strm270	0.0%	No	0	Yes	Not applicable (no City shoreline)	28.28%	0.00%	60.37%	74.38%
GIS or Document Review, Other	GIS Analysis	GIS	GIS Analysis	GIS	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis
Data Sources	City of Port Orchard "Watershed by Creek" topographic delineation		City of Port Orchard Outfalls; Kitsap wetlands; DNR and NHD streams/water bodies		City of Port Orchard Outfalls; Kitsap wetlands; DNR and NHD streams/water bodies	Kitsap County GIS – Port Orchard LCA Parcels			ESRI 2021–2026 USA Population Growth, accessed via hosted online service in February 2022 (Block group scale)
Purpose	Describes how much of the basin is WQ treatment only.		Storm						Population growth indicates future development or redevelopment pressure. All new impervious development will be constructed under current codes, but may still have negative influence on water bodies.

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Table A-3 (continued). Assess Stormwater Management Influence.

	Infrastructure (continued)					Future Development			
	Percent Flow Control Exempt Areas	**Discharge to Lake or Wetland inside City Limits?**	**Outfalls to Streams**	**Discharge to marine shoreline?**	**Outfalls to Shoreline**	**Percent of Watershed Within City Limits that is Vacant, Under Utilized, or Partially Utilized (Buildable Lands Report)**			**Percent of Basin Area with Projected Population Growth Greater Than 1.9%**
Metric Detail	**Acres of FC Exempt/Total Acres**	**Yes/No**	**Port Orchard MS4 Outfalls (or Mapped Discharge) in Extended Riparian Zone of Stream, Lake, or Wetland**	**Yes/No**	**Port Orchard MS4 Outfalls (or Mapped Discharge) to Shoreline**	**Partially Utilized**	**Under Utilized**	**Vacant**	**Area by Census Block Group with Projected Population Growth Greater than 1.9% from 2021–2026**
Data Gaps	Calculated using the original Kitsap topo stream basin boundaries, which exclude areas draining directly to Puget Sound. Does not include upstream piped areas with outfalls to the Sound. Does not include any lake drainage areas (lakes are too small, not listed in Appendix I-A: Flow Control Exempt Receiving Waters of the SWMMWW).	Outfall ownership data is not available. Count of outfalls may include private outfalls in outfall mapping layer. Available only inside City limits.	Lack of outfalls mapped outside the city, only including PO MS4 stream outfalls (excludes direct outfalls to Puget Sound)	Outfall ownership data is not available. Count of outfalls may include private outfalls in outfall mapping layer. Available only inside City limits.		LCA parcels only available for basin area inside Port Orchard City Limits. Reported percent does not reflect entire basin area. Calculations are likely to be skewed for basins with a large percentage of area outside the City.			Data is at coarse block group scale. Block group polygons do not align with watershed boundaries. Population growth estimate is high-level; detailed population data not available.
Notes/Comments		"Yes" indicates mapped outfall within extended riparian zone of mapped wetland or lake/pond. No major outfalls mapped at named lakes (some located near unnamed water bodies and wetlands).	Some outfalls outside the riparian zone were excluded with a few are quite close to the boundary. These can be added to the count if preferred. May want to map and verify approach during prioritization step.	Sinclair Inlet Only		Calculations method: 1. Clip basins to Port Orchard City Limits 2. Set definition query on LCA Parcels: LCA_CLASS IN ('PARTIALLY UTILIZED', 'UNDERUTILIZED', 'VACANT') 3. Dissolve LCA Parcels by LCA_CLASS to remove any overlapping parcels 4. Intersect the dissolved LCA Parcels with the clipped basins. 5. Aggregate via pivot table, generating areas per basin for Partially Utilized, Under Utilized and Vacant 6. Per basin, divide the area of the Partially Utilized Under Utilized and Vacant by the area of the clipped basin to generate percentage 7. For Blackjack Creek Aggregate, follow this method: For the included basins, sum the areas of each LCA class and divide by the sum of area of basins.			Assigned % to each block group based on hosted ESRI service layer, then intersected with watershed boundaries to calculate area for each growth category. Summarized as % of watershed area in only the highest growth category (>1.9%). Note – 0% in this column does NOT indicate zero growth. Watershed may still have projected growth in the lower range (e.g., 1.25%)
City or Basinwide Metric?	**Basin**	**City**	**City**	**City**	**City**	**City**	**City**	**City**	**Basinwide**

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	Table A-4. Equity.				
	Combined	**Environmental Exposures**	**Environmental Effects**	**Socioeconoic Factors**	**Sensitive Populations**
	Basinwide	**Basinwide**	**Basinwide**	**Basinwide**	**Basinwide**
Annapolis Creek	7.00	6.00	5.00	6.00	8.00
Johnson Creek	8.00	7.00	7.00	7.00	6.00
Karcher Creek	6.22	5.24	4.58	6.13	6.17
Ross Creek	4.75	5.38	4.56	4.56	3.56
Anderson Creek (Gorst)	4.00	5.00	4.00	4.00	3.00
Blackjack Creek – Aggregate	Not Available	Not Available	Not Available	Not Available	Not Available
Lower Blackjack	5.91	6.14	4.70	5.35	5.38
Middle Blackjack	3.86	5.63	2.51	4.79	2.65
Upper Blackjack	3.20	3.60	2.00	5.80	2.20
Ruby Creek	4.00	5.00	4.00	4.00	3.00
Square Creek	3.30	3.59	2.59	5.41	2.30
Coulter Creek	3.85	3.59	2.81	5.41	3.29
Rocky Creek	2.69	4.03	4.59	4.42	5.45
Gorst Creek (Parish Creek in City portion)	4.59	3.12	1.74	4.76	3.18
Sacco/Sullivan Creek	7.00	6.00	5.00	6.00	8.00
Downtown-County Campus	8.00	7.00	7.00	7.00	6.00
Melcher Creek	8.00	7.00	7.00	7.00	6.00
Caseco Creek	8.00	7.00	7.00	7.00	6.00
Strm270	4.00	5.00	4.00	4.00	3.00
GIS or Document Review, Other	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis

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	Table A-4. Equity.				
	Combined	**Environmental Exposures**	**Environmental Effects**	**Socioeconoic Factors**	**Sensitive Populations**
	Basinwide	**Basinwide**	**Basinwide**	**Basinwide**	**Basinwide**
Data Sources	Kitsap Overburdened Communities Assessment, WA Environmental Health Disparities Map	Kitsap Overburdened Communities Assessment, WA Environmental Health Disparities Map	Kitsap Overburdened Communities Assessment, WA Environmental Health Disparities Map	Kitsap Overburdened Communities Assessment, WA Environmental Health Disparities Map	Kitsap Overburdened Communities Assessment, WA Environmental Health Disparities Map
Purpose	Composite score evaluating threat to and vulnerability of populations	Indicators in the environmental exposures theme use data from measured environmental concentrations and releases of contaminants from pollution sources as a way to quantify pollution burden from exposure to pollutants.	Indicators in the environmental effects theme illustrate the potential risk of the environmental hazard on communities nearby. However, as proximity to a potential exposure does not necessarily reflect actual exposure.	Indicators in this theme are often found to be associated with environmental justice conditions, such as poverty or unemployment, which modify the effects of environmental exposures on health.	Indicators in this theme relate to biological susceptibility. People with pre-existing cardiovascular disease or low-birth-weight infants may be more vulnerable to environmental risk factors.
Data Gaps	Data is available at the Census Tract scale, which does not align with watershed delineations; data processing involved area-weighting to assign watershed values	Data is available at the Census Tract scale, which does not align with watershed delineations; data processing involved area-weighting to assign watershed values	Data is available at the Census Tract scale, which does not align with watershed delineations; data processing involved area-weighting to assign watershed values	Data is available at the Census Tract scale, which does not align with watershed delineations; data processing involved area-weighting to assign watershed values	Data is available at the Census Tract scale, which does not align with watershed delineations; data processing involved area-weighting to assign watershed values
Notes/Comments		Higher numbers indicate higher threat from environmental exposures.		Higher numbers indicate greater vulnerability of populations within the watershed	

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	Table A-5. Assess Watershed Stormwater Impacts, Restoration/Protection Goals, and Potential Management Actions.			
	Major Stormwater Impacts	**Potential Restoration/Protection Goals**	**Potential Management Actions**	**Existing Plan or Project**
Annapolis Creek	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline Fragmented stream habitat	Reduce stormwater pollutants Reduce uncontrolled flows Remove fish passage barriers	High priority basin for business source control inspections High priority basin for storm system maintenance Identify flow control retrofit projects Identify fish passage barrier removal projects Identify riparian improvement projects	Annapolis Creek Culvert Replacement
Johnson Creek	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline Fragmented stream habitat	Reduce stormwater pollutants Reduce uncontrolled flows Remove fish passage barriers	High priority basin for business source control inspections High priority basin for storm system maintenance Identify flow control retrofit projects Identify fish passage barrier removal projects Identify riparian improvement projects	Johnson Creek Stream Realignment Johnson Creek Estuary Restoration
Karcher Creek	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline Fragmented stream habitat 11% City control, increases to %100 if Annexed	Reduce stormwater pollutants Reduce uncontrolled flows Remove fish passage barriers		No projects identified
Ross Creek	Uncontrolled flows to stream and shoreline Fragmented stream habitat Future growth	Reduce uncontrolled flows Remove fish passage barriers	Identify flow control retrofit projects Identify fish passage barrier removal projects Identify riparian improvement projects	Ross Creek Beaver Dam Analogs Installation Ross Creek Estuary Restoration and Beach Recreation Area
Anderson Creek (Gorst)	Fragmented stream habitat Future growth	Remove fish passage barriers	Identify fish passage barrier removal projects Identify riparian improvement projects	Anderson Creek Culvert Retrofits McCormick Woods Drive Culvert Barrier Replacement
Lower Blackjack	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline Fragmented stream habitat Future growth	Reduce stormwater pollutants Reduce uncontrolled flows Remove fish passage barriers	High priority basin for business source control inspections High priority basin for storm system maintenance Identify flow control retrofit projects Identify fish passage barrier removal projects Identify riparian improvement projects	SE Salmonberry Road Lower Blackjack Creek Culvert Replacement Blackjack Creek Floodplain Restoration and Stormwater Plan Management Port Orchard East Shoreline Acquisition and Easement Right Rockwell Area Stormwater Improvements Silver Creek Rehabilitation South Blackjack Creek Culvert Removal and Bridge Installation Blackjack Creek Storm Outfall Assessment and Retrofits South Sidney Regional Facility Westbay Stormwater Improvements

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	Table A-5. Assess Watershed Stormwater Impacts, Restoration/Protection Goals, and Potential Management Actions.			
	Major Stormwater Impacts	**Potential Restoration/Protection Goals**	**Potential Management Actions**	**Existing Plan or Project**
Middle Blackjack	Fragmented stream habitat 0% City Control/Contribution No MS4 outfalls to stream	Not Applicable	None	Watershed not moved forward to prioritization
Upper Blackjack	Low level of stormwater impacts 0% City Control/Contribution No MS4 outfalls to stream	Not Applicable	None	Watershed not moved forward to prioritization
Ruby Creek	Fragmented stream habitat Future growth	Remove fish passage barriers	Identify fish passage barrier removal projects Identify riparian improvement projects	Glenwood Road Ruby Creek Culvert Replacement
Square Creek	Low level of stormwater impacts 7% City Control/Contribution	Not Applicable	None	Watershed not moved forward to prioritization
Coulter Creek	Low level of stormwater impacts 1% City Control/Contribution No MS4 outfalls to stream	Not Applicable	None	Watershed not moved forward to prioritization
Rocky Creek	Low level of stormwater impacts 1% City Control/Contribution No MS4 outfalls to stream	Not Applicable	None	Watershed not moved forward to prioritization
Gorst Creek (Parish Creek in City portion)	Low level of stormwater impacts 5% City Control/Contribution	Not Applicable	None	Watershed not moved forward to prioritization
Sacco/Sullivan Creek	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline 21% City control, increases to %100 if Annexed	Reduce stormwater pollutants Reduce uncontrolled flows		No projects identified
Downtown-County Campus	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline Fragmented stream habitat	Reduce stormwater pollutants Reduce uncontrolled flows Remove fish passage barriers	High priority basin for business source control inspections High priority basin for storm system maintenance Identify flow control retrofit projects Identify fish passage barrier removal projects Identify riparian improvement projects	Central Sidney Stormwater Improvements Downtown Basin Stormwater Upgrades
Melcher Creek	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline Fragmented stream habitat Future growth	Reduce stormwater pollutants Reduce uncontrolled flows Remove fish passage barriers	High priority basin for business source control inspections High priority basin for storm system maintenance Identify flow control retrofit projects Identify fish passage barrier removal projects Identify riparian improvement projects	No projects identified

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	Table A-5. Assess Watershed Stormwater Impacts, Restoration/Protection Goals, and Potential Management Actions.			
	Major Stormwater Impacts	**Potential Restoration/Protection Goals**	**Potential Management Actions**	**Existing Plan or Project**
Caseco Creek	Pollutant export to stream and marine waters Uncontrolled flows to stream and shoreline Fragmented stream habitat Future growth	Reduce stormwater pollutants Reduce uncontrolled flows Remove fish passage barriers	High priority basin for business source control inspections High priority basin for storm system maintenance Identify flow control retrofit projects Identify fish passage barrier removal projects Identify riparian improvement projects	No projects identified
Stream 270	Fragmented stream habitat Minimal stormwater influence	Remove fish passage barriers	Identify fish passage barrier removal projects	No projects identified

Rationale:	**Rationale:**
Pollutant export : Presence of outfalls to stream, presence of outfalls to marine nearshore	Goals are related to identified stormwater impacts
Uncontrolled flows to stream and shoreline: >10% TIA, or >10% TIA in Riparian **and** Presence of outfalls to stream, presence of outfalls to marine,	
Fragmented stream habitat: > 3 WDFW Fish Barriers related to road crossings per mile	
Future Development: >20 of City watershed vacant lands	

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APPENDIX B

Nearshore and Stream Habitat Conditions Scoring Methods and Results

APPENDIX B

SALMONID HABITAT LIFE HISTORY SUPPORT METHODOLOGY AND RESULTS

Prepared by GeoEngineers for Herrera Environmental Consultants, Inc., April 2021.

1.0 RELATIVE NEARSHORE HABITAT EVALUATION

A rapid assessment of nearshore habitat conditions was performed for the nine basins that contain nearshore habitat within City limits to generate relative nearshore habitat scores for each basin. The assessment utilized available geospatial data from the sources listed below. Nearshore habitat zones and relative nearshore habitat values were established based on review of existing Habitat Equivalency Analysis (HEA) publications listed below. The following sections identify the data and methods used to conduct the relative nearshore habitat evaluation for the basins within the study area and the results of this assessment.

1.1 Data Review

Geospatial data obtained for this assessment included:

- DNR Shorezone Inventory – Shoreline Modification (DNR 2019)
- Forage Fish Spawning Map (WDFW 2021)
- World Imagery (ESRI 2021a)
- World Topographic Map (ESRI 2021b)

The following HEA publications were reviewed for this assessment:

- *Use of The Puget Sound Nearshore Habitat Values Model with Habitat Equivalency Analysis for Characterizing Impacts and Avoidance Measures for Projects that Adversely Affect Critical Habitat of ESA-Listed Chinook and Chum Salmon* (Ehinger et al. 2015)
- *Hylebos Waterway Natural Resource Damage Settlement Proposal Report* (NOAA 2002)
- *Determining Habitat Value and Time to Sustained Function* (Iadanza 2001)
- *Puget Sound Nearshore Habitat Conversion Calculator 2021 V1.3* (NOAA 2021)

1.2 Methodology

Establishment of Nearshore Habitat Zones

Each basin was divided into up to three nearshore habitat zones:

- Riparian
- Intertidal
- Estuarine

The riparian zone was established by extending a line 40 meters (130 feet) from the DNR Shorezone Inventory shapefile (DNR 2019) landward based on the size of the riparian zone assessed in current NOAA HEA guidance (NOAA 2021). Although current HEA NOAA guidance for assessing nearshore habitat divides intertidal habitat into two zones (upper shore zone and lower shore zone), intertidal habitat was assessed as one zone in this assessment because site specific information regarding tidal elevations and submerged aquatic vegetation were not available at the time of this assessment. Intertidal habitat was mapped from the edge of the DNR Shorezone Inventory shapefile waterward to a low tide line created through visual interpretation of satellite and aerial imagery (ESRI 2021a) of the study area during a low tide. Estuarine zones were estimated using the waterbody polygons available on World Topographic Map (ESRI 2021b).

1.2.1 Relative Nearshore Habitat Values

The relative nearshore habitat values for this assessment were established based on published HEA values from the following sources: DNR Shorezone Inventory – Shoreline Modification (DNR 2019), Forage Fish Spawning Map (WDFW 2021a), World Imagery (ESRI 2021a).

World Topographic Map (ESRI 2021b)Using the HEA concept, habitat values range between 0 and 1 with a value of 1 being the best available habitat. Modifiers were applied to the maximum value of each habitat zone based on the level of modification present in that basin. These modifiers range from fully functioning habitat, which retains the total value for that habitat zone, to developed, which provides no habitat function and receives a habitat value of 0.

Estuarine habitat zone habitat has been assigned a value of 1, which reflects the local importance of habitat in this zone for salmonid species that utilize the City nearshore environment. This value is generally consistent with the habitat value of 1 assigned to estuarine marsh habitat (Iadanza 2001 and NOAA 2002). The intertidal zone was assigned a maximum habitat value of 0.8 which is within the range of previously established maximum habitat values of 0.75 (Iadanza 2001) and 0.9 (NOAA 2002). Riparian habitat was assigned a maximum habitat value of 0.5, which is consistent with maximum habitat value documented by Iadanza (2001). Table 1 shows the relative nearshore habitat values used in this assessment.

Table 1. Relative Nearshore Habitat Values

Nearshore Habitat Zone	Developed	Degraded	Partially Functioning	Fully Functioning
Riparian Zone	0	0.1	0.25	0.5
Intertidal Zone	0	0.1	0.4	0.8
Estuarine Zone	N/A	N/A	N/A	1

For the purposes of this relative nearshore habitat assessment, the following definitions were applied for each modifier for each habitat zone:

Riparian Zone

- Developed: Impervious surface
- Degraded: Invasive vegetation dominant

- Partially Functioning: Mix of native and invasive vegetation or native vegetation disconnected from intertidal zone by roadway or bulkhead.
- Fully Functioning: Native vegetation connected to intertidal zone

Intertidal Zone

- Developed: Covered by overwater structures
- Degraded: Adjacent to filled intertidal and/or shoreward of overwater structures
- Partially Functioning: Debris present, located between structures and/or adjacent to bulkheads.
- Fully Functioning: No disturbance

Estuarine Zone

For the estuarine zone, only two estuarine zones were mapped in the City with minimal disturbance (Blackjack and Ross creeks). Therefore, modifiers were not assigned to the estuarine zone.

Nearshore multipliers

Nearshore multipliers were assigned based on two mapped conditions: 1) documented forage fish spawning and 2) shoreline modification. In basins with documented forage fish spawning (WDFW 2021), a multiplier of 1.5 was assigned to intertidal and estuarine zones. In basins with shoreline armoring (DNR 2019), a multiplier of 0.5 was applied to the percentage of each nearshore habitat zone containing shoreline armoring.

1.2.2 Nearshore Habitat Condition Assessment

The nearshore habitat assessment was completed through visual estimation of the amount of each zone that met each of the definitions described previously. These percentages were then multiplied by the overall size of each zone and the applicable habitat value. Multipliers were then applied to each zone to generate a relative nearshore habitat score for each zone within each basin. The sum of the scores represents the relative nearshore habitat score for each basin in "acre-points." Because this assessment method uses size of the zone as a factor, scores for larger basins were generally larger. To provide a second metric that reflects habitat value independent of basin size, size was factored out of each score to generate a second score in "relative nearshore habitat points-per-acre."

1.3 Results

Nearshore habitat within the City basins have been historically impacted through the placement of fill, construction of bulkheads and overwater structures and upland development within the riparian zone. However, intact intertidal, estuarine and riparian areas are present within the City that provide quality habitat for salmonids. The results of the nearshore habitat condition assessment for each habitat zone are presented for each basin in Table 2.

Table 2. Nearshore Habitat Condition Assessment

Basin	Zone	Size (Acres)	Percentage of Zone					Forage Fish Spawning
			Bulkhead	Developed	Degraded	Partially Functioning	Fully Functioning	
Annapolis	Riparian	4.7	100	95	2	3	0	N/A
Annapolis	Intertidal	16.0	100	5	10	85	0	Yes
Anderson	Riparian	5.0	100	95	5	0	0	N/A
Anderson	Intertidal	5.3	100	25	0	75	0	Yes
Caseco	Riparian	3.6	100	95	5	0	0	N/A
Caseco	Intertidal	7.5	100	10	30	60	0	Yes
Downtown	Riparian	9.1	100	95	5	0	0	N/A
Downtown	Intertidal	7.3	100	40	40	20	0	Yes
Johnson	Riparian	2.3	100	95	2	3	0	N/A
Johnson	Intertidal	3.3	100	10	90	0	0	No
Karcher	Riparian	2.1	100	90	5	5	0	N/A
Karcher	Intertidal	7.9	100	0	0	100	0	Yes
Blackjack	Riparian	18.2	90	85	5	0	10	N/A
Blackjack	Intertidal	75.5	99	5	10	85	0	Yes
Blackjack	Estuarine	0.5	0	0	0	0	100	Yes
Melcher	Riparian	3.7	100	75	10	15	0	N/A
Melcher	Intertidal	3.9	100	20	80	0	0	Yes
Ross	Riparian	22.4	55	35	20	30	15	N/A
Ross	Intertidal	27.6	55	5	5	45	45	Yes
Ross	Estuarine	1.1	10	0	0	10	90	Yes

The HEA metrics described in Section 2.2.1 were applied to the nearshore habitat condition assessment data shown in Table 2 to generate relative nearshore habitat scores in both “acre-points” and “relative nearshore habitat points-per-acre.” The results of the relative nearshore habitat assessment are shown in Table 3.

Table 3. Relative Nearshore Habitat Scores by Basin

Shoreline	Acre-Points	Points/Acre
Annapolis	4.2	0.20
Anderson	1.2	0.12
Caseco	1.5	0.14
Downtown	0.7	0.04
Johnson	0.2	0.03
Karcher	2.4	0.24
Blackjack	20.9	0.22
Melcher	0.3	0.04
Ross	20.6	0.40

The results of the assessment indicate that nearshore habitat in the Blackjack Creek basin generated the highest score of 20.9 acre-points, which resulted from the high quantity of intertidal habitat available at the Blackjack Creek delta. Nearshore habitat within the Ross Creek basin received a similar score of 20.6 are-points and is roughly half the size of the nearshore habitat evaluated for the Blackjack Creek basin. Thus, when evaluated on a points-per-acre basis, nearshore habitat in the Ross Creek basin has a value of 0.40, which is nearly double that of the Blackjack Creek basin or any other basin in the City. This reflects the quality of the available intertidal and riparian habitat and the relatively low amount of shoreline armoring in the Ross Creek Basin. Nearshore habitat in the Annapolis Creek, Blackjack Creek and Karcher Creek basins generated scores between 0.20 and 0.24 when evaluated on a points-per-acre basis indicating comparatively moderate nearshore habitat values. While the nearshore habitats in the remaining basins received points-per-acre scores below 0.20, indicating comparatively low nearshore habitat values with high levels of disturbance.

This relative nearshore habitat assessment represents a high-level evaluation of existing conditions of the nearshore environment within City limits using readily available information and does not include field evaluation of habitat conditions. The framework established for this assessment is scalable and can be modified and/or expanded in the future to refine the results of the assessment.

2.0 FRESHWATER HABITAT EVALUATION

Four freshwater habitat metrics were used to compare salmonid habitat potential among basins located within the City of Port Orchard: spawning, rearing, migration, and riparian refuge. An overall summary of each metric's calculation method is provided followed by a basin-by-basin summary.

2.1 Data Review

Geospatial data was provided by Herrera and is described in previous sections. Additional data acquired by for this assessment includes detailed habitat assessment result spreadsheets provided by WDFW. Methods used to collect this information are described in the *Fish Passage Inventory, Assessment, and Prioritization Manual* (WDFW 2019).

2.2 Methodology

2.2.1 Spawning and Rearing

WDFW habitat assessments conducted as part of their barrier assessment, inventory, and prioritization work was utilized for two metrics: spawning and rearing potential. During this work, fish biologists walk the stream, break down the drainage into reaches (by physical parameters or the influence of road crossings), and assign each reach a spawning and rearing 'habitat quality modifier' (HQM) from 0 to 1 (WDFW 2019). For each basin these HQMs are averaged across each reach located within the City. Occasional assumptions were made where data was not available.

Table 10.2. Spawning habitat quality modifiers and criteria.

Spawning Habitat Quality Modifier		
Habitat Condition	**HQM Value**	**Habitat Criteria**
Good to Excellent	1	Spawning gravel patches have ≤ 16% fine particles.
Fair	0.67	Spawning gravel patches show moderate to widespread signs of instability (scour/filling), and/or > 16% to 21% fine particles.
Poor	0.33	Spawning gravel patches show widespread to major signs of instability (scour/filling), and/or 21% to 26% fine particles.
No Value	0	Spawning gravel patches have > 26% fine particles.

Table 10.3. Rearing habitat quality modifiers and criteria.

Rearing Habitat Quality Modifier		
Habitat Condition	**HQM Value**	**Habitat Criteria**
Good to Excellent	1	Rearing habitat is stable, and in a normal productive state, without features that negatively influence rearing conditions. Barring the presence of features that negatively influence rearing conditions, ponds and wetlands always have an HQM value of 1.
Fair	0.67	Rearing habitat shows signs of moderate to widespread instability and/or disturbances known to reduce productive capacity. A few of the features that positively influence rearing conditions are present, but only within ≤ 67% of the reach.
Poor	0.33	Rearing habitat shows signs of widespread to major instability and/or disturbances known to reduce productive capacity. A few of the features that positively influence rearing conditions are present, but only within ≤ 33% of the reach.
No Value	0	Habitat is severely disturbed and provides no rearing value to salmonids at this time.

Table 4. Spawning and Rearing Metric Results Summary

Basin	Spawning HQM	Rearing HQM
Annapolis Creek	0.67	1.00
Johnson Creek	0.73	0.97
Karcher Creek	1.00	1.00
Ross Creek	0.67	0.67
Anderson Creek (Gorst)	1.00	0.97
Lower Blackjack	0.88	1.00
Ruby Creek	0.15	0.67
Square Creek	0.17	1.00
Coulter Creek	Assumed 1.00	Assumed 1.00
Rocky Creek	Assumed 0.00	Assumed 1.00
Gorst Creek (Parish in City portion)	0.81	0.95
Sacco/Sullivan Creek	No data	No data
Downtown-County Campus	Assumed 0.50	Assumed 0.50
Melcher Creek	1.00	1.00
Caseco Creek	0.22	0.67
Strm270	1.00	0.67

2.2.2 Migration

Migration was assessed specifically for the portions of basins located within City limits, independent of impacts to migration caused by fish passage barriers located outside City jurisdiction. The goal of this assessment is to create a planning tool for potential City capital improvement projects.

A GIS-based assessment was conducted to quantify the impact of fish passage barriers on fish migration within each basin. First, linear feet of stream length were calculated for DNR type-F streams within each basin. This layer was then modified in Johnson, Melcher, and Caseco Creek basins according to on-the-ground observations from WDFW regarding length of potential fish habitat in each basin. Second, the

mainstem length downstream from the lowest total blockage was calculated, representing the quantity of currently accessible salmonid habitat. Finally, the number of partial barriers within each basin were tallied.

Basins with no total blockages received 1 'foot-point' per linear foot of stream habitat. Each partial barrier within the basin was assigned a multiplier of 0.75. In basins with total passage barriers only the accessible habitat downstream from a total passage barrier was used for this metric. Foot-points were converted to miles for readability.

No attempt was made to normalize scores between basins based on size or stream length. For this metric, large basins with multiple tributaries and a lack of total barriers did and should score higher for fish migration potential due to the increased quantity of habitat available. Potential refinements to this metric could include adding a reduction modifier for basins with a downstream (total and/or partial) passage barrier outside City limits. Additionally, further refinement of hydrography mapping and determining the limits of potential fish habitat would provide a more realistic picture of habitat resources and migration opportunity within each basin. Table 5 is the migration metrics results summary.

Table 5. Migration Metric Results Summary

Basin	Within City of Port Orchard					Feet-Points	**Mile-Points**
	Potential Fish Habitat Stream Length (Feet)	No barriers (T/F)	Partial Barriers (Count)	Total Barrier (Yes/No)	Stream Length Downstream of Total Blockage (Feet)		
Annapolis Creek	5158	F	1	Y	1851	1388.25	**0.26**
Johnson Creek	9606	F	6	Y	850	151.28	**0.03**
Karcher Creek	3876	F	0	Y	0	0.00	**0.00**
Ross Creek	20160	F	1	Y	4502	3376.50	**0.64**
Anderson Creek (Gorst)	9229	F	2	N	N/A	5191.31	**0.98**
Lower Blackjack	28963	F	3	N	N/A	12218.77	**2.31**
Ruby Creek	10439	F	3	N	N/A	4403.95	**0.83**
Square Creek	2036	T	0	N	N/A	2036.00	**0.39**
Coulter Creek	1042	T	0	N	N/A	1042.00	**0.20**
Rocky Creek	2060	T	0	N	N/A	2060.00	**0.39**

Gorst Creek (Parish in City portion)	5828	F	2	N	N/A	3278.25	**0.62**
Sacco/Sullivan Creek	0	T	0	N	N/A	0.00	**0.00**
Downtown-County Campus	1798	F	0	Y	0	0.00	**0.00**
Melcher Creek	2421	F	1	Y	115	86.25	**0.02**
Caseco Creek	1201	F	0	Y	0	0.00	**0.00**
Strm270	1679	T	0	N	N/A	1679.00	**0.32**

2.2.3 Riparian and Refuge

The riparian and refuge function metric assesses the influence of development on riparian processes as an indicator for LWD recruitment and off-channel refuge. A 150-foot buffer was applied to fish-bearing streams to calculate a total riparian buffer area within each basin. Adjacent wetlands mapped within 50 feet of the stream were considered potentially accessible off-channel refuge areas and were included as part of the metric. Esri World Imagery (ESRI 2021a) polygons were digitized around areas of visible disturbance within each buffer.

To calculate this metric, wetland area and disturbance area were subtracted from the total buffer area, resulting in an area of undisturbed upland riparian buffer. This upland acreage was assigned a multiplier of 0.5. Total wetland area was assigned a multiplier of 1. These multipliers differ in order to recognize the typically greater value off-channel wetlands provide compared to upland riparian buffers. These values approximate those developed in the HEA document *Relative Chinook Salmon Lower Willamette Habitat Values* (USFWS 2012), where off-channel aquatic habitats typically have habitat values of 0.9 to 1.0 while riparian forest habitat values are between 0.5 to 0.65. The sum of the scores represents the relative riparian and refuge habitat score for each basin in "acre-points." Because this assessment method uses size of the basin as a factor, scores for larger basins were generally larger. To provide a second metric that reflects value independent of basin size, size was factored out of each score to generate a second score in "relative riparian/refuge points-per-acre." Generally, this caused smaller, less developed basins, particularly those with large wetland complexes, to score highest while scores for basins closer to dense development were moderate and less variable. Riparian and refuge metrics results summary are in Table 6.

Table 6. Riparian and Refuge Metric Results Summary

NAME	Total Buffer Area (acre)	Disturbed Buffer Area (acre)	Total Adjacent Wetland Area (acre)	Undisturbed Upland Buffer (acre)	total acre points	acre points per total buffer area
Annapolis Creek	33.02	15.47	0.00	17.55	8.77	0.27
Anderson Creek (Gorst)	61.08	4.45	22.22	49.33	46.89	0.77
Caseco Creek	19.73	6.75	2.13	10.85	7.55	0.38
Downtown-City Campus	13.12	11.89	0.00	1.22	0.00	0.05
Coulter Creek	3.28	0.00	0.00	3.28	1.64	0.50
Gorst Creek	21.64	2.17	0.40	19.07	9.93	0.46
Johnson Creek	45.13	14.58	0.00	30.55	15.28	0.34
Karcher Creek	26.54	4.28	0.00	22.26	11.13	0.42
Lower Blackjack Creek	223.19	62.85	6.90	157.02	85.42	0.38
Melcher Creek	17.06	2.84	0.97	13.25	7.60	0.45
Rocky Creek	34.00	0.00	18.48	15.52	26.24	0.77
Ross Creek	148.18	31.20	28.71	100.49	78.96	0.53
Ruby Creek	61.68	9.59	11.86	41.80	32.76	0.53
Square Creek	12.51	0.00	3.20	10.86	8.63	0.69
Stream 270	12.18	0.00	0.00	12.18	6.09	0.50

2.3 Results

Annapolis Creek

Annapolis Creek is mapped as a type-N (non-fish) stream per DNR hydrography, however this is a known error as adult salmonids have been documented along Arnold Ave E. WDFW barrier assessment at site 920412, which spans Mile Hill Drive and several commercial buildings, lists 2,349 feet of potential habitat upstream and 6,319 feet downstream to the mouth. Portions of this distance just upstream of Sinclair Inlet flow through County land.

Herrera measured 4,316 feet from the mouth to the first total passage barrier (Site 920484), located on South Kitsap High School grounds. Assessment of mapped hydrology included 5,158 feet of stream habitat within the City limits, 1,851 feet of which are located downstream of total passage barriers.

Spawning and Rearing HQM

WDFW data only includes the area upstream of Mile Hill Drive. Two reaches were documented, however the 2nd reach was outside City limits, so only the HQM's from Reach 1 were included. Field assessment of downstream reaches could further refine this metric.

Migration

Three total passage barriers are mapped within the basin, two of which are located on City property. One partial barrier is also mapped within the City limits, located at the mouth of the creek discharging to Sinclair Inlet.

Riparian and Refuge

Buffers and disturbance quantity has not yet been calculated for this basin. An approved distance of fish-bearing stream channel is needed to perform the assessment. No wetlands are mapped near the creek and the landscape is highly developed so this basin will likely score low for this metric. WDFW did note several areas of undefined channel that appeared more like wetland habitat during their upstream assessment, which combined with the type-N stream designation, provides a good reminder of the limitations of public-mapped hydrology and wetland layers.

Anderson Creek

Within City limits Anderson Creek provides two fish-bearing channels with a strong wetland/beaver influence. Comparing aerial imagery to mapped wetland boundaries, the potential refugia may be underestimated. Downstream of City limits the creek flows through relatively undeveloped forestland however multiple relic crossings impede upstream fish passage. WSDOT has recently completed barrier corrections at the SR-16 crossing located at the mouth of the creek.

Herrera measured 5,797 feet from the mouth to the first total passage barrier (Site 998901) located outside City limits. Another total passage barrier (Site 998905) is located on a separate fork of the creek, also outside the City. Assessment of mapped hydrology included 9,229 feet of stream habitat within the City, a distance which discounts a small unmapped tributary documented by WDFW located within McCormick Village Park.

Spawning and Rearing HQM

Reaches 1 through 3 from WDFW data were discounted as they are located outside City limits. A total of ten reaches located within the City were averaged for this basin, which featured only 1 reach with a value less than 1.

Migration

Two partial and no total fish passage barriers were included in this assessment. The unmapped McCormick Village Park tributary features an additional one total and one partial passage barrier not included in this metric. This basin would be a good candidate for refining this metric to include a points reduction element for downstream passage barriers outside the City limits.

Riparian and Refuge

Only a small portion of the riparian buffer is impacted by a dense residential community and the road crossing on SW Old Clifton Road. Several large wetland complexes are associated with the upstream limits of the creek, causing this basin to provide one of the highest riparian/refuge scores within the City.

Caseco Creek

Similar to Annapolis Creek, Caseco Creek is mapped as a non-fish bearing channel located entirely within City limits. A total passage barrier drains the creek to Sinclair Inlet, above which WDFW documents 1,201 linear feet of potential fish habitat. This distance ends at crossing 934392, which drains retention ponds down a steep slope.

Spawning and Rearing HQM

WDFW identified 3 reaches within Caseco Creek, each with limited spawning and rearing habitat potential.

Migration

Due to the passage barrier located at the mouth, Caseco Creek scored 0 points for migration.

Riparian and Refuge

This metric features moderate disturbance near the mouth of the creek and several small associated wetlands.

Downtown-City Campus

Salmonid habitat assessment of this basin was not conducted. No WDFW habitat or barrier assessment data was identified, and no fish-bearing channel is mapped. Based on the degree of development in this basin it can be presumed that no anadromous access is possible into the greenbelt with mapped drainage between City Hall and the Kitsap County administration building.

Spawning and Rearing HQM

N/A – no data.

Migration

N/A – presumed 0.

Riparian and Refuge

Extremely limited riparian habitat is located surrounding this drainage. There is a small greenbelt surrounding the channel that shows signs of disturbance throughout most of its width.

Coulter Creek

The Coulter Creek basin is located in the far southwest portion of the City, and only includes a short section of channelized habitat draining a relatively small headwater wetland. Besides a few dirt roads visible on aerial photography the entire basin is undeveloped within City limits.

Spawning and Rearing HQM

WDFW habitat data was not collected for this site. Given the lack of human development in the area, spawning and rearing habitat modifiers are assumed to be 1 for this basin.

Migration

No passage barriers are mapped on the short section of creek within the City. There are several partial barriers on mainstem Coulter Creek as well as total barriers on several tributaries. This relatively large system drains south towards Allyn and features a fish hatchery near the mouth.

Riparian and Refuge

Coulter Creek received a moderate score for riparian and refuge function as no disturbance to the buffer nor adjacent wetlands were identified, in this scenario (no associated wetlands or buffer impacts) the metric will score 0.50 acre-points per buffer area regardless of buffer size.

Gorst Creek

A relatively small portion of this tributary to Gorst Creek (Parish Creek) is located within City limits, along Feigley Road north of Old Clifton Road. The stream crosses SR-3 in Gorst, meeting the mainstem Gorst Creek just upstream of its confluence with the western tip of Sinclair Inlet. The upstream portion of Parish Creek appears impacted by residential development along Lone Bear Lane, including a stormwater standpipe in the channel straightened ditch like segments of the Creek.

Spawning and Rearing HQM

Seven total reaches were included from WDFW's assessment, resulting in an average 0.83 HQM for spawning and 0.95 for rearing.

Migration

A total of 5,828 feet of fish-bearing channel is mapped within the City in this basin. No total barriers and two partial barriers are located along this length, resulting in a score of 0.62. A total downstream barrier is mapped outside the City, currently precluding anadromous access.

Riparian and Refuge

Generally small areas of disturbance and associated wetlands are mapped within this drainage.

Johnson Creek

Johnson Creek roughly parallels Port Orchard Boulevard from Sinclair Inlet to Tremont Street then extends further to its headwaters near Cedar Heights Junior High. The stream crosses Port Orchard Blvd several times, exacerbating passage issues.

Herrera measured 859 feet from the mouth to the first total passage barriers (Site 996960) based on mapped hydrology. WDFW assessment of this stream measured 637 feet between the creek's mouth and the first total barrier. The stream is entirely within City limits and mapped fish bearing for its full mapped length of 7,743 feet. Including tributaries, WDFW lists 9,606 linear feet of potential habitat gain upstream of the Bay Street culvert discharging to Sinclair Inlet.

Spawning and Rearing HQM

A total of 10 WDFW reaches were assessed, with spawning HQMs occasionally limited by substrate condition. Despite the number of road crossings along Port Orchard Blvd the stream appears to remain potentially functional as salmonid habitat.

Migration

Migration is severely impacted in this basin. Less than 10% of the creek is accessible to anadromous fish, and passage of resident fish throughout the basin is also severely impacted by the frequency of partial and total passage barriers.

Riparian and Refuge

No wetlands are mapped adjacent to Johnson Creek, and the drainage pathway parallel to a relatively major roadway limits buffer function.

Karcher Creek

Karcher Creek flows along the eastern boundary of Port Orchard, with only two relatively short stretches within City limits, one near the mouth and the other further upstream within the Veterans Memorial Park. Most of the drainage flows through relatively undeveloped parks, with increased residential and utility infrastructure encroachment near the mouth.

There is a total passage barrier (Site 995350) mapped at the mouth, however WDFW notes the culvert backwaters at high tide and salmonid juveniles were observed upstream of the crossing. For this assessment we presumed this crossing is a total passage barrier (as mapped by WDFW), precluding anadromous access to the creek.

WDFW habitat assessment was conducted surrounding the Mile Hill Drive crossing. They measured 5,449 feet of channel during their downstream check, and list 8,255 feet of potential habitat gain upstream of Mile Hill Drive. GIS assessment measured approximately 3,876 feet of channel located within City limits.

Spawning and Rearing HQM

WDFW habitat assessment data was only available for portions of the creek upstream of Mile Hill Drive, outside the City boundary. Seven reaches were mapped about this location, all with spawning and rearing HQM values of 1. For this assessment we assumed similar conditions downstream.

Migration

For the purposes of this study we followed WDFW's assessment of the Beach Drive culvert being a total barrier, scoring 0 points for migration. There is an additional total barrier (Site 999570) located at the downstream end of the City boundary. The Mile Hill Drive crossing (Site 15.0201 0.90) is also a total passage barrier.

Riparian and Refuge

Karcher Creek scored moderately low for this metric due to the lack of mapped wetlands and frequency of buffer impacts, particularly at the downstream end of the creek.

Lower Blackjack Creek

Blackjack Creek is the largest and most productive watershed in Port Orchard, with most of the lower basin located within City limits. Downstream of SR-16 the mainstem (approximately 18,600 feet) features a relatively intact riparian zone upstream of its bridge outlet to Sinclair Inlet (Site 931350). An additional tributary (also known as Silver Creek) paralleling the Bethel Road corridor is mapped joining the mainstem just upstream of this outlet crossing that appears to provide limited fish habitat opportunity due to the amount of surrounding development.

Upstream of the partial-barrier SR-16 highway crossings (Sites 996755, 990038, and 996756), cleared fields and residential lots encroaching upon the creek become more common. Much of the upper watershed is outside City limits except for portions of two tributaries (Ruby Creek and Square Creek).

Approximately 28,963 linear feet of fish-bearing channel is mapped within City portions of Lower Blackjack Creek. No total passage barriers are mapped along this length however total barriers are present on smaller tributaries that provide the physical parameters required to support fish life (Sites 935527 and 935492).

Spawning and Rearing HQM

WDFW habitat assessment data is not available downstream of SR-16. Notes from their downstream check conducted in late October 2010 include frequent observations of adult chum and active redds. Spawning HQM was assessed at 0.33 on the reach upstream of SR-16 due to the lack of riffle habitat, a distance of 4,157 feet. Assuming a value of 1.0 for the 18,600 feet downstream of SR-16 and including the 4,157 feet upstream with a 0.33 spawning HQM, the Lower Blackjack Creek spawning HQM is 0.88. Rearing HQM is presumed 1.0 for the entire basin, as listed in the two reaches formally assessed and qualitatively documented in the downstream check.

Migration

Three partial barriers are mapped within City limits on Lower Blackjack Creek, all in quick sequence at the SR-16 crossing. Two total barriers are also mapped but were discounted from this assessment:

- Site 935492, located along the Sedgewick Road/SR-16 interchange, is not listed as a significant reach that supports at least 200 meters of potential fish habitat. No apparent hydrography is mapped draining through this site.

- Site 935527, located on the intersection of SE Rose Road and SE Cedar Road, does convey a significant reach of stream however this site is located at the very upstream end of City jurisdiction, and its inclusion would not impact the reported metric.

Given 28,963 linear feet of type-F channel and 3 partial barriers to fish passage Lower Blackjack Creek scored 2.31 “mile points” for migration.

Riparian and Refuge

Riparian and refuge scores for Lower Blackjack Creek were largely impacted by the tributary flowing adjacent to Bethel Road. A relatively high proportion of the riparian zone at and upstream of SR-16 is also impacted.

Melcher Creek

Melcher Creek is a small tributary to Sinclair Inlet located entirely within the City. The outlet culvert (Site 996957) is relatively degraded along the tideflats and is mapped as a partial passage barrier. There is a total barrier (Site 934601), measured via hydrology at 285 feet upstream. WDFW survey notes measure this distance at 115 feet. WDFW ended their “Threshold Determination” 715 feet upstream of the mouth, confirming a significant reach of habitat within this basin. Additional potential fish habitat could exist above this distance as a detailed, full survey was not conducted.

Spawning and Rearing HQM

WDFW did not perform a detailed habitat survey at this crossing. Spawning and rearing metrics were presumed to be 1.0 given the lack of data to the contrary. This assumption could be refined in later phases with field verification.

Migration

Migration is severely limited in this basin due to the degraded outlet culvert at the mouth and total passage barrier not far upstream. Distances measured by WDFW to the nearest total barrier combined with the full 2,421 feet of mapped channel were used to calculate this metric. Melcher Creek scored 0.03 “mile points” for migration.

Riparian and Refuge

Riparian buffer impacts are largely limited to the lower portion of the creek. Further upstream the drainage flows through a relatively steep valley with limited development apparent on aerial imagery. Impacts within this valley due to landscaping or other debris dumping are unknown but not uncommon in this setting. Additionally, Melcher Creek is mapped terminating downstream of W Melcher Street, above which headwater wetlands could connect to the creek and provide additional off-channel refuge habitat.

Rocky Creek

A small portion of the Rocky Creek basin extends into the far southwest corner of City limits. Aquatic habitat within the City is entirely ponded, consisting of the northern half of Nels Johnson Lakes. Smaller wetland and ponded areas as well as dirt/gravel roads are visible on aerial imagery. A few houses along McCormick Woods Drive are located in the northeastern portion of the basin.

WDFW does not map total passage barriers downstream of the lake however there are several partial barriers and wetland complexes that could limit passage during certain portions of the year. Mapped hydrography includes 2,060 feet of ‘channel,’ which is roughly centered around the lake. Within the City and basin the lake measures roughly 18.5 acres (mapped NWI wetland) and appears to extend slightly north into the Anderson Creek basin.

Spawning and Rearing HQM

For the purposes of this assessment spawning activity was not considered viable in this basin due to the lack of channelized habitat available. Rearing potential was assumed to be 1.0 as the lake likely provides year-round rearing habitat for coho, cutthroat, and steelhead as well as warm-water fish such as bass and bluegill.

Migration

No known limitations to migration exist within the City, however seasonal fluctuations in water level could limit access to portions of the lake. Using the mapped centerline of 2,060 feet the basin scored 0.39 points for migration.

Riparian and Refuge

No development is evident within 150 feet of the mapped channel line or the visible lake boundary. The houses along McCormick Woods Drive are just over 150 feet from the mapped wetland boundary. Buffer areas used for this metric were calculated using the NWI-mapped wetland boundary rather than the DNR channel to more accurately reflect riparian and buffer conditions within the basin.

Ross Creek

Ross Creek is a relatively large basin that includes portions within and outside City limits. The creek outlet features a small pocket estuary that drains through a box culvert under SW Bay Street that is presumed to be a velocity barrier during certain periods of tidal exchange. Relatively unimpacted conditions exist between Bay Street and SR-16. Upstream of the highway habitat conditions are more highly impacted as the creek flows through the Port Orchard Industrial Park and then the McCormick Woods Golf Course.

Herrera measured 4,502 feet from the mouth to the first total passage barriers (Site 15.0210 0.17), located on an abandoned road approximately 423 feet downstream of SR-16. 20,160 feet of potential type-F stream was calculated within City limits and this basin.

Spawning and Rearing HQM

WDFW habitat assessment data was not available for the Ross Creek basin. Surveys were conducted in 1997 however this data utilized an obsolete spreadsheet program and is considered too dated for relevancy. A basin-wide metric of 0.67 was assumed given the disparity between relatively natural conditions downstream of SR-16 versus highly impacted conditions upstream of the highway. Upstream habitat survey notes available in the inventory summary report for site 990270 indicate that upstream reaches go dry during summer and offer limited rearing habitat, with the exception of several lakes. Electroshocking in 1997 did not encounter salmonids.

Migration

Herrera measured 4,502 feet of mainstem stream habitat available downstream of the first total passage barrier. We considered the outlet culvert a partial barrier, resulting in a migration score of 0.64.

Riparian and Refuge

Ross Creek received a moderate riparian and refuge function score of 0.53 due to the frequency of wetland and lake habitat, primarily upstream of SR-16, as well as the relatively unimpacted conditions downstream of the highway.

Ruby Creek

Ruby Creek is a tributary to Blackjack Creek with a confluence near SR-16 and Sedgewick Road. It flows through a mix of residences, cleared fields, and native forest from its headwaters. Several small tributaries and maintained ponds enter the creek near Glenwood Road SW and SW Harper Road, providing minor supplements to available fish habitat resources (located outside City limits).

There are no total fish passage barriers mapped on the mainstem drainage. Total barriers are mapped on several of the small tributaries, blocking access to relatively small quantities of potential fish habitat. A total length of 10,439 feet of type-F channel is mapped within City limits, a length that likely underestimates available habitat due to the limitations of existing hydrology maps. Updating hydrology to match 2013 Wild Fish Conservancy assessments would provide a more accurate representation of conditions within the basin, both within and outside the City.

Spawning and Rearing HQM

WDFW assessed a total of 13 reaches within City limits, including the mainstem and three tributaries. Nine of these reaches provided no spawning habitat, while the majority featured minor to moderate impacts to potential rearing capacity. Averaging scores across the basin resulted in an average spawning HQM of 0.15 and a rearing HQM of 0.67.

Migration

Three partial and no total fish passage barriers were included in this assessment resulting in a migration score of 0.83 "mile points." One total barrier and one partial barrier located within the City were not included due to inaccurate hydrology west of development surrounding the Sedgewick and Sydney Road intersection. An additional 8 partial and 3 total barriers are mapped outside City limits within this basin.

Riparian and Refuge

Riparian health and potential refuge habitat are variable throughout the basin, with impacts more frequently encountered near the confluence with Blackjack Creek. Portions of a large wetland complex adjacent to SW Harper Road increases the potential refuge value.

Square Creek

Square Creek is the 2nd major tributary to Blackjack Creek located partially within City limits. It flows roughly 6,300 feet from the north end of Square Lake across Glenwood Road to its confluence with Blackjack Creek, generally west of the residential community along Vern Vista Place SW. Roughly 2,036 feet of this length is located within the City. WDFW maps a total passage barrier located outside the City at approximately 1,580 feet downstream from Square Lake.

Spawning and Rearing HQM

Reaches 1 and 6 from WDFW data covered portions of the creek within the City. No spawning habitat is located in lower sections of the creek while occasional marginal spawning grounds were observed near the lake, resulting in a low spawning score of 0.17. No impacts to rearing habitat conditions were identified in either reach, with both receiving a 1.0 score.

Migration

No passage barriers are mapped on the 2,036 feet of City-owned stream channel, resulting in a migration score of 0.39 "mile points." One total and two partial barriers are located outside the City.

Riparian and Refuge

No development or other signs of riparian impact are visible on aerial photography within the City. Square Lake is the only mapped non-channelized aquatic habitat within City portions of the basin. Roads, buildings, and fields are common adjacent to the creek outside City limits.

Stream 270

Headwater portions of the Stream 270 drainage are located within the City, originating near active residential construction west of McCormick Village Park. Approximately 1,679 feet of potential fish habitat was measured, which is currently inaccessible to anadromous fish due to a total passage barrier located outside City limits on SR-3 (Site 991670). This length includes a section of mapped type-N channel which was included in WDFW's assessment as potential fish habitat. No other passage barriers are mapped within the system – previous barrier site 996761 was replaced in 2018 with a 16-foot span bridge.

Spawning and Rearing HQM

WDFW comments on barrier inventory reports indicate quality habitat upstream of SR-3. The assessed reach within the City received a 1.0 HQM for spawning and a 0.67 HQM for rearing.

Migration

No barriers are mapped within City portions of this system. Upon replacement of the downstream highway culvert, fish will have unimpeded access to all potential habitat within the basin. Stream 270 scored 0.32 "mile points" for the relatively short length of unimpeded habitat located within the City.

Riparian and Refuge

No buffer impacts or adjacent wetlands were identified within City portions of the creek, resulting in a score of 0.50 for this basin.

REFERENCES:

DNR (Washington Department of Natural Resources). 2019. ShoreZone Inventory – Shoreline Modification. Washington Department of Natural Resources GIS Open Data. Updated March 5, 2019. Available online at: https://data-wadnr.opendata.arcgis.com/datasets/wadnr::shorezone-inventory-shoreline-modification/about

Ehinger, S.I., J. P. Fisher, R. McIntosh, D. Molenaar and J. Walters. 2015. Working Draft, April 2015: Use of The Puget Sound Nearshore Habitat Values Model with Habitat Equivalency Analysis for Characterizing Impacts and Avoidance Measures for Projects that Adversely Affect Critical Habitat of ESA-Listed Chinook and Chum Salmon.

ESRI. 2021a. World Imagery. Available online at: https://www.arcgis.com/home/item.html?id=10df2279f9684e4a9f6a7f08febac2a9

ESRI. 2021b. World Topographic Map. Available online at: https://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f

Iadanza, N. 2001. Determining Habitat Value and Time to Sustained Function – Commencement Bay NRDA Site Appendix C. Available online at: http://www.cbrestoration.noaa.gov/documents/cbhy-c.pdf

NOAA (National Oceanic and Atmospheric Administration). 2002. Hylebos Waterway Natural Resource Damage Settlement Proposal Report. A Habitat Restoration-Based Approach For Resolving Natural Resource Damage Claims Relating to the Hylebos Waterway Of the Commencement Bay Nearshore/Tideflats Superfund Site Combined With a Proposal For Allocating Liability for Settlement Purposes. Public Review Draft dated March 14, 2002.

NOAA (National Oceanic and Atmospheric Administration). 2021. Puget Sound Nearshore Habitat Conversion Calculator 2021 V1.3. Available online at: https://www.fisheries.noaa.gov/resource/tool-app/puget-sound-nearshore-conservation-calculator

USFWS (United States Fish and Wildlife Service). 2012. Relative Chinook Salmon Lower Willamette Habitat Values. Available online at: https://www.fws.gov/portlandharbor/sites/default/files/documents/Q4HabitatValuesTable_1729.pdf

WDFW (Washington Department of Fish and Wildlife). 2019. Fish Passage Inventory, Assessment, and Prioritization Manual. Olympia, Washington.

WDFW (Washington Department of Fish and Wildlife). 2021. Forage Fish Spawning Map. Available online at: https://wdfw.maps.arcgis.com/home/webmap/viewer.html

Appendix B
WSSOG Annual Report 2022

2022 SUMMARY OF ACTIVITIES

WEST SOUND STORMWATER OUTREACH GROUP

PREPARED BY: KYM PLEGER, EDUCATION AND OUTREACH COORDINATOR, KITSAP COUNTY

Cover Photo: Olympic College storm drain art, Kisha Baggs, Kitsap County

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WHO WE ARE

Kitsap County and the Cities of Bremerton, Gig Harbor, Port Orchard, and Poulsbo, have been working to jointly fund, develop and implement NPDES Municipal Stormwater Permit required outreach via interlocal agreements since 2008. With the additions of Bainbridge Island and Port Angeles in 2012, the group assumed the name of West Sound Stormwater Outreach Group (WSSOG). The US Navy participates as an informal member.

Our goal is to work cooperatively to improve water quality and to meet key requirements of the public education and outreach components of the NPDES Phase II Municipal Stormwater Permit (herein referred to as permit). In doing so, we create cost savings and efficiencies and benefit the community through consistent outreach and messaging.

2022 HIGHLIGHTS

In 2022, WSSOG focused on expanding the natural yard care behavior change campaign. WSSOG initially began working with a consultant, C+C, in 2018 to identify a new priority audience and best management practice (BMP). WSSOG chose to focus on natural yard care and identified residents who have either children or pets in their homes as the priority audience. The BMP selected was the use and storage of pesticides, fertilizers and/or other household chemicals. WSSOG piloted implementation of the strategy in 2021. In 2022, WSSOG successfully expanded the program throughout all the jurisdictions.

In addition to expanding this new behavior change campaign, the group focused on maintaining and improving existing programs including our successful Mutt Mitt program, spills and illicit discharge outreach and continued to stay involved in

regional collaborative efforts including local work groups and the STORM group (Stormwater Outreach for Regional Municipalities.) The group also participated in Puget Sound Starts Here Month in September.

Lastly, Kitsap County was awarded a Grants of Regional or Statewide Significance (GROSS) from the Washington State Department of Ecology in July 2021 on behalf of WSSOG. The grant included three distinct deliverables, designed to help WSSOG's efforts in reaching overburdened communities. The grant provides for training, enhancement of an equity mapping tool, and an analysis of WSSOG's outreach programs. Two of the deliverables were completed in 2022.

Permittee may choose to meet these requirements individually or as a member of a regional group. regional collaboration…includes permittees developing a consistent message, determining the best methods for communicating the message…and creating strategies to effect behavior change. if a permittee chooses to adopt…a regional program, the permittee should participate in the regional group and shall implement the adopted element(s) of the regional program in the local jurisdiction.

NPDES Municipal Stormwater Permit – s5.c.2

BEHAVIOR CHANGE PROGRAMS (S5.C.2.a.ii)

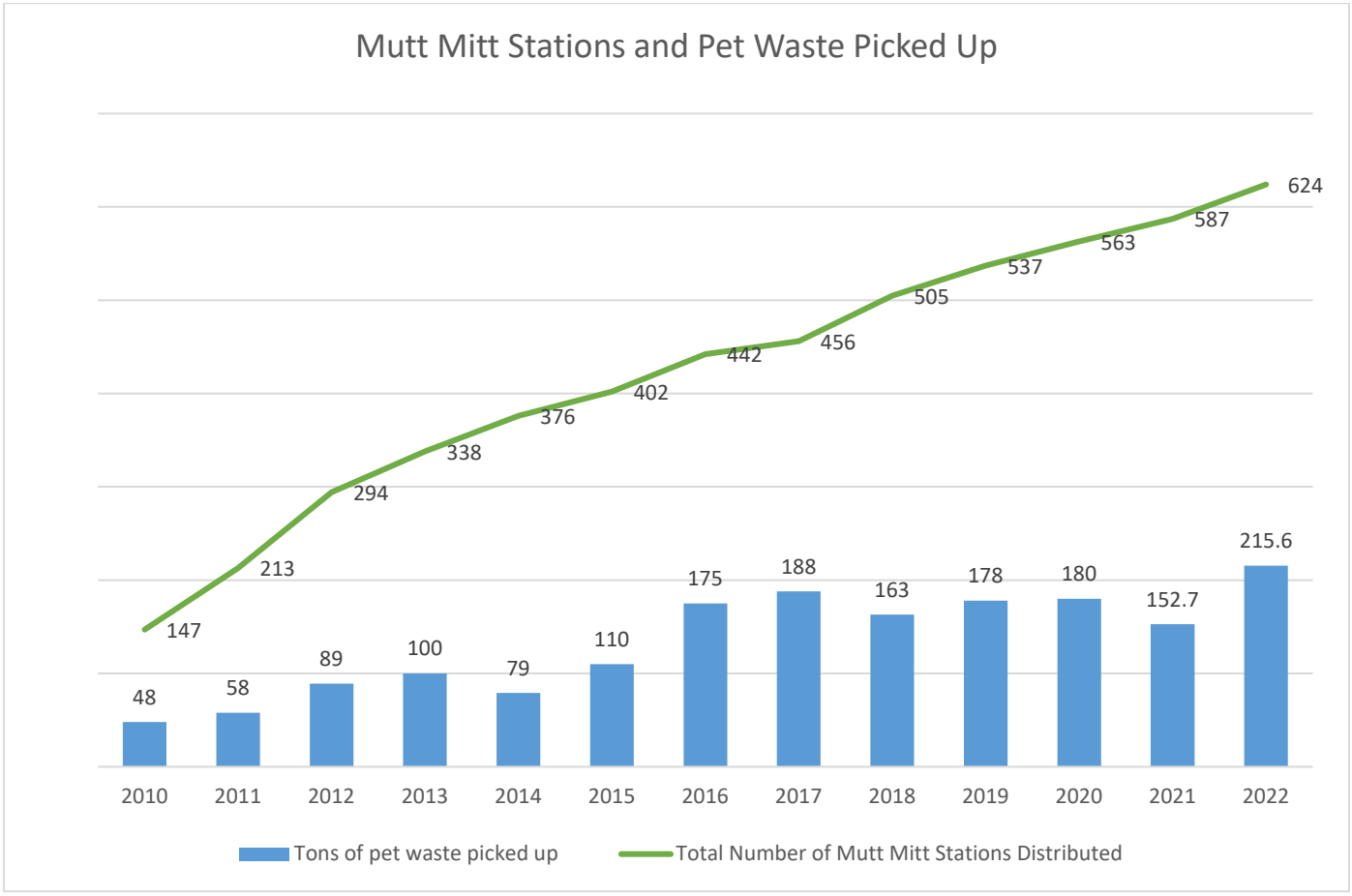
WSSOG coordinates two behavior change campaigns, the long-standing Mutt Mitt program, and the natural yard care campaign.

PET WASTE IN PUBLIC AREAS – MUTT MITT PROGRAM

Members of WSSOG continue to meet the requirements of S5.C.2.a.ii through the highly successful Mutt Mitt program including evaluation of the program by the July 1, 2020 permit deadline. Established in 2009, this program focuses on installing and maintaining pet waste bag stations to encourage and facilitate dog walkers to pick up after the pets when they are in public places such as parks, apartment complexes, or neighborhoods.

Adoption of the target behavior is measured in part through growth of the program. As of the end of 2022, there have been a total of 624 pet waste stations distributed throughout the Kitsap Peninsula, Gig Harbor and Port Angeles. On average, 20-40 stations are added annually. In 2022, Kitsap County along with partner cities and community sponsors distributed over 1,306,000 pet waste bags, resulting in a reduction of 215.6 tons of pet waste into local waterways.

Dog walkers depend upon stations that are reliably stocked with bags to help them adopt this behavior. It is essential that Mutt Mitt branded stations are continuously stocked and in good working order. Kitsap County typically conducts inspections of all Mutt Mitt stations located within Bainbridge Island, Bremerton, Port Orchard and Poulsbo on an annual basis and all other stations located within the County on a biannual basis. All Mutt Mitt stations were inspected during 2022. Of the stations that were found during their inspection, 83% were stocked. Emails were sent to all sponsors (with working email addresses) that had missing or unstocked stations.



TAKING (AND TOSSING POOP FOR WATER QUALITY

After a brief hiatus during the pandemic, 2022 saw the return of the popular Poop Toss game at various public events. The humorous nature of the game attracts participants of all ages and makes it easy to start a conversation about a topic people might otherwise have preferred to avoid. The Poop Toss game was used by jurisdictions at community events like Pets Walk (Poulsbo and Kitsap County), and the Clallam County Fair (Port Angeles). Port Angeles made contact with approximately 1,800 people at the Clallam County Fair. Kitsap County and Poulsbo spoke with 252 people at PetsWalk in 2022.

Vince McIntyre from Port Angeles shows two kids how to play the Poop Toss game.

Game participants learn about the correct behavior when they play and receive a Puget Sound Starts Here (PSSH) branded clip-on bag dispenser for playing, which gives them the tool they need to implement the behavior and a physical reminder to reinforce the action long after the staff contact.

In total, this game helped jurisdictions reach and engage over 2,000 residents on proper pet waste pick up and disposal.

NATURAL YARD CARE – NEW BEHAVIOR CHANGE PROGRAM

Section S5.C.2.ii(b) of the permit required permittees to conduct a new evaluation of the effectiveness of an ongoing behavior change campaign (required under the 2013 permit) and to document lessons learned and develop a strategy and schedule to improve or expand the existing program or identify a new target audience and BMP behavior change campaign, by July 1, 2020.

In 2018, WSSOG piloted an effort to encourage people to pick up their dog's waste at home. This effort promoted the use of a sticker placed on outdoor garbage cans at home to help set a social norm for scooping. The pilot effort used a postcard to promote the use of the sticker and importance of home scooping. Following the pilot, the group evaluated the campaign and ultimately decided not to move forward with this target audience and BMP per the permit's behavior change requirements of S5.C2a.ii.(c)3.

The group evaluated the Mutt Mitt program but determined that the program does not need to be expanded and only needs to be sustained at existing levels.

With these decisions made, the group agreed to develop a strategy and schedule for a new audience and BMP. WSSOG hired a communications consultant in 2018, C+C, to help coordinate the selection of a new audience and behavior change. C+C worked with WSSOG to identify Natural Yard Care as the new behavior change program. The priority audience focuses on single family home or townhome residents with kids and/or pets who have "Do It Yourself" yards and are potentially using harmful yard care products. The selected BMP is the responsible, minimal use and storage of pesticides, fertilizers and/or other chemicals.

WSSOG's campaign focuses on the use of traditional "weed and feed" products in single family residences or homes with lawns. The behavior campaign ask is, "In order to reduce pollutants in stormwater runoff, fertilize only with safer products, if you plan to fertilize your lawn."

Through our market research, the cost of organic/natural fertilizers was identified as a key barrier to the preferred behavior change. A coupon for an organic/natural fertilizer was offered as part of our strategy towards addressing this barrier. The coupon was also identified as an output towards measuring the change in behavior. Additionally, the priority audience indicated that Master Gardeners are the spokespeople the audience believes most when it comes to using organic products. The group worked with the local WSU extension office to coordinate educational webinars for the target audience.

NATURAL YARD CARE CAMPAIGN STRATEGY AND SCHEDULE

The following activities have been conducted through the multi-year effort:

Social Marketing Sessions (December 2018 - February 2019)

The WSSOG conducted five social marketing planning sessions to define key project elements, including the campaign's focus on getting residents to reduce the use of chemical fertilizers on their lawns.

Initial Audience Research (December 2018)

Research was conducted to better understand the priority audience's perceived barriers, benefits, and motivators in relation to the desired behavior. A total of 212 people responded to the survey, with 164 falling within the priority audience parameters. Some of the key high-level findings were:

When asked "have you ever considered switching to ALL organic yard care products," 56% of the priority audience indicated they have considered making the change.

The top three concerns the priority audience had about using organics:

- 50% believe organic products cost more
- 27% do not think organic products would work as well
- 35% are not sure where they would purchase organic products

Creative Development and Testing (April-June 2019)

Based on research findings, creative concepts were developed then tested among the priority audience. The research results showed that the artwork of "Child and Puppy" performed the strongest overall and performed strong enough that no changes to the image or message were needed. The group selected this artwork for the pilot.

COVID-19 Delays the Pilot (January - June 2020)

WSSOG was prepared to pilot the program in spring 2020 and began planning in earnest. Event dates and a retail

partner had been scheduled. Due to COVID-19, the 2020 pilot was delayed to 2021. While the pilot was delayed, WSSOG used that time to conduct additional marketing research to further refine planned campaign tactics and messaging. WSSOG worked with C+C to conduct focus groups to test the ad concepts, language, and the audience's readiness for online/virtual events.

Campaign Pilot (April 2021 – August 2021)

The pilot behavior change campaign was conducted in Poulsbo during peak fertilizer season in spring 2021, and included webinars hosted by WSU Kitsap County Extension's Master Gardeners; an organic fertilizer discount offered through a partnership with a local retailer; and campaign communications including a Facebook ad campaign, a postcard, and government delivery channels such as e-newsletters, organic social media, and utility bill messaging.

The WSSOG chose the City of Poulsbo for the pilot based on several factors including the availability of Master Gardener outreach channels, the city's mix of representative demographics, and its central location within the county. With roughly 4,126 households and a population of 10,602, Poulsbo makes up just 3.9% of the population - making it an ideal fit to pilot the campaign and build toward Kitsap County-wide implementation.

Campaign Implementation Strategy and Schedule (January 2022 -present)

In 2022, the WSSOG expanded the program to include all the jurisdictions – Kitsap County, and the Cities of Bainbridge Island, Bremerton, Gig Harbor, Poulsbo, Port Angeles, and Port Orchard. The format of the program followed the same parameters as the pilot – virtual webinars hosted by Master Gardeners, a retail discount and similar outreach strategies. Using the results and lessons learned from the pilot campaign, the 2022 program was modified to include a larger product discount and ability to use the discount at multiple retailers in different jurisdictions. Webinars were also expanded to include different topics.

A total of four webinars were offered. The two topics were "Lawn Alternatives" and "Nature Friendly Gardening for Beginners." For the product discount, four retailers with five physical locations offered a 25% discount off a bag of an organic lawn fertilizer.

2022 Campaign by the Numbers:

- 123,360 people reached on Facebook
- 14,350 direct mail impressions
- 3,391 link clicks on Facebook
- 318 webinar registrations
- 139 webinar attendees
- 70 coupons redeemed in-store
- Continued successful partnership with Master Gardeners

Moving forward in 2023, the WSSOG will use lessons learned from the past two years to continue the webinars and a product discount. A detailed campaign report for 2022 has been included in Appendix A.

The next key activity for the permit is evaluation and reporting no later than March 31, 2024. WSSOG is contracting with a consultant in 2023 to begin to identify the evaluation mechanisms and is on track to complete all required elements of the permit.

ILLICIT DISCHARGE DETECTION AND ELIMINATION - S5.C.5.d.ii

REPORTING SPILLS

All WSSOG jurisdictions have a publicly listed hotline, telephone number and/or app for reporting spills and other illicit discharges. Kitsap County and Bainbridge Island, Bremerton, Poulsbo, and Port Orchard share the Kitsap1 phone number and SeeClickFix app.

WSSOG shares common branding and publicity through a tagline and graphics called *Spills Happen*. This catchy phrase and graphics are intended to bring awareness and encourage residents to report spills. Jurisdictions post their spills reporting phone numbers and app on their websites as well on print materials.

Stella Collier, Bainbridge Island, hosts a booth at the Bainbridge Island Farmers Market

WSSOG utilizes outreach methods, including:

- Display of the upright *Spills Happen* banners at events, in billing offices and public spaces.
- Bainbridge Island offers *Spills Happen* magnets and hotline stickers at their City Hall front counter displays or upon request.
- Bainbridge Island shared information at the Bainbridge Island Farmers Market in September 2022.
- Bainbridge Island has the spills hotline phone number on the back of staff business cards.
- Bremerton features the *Spills Happen* branding on their sweeper trucks.
- Bremerton distributed *Spills Happen* paint sticks.
- Gig Harbor distributed *Spills Happen* paint sticks and magnets at City Hall.
- Kitsap County displays the *Spills Happen* graphics on a total of three spills trailers. The phone number is also on a spill response truck.
- Port Angeles promoted the program in their October 2022 *Stormwater Rains* newsletter.
- Port Orchard handed out educational flyers, including spill, pressure washing, painting and IDDE pamphlets and 100 fridge magnets to interested parties, advertised the *Spills Happen* campaign on their website and posted banners within City Hall.
- Poulsbo distributes *Spills Happen* magnets at City Hall.
- Poulsbo stocks field vehicles with BMP pamphlets to hand to residents when an illicit discharge is spotted.

SPILLS REPORTING CALLS

A total of 83 spill complaints were received by Kitsap1. 25 spills related calls were received by Kitsap1 to the phone number, 36 spill complaints were received via the Kitsap1 email, and 22 were reported through the SeeClickFix app or online reporting form in 2022. (Bainbridge Island – 2, Bremerton – 45, Poulsbo – 4, Port Angeles – 7, Port Orchard – 8 spill complaints reported through SeeClickFix and 26 ERTS reports. (S5.C.3.d.ii).

TRAINING PROGRAM

Jurisdictions coordinate an ongoing training program and follow up trainings to their field staff on how to recognize, respond to and report spills (S5.C.5.d.iii). WSSOG reported the following trainings held in 2022:

- Bainbridge Island – Provided training as needed to new employees. A total of three employees completed the training in 2022.
- Bremerton – A total of 21 employees completed the online training called "Municipal Storm Watch" consisting of a video and quiz became mandatory for all city employees. Four employees completed online training "IDDE: A Grate Concern" consisting of a video and quiz.
- Kitsap County – Trainings were conducted both online and in person. A total of 89 Kitsap County Sheriff's officers completed the online training in 2022. An additional 94 county staff were trained, for a total of 183.
- Port Angeles – Provided training to all new employees. Port Angeles has also hired a new Pollution Prevention Assistance and Source Control Specialist to help manage the program.
- Port Orchard – In 2022 the City provided stormwater awareness training and IDDE training to new public works employees within 4-6 months of employment. Specialized trainings for stormwater staff also include IDDE, Illicit Connection Identification, stormwater good housekeeping, Hazmat awareness, Spill management/reporting procedures and construction inspection training depending on staff roles and responsibilities. These are conducted as needed or if staff or NPDES permits change.

GENERAL AWARENESS - S5.C.2.a.i

GENERAL AWARENESS THROUGH PUGET SOUND STARTS HERE

Puget Sound Starts Here (PSSH) is a regional effort to raise awareness about actions residents can take to reduce their impact and keep Puget Sound and the Salish Sea healthy (S5.C.2.a.i). Local implementation of PSSH included a variety of outreach approaches, including the promotion of Puget Sound Starts Here Month in September.

While distribution of items took a break during the pandemic, jurisdictions are making a return to outreach events. Many jurisdictions distribute branded "swag" items with the Puget Sound Starts Here logo through outreach events, at front desk counters and other mechanisms.

Collectively, these efforts placed over 7,986 Puget Sound Starts Here-branded items in the hands of West Sound residents and visitors.

Jurisdiction	Coasters	Coffee Sleeves	Pencils	Leash Bag Holders	Leash Bag Holder Refills	Bike Safety Lights	Tote Bags	TOTAL Impressions
Bainbridge Island	100			200				400
Bremerton	20		5	15				40
Gig Harbor								-
Kitsap County	2,250			750				3,000
Port Angeles			133	680	167	90	355	1,425
Port Orchard		2,600		81				2,681

Poulsbo		-
	TOTAL IMPRESSIONS	**7,986**

Jurisdictions also shared the Puget Sound Starts Here message at local events.

- Port Angeles hosted a booth at the City Pier for Earth Day. They also participated in the City's Halloween event, where they gave out swag and provided information about the proper disposal of pet waste.
- Bainbridge Island included a PSSH article in the weekly City Manager's e-newsletter each Friday in September. They were also highlighted in the City Manager's video to accompany the e-newsletter.

PUGET SOUND STARTS HERE MONTH DIGITAL CAMPAIGN

The regional Puget Sound Starts Here Committee coordinated PSSH Month in September. The committee coordinated a digital marketing campaign and jurisdictions were invited to financially participate in the campaign. Bainbridge Island, Bremerton, Kitsap County, Port Angeles, Port Orchard, and Poulsbo invested in the campaign.

This year's campaign focused on vehicle maintenance behaviors. The digital campaign's goals were to drive people to the PSSH website landing page and encourage them to fill out a form to receive a free car wash coupon. 350 people throughout the region requested car wash coupons. The website provided actions that individuals can take to reduce stormwater pollution from their cars including inflating tires, using commercial car washes, and fixing leaks.

The campaign's audience were adults aged 18-64 in the Puget Sound region. The ads were run in English, Spanish, Korean and Vietnamese. A portion of the ad budget was allocated towards targeting overburdened communities using factors such as income, education, people of color and/or those who speak limited English.

The campaign resulted in 6.4 million impressions across the digital ad placement platform, Facebook, and YouTube. An impression is the number of people who saw the ad. The videos that were used in the ads were played over 1.1 million times.

Jurisdiction	Impressions (# of times an ad was viewed)
Bainbridge Island	18,447
Bremerton	30,734
Gig Harbor	23,045
Kingston	2,643
Port Angeles	22,261
Port Orchard	27,370
Poulsbo	9,856
Silverdale	5,299
Total Impressions	139,655

Tami Allen, Harbor Master and Stella Collier, Stormwater Management Program Coordinator, accept the PSSH Proclamation for Bainbridge Island

PUGET SOUND STARTS HERE MONTH PROCLAMATION

The Bainbridge Island City Council issued a proclamation declaring September to be Puget Sound Starts Here Month.

Kitsap County's Board of Commissioners also declared the month of September as Puget Sound Starts Here Month through a proclamation. The Commissioners proclaimed, in part, *"Kitsap County will join with other governing bodies, organizations and community groups to strengthen stewardship of our shared watershed and encourage all to take action to improve the health of Puget Sound."*

PUGET SOUND STARTS HERE THEATRE ADVERTISING

Port Angeles continued their practice of running on-screen cinema ads featuring PSAs about stormwater best management practices. Port Angeles movie ads were run on eight screens at Deer Park Cinemas for three months. The ad was run at least two times prior to each feature film on every screen throughout the month, with number of impressions each month depending on how many ads were in the cycle. Theatergoers could expect to see the ad within six minutes or less before the start of each movie, and if they were there earlier, could view those ads every six minutes in rotation.

STEWARDSHIP - S5.C.2.a.iii

CREATIVE WAYS TO ENGAGE THE PUBLIC

Jurisdictions provided a variety of ways for residents to participate in activities and events.

- Bainbridge Island participated in several one-time events including the Bainbridge Island Farmers Market, annual beach clean-up event, and a Kitsap Solid Waste hazardous waste collection event hosted on Bainbridge Island.
- Bainbridge Island continues to support quarterly watershed council meetings and a salmon monitoring program.
- Bremerton participated in Salmon Tours in November, a Sinclair Inlet Clean Up event in September, and Kids Fishing Day in April.

Sarah Wilson, City of Bremerton, at Kids Fishing Day event

- Bremerton provided educational information to a classroom at Kitsap Lake Elementary School about the path of stormwater from catch basins.
- Kitsap County conducted their fourth annual Art for Clean Water event at Olympic College. Kitsap County partnered with the city of Bremerton to coordinate this year's event. This event features an art contest for the public. Five designs were selected, and artists painted large 10 by 10-foot murals at the Bremerton campus of Olympic College. Two of the five designs were painted by Olympic College staff and students.
- Port Angeles supports Streamkeepers of Clallam County; a volunteer organization that performs water quality monitoring in Tumwater, Peabody, Valley, White, Ennis, and Dry Creeks. Over the last two years, the program has seen approximately 32 volunteers come and go with varying levels of commitment. The City funds the program's wet weather and dry weather sampling efforts within the City limits and, this year, was able to additionally support a Benthic macroinvertebrate sampling program in four of the creeks.
- Poulsbo held 15 work parties in Fish Park for restoration, planting, and clean-up, totaling 1,631.5 volunteer hours! Work party activities include riparian and upland plant/landscape maintenance and planting, as well as trail maintenance and garbage pick-up.
- Poulsbo hosted a site for Kitsap Salmon Tours and had approximately 350 people visit.
- Port Orchard continues to participate in the West Sound Partners for Ecosystem Recovery, Benthic macroinvertebrate sampling in Blackjack Creek and is continuing to develop a program with South Kitsap High School for stream and watershed monitoring.

MAXIMIZING OUR REACH THROUGH PARTNERSHIPS

Kitsap staff continues to represent the County and WSSOG as partners in the larger regional efforts of STORM and Puget Sound Starts Here. In 2022, Kitsap staff provided input at STORM's quarterly meetings, within workgroups, and at the 2022 STORM Symposium. Significant accomplishments of the STORM group are summarized in their annual report (included as Appendix B).

WORK GROUPS

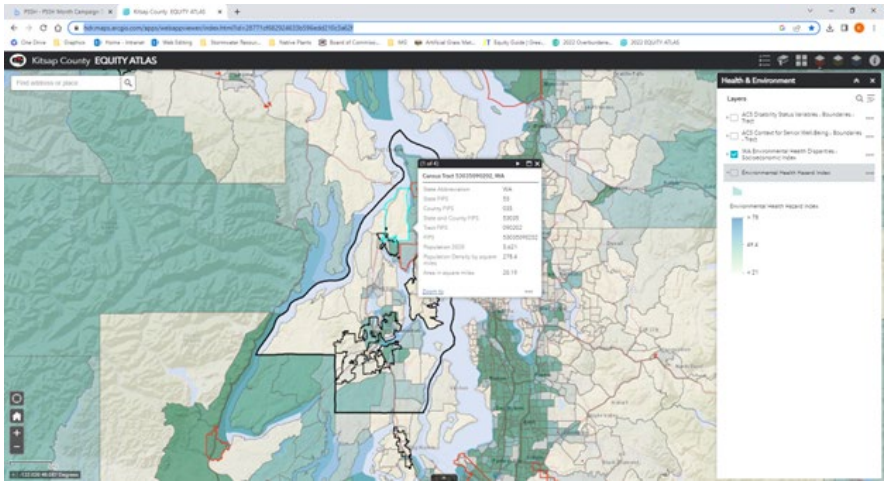
Kitsap staff participated in several work groups under STORM's umbrella in 2022 on issues of regional significance, including the Business Inspection Group (BIG). Kitsap staff also participate in work groups such as the Natural Yard Care and Pet Waste, which periodically meet as needed.

STORM STEERING COMMITTEE & PUGET SOUND STARTS HERE COMMITTEE

Kitsap County continues to represent the County and the WSSOG partnership as a member of the STORM steering committee. This committee meets twice a month on tasks that guide the regional STORM group. Notable projects by the STORM and PSSH Steering Committees in 2022 included working with the Washington Stormwater Center to create a work plan for a new statewide E&O Coordinator position, planning and facilitating virtual quarterly meetings and the annual Symposium, and coordinating a regional PSSH Month digital advertising campaign. The PSSH committee also hired a consultant under a National Estuary Program (NEP) grant to begin development of a social marketing campaign to encourage the proper inflation of car tires to potentially reduce the impacts of 6PPD. Work on this grant began in late 2022 and will continue through 2023.

GROSS GRANT

In July 2021, Kitsap County was awarded a $42K Municipal Grant of Regional or Statewide Significance (GROSS) from the Department of Ecology. The grant is intended to support the WSSOG's efforts in providing overburdened communities meaningful opportunities for public involvement and participation (a permit requirement). Two of the three deliverables of the grant were achieved in 2022, with the third one planned for the first part of 2023.



In 2021, the County created a web-based story map designed to guide the County and partner agencies toward meaningful, inclusive, and equitable outreach. This tool is comprised of 23 demographic, socioeconomic and health/environment metrics (or indicators) from Federal, State, and private data sources and allows for community exploration down to a neighborhood level or census tract. Through the GROSS grant, Kitsap County updated the map in 2022 with the latest available data sources and enhanced usability with minor adjustments to the layout. The new tool also included the development of an Equity Atlas, which allows users to explore multiple data layers within one single map. WSSOG stormwater infrastructure data was included to provide jurisdictions with additional tools for decision-making.

The second deliverable of the GROSS grant was to coordinate a regional online training for WSSOG and STORM members on community engagement strategies to overburdened communities. Kitsap County contracted with Greenprint Partners to provide a virtual day long training on the topic of "centering community." A total of 34 participants received tools and resources to help them assess their current engagement practices and a framework for determine where to focus equity efforts in the future. The training was based on the Equity Guide for Green Stormwater Infrastructure Practitioners, which was published in 2022.

PLANNING FOR 2023

OVERVIEW

All WSSOG members renewed their inter-local agreements effective from 2023 through 2025. The WSSOG will continue to coordinate and sustain existing efforts. Additionally, the group will coordinate on new initiatives when appropriate, such as coordinating business inspection materials. The 2023 work plan is in Appendix C

In 2023, WSSOG will begin work towards evaluating and reporting on the Natural Yard Care campaign. The permit deadline to report on the campaign is March 31, 2024.

Lastly, the GROSS grant includes one final deliverable to evaluate existing outreach programs and identify strategies to reach underserved communities. A consultant has been hired to complete this work in the first quarter of 2023.

APPENDIX A: NATURAL YARD CARE REPORT

12/22/2022

WSSOG NATURAL YARD CARE SOCIAL MARKETING PROGRAM

FINAL REPORT 2022

Prepared by: Kym Pleger
KITSAP COUNTY PUBLIC WORKS – STORMWATER DIVISION

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2 EXECUTIVE SUMMARY

The West Sound Stormwater Outreach Group, or WSSOG, is a multijurisdictional partnership between Kitsap County and the Cities of Bainbridge Island, Bremerton, Gig Harbor, Poulsbo, Port Angeles, and Port Orchard. The group works together to improve water quality by reducing pollutants in stormwater runoff, which are a major source of pollution to local waterways and the Puget Sound. The following report details results and findings from the second-year implementation of the Natural Yard Care campaign.

This program satisfies the current Western Washington Phase II Municipal Stormwater NPDES permit to affect behavior change (S5.C.2). Planning for the program began in 2018, and the pilot occurred in 2021. In 2022, the campaign was expanded to all the WSSOG-member jurisdictions. The following activities were conducted through the multi-year effort:

- **Social Marketing Sessions/Campaign Planning** - The WSSOG conducted five social marketing planning sessions to define key project elements, including the campaign's focus on getting residents to reduce the use of chemical fertilizers on their lawns.
- **Initial Audience Research -** Research was conducted to better understand the priority audience's perceived barriers, benefits, and motivators in relation to the desired behavior.
- **Creative Development and Testing -** Based on research findings, creative concepts were developed then tested among the priority audience.
- **COVID-19 Pivot to Research -** Due to COVID-19, the 2020 pilot was delayed to 2021. While the pilot was delayed, additional research was conducted to further refine planned campaign tactics and messaging.
- **Pilot Campaign in Poulsbo –**A pilot was conducted in Poulsbo during peak fertilizer season in spring 2021, and included webinars hosted by WSU Kitsap County Extension Master Gardeners; an organic fertilizer discount offered through a partnership with a local retailer; and campaign communications including a Facebook ad campaign, a postcard, and government delivery channels such as e-newsletters, organic social media, and utility bill messaging.
- **Campaign Expansion** – In 2022, the campaign was expanded to include all WSSOG jurisdictions. Four webinars were hosted by WSU Kitsap County Extension Master Gardeners; an organic fertilizer discount was offered at five locations; and campaign communications included a postcard mailer, Facebook ad campaign and local government delivery channels.

3 2022 CAMPAIGN BY THE NUMBERS

3.1 2022 CAMPAIGN RESULTS

- 123,360 people reached on Facebook
- 14,350 direct mail impressions
- 3,391 link clicks on Facebook
- 318 webinar registrations
- 139 webinar attendees

- 70 coupons redeemed in-store
- Continued successful partnership with Master Gardeners

4 Campaign History (2018 – 2021)

4.1 Social Marketing Sessions (December 2018 - February 2019)

Social marketing is a process that applies marketing principles and techniques to create, communicate, and deliver value to influence a priority audience's behaviors to benefit society. In line with social marketing best practices, the WSSOG participated in five social marketing planning sessions led by C+C Social Marketing Strategist Nancy Lee. Lee has over two decades of experience in social marketing, co-authoring 13 books on social marketing with Philip Kotler; teaching Introduction to Social Marketing at the University of Washington; and consulting with over 100 governmental agencies in Washington state.

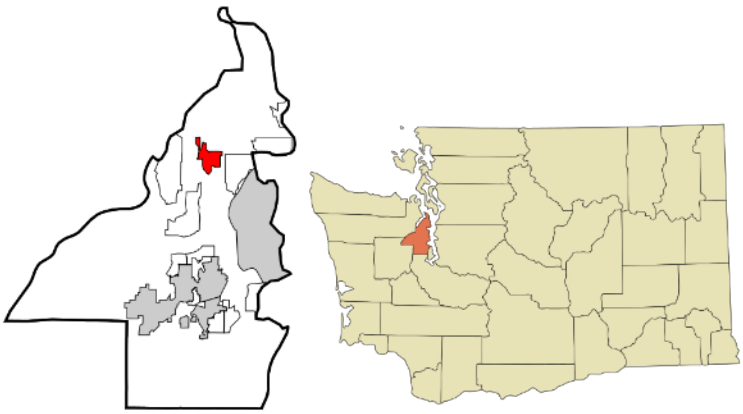
Each of Lee's sessions included an overview and presentation of a social marketing tenet, and a corresponding workshop to design each plan element. The purpose of the campaign was defined as: To reduce pollutants in stormwater runoff by increasing the amount of safe products used in yard care and decreasing the amount of harmful products used in yard care. The five sessions were as follows:

1. Background, Purpose, and Focus
2. Situation Analysis
3. Priority Audience
4. Desired Behavior Objectives & Goals
5. Priority Audience Barriers, Benefits, Motivators, Competition, and Influential Others

The result of the workshops was a complete social marketing plan, ready for pilot development and implementation. The following key elements were chosen:

Campaign "Ask" - To reduce pollutants in stormwater runoff, fertilize only with safer products, if you plan to fertilize your lawn.

Campaign Audience - Single family home or townhome residents with kids and/or pets who have "Do It Yourself" yards and are currently using harmful products.



Pilot Area - The WSSOG chose the city of Poulsbo for the pilot based on several factors including the availability of Master Gardener outreach channels, the city's mix of representative demographics, and its central location within the county. With roughly 4,126 households and a population of

10,602, Poulsbo makes up just 3.9% of the population - making it an ideal fit to pilot the campaign and build toward Kitsap County-wide implementation.

4.2 Initial Audience Research *(December 2018)*

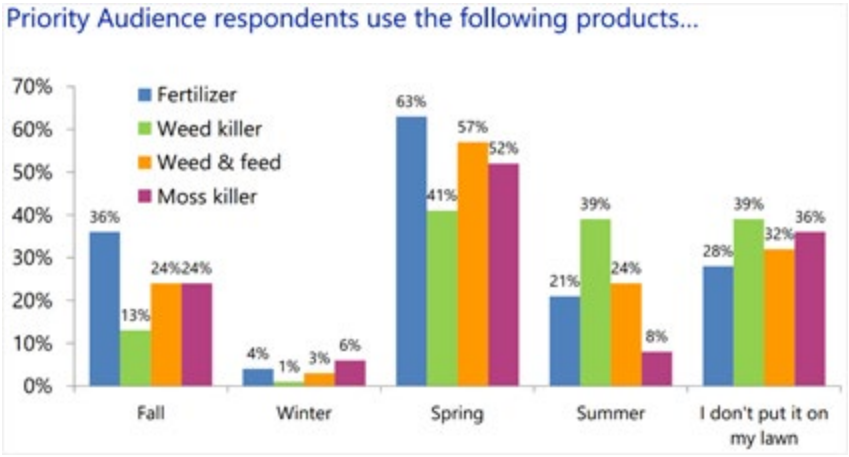
Between social marketing sessions four and five, the WSSOG and C+C worked with Hardwick Research to gain a better understanding of the priority audience. A survey was designed to identify the perceived barriers and benefits related to lawn care and fertilizer usage by Kitsap County residents. The priority audience was defined as those who:

- Live in Kitsap County, Poulsbo, Bremerton, Port Orchard, Gig Harbor, Bainbridge Island, or Port Angeles
- Own a single-family home, townhouse, or duplex
- Have grass on their property
- Maintain the grass themselves
- Have at least one child under 18 years of age living in their household OR have a pet that goes out in the yard
- Uses a fertilizer on the lawn

The survey was promoted through Facebook, government communication channels, and digital neighborhood groups such as Nextdoor. A total of 212 people responded to the survey, with 164 falling within the priority audience parameters. Some of the key high-level findings were:

- When asked “have you ever considered switching to ALL organic yard care products,” 56% of the priority audience indicated they have considered making the change.
- The top three concerns the priority audience had about using organics:
    - 50% believe organic products cost more
    - 27% do not think organic products would work as well
    - 35% are not sure where they would purchase organic products
- The priority audience said Master Gardeners are the spokespeople they believe most when it comes to using organic products. 43% believe Master Gardeners; 39% believe professional gardeners (groundskeepers, golf course managers, landscapers, etc.); 34% believe university researchers; 27%

believe local nurseries or garden centers; Friends/neighbors, governments, celebrity gardeners, medical experts, major brands, veterinarians, and the internet all ranked below 17%



- 64% of priority audience respondents thought that free or discounted organic products or a list of what products to use would make them more likely to use organic products on their lawn.
- Spring is the peak season for participants who were putting chemical products on their lawns, followed by fall.

4.3 Creative Development and Testing *(April - June 2019)*

Once the social marketing plan was developed, the WSSOG worked with C+C to develop campaign creative and determine the best combination of imagery and messaging to resonate with the priority audience. Message testing with the priority audience helped determine which combination of image and text would be most motivating to get them to switch from using harmful products to using safer ones. The survey was conducted using the online tool Ask Your Target Market. For this testing effort, C+C and the WSSOG developed four separate adcepts (pictured below).

Figure 1: Four adcepts used for testing

Respondents answered questions to capture the following information:

- Open-ended (qualitative) questions regarding **understanding**
- Likert rating of each ad to determine success factors: **important, relevant, believable, motivating, engaging**

- Rank order from most motivating to least motivating
- Open-ended explanation of elements that contribute to most and least motivating
- Open-ended description of an ad that would be most motivating

Research Results:

- The “Child & Puppy” creative performed the strongest overall, and performed strong enough that no changes to the image and message were needed
- The “Child & Puppy” and “Otter” adcepts both scored very well in comparison to the group.
- “Otter” performed well, especially among those who already have some knowledge about the issues associated with natural yard care – as the audience becomes more aware/educated, “Otter” could be the “next generation” key message.
- All the messages were well understood, including the nuances beyond organic is better than chemical fertilizers.
- Images with children were ranked as engaging and relevant.

With research finding the “Child & Puppy” adcept was the strongest, the WSSOG finalized the campaign creative (pictured below).

Figure 2: Selected adcept for the campaign

4.4 COVID-19 Delays Outreach, Pivot to Research (January - June 2020)

Based on the results of social marketing sessions and research, in-person events with Master Gardeners at gardening supply retail stores were chosen as the main outreach tactic. Ahead of the spring fertilizing season, Master Gardeners would be on-hand to answer natural yard care questions from the priority audience, while organic fertilizer would be discounted and offered to store attendees.

Planning for the pilot program was well underway – a retailer was selected, and tabling dates were scheduled. Due to the impact of COVID-19, the WSSOG's natural yard care pilot campaign was unexpectedly postponed from spring 2020 until spring 2021. With a need to restructure pilot tactics for the pandemic, the team utilized the remainder of 2020 to conduct additional market research on the priority audience. Results and analysis from the research would be used to better inform the execution of the 2021 pilot.

4.5 Further Research - Tactics and Messaging in the COVID Environment (June– August 2020)

With the delay of the pilot campaign due to COVID-19, the WSSOG and C+C conducted additional surveying to refine the tactics within the campaign, such as interest in virtual versions of the events, and preferred descriptions for virtual events. WSSOG also sought to narrow the pilot's Facebook ad strategy by testing which topics would drive the most engagement.

Respondents were recruited by placing two Facebook ads letting Kitsap residents know the WSSOG was seeking people who do their own yard care to participate in a paid research study. Residents who were interested clicked on a link that took them to a short survey to ensure they fit the target audience profile. If they did, they received information about how to participate.

This online research was conducted using the Revelation™ platform with 13 people – or the equivalent of two focus groups. Respondents spent about 1 hour over a 2-day period participating in the research and were compensated $80 each for their opinions. Select key insights were provided below.

Planned Pilot Insights:

- The target audience is very receptive to online Master Gardener events because they are more convenient. Although a few respondents complained of "Zoom fatigue," most respondents were excited about the idea of having lawn care education online, provided by Master Gardeners.
- Although cost is a significant barrier to purchase, the way a campaign expresses price reduction has potential to deter people from purchasing organic products.
- Keep focusing on kid / pet health and safety as a motivator. The majority of respondents are not connecting their lawn care practices to the health of the Puget Sound. However, a number of respondents were already concerned about the negative health implication of chemicals on their kids and pets.

Facebook Ad Strategy Insights:

- The Facebook ad that highlighted Master Gardener informational events was preferred over the Facebook ad that provided a coupon. The drivers were:
    - Respondents are eager to interact with Master Gardeners and believe they would learn useful information from them. Credibility is very high.
    - Those who said they would attend a Master Gardener event were motivated by the educational aspect. This also made some respondents believe that the ad wasn't just an advertising gimmick.

- Respondents liked the idea of a coupon at the Master Gardener event, but that was not a significant driver for attendance.
- Respondents would be more likely to click either ad if it was posted by a friend or trusted source.
- Although some people loved the idea of coupons, many felt that coupons or discounted products, especially without a familiar brand name, signal lower quality products and/or products that have been sitting around and need to be sold.
- The ads with coupons didn't promote a specific product, so respondents didn't feel confident that the coupon would be worthwhile.
- Additionally, when respondents found that they had to fill out a form to get a coupon mailed to them, they thought it wasn't worth the effort. Others were concerned that it would just get their name on a mailing list.

4.6 Pilot Activities (January – May 2021)

The pilot was timed for spring 2021, based on survey findings showing that the majority of the priority audience fertilized their lawns in the spring.

4.6.1 Virtual Events with the Master Gardeners

In spring 2021, the pandemic was still going strong, and the Master Gardeners were not doing in-person events. The project shifted from the original plan of tabling at lawn and garden retailers, to conducting natural yard care webinars. The events would cover the basics of natural yard care and would be led by a Master Gardener, with a WSSOG representative serving as the host. Based on the research, the events were titled "Natural Lawn Care with Master Gardeners: For Healthier Yards and Safer Families." A total of three webinars were held in late March and early April.

4.6.2 Retail Partnership and Product Discount

Valley Nursery in Poulsbo agreed to partner with the program. Residents would be able to purchase a 20 lb. bag of E.B. Stone Organic Lawn Food (pictured) with a 15% discount. The WSSOG would reimburse Valley Nursery for the cost of the discount. Valley Nursery also agreed to commit to stock organic fertilizer throughout the spring season (once the discount is over), an added benefit since other similar programs in the region have found that one barrier to these programs is that retailers may not keep organic product stocked throughout the popular spring fertilizing season.

4.6.3 Outreach Mechanisms

WSSOG partnered with C+C on several outreach strategies to reach the priority audience. All the strategies focused on the pilot's selected city of Poulsbo. Strategies included a paid social campaign on Facebook. Facebook was identified for the paid social campaign for its widespread usage, flexibility, and scalability. A large attention-getting 6"x9" postcard was mailed to 2,933 residents in Poulsbo and virtual events were promoted through the City of Poulsbo's monthly e-newsletter and monthly utility bill insert. Kitsap County also hosted two web pages to serve as a central source of information about the campaign and the webinar.

5 CAMPAIGN EXPANSION IN 2022

In 2022, the WSSOG expanded the program to include all the jurisdictions – Kitsap County, Cities of Bainbridge Island, Bremerton, Gig Harbor, Poulsbo, Port Angeles, and Port Orchard. The format of the program followed the same parameters as the pilot – virtual webinars hosted by Master Gardeners, a retail discount and similar outreach strategies. Using the results and lessons learned from the pilot campaign, the 2022 program was modified to include a larger product discount. Webinars were also expanded to include different topics.

5.1 VIRTUAL EVENTS WITH THE MASTER GARDENERS

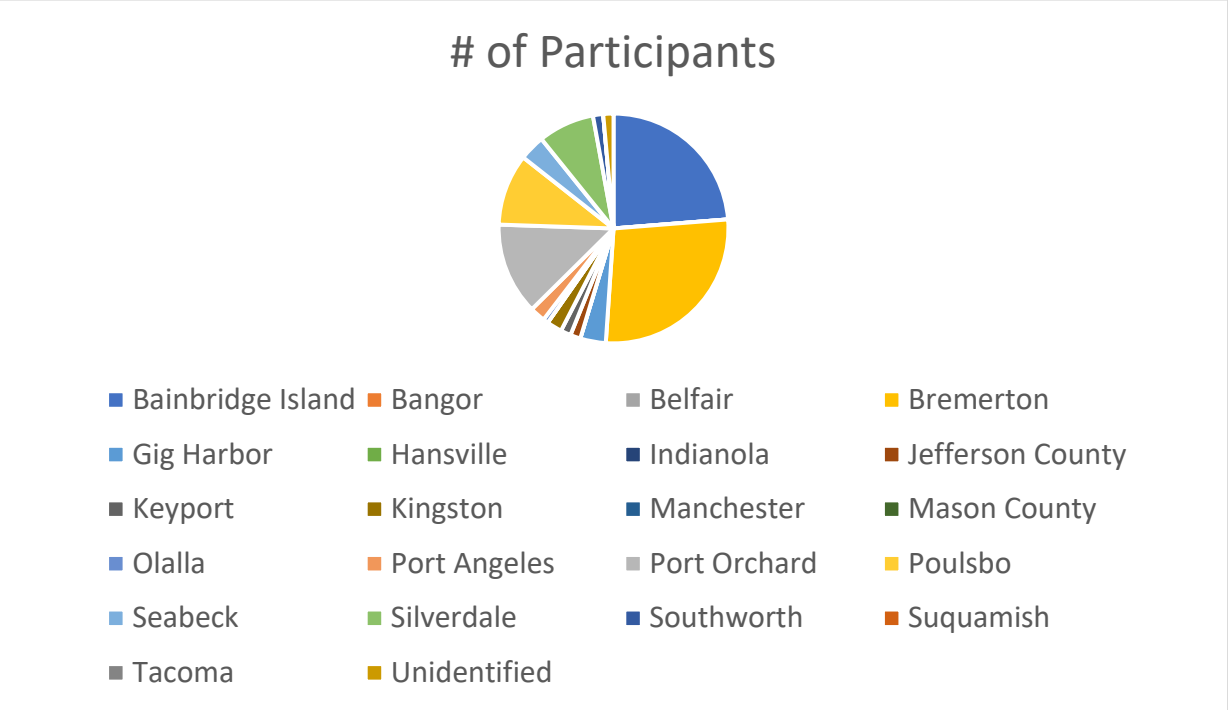
In 2022, two Master Gardeners volunteered to offer two different webinars. The topics selected were "Lawn Alternatives" and "Nature Friendly Gardening for Beginners." Each topic was offered twice, for a total of four webinars.

In total, 318 registered and 139 attended for an average of 35 attendees per webinar.

- 44% of people who registered attended a webinar
- 65% of people who attended one of the webinars had kids or pets at home
- Of the webinar dates and times, Saturday, April 16 at 10 a.m. was the most popular with 87 attendees.

Event Registration & Attendance				
Webinar Date	**# Registered**	**# of Registrants with Pets or Kids at Home**	**# Attended**	**# of Attendees with Pets or Kids at Home**
Lawn Alternatives, Saturday, April 16, 10 am	117	87	57	43
Lawn Alternatives, Friday, April 22 at Noon	79	47	37	17
Nature Friendly Gardening for Beginners, Saturday, April 23, 10 am	69	51	29	19
Nature Friendly Gardening for Beginners, Wednesday, April 27 at 6 pm	53	39	16	12
TOTALS	**318**	**224**	**139**	**91**

Attendees at the webinars were from all the WSSOG jurisdictions. The largest number of attendees reside in Bremerton (38 or 27%) followed by Bainbridge Island (33 or 24%).



Registrant Fertilizer Use

When asked, "What kind of fertilizer(s) do you use on your lawn currently?

- 58 of the 318 registrants (18%) indicated that they use a "weed & feed" product on their lawn.
- 147 of the 318 registrants (46%) indicate they do not use any products.
- 13 of the registrants (4%) do not have a lawn.

While the program was successful in reaching the priority audience of people with kids or pets at home (65% of attendees), it saw limited success in reaching those who use "weed and feed" products.

One sub-group stands out from this question – almost half (46%) of the registrants indicate they do not use any products at all.

Participant Engagement

The average time spent in each session was 52 minutes, with each webinar running between 45 minutes to one hour. This is a substantial amount of time to engage with the topic – much longer than a conversation an attendee might have in a retail store setting, and more in-depth than viewing an ad, postcard, or other communication.

43% of attendees took the post-event survey (60). A total of 14 respondents indicated they were interested in having a Master Gardener follow up with them.

Registrant Questions

A total of 106 questions were submitted by registrants, with many people asked questions pertaining to a variety of lawn and garden topics. Many questions submitted pertained to the topic of lawns, as well as the types of chemicals that could be used to treat lawns and common lawn problems. Moss, for example, was a recurring topic.

- "My lawn area is about 8000 square feet, which I find to be a little overwhelming. My big concern is water usage. I do not water during the summer, but the lawn suffers. **Moss** is a "problem" although I like moss well enough. If I were to seed areas with meadow type plants, can I do that over a drain field. I have a concern, unsupported by any data, that deep roots might be a problem. I'm also curious if there are any Bainbridge Island ordinances about planting meadow versus lawn. How do I keep the lawn barely alive without hurting the property value?"
- "I don't use any **chemicals** because I have a seasonal pond that I don't want getting toxic & I usually have a dog. I have an acre in the country, so it is mostly black berries & dandelions...not a lot of grass, but I have a hill that has to be mowed or the grass gets very long. I want to know what to do to take over the grass...wildflowers, ground covers, etc.? Do I need to cover/kill it first? I've tried planting some wildflowers, but the grass always takes over. Part of it has the drain field, too so it is thick. Also, how can I get rid of the blackberries?"
- "Interested in learning about alternative, low maintenance ground covers. **We don't water or fertilize the grass**; it sort of dies back in the summer, but we still mow it. I am wondering about alternatives that can be walked on."
- "Are **organic lawn fertilizers safe** for use near the salt water of Puget Sound?"
- "How to **remove moss** from lawn. One lawn is over the septic field area. Also, how to eliminate moss growing on patio pavers and to remove green from driveway."

Post-Event Survey Results

60 respondents took the post-event survey (43%), which showed up on-screen immediately post-event and was also emailed to attendees.

In the Lawn Alternatives webinar, 48% of attendees reported they were "very likely" or "likely" to switch to organic fertilizer. In the Nature Friendly Gardening for Beginners webinar, 60% of attendees reported they were "very likely" or "likely" to switch to organic fertilizer.

Lawn Alternatives					
How likely are you to switch to using organic fertilizer?					
Very likely	Likely	Neither likely nor unlikely	Unlikely	Very unlikely	N/A I already use organic fertilizer
11	8	6	0	2	13

28%	20%	15%	0%	5%	33%
48%	Percent either "very likely" or "likely" to switch to organic				

Nature Friendly Gardening for Beginners					
How likely are you to switch to using organic fertilizer?					
Very likely	Likely	Neither likely nor unlikely	Unlikely	Very unlikely	N/A I already use organic fertilizer
6	6	2	0	0	6
30%	30%	10%	0%	0%	30%
60%	Percent either "very likely" or "likely" to switch to organic				

In both the Lawn Alternatives and the Nature Friendly Gardening for Beginners webinar, 55% of respondents said they were “very likely” or “likely” to use the coupon.

- Very Likely -16
- Likely - 17
- Neither likely nor unlikely - 12
- Unlikely - 7
- Very unlikely - 8

5.2 Retail Partnership and Product Discount

With two-thirds of the priority audience saying free or discounted products were their top motivator to try the desired behavior, the WSSOG sought to again offer a discounted product. Organic lawn fertilizers range between approx. $20-$70 per bag or carton, so they are not a small, inexpensive "giveaway item". Further, a small sample amount would not be a strong behavior-change incentive, since it would only cover a very small part of the lawn and would be used next to synthetic fertilizer, and organic fertilizer may take longer to get results. Due to these factors, the WSSOG sought a way to conduct an innovative partnership to provide free or discounted product as part of the pilot project.

In 2022, the WSSOG conducted robust outreach to solicit retailer participation. Ultimately, four retailers and a total of five locations across the West Sound participated in Kitsap's Natural Yard Care coupon promotion, providing coverage across the entire WSSOG region. Through these retailers, customers could receive 25% off (or up to $15 off) select natural or organic lawn fertilizer.

Each retailer identified an organic lawn fertilizer and the bag size. All products ranged in retail price from $38.99 up to $68.99. For example, Bremerton City Nursery provided two options – an 18-pound bag for $38.99 or a 40-pound bag for $68.99.

During the eight-week period the coupon was active (between April 1 and May 30), 70 total coupons were redeemed at participating stores:

- Airport Garden Center in Port Angeles redeemed **7 coupons**
- Bay Hay and Feed on Bainbridge Island redeemed **20 coupons**
- Bremerton City Nursery redeemed **35 coupons**
- Wilco in Bremerton redeemed **7 coupons**
- Wilco in Gig Harbor redeemed **1 coupon**

This year, retail stores reported a mix of physical coupon redemptions as well as digital coupon redemptions with customers showing the coupon on their phone from the website.

The program team received valuable insight from retail stores about spring sales overall for 2022, with many saying that poor weather in April and May kept customers out of their gardens and therefore out of the nursery/retail stores, causing a slower year overall for lawn fertilizer sales.

Key insights from retailers:

- Bay Hay and Feed reported that, "It was a cold spring so grass seed and fertilizer was not as good as previous years, we sold half of what we normally sell in April," and in general, "Nursery sales are incredibly dependent on good weather…you cannot do much about that."
- Bremerton City Nursery told us that, "This was the coldest, wettest Spring we have had in over 70 years (according to the weather experts!), so I would say our lawn fertilizer sales were slow."
- Airport Garden Center said, "We are having an unusually busy June and July...I believe the weather [in April and May] was the culprit to our low overall spring sales this year.

5.3 Outreach Mechanisms

5.3.1 Postcard Mailer

A large, attention-getting 6”x9” postcard was sent to 14,350 households throughout all the WSSOG jurisdictions. Each jurisdiction provided their own mailing list and set their own criteria. Allocation numbers were determined through the interlocal agreements and population percentages. The postcard conveyed the benefits of using safer products, encouraged residents to attend a webinar, and included the coupon.

Jurisdiction	Relative Population	Postcard # Allocated	# Actual
Unincorporated KC	59.20%	8880	8513
Bremerton	14.00%	2100	2071
Bainbridge Island	8.20%	1230	1230
Port Angeles	6.50%	975	1031
Port Orchard	4.80%	720	560
Poulsbo	3.70%	555	561
Gig Harbor	3.60%	540	565
TOTAL	**100%**	**15000**	**14531**

Figure 3: Front of Postcard

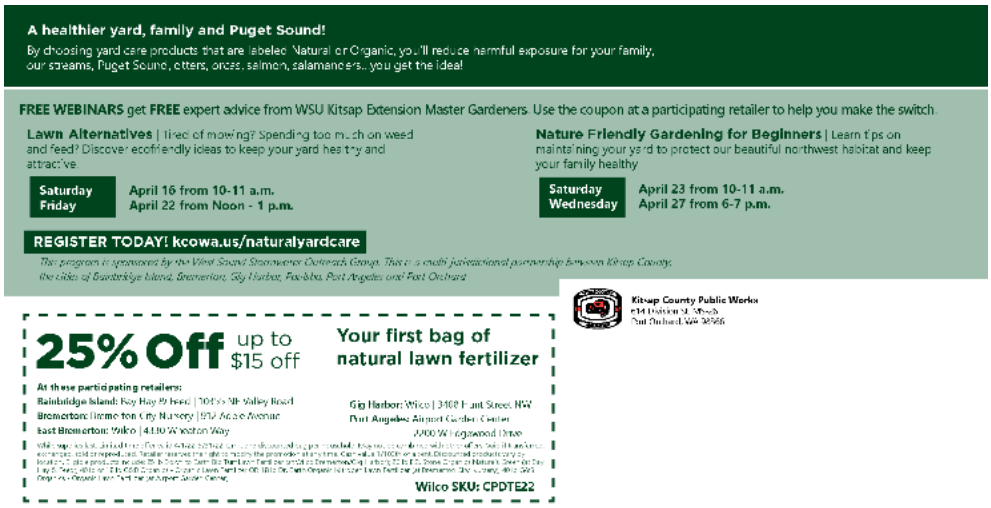


Figure 4 Back of postcard

5.3.2 Government Delivery Channels and County Website

One landing page was hosted on the Kitsap County government website, sharing information on the virtual events, the coupon, and more information about using only natural or organic lawn care products. An additional page served to promote just the webinars and registration. Both pages received strong traffic. The Natural Yard Care landing page (kcowa.us/naturalyardcare) received a total of 2,497 unique visitors during the campaign period spanning April 1, 2022, through May 31, 2022. The webinar registration page received a total of 121 unique visitors for a combined total of 2,618 unique visitors. This is double from the 2021 pilot number (with a total of 1,325 unique visitors from March 1, 2021, through April 30, 2021).

Kitsap County also sent out an email bulletin to a total of 14,207 recipients. The bulletin had 3,616 unique opens and 229 total clicks on the various hyperlinks included in the bulletin. The top link clicked was the webinar registration page with 61 total clicks.

5.3.3 Digital Campaign

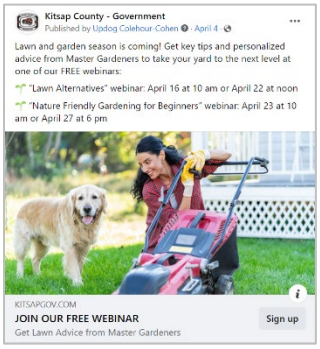
A paid social campaign was once again used to promote the virtual events and the campaign overall. With the success of the campaign's social ads in the 2021 pilot, and roughly two-thirds of U.S. adults (68%) reporting that they are Facebook users (Pew), Facebook was again utilized as the main advertising vehicle for the campaign based on its widespread usage, flexibility, scalability, and affordability.

The 2022 campaign utilized the same imagery as the 2021 pilot, with updated text to reflect the 2022 campaign events, coupon, and other parameters.

In total, the Facebook campaign reached 123,360 people and received 3,391 link clicks - a strong showing for the audience area in Kitsap County. The average cost per click (CPC) was $1.36, which is in line with other campaigns running in Q1/Q2 2022.

The Facebook campaign also had a high frequency, with people seeing the ads roughly 4 times on average. Research shows that people need to see most ads multiple times to recall them later. Below is a breakdown of how the ads performed separately:

<u>Webinar Ad (April 1, 2022, to April 26, 2022)</u>



- 1,039 link clicks
- Over 274,951 appearances on people's newsfeed
- 71,520 people reached*
- $1.44 cost per click
- This ad received 6 comments, 96 reactions, 27 shares, and was saved 11 times by Facebook users
- On average, this ad was seen ~4 times by each person

<u>General Campaign/Coupon Ad (April 1, 2022, to May 24, 2022)</u>

- 2,352 link clicks
- Over 490,379 appearances on people's newsfeed
- 98,752 people reached*
- $1.28 cost per click
- This ad received 42 comments, 338 reactions, 69 shares, and was saved 23 times by Facebook users
- On average, this ad was seen ~5 times by each person

**46,912 people saw both ads leading to *123,360 total people reached*

<u>Ad Comparison While Both Ads Were Running (April 1, 2022 – April 26, 2022)</u>

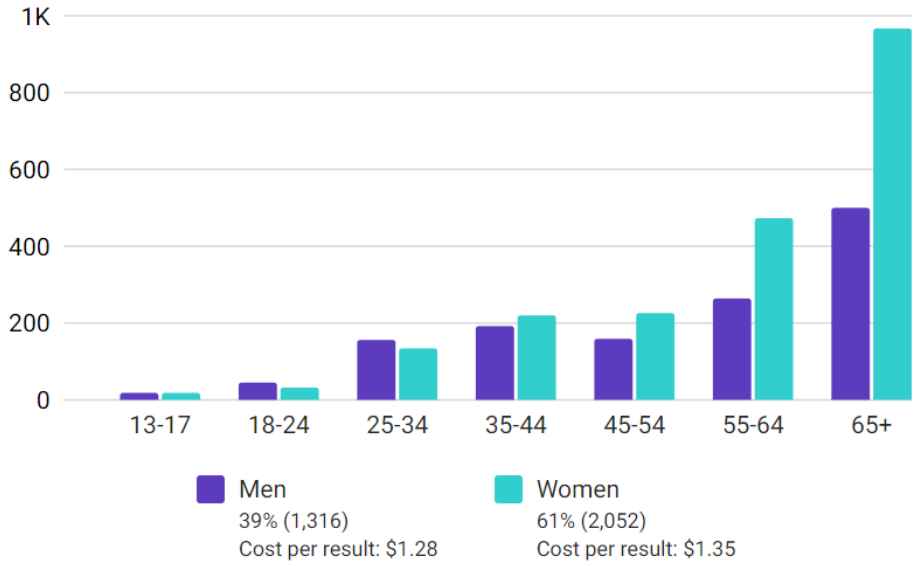
The webinar ad run time was a few weeks shorter than the general campaign/coupon ad since the campaign ended later than the last webinar. While both ads were running, the general campaign/coupon ad had a slightly stronger performance than the webinar ad.

- The coupon ad drove 757 link clicks, spending $686.06 in this period, while the webinar ad drove 1,039 link clicks, spending its budget in its entirety of the allocated $1,500.
- The coupon ad had higher post engagement indicating it was the more relevant ad for the target audience, garnering 62% of the engagement, 78.5% of the comments, and 57% of the post shares during this period.
- The webinar ad had a higher frequency, meaning the ad was shown more times to the same people than the coupon ad—being seen 4 times per person, compared to the coupon ad frequency of 5.

Both the general campaign/coupon and webinar ads performed well in Kitsap County, receiving an above average quality ranking for both ads, meaning the ad experience and post-ad experience were ranked highly when competing with other ads targeting the same audience. The expanded geotargeting area (compared to the

2021 pilot in Poulsbo) proved to be a successful optimization, reaching over 123,000 people. With a wider audience, this year's campaign was able to reduce ad fatigue (versus the pilot), which helped maintain the audience's interest.

The audience skewed towards people ages 65+, who made up 43.5% of total link clicks. Within this age group, men delivered 500 link clicks while women delivered 967 link clicks.



6 Post-Campaign Evaluation Results

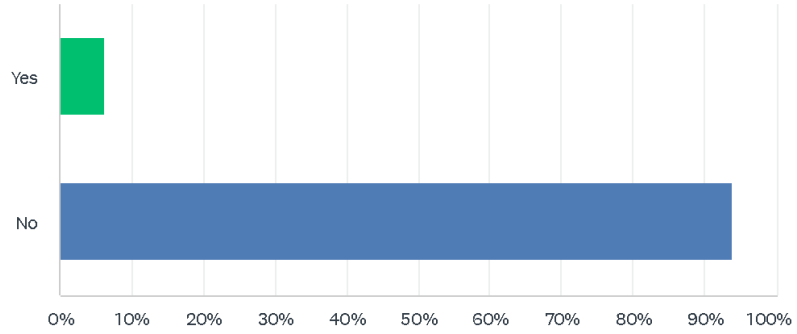
In September 2022, approximately three months after the campaign's conclusion and to coincide with the summer gardening season, a qualitative post survey was distributed to all registrants, regardless of whether they had attended a webinar or not. There was a total of 19 respondents, made up primarily of webinar attendees (Appendix A).

A total of 5 respondents indicated they have "stopped using weed and feed on existing lawn." All these respondents attended the "Lawn Care Alternatives" webinar.

The survey asked respondents if they redeemed the coupon for natural lawn fertilizer. Only one respondent affirmed they used the coupon.

Q19 Workshop registrants were given a link to a coupon for 25% off of natural lawn fertilizer. Did you redeem this coupon?(Image Description: Coupon for 25% off your first bag of natural lawn fertilizer. Up to $15 off.)

Answered: 16 Skipped: 3

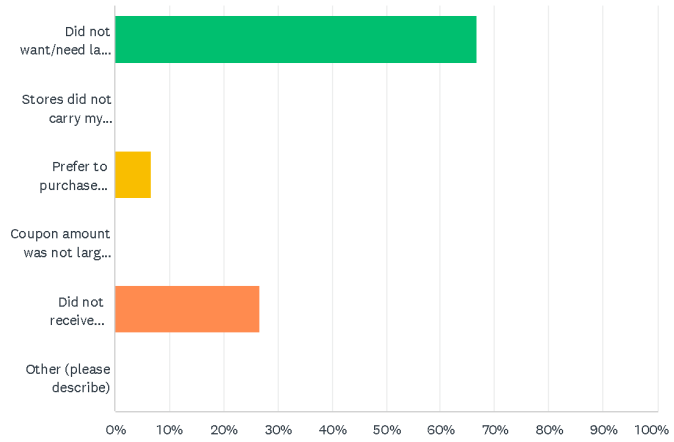


ANSWER CHOICES	RESPONSES	
Yes	6.25%	1
No	93.75%	15
TOTAL		16

For those that responded they did not redeem the coupon, over half (66.67%) indicated they did not need or want lawn fertilizer. Another 26.67% of respondents indicated they did not receive the coupon/or did not remember receiving the coupon. While each webinar briefly mentioned the coupons and the coupons were included in a follow-up email, the coupon does not appear to be drawing much attention from webinar registrants. The coupon may be more effective in its physical form, such as when mailed or handed out.

Q20 What was the main reason you did not use the coupon?

Answered: 15 Skipped: 4

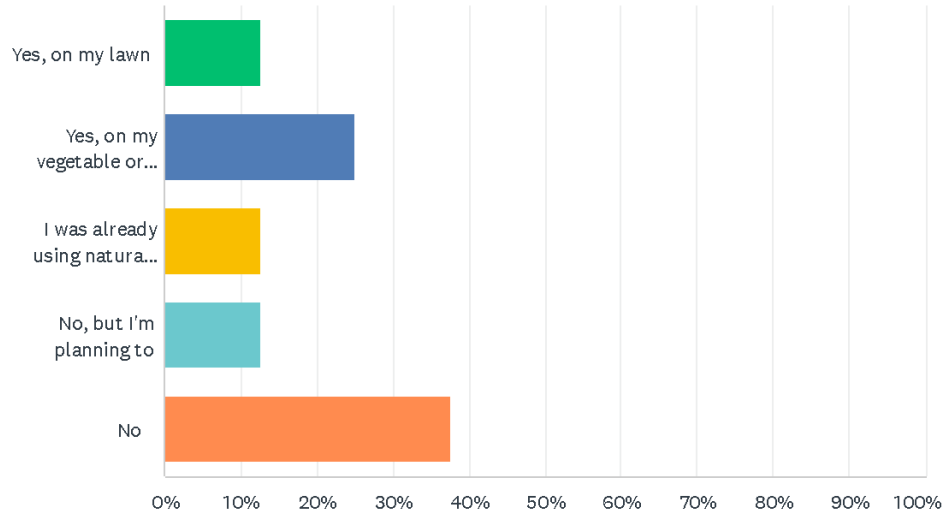


ANSWER CHOICES	RESPONSES	
Did not want/need lawn fertilizer	66.67%	10
Stores did not carry my preferred brand of fertilizer	0.00%	0
Prefer to purchase fertilizer elsewhere	6.67%	1
Coupon amount was not large enough to be worth my while	0.00%	0
Did not receive coupon/do not remember receiving coupon.	26.67%	4
Other (please describe)	0.00%	0
TOTAL		15

Finally, the survey asked respondents to indicate if they tried using natural or organic fertilizer. There were mixed results with 12.5% indicating they had tried using natural or organic lawn fertilizer. 37.5% or respondents indicated they did not try using natural or organic fertilizer. However, we do not know what, if any, chemicals those respondents use.

Q21 Did you try using natural or organic fertilizer?

Answered: 16 Skipped: 3



ANSWER CHOICES	RESPONSES	
Yes, on my lawn	12.50%	2
Yes, on my vegetable or flower garden	25.00%	4
I was already using natural or organic fertilizer prior signing up for the workshop	12.50%	2
No, but I'm planning to	12.50%	2
No	37.50%	6
TOTAL		16

7 APPENDIX

7.1 A. POST CAMPAIGN SURVEY FOLLOW UP

APPENDIX B: STORM 2022 ANNUAL REPORT

STORM

STORMWATER OUTREACH FOR REGIONAL MUNICIPALITIES

2022 ANNUAL REPORT

STORM is celebrating its 15th year as a collaborative!

STORM is…

- An efficient model of **smart government** with cities and counties working together on engagement
- Improving the effectiveness of jurisdictions of any size by **sharing resources and messaging**
- Working together to reach audiences, build skills, and **improve equity practices**
- Using **social marketing** approaches to deliver and evaluate clean water action programs
- Fostering jurisdiction and nonprofit teams that tackle grant projects totaling over **$5 million to date**
- A **supportive collaborative** of folks sharing their skills and passion
- An example of **civic engagement** that reaches local government, nonprofits, communities, educators, students and volunteers
- Making a difference in awareness and environmental engagement to **improve outcomes for the Puget Sound Watershed!**

Everyone brings something to the STORM group and adds to our communities. Thank you! - The STORM Steering Committee

Laurie Devereaux, Bellevue	Susan McCleary, Olympia
Mary Rabourn, King County	Katherine Straus, Seattle
Kym Pleger, Kitsap County	Paige Scheid, Burien
Anne Melrose, Washington Stormwater Center	

About STORM

STORM is a coalition of city and county governments working together to improve water quality in our lakes, rivers, streams, and Puget Sound by meeting outreach requirements from the federal Clean Water Act.

STORM's Vision: People living and working in our communities take actions that protect water quality within the Puget Sound Basin.

STORM's Mission: Work together with regional partners to address polluted runoff by advancing broad-scale behavior change.

If your municipality would like to join STORM, or receive our updates, send your request to Anne Melrose, Statewide Municipal Stormwater E&O Coordinator, ***anne.melrose@wsu.edu***.

Check out the STORM Resource Reservoir at ***pugetsoundstormgroup.org***.

STORM by the Numbers 2022

250 attendees at STORM sponsored events

700 cumulative steering committee hours dedicated to STORM

1349 downloads from the Resource Reservoir

6 experts hosted by STORM for professional development

A New Face on the Steering Committee

Anne Melrose, Statewide Municipal Stormwater Education & Outreach

Anne joined the Washington Stormwater Center (WSC) in October 2022 in the newly created position of Statewide Municipal Stormwater Education & Outreach Coordinator.

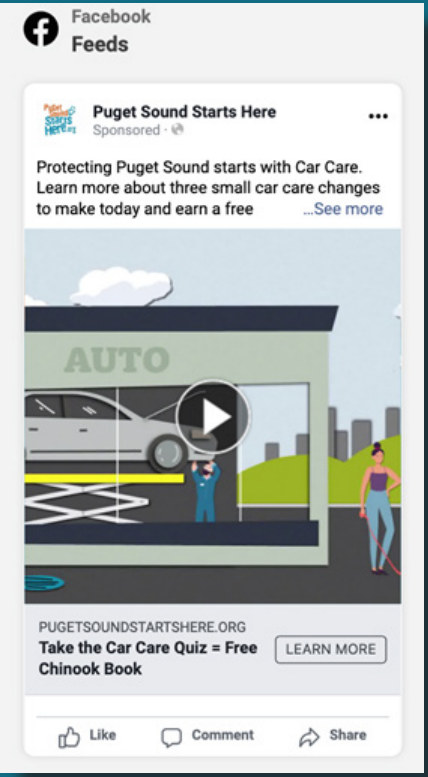
An Environmental Studies graduate, Anne spent time working in the solar world in Southern CA. After earning a Single Subject Science Teaching Credential, she went on to teach 7th-9th grade science in the L.A. Public School System. Following that, she spent 8 years as part of the Public Participation team working for the Extension Service in CA, representing a forest study in the Sierra. The goal of that project was to share study findings with a variety of different stakeholders. Anne also spent time writing and managing grants for a Resource Conservation District, as well as working for the Air Pollution Control District in Fresno.

Anne is looking forward to working with STORM, helping members meet their education and outreach needs.

You can reach Anne at anne.melrose@wsu.edu.

Puget Sound Starts Here Month Recap

PSSH Month went into high drive with the completion of a two-month digital ad campaign focused on raising awareness around car care actions. Additionally, Governor Jay Inslee issued a proclamation for PSSH Month in September encouraging all people in our state to support clean water and healthy habitat.



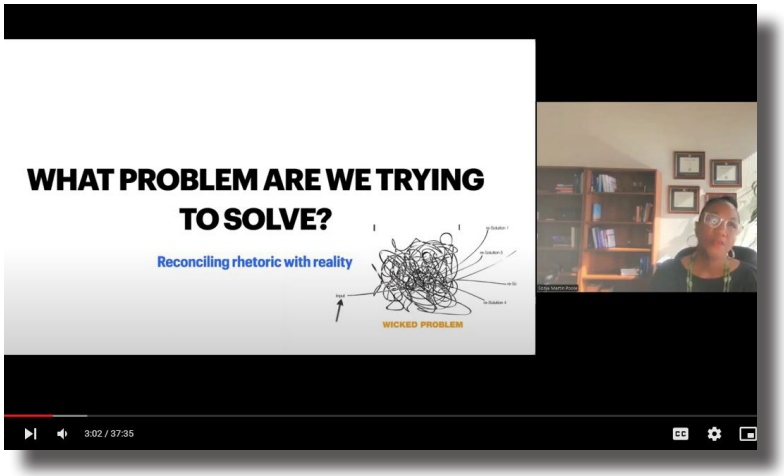
Jurisdictions contributed $66,000 to the Puget Sound Starts Here regional awareness campaign. The campaign collectively reached over 6.5 million total media impressions, which covered our participating STORM consortium zip codes across digital and social media – including relevant local and national publishers to sensitive populations in four languages. This year's regional media campaign:

- Delivered over 24K clicks to the website for Car Care specific information
- Saw a YTY 110% increase in ad-to-website click through rate (CTR) and a YTY 19% increase in video views
- Efficiencies created a 91% decrease in cost per clicks (CPC) YTY
- Saw that campaign optimizations over a longer period create more media efficiency opportunities. This showed that lengthening the PSSH campaign creates paid media efficiencies for all our jurisdiction collective dollars

Collectively, we were able to provide far more reach and key media performances across the region, which increases the reach in our jurisdictions, too. Together we achieved much more than we could have alone.

2022 STORM Symposium

The 2022 STORM Symposium was held virtually for the 3rd year in a row. We had over 85 STORM members join us for the 2 day event!



This symposium welcomed several engaging speakers on day one. Warren Kagarise with King County presented on how to use social media to engage directly with your community, Amielle DeWan with Impact by Design presented on how to evaluate behavior change programs and provided best practices for evaluating impact, and Dr. Sonja Martin Poole presented on how to manage a social marketing program through an anti-racist lens. On day two we heard from Carrie McCausland with the City of Olympia around how to create an effective communications strategy, and we got an update from Julia Burke at GA Creative about the PSSH NEP grant work. Both days of the symposium held breakout sessions to network with STORM peers and hear about success stories and challenges jurisdictions are facing when implementing education and outreach programs.

Long Term Funding Committee Closes Up Shop

In late 2018 a handful of dedicated STORM members came together to form the Long Term Funding Committee (LTFC). Their goal was to explore different potential funding models for STORM and to secure dedicated funding for a STORM Coordinator, which until that point had been pieced together through various grants.

From 2018-2022 the LTFC conducted an intensive process of identifying various funding options as well as interviewing key stakeholders and STORM members to determine what kind of support they most needed to meet their E&O requirements.

In the beginning of 2022 the LTFC coordinated with the Washington Stormwater Center to finalize a workplan for the new Statewide Municipal E&O Coordinator. This brought to a close many years of hard work by the group to secure funding for STORM administrative support. This was essential in ensuring the long term sustainability of STORM. Hats off to the team for all their hard work and perseverance!

With the onboarding of Anne Melrose in October of 2022, STORM now has ongoing support for administrative duties, so STORM can continue its vital role of providing outreach and engagement resources and assistance to municipal stormwater permittees to meet NPDES outreach requirements.

National Estuary Program (NEP) Grant Supports Regional Messaging

Despite serious delays from COVID impacts on King County contracting staff, the Puget Sound Starts Here grant rolled out a digital ad campaign in 2022. The campaign expanded on the regional efforts of Puget Sound Starts Here Month. A Request for Proposal had one response from GA Creative and Rich Marketing. Together with the PSSH team, they put together a strategy to reach English, Spanish, Korean and Vietnamese speakers about the tire pollutant 6PPD.

The team learned many lessons along the way! 2023 will continue with testing and refining campaign messaging, as the team learns online audience survey techniques. For more information or to join the team, contact Mary Rabourn, King County.

2022 STORM Work Group Accomplishments

STORM work groups are created on an ad hoc basis and facilitated by STORM members. They are member-driven and self-directed. The formation and focus of work groups often aligns with new permit requirements, initiatives of the STORM Steering Committee or from requests by STORM members.

Work group participation is voluntary and based on the interest of individual members. These groups tend to be task-oriented and may have end dates. Work group members determine their structure and function, meeting frequency, work plans and decision-making.

Business Inspection Group (BIG): BIG is a collaborative work group serving over a hundred members representing 60 jurisdictions across the region. BIG members met 6 times in 2022. Meeting presentations and discussions focused on topics to help prepare Phase 2 jurisdictions to launch their source control programs in January of 2023. BIG members also provided technical support for the SAM Source Control Guidance Manual and trainings. In 2023, BIG is inviting jurisdictional staff doing any stormwater related inspections to join the group. For more information or to be added to BIG's distribution list contact Laurie Larson-Pugh, WSC.

Adopt-a-Drain (AAD): AAD Washington launched in October 2021 and is already at 13 jurisdictions and still growing! In 2022, 288 of the volunteers reported cleanings. That is 30% of all volunteers. Collectively, 983 adopters reported collecting 11,363 lbs. of debris from 1,729 drains. AAD is also working to adapt the campaign for other languages and cultures. The current focus is on developing a Spanish Language Digital Media Campaign using social science principles. For more information email Susan Harper, City of Seattle.

Green Stormwater Infrastructure (GSI): In 2022, the GSI work group finalized the GSI Guidebook. This publication is a tool for managers, planners, and other agency staff to update or create a GSI Assistance Program. The guidebook reviews 17 Western Washington GSI Assistance Programs that use technical assistance and/or financial incentives to support GSI installations on private property. Staff from these programs were interviewed and their guidance for developing, implementing, and evaluating GSI Assistance Programs is collated into the guidebook. Look for the guidebook on the STORM Resource Reservoir and the Washington Stormwater Center's E&O Library in early 2023. For more information, contact Alison Schweitzer, King County or Christie Lovelace, Shoreline.

Dumpster Outreach Group (DOG): The focus of the Dumpster Lid Program is to help commercial businesses keep dumpster lids shut to protect surface water quality.

In 2022, DOG produced the 2021 Pilot Summary. Over 30 jurisdictions reached nearly 150 businesses throughout Puget Sound with educational materials and tools in 2021. The Pilot Summary shares the remarkable results, including that dumpster lid closure significantly improved from our efforts. The percentage of lids closed rose from 49% during the baseline evaluation to 77% during the final evaluation. The final lid closure rate for businesses participating in the pilot rose 57% over baseline observations.

In 2022, new dumpster sticker and sign art were created, including a translated version. The art, 2021 Pilot Summary, 2020 Dumpster Summit Social Marketing Plans and more are available on DOG's page on the Washington Stormwater Center website.

DOG will meet as needed in 2023. To be added to the contact list, email Laurie Devereaux, City of Bellevue, or Susan McCleary, City of Olympia.

APPENDIX C: WSSOG 2023 WORK PLAN

WSSOG 2023 Work Plan

Objectives from Exhibit "A" -
West Sound Stormwater Outreach Group Scope of Work & Budget for 2023-2025

Sustain successful efforts with pet waste outreach (Objective 2)

- Continue Pet Waste outreach *(2.2)*
    - Continue to implement Mutt Mitt E&O plan
    - Sustain Mutt Mitt program
    - Participate in the regional STORM Pet Waste workgroup as appropriate

Continue social marketing campaign development (Objective 3, 6)

- Continue Natural Yard Care campaign implementation *(3.1)*
    - Continue expansion of the Natural Yard Care campaign to all jurisdictions within WSSOG. Program to include three workshops in partnership with the WSU Master Gardeners in spring 2023 and a product discount
    - Coordinate efforts with WSU Master Gardeners on webinar topics, and dates
    - Coordinate follow up email outreach to be done by Master Gardeners including logistics, talking points, etc.
- With a consultant, identify metrics to evaluate success of the natural yard care campaign; begin developing a report on the changes in understanding and adoption of the targeted behaviors. This work will be done in preparation for the permit evaluation deadline of March 31, 2024 *(3.2, 3.3)*
- Monitor the progress of other jurisdictions' behavior change campaigns and adapt elements as appropriate *(6.4)*
- Participate in regional STORM natural yard care work group as appropriate *(6.4)*

Collaborate on joint outreach for the business inspection program (Objective 4)

- Develop a jointly branded rack card for all jurisdictions to use *(4.1)*

Collaborate on mutually beneficial outreach opportunities – these activities may be optional and vary by jurisdiction (Objective 5, 6)

- Continue to implement spills hotline outreach opportunities, including but not limited to *(5.2)*:
    - Distribution of paint sticks, when feasible
    - Promotion of the SeeClickFix application and spills reporting phone number in social media, print or digital
- Continue to participate in *Puget Sound Starts Here* outreach *(6.3)*
    - Promote PSSH Month

    - Distribute PSSH-branded merchandise, including but not limited to coasters and pet waste bag holders, when feasible
    - Participate in STORM-sponsored regional ad buys and/or place local ads
- Using the GROSS grant, hire a consultant to evaluate priority outreach programs agreed upon by WSSOG, and identify shared strategies to increase participation of underserved communities *(5.3)*
- Provide lessons for school aged children, for those jurisdictions that offer youth education *(5.2)*
- Pilot field monitoring programs with high school and elementary students if in-person schooling resume *(5.2)*
- Advertise via a variety of channels as appropriate: digital, print, or other media *(6.3)*
- Consider partnerships on stewardship opportunities as appropriate *(5.2)*

Strengthen coalition and represent WSSOG on regional efforts (Objective 6 and 7)

- Participate on the STORM Steering Committee and PSSH committee *(6.1)*
- Participate in STORM's regional workgroups as appropriate *(6.4)*
- Provide STORM and PSSH support and attend Quarterly meetings *(6.1)*
- Promote capacity building as needed *(6.2)*
- Provide annual summary of activities, track and maintain records, and report out on programs as appropriate *(7)*

APPENDIX D: PUGET SOUND STARTS HERE PROCLAMATIONS

CITY OF
BAINBRIDGE ISLAND

PROCLAMATION

A PROCLAMATION by the City Council of the City of Bainbridge Island, Washington, declaring September 2022, as "Puget Sound Starts Here Month."

WHEREAS, we resolve to protect Puget Sound and its tributaries which are the source of our communities' well-being, health, economy, and quality of life; and

WHEREAS, we acknowledge that we are on the land of the "People of the Clear Salt Water" (Suquamish People), who have stewarded this land from time immemorial; and

WHEREAS, a healthy and vibrant Puget Sound defines our Northwest and Island culture, as do our indigenous people's stories, our tribal treaty responsibilities, and our shared legacy for future generations; and

WHEREAS, the health of Puget Sound is declining, and creatures and plants great and small, from our bull kelp forests and salmon to our orcas and shellfish, are at risk from the human impacts of stormwater runoff, loss of natural habitats, and a changing climate; and

WHEREAS, we all have the power to protect our Puget Sound treasure by working together to discover and take clean water actions through the Puget Sound Starts Here Campaign; and

WHEREAS, in the month of September, the City of Bainbridge Island will join other governing bodies, organizations and community groups to strengthen stewardship of our shared watershed and encourage all to take action to improve the health of Puget Sound.

NOW, THEREFORE, I, Joe Deets, Mayor of City of Bainbridge Island, on behalf of the City Council, do hereby proclaim September 2022, as

PUGET SOUND STARTS HERE MONTH

in the City of Bainbridge Island and urge residents to support clean water and healthy habitat by joining us in this special observance to discover how to make a difference and be part of the solution!

DATED, this 13th day of September, 2022

CITY OF BAINBRIDGE ISLAND
SEAL
KITSAP COUNTY

Joe Deets, Mayor