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TECHNICAL MEMORANDUM

Date: March 21, 2022

To: Stella Collier, City of Bainbridge Island

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

Subject: City of Bainbridge Island—Watershed Inventory and Assessment

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BACKGROUND

The purpose of this technical memorandum is to document the process used to prepare a receiving water conditions inventory and preliminary assessment of relative conditions and contributions to identify candidate watersheds for prioritization for the City of Bainbridge Island (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, the water resources, and the landscape.

The inventory and assessment was conducted in four general steps, which are presented in the following sections:

- Watershed Delineation and Receiving Water Identification
- Water Condition and Water Resources Use Assessment
- Stormwater Management Influence Assessment
- Candidate Watersheds for Prioritization

The full results from the receiving water conditions inventory are found in Appendix A. The preliminary assessment criteria and scoring are found in Appendix B. Maps corresponding with selected water conditions, water uses, and stormwater influence are found in Appendix C.

Summary information and a list of project opportunities is provided for each of the watersheds that were retained for the next phase of planning. This technical memorandum will be submitted to Ecology with the City's annual report by March 31, 2022, as required by the NPDES Phase II permit.

During the next prioritization phase of the work, candidate watersheds will be further evaluated. This will involve incorporating stakeholder input from a workshop held March 1, 2022, evaluating planned activities and projects, expected changes in pollutant loads or flows, opportunities, management goals, and other information to support an informed decision.

Watershed Delineation and Receiving Water Identification

The first step in the SMAP planning process was to delineate the City's watersheds and identify receiving waters so that the inventory data could be matched with the appropriate watershed and receiving waters (see Figure 1). The number of watersheds defined is dependent upon the scale used and needs to be appropriate for supporting the inventory and planning effort. Ecology's SMAP guidance (Ecology 2019) recommends a scale of 1 to 20 square miles. Eleven of the twelve watersheds are of adequate size to meet this guidance with the exception of Agate Pass watershed, which falls just under 1 square mile in area but is considered appropriate scale for this study and will be maintained with current boundaries for consistency with previous analyses.

Methods

The City previously delineated Bainbridge Island into 12 watersheds that resulted from a 1995 watershed study. No revisions or adjustments to watershed boundaries were necessary for the SMAP. Because the City's jurisdiction covers the entire island, calculations for jurisdictional control and evaluation of watersheds that extend into neighboring jurisdictions were not necessary. Table 1 summarizes the data sources used for watershed delineations.

Table 1. Data Sources for the Watershed Delineation.

Metric	Data Source	Method Notes
Watershed area	City GIS data: City of Bainbridge Island "BI_Wtrshd_EngUpdate" layer shared 2020 – based on 1995 watershed study	No modifications were made to the City's watershed delineation
Receiving waters	City GIS data: BI Stream feature class; Stream names derived from Open Street Map data, Geographical Names Used by the Indians of the Pacific Coast, Waterman, T.T., 1922. American Geographical Society, Streams of Bainbridge Island, Elfendahl, Gerald 1997	Many streams were mapped without names; these were supplemented from Open Street Map
Stream type	City GIS data: BI Stream feature class	From "Type" field of BI Stream feature class
Jurisdiction control	Not Applicable	Not Applicable – City of Bainbridge boundary covers all of and only Bainbridge Island

GIS = Geographic Information Systems

Results

Watersheds were named based on hydrologic features of interest. All watersheds ultimately flow to Puget Sound. Table 2 lists the 12 watersheds to be evaluated and prioritized through the SMAP process. Detailed information is provided in Table 1 in Appendix A.

Table 2. City of Bainbridge Island Watersheds for the SMAP Process.

Watershed Name	Area (square miles)	Percent of Total Watershed Within City Limits (percent)	Major Streams and Lakes Within the Watershed	Marine
Agate Pass	0.93	100	• Young Cedars Creek (Xexpai'yats)	Agate Passage
Blakely Harbor	2.14	100	• Mac's Dam Creek • Tani Creek • Sunny Hill Creek • Blakely Falls Creek • Toe Jam Hill Creek	Blakely Harbor
Eagledale	1.69	100	• Whiskey Creek • Cougar Creek • Creosote Creek • McDonald Creek • Ross Creek	Eagle Harbor
Fletcher Bay	3.33	100	• Springbrook Creek • Issei Creek • North Fletcher Bay Creek • Fosters Creek	Fletcher Bay
Gazzam Lake	1.39	100	• Gazzam Lake Creek • Lindquist Creek • Crystal Springs Creek • Gazzam Lake	Port Orchard Passage
Manzanita	3.57	100	• Manzanita Creek (Lkwi'aup) • Fairy Dell Creek • Miemois Creek	Manzanita Bay
Murden Cove	3.16	100	• Woodward Creek • Meigs Creek • Murden Creek (Doe Qud Sake Qub) • Manitou Beach Creek	Murden Cove
North Eagle Harbor	3.37	100	• Cooper Creek • Hawley Creek • Ravine Creek • Sportsman's Club Creek	Eagle Harbor
Pleasant Beach	2.26	100	• Schel-Chelb Creek • Point White Creek • Lytle Creek	Rich Passage

Table 2 (continued). City of Bainbridge Island Watersheds for the SMAP Process.

Watershed Name	Area (square miles)	Percent of Total Watershed Within City Limits (percent)	Streams and Lakes Within the Watershed	Marine
Port Madison	2.16	100	• Coho Creek • Agate Pass Creek • Hidden Cove Creek (Scwa-qob) • Nature Preserve Creek • Oots-Aht-Ub Creek • Tochhookwap Creek	Port Madison
South Beach	1.10	100	• South Beach Creek	Rich Passage
Sunrise	2.09	100	• Dripping Water Creek (C'txa) • Heron Creek • Rolling Bay Creek	Rolling Bay

Legend

- Watersheds
- Wetlands and Lakes
- Streams
- Roads

Figure 1.
City of Bainbridge Island Watersheds.

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Miles

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City of Bainbridge

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RECEIVING WATER CONDITIONS ASSESSMENT

The goal of the receiving water conditions assessment is to develop a high-level screening of the City's watersheds to provide a simple comparison of the existing condition of each water resource and the water resource uses. Information and attributes were scored to allow a quantitative comparison of the watersheds.

Methods

The first step of the receiving water conditions assessment was to develop a list of qualitative metrics and fill in with existing data from available sources by watershed. The City has a long term program of water quality and groundwater monitoring therefore a variety of environmental monitoring data was available for the assessment. Additionally, recent stream typing work completed by the Wild Fish Conservancy provided additional salmonid data supplemental to standard existing data. Numerous metrics were developed; not all were used in the scoring due to suspected auto-correlation and to simplify and focus the assessment on the metrics that were most descriptive. All metrics developed are listed in Table 2 in Appendix A. Metrics not used in the scoring may be useful during sub-catchment delineation and prioritization. Table 3 summarizes all metrics and data sources developed for Table 2 in Appendix A.

Table 3. Data Sources for the Receiving Water Conditions Assessment.

Metric Category	Metric(s)	Data Source(s)	Method Notes
Water Quality Conditions	**Benthic index of biotic integrity (B-IBI)**	Puget Sound Benthos Database 2019 State of the Waters Report, City of Bainbridge Island	Three most recent years of data averaged
	Marine WQ–Bacteria, Nearshore sampling	WSDOH Growing Classification and Sanitary Survey Program	Excellent–all samples meet marine water criteria Moderate–some closure areas Poor—All areas closed
	Water Quality Index	2019 State of the Waters Report, City of Bainbridge Island	Ecology methodology
	303(d) Listing Water	Washington State Department of Ecology Water Quality Assessment 303(d) List 2014	
	Mussel Study Copper and Zinc	Stormwater Action Monitoring 2017/2018 Mussel Monitoring Survey, WDFW. October, 2020	Percentile range of all study samples Puget Sound region

Table 3 (continued). Data Sources for the Receiving Water Conditions Assessment.

Metric Category	Metric(s)	Data Source(s)	Method Notes
Water Quality Conditions (continued)	Freshwater Sediment Copper and Zinc Concentration	State of the Island Sediment Report, June 2020	2019 sampling result
	Marine Sediment Copper and Zinc Concentration	State of the Island Sediment Report, Prepared by Integral, June 2020	2019 sampling result
Water Flow	**Degradation Model**	Puget Sound Watershed Characterization, Bainbridge Island Custom Basin Water Flow Model, 2016	Ecology analysis result
	Importance Model		Ecology analysis result
Water Resource Uses	**Shoreline Habitat**	Washington State Ecology Coastal Atlas	GIS layer
	Shoreline Biological	Washington State Ecology Coastal Atlas	GIS layer
	Pocket Estuary	Washington State Ecology Coastal Atlas	GIS layer
	ESA Listed Salmon	SWIFD (Northwest Indian Fisheries Commission and WDFW), Wild Fish Conservancy, NMFS West Coast Region Endangered Species Act critical habitat geodatabase (NOAA Fisheries)	
	Salmonid and Resident Fish Presence		Databases accessed Janurary 2022
	Shellfish Classification	WSDOH Commercial Shellfish Map	GIS layer
	Public Recreation Opportunities	Washington State Ecology Coastal Atlas and City staff refinement	GIS layer

[a] **Bold** denotes metrics used for assessment scoring

ESA = Endangered Species Act

GIS = Geographic Information Systems

NOAA = National Oceanic and Atmospheric Administration

SWIFD = Statewide Washington Integrated Fish Distribution

WDNR = Washington Department of Natural Resources

WSDOH = Washington State Department of Health

The City has an abundance of marine nearshore, freshwater streams and groundwater resources. An initial challenge for selecting metrics was developing a balanced representation of these resources.

A challenge for selecting metrics for water conditions is the disparity in the type and quantity of monitoring data. For example, for WQI only 10 of 12 watersheds are represented, for B-IBI only 5 of 12 watersheds are represented, and for WDFW nearshore mussel study, 6 of 12 watersheds have mussel data. It is acknowledged that three of the four metrics for water conditions are biased towards watersheds that are monitored.

Metrics selected for water resource uses were equally representative across the watersheds.

Table 4 lists the metrics and correlating resource representation.

Table 4. Water Conditions and Water Resource Uses Metrics and Representation.

Type of Metric	Metric	Water Resource Represented
Water Conditions	Water Quality Index	Freshwater quality
	BIBI	Freshwater aquatic macroinvertebrates
	Metals in mussel tissue	Marine nearshore
	Water flow degradation	Impairment of water flow processes
Water Resource Uses	Water flow importance	Importance of water flow processes related to streams and groundwater
	Shoreline habitat	Pocket estuary and forage fish habitat presence
	Aquatic species	Salmonid and resident fish habitat presence
	Public recreation	Public access areas

Water resource condition scoring was based upon the concept that higher levels of water resource use and more impaired water condition receive higher scores (Table 5).

Table 5. Metrics Used to Complete the Receiving Water Conditions Assessment.

Metric	Scoring Method
Water Resource Condition	
Water Quality Index	Watersheds were scored based on the WQI score category. Agate Passage and Sunrise watersheds were not scored because they are not monitored. Average scores were used for watersheds where multiple streams are monitored. ● **Score of 0:** No data ● **Score of 1:** Excellent ● **Score of 2:** Moderate ● **Score of 3:** Poor
BIBI	Watersheds were scored based on B-IBI scores. The following watersheds did not have scores: Agate Passage, Blakely Harbor, Gazzam Lake, Pleasant Beach, Port Madison, South Beach and Sunrise. Average scores were used for watersheds where multiple streams are monitored. ● **Score of 0:** No data ● **Score of 1:** Good ● **Score of 2:** Fair ● **Score of 3:** Poor/Very Poor

Table 5 (continued). Metrics Used to Complete the Receiving Water Conditions Assessment.

Metric	Scoring Method
Water Resource Condition (continued)	
Metals in Mussel Tissue	Watersheds were scored based on percentile range compared to all samples collected Puget Sound-wide. No data is available for Agate Passage, Blakely Harbor, Gazzam Lake, Port Madison, and South Beach watersheds. Data from the Puget Sound study area was statistically separated by percentile. Copper and zinc were selected as indicators of stormwater influence. ● **Score of 0:** No data or both copper and zinc in the <25th percentile ● **Score of 1:** Either copper or zinc in the 25th to 75th percentile ● **Score of 2:** Both copper and zinc in the 25th to 75th percentile ● **Score of 3:** Both copper and zinc results in the >75th percentile
Water Flow Degradation	Watersheds were scored using the Ecology refined Bainbridge Island Puget Sound Watershed Characterization analysis. ● **Score of 0:** Low ● **Score of 1:** Moderate ● **Score of 2:** Moderate High ● **Score of 3:** High
Water Resource Uses	
Water Flow Importance	Watersheds were scored using the Ecology refined Bainbridge Island Puget Sound Watershed Characterization analysis. ● **Score of 0:** Low ● **Score of 1:** Moderate ● **Score of 2:** Moderate High ● **Score of 3:** High
Shoreline Habitat	Watersheds were scored based upon the Washington State Forage Fish Mapping and the Washington State Ecology Coastal Atlas Mapping. ● **Score of 0:** No pocket estuary or forage fish habitat ● **Score of 1:** Pocket estuary or forage fish habitat present ● **Score of 2:** Both pocket estuary and forage fish habitat, or forage fish habitat and pre-spawner holding area ● **Score of 3:** Both pocket estuary, and forage fish habitat, and pre-spawner holding area
Freshwater Salmon and Trout Species	Watersheds were scored based upon Statewide Salmon Distribution Database, NOAA Critical Habitat Mapping for ESA listed species, and Wild Fish Conservancy Water Typing documentation, 2016. ● **Score of 0:** No species ● **Score of 1:** One species presence ● **Score of 2:** Two species presence ● **Score of 3:** Three more species presence
Public Recreation	Watersheds were score based upon the Washington State Ecology Coastal Atlas Mapping with refinement by City staff. ● **Score of 0:** No public access ● **Score of 1:** 1 to 3 public access areas ● **Score of 2:** 4 to 6 public access areas ● **Score of 3:** greater than 7 public access areas

Results

Table 6 provides the receiving water conditions assessment scores for each watershed and ranking in the list of the 12 watersheds. Note that a high score indicates lower water quality and higher levels of water resource uses. Detailed results are provided in Appendix B.

Table 6. City of Bainbridge Island Receiving Water Conditions and Water Resource Use Assessment Scores.

Watershed	Water Resource Condition + Water Resource Uses Score	Rank
Manzanita	18.0	1
North Eagle Harbor	16.5	2
Eagledale	16.0	3
Murden Cove	15.5	4
Fletcher Bay	15.0	5
Pleasant Beach	15.0	5
Sunrise	10.0	7
Port Madison	9.0	8
Blakely Harbor	8.0	9
Gazzam Lake	6.5	10
Agate Pass	4.0	11
South Beach	2.0	12

The sum of the scores for the receiving water conditions and water resource use assessment ranged from 2.0 to 18.0. A score of 2.0 to 6.5 represents a watershed with few known water condition problems (or watersheds with no data) and fewer water resource uses. Scores of 8.0 to 10.0 represent a watershed with water condition issues and moderate water resource uses. Scores of 15.0 represent a watershed with higher water condition issues and higher water resource uses.

The watersheds were ranked from 1 to 12 (accounting for ties). The watersheds with more water quality issues and potential to support multiple water resource uses were Manzanita, North Eagle Harbor, Eagledale, Murden Cove, Fletcher Bay, and Pleasant Beach.

STORMWATER MANAGEMENT INFLUENCE ASSESSMENT

The intent of this step in the process was to evaluate the extent to which stormwater might be expected to impact water resource conditions and thereby indirectly provide an evaluation of the extent to which stormwater management actions might benefit a watershed.

Methods

The first step of this part of the assessment was to define a list of metrics that might be used to evaluate the watersheds with respect to stormwater management influence. Table 7 summarizes by metric the data sources and method notes. All metrics including the data sources used to develop them are summarized in Table Appendix A. Metrics not used may be useful during sub-catchment delineation and prioritization. While a wide variety of metrics were initially calculated, those that most clearly characterized stormwater impacts and prevented autocorrelation were evaluated.

Table 7. Data Sources for Stormwater Management Influence Assessment.

Metric Category	Metric	Data Source(s)	Method Notes
Existing Landscape Condition	**Percent Total Impervious Area**[a]	2015 Bainbridge Island Land Cover	Island-wide detailed land cover polygons. Categories included are: Building, Impervious, Road, TreeOverBuilding, TreeOverRoad
	Road Density	Bainbridge Island GIS "BIRD_Merge" layer supplemented with WSDOT mapping of HWY 305	Calculate linear feet of road per acre
	Fish Passage Barriers	• WDFW Web Map Tool, extracted data January 2022 • Bainbridge Island stream layer	Count of barriers related to road crossings (excluding dams and natural barriers)
	Length of Usable Habitat not Accessible Due to Full Barrier	• WDFW Web Map Tool, extracted data January 2022 • Bainbridge Island stream layer	Identify first "total" (0 percent passable) barrier and measure downstream linear feet accessible to fish
	Percent Canopy Cover in Riparian Buffers	• City of Bainbridge GIS: 2015 Land Cover, stream buffers, and wetland buffers	Percent canopy cover in riparian buffer (includes stream, and wetland buffers) Calculated for Classname = Tree, excludes all other class types (such as Shrub, Tree over Road, Tree over Building, etc.)
	Average Age of Development	Bainbridge Island GIS parcel layer (year built) Parcel Layer	Percent area with year built prior to 2005; excluded parcels with missing (0) or non-year values

Table 7 (continued). Data Sources for Stormwater Management Influence Assessment.

Metric Category	Metric	Data Source(s)	Method Notes
Future Development	Projected New Permit-Exempt Wells	WRIA 15 Watershed Planning: Potential Permit-Exempt Wells (layer shared by City in Dec 2021)	Well Count and Additional Dwellings count
	Vacant, Partially Utilized and Underutilized Buildable Lands	Bainbridge Island Buildable Lands Report and associated GIS layers, Kitsap County Buildable Lands Report 2021	Percent area (from Bainbridge Island Buildable Lands Report) that is Partially Utilized, Under Utilized, or Vacant
Equity	Combined Environmental Health Disparities Rank, Environmental Exposures, Environmental Effects, Socioeconomic Factors, Sensitive Populations	Kitsap Overburdened Communities Assessment, WA Environmental Health Disparities Map	

[a] **Bold** denotes metrics used for stormwater influence scoring

GIS = Geographic Information Systems

WSDOT = Washington State Department of Transportation

The metrics selected from those listed in Table 7 to represent stormwater impacts were:

- Percent total impervious surface area
- Percent canopy in buffer areas
- Fish passage barriers
- Percent area developed prior to 2005 (when more stringent flow control standards were put in place)
- Vacant plus underutilized buildable lands

Table 8 provides a list of these metrics and a brief description of the scoring and weighting of metrics evaluated.

Stormwater management influence scoring was based upon the concept that higher levels of impact receive higher scores.

Table 8. Scoring and Weighting Method Used to Complete Stormwater Management Influence Assessment.

Metric	Method
Landscape Condition	
Percent Total Impervious Area	Calculated watershed wide. ● **Score of 0:** Less than 5 percent impervious area ● **Score of 1:** 5 to 10 percent impervious area ● **Score of 2:** 11 to 15 percent impervious area ● **Score of 3:** 16 percent and greater impervious area
Percent of Riparian Canopy Cover	Riparian stream buffers were based on stream buffer standards. The total percent canopy cover was then calculated within these buffer widths. Watershed scores were based on the following percentages: ● **Score of 0:** 90 to 100 percent canopy cover ● **Score of 1:** 80 to 90 percent canopy cover ● **Score of 2:** 70 to 80 percent canopy cover ● **Score of 3:** Less than 70 percent canopy cover
Fish Passage Barriers	Total count of road-related fish passage barriers indicating intensity of road crossings and stream buffer impacts from impervious surfaces. ● **Score of 0:** 0 fish passage barriers ● **Score of 1:** 1 to 5 fish passage barriers ● **Score of 2:** 6 to 10 fish passage barriers ● **Score of 3:** Greater than 10 fish passage barriers
Area Developed Prior to Higher Level of Flow Control Requirements	Percent area developed prior to 2005 ● **Score of 0:** Less than 30 percent ● **Score of 1:** 30 to 40 ● **Score of 2:** 40 to 50 ● **Score of 3:** Greater than 50 percent
Future Development	
Vacant, Partially Utilized and Underutilized Buildable Lands	Percent of City watershed areas identified as redevelopment or development activity were calculated. ● **Score of 0:** Less than 10 percent of watershed area ● **Score of 1:** 10 to 15 percent of watershed area ● **Score of 2:** 15 to 20 percent of watershed area ● **Score of 3:** Greater than 20 percent of watershed area

Results

Table 9 is a summary of the stormwater management influence scoring results. Detailed results are provided in Appendix B. The sum of the scores for the stormwater influence assessment ranged from 5.0 to 11.0. A score of 5.0 to 6.0 represents a watershed with lower stormwater management influence. Scores of 9.0 to 11.0 represent a watershed with higher stormwater influence. The watersheds that received the highest scores for stormwater management influence were North Eagle Harbor, Manzanita, Eagledale and Murden Cove. Moderate scores

were received by Blakely Harbor, Fletcher Bay, Sunrise, Agate Pass, Pleasant Beach, and Port Madison. Lower scores were received by Gazzam Lake and South Beach.

Table 9. City of Bainbridge Island Stormwater Influence Assessment Scores.

Watershed	Stormwater Impacts Score	Rank
North Eagle Harbor	11	1
Manzanita	10	2
Eagledale	9	3
Murden Cove	9	3
Blakely Harbor	8	5
Fletcher Bay	8	5
Sunrise	8	5
Agate Pass	7	8
Pleasant Beach	7	8
Port Madison	7	8
Gazzam Lake	6	11
South Beach	5	12

RELATIVE CONDITIONS AND CONTRIBUTIONS ANALYSIS

Combining the water condition scores with the stormwater influence scores (Table 10) provides on a comparison basis, the relative conditions of water resource use and water conditions and the stormwater contributions. The purpose of the combined scoring matrix is to identify a credible and manageable list of watersheds to move forward for prioritization.

Based on the results in Table 10, it is recommended that watersheds of moderate and higher combined scores move forward to prioritization. Manzanita, North Eagle Harbor, Eagledale, Murden Cove, Fletcher Bay, Pleasant Beach, Sunrise, Blakely Harbor, and Port Madison are retained for the prioritization phase.

Table 10. Combined Scoring and Final Ranking.

Watershed	Score	Rank
Manzanita	28.0	1
North Eagle Harbor	27.5	2
Eagledale	25.0	3
Murden Cove	24.5	4
Fletcher Bay	23.0	5
Pleasant Beach	22.0	6
Sunrise	18.0	7
Blakely Harbor	16.0	8
Port Madison	16.0	8
Gazzam Lake	12.5	10
Agate Pass	11.0	11
South Beach	7.0	12

CANDIDATE WATERSHED CHARACTERIZATION SUMMARY

Key characteristics of the watersheds retained for the prioritization phase, along with brief descriptions of current storm and stream improvement projects under consideration, are provided below.

Manzanita

Summary: Manzanita watershed is 3.57 square miles with Manzanita, Miemois, and Fairy Dell Creeks connecting to Puget Sound at Manzanita Bay. The watershed is 9 percent impervious surface and has 59 linear feet of roads per acre. Documented aquatic species habitat is present for coho, resident trout, fall chum, sand lance and surf smelt. There are 28 fish passage barriers. Water flow degradation is moderate high, and water flow importance is high. There are five public recreations areas.

Projects: Projects include Manzanita Creek Culvert Replacement/Channel Regrade/Riparian Corridor Improvement, and 13 stormwater retrofit projects identified (Herrera 2022) during the Manzanita Watershed Assessment project.

North Eagle Harbor

Summary: North Eagle Harbor watershed is 3.37 square miles with Cooper, Hawley, Ravine, and Sportsman's Club Creeks, connecting to Puget Sound at Eagle Harbor. At 21 percent, the watershed has the highest percent impervious area of all of the watersheds; it has 99 linear feet of roads per acre. Documented aquatic species habitat is present for coho, resident trout, fall chum, and surf smelt. There are 15 fish passage barriers. Water flow degradation is high, and water flow importance is moderate. There are 10 public recreations areas.

Projects: Projects include Yeomalt Area Drainage Improvements and Eagle Harbor Drive Cooper Creek Fish Passage.

Eagledale

Summary: Eagledale watershed is 1.69 square miles with Whiskey, Cougar, Creosote, McDonald, and Rose Creeks connecting to Puget Sound at Eagle Harbor. The watershed percent impervious area is 10 percent; there are 68 linear feet of roads per acre. Documented aquatic species habitat is present for coho, fall chum, resident trout, and surf smelt. There are 11 fish passage barriers. Water flow degradation is moderate high, and water flow importance is moderate high. There are four public recreations areas.

Projects: Projects include Eagle Harbor Drive at McDonald Creek Culvert Replacement, and Pritchard Park Outfall Relocation.

Murden Cove

Summary: Murden Cove watershed is 3.16 square miles with Murden (Doe Qud Sake Qub), Woodward, Manitou Beach, and Meigs Creeks connecting to Puget Sound at Murden Cove. The watershed percentage impervious surface is 10 percent; there are 68 linear feet of roads per acre. Documented aquatic species habitat is present for resident trout and surf smelt. There are 23 fish passage barriers. Water flow degradation is moderate high, and water flow importance is moderate high. There are two public recreations areas.

Projects: Washington State Department of Transportation State Route 305/Murden Creek Fish Barrier Removal project.

Fletcher Bay

Summary: The Fletcher Bay watershed is 3.33 square miles with Springbrook, Issei, North Fletcher Bay, and Fosters Creeks connecting to Puget Sound at Fletcher Bay. The watershed percentage impervious surface is 7 percent; it has 46 linear feet of roads per acre. Documented aquatic species habitat is present for coho, resident trout, fall chum, winter steelhead, sand lance, surf smelt, and herring. There are 17 fish passage barriers. Water flow degradation is moderate, and water flow importance is moderate high. There are three public recreation areas.

Projects: Projects include the Springbrook Creek Fish Passage, Fletcher Bay Road NE and High School Road Culvert and Stream Improvements, Eddy Culvert and Armor Removal, Rekow Stream and Riparian Restoration, Issei Creek Culvert restoration, Island Center Stormwater retrofits, and Johnson Farm Managed Aquifer Recharge.

Pleasant Beach

Summary: The Pleasant Beach watershed is 2.26 square miles with Schel-Chelb, Point White, and Lytle Creeks connecting to Puget Sound at Rich Passage. The watershed percentage impervious surface is 10 percent; there are 69 linear feet of roads per acre. Documented aquatic species habitat is present for coho, resident trout, fall chum, sand lance, and surf smelt. There are four fish passage barriers. Water flow degradation is high, and water flow importance is high. There are three public recreation areas.

Projects: No projects have been identified.

Sunrise

Summary: The Sunrise watershed is 2.09 square miles with Dripping Water (C'txa), Heron, and Rolling Bay Creeks connecting to Puget Sound at Rolling Bay. The watershed percentage impervious surface is 11 percent; it has 73 linear feet of roads per acre. Documented aquatic species habitat is present for coho, resident trout, sand lance, surf smelt, herring, and pre-spawner herring holding area. There are five fish passage barriers. Water flow degradation is moderate, and water flow importance is low. There are three public recreation areas.

Projects: No projects have been identified.

Blakely Harbor

Summary: The Blakely Harbor watershed is 2.14 square miles with Mac's Dam, Tani, Sunny Hill, Blakely Falls, and Toe Jam Hill Creeks connecting to Puget Sound at Blakely Harbor. The watershed percentage impervious surface is 6 percent; it has 53 linear feet of roads per acre. Documented aquatic species habitat is present for coho, resident trout, and surf smelt. There are 10 fish passage barriers. Water flow degradation is low, and water flow importance is moderate. There is one public recreation area.

Projects: The Mac's Dam culvert replacement/grade controls installation, dam removal, and restoration project.

Port Madison

Summary: The Port Madison watershed is 2.16 square miles with Coho, Agate Pass, Hidden Cove (Scwa-qob), Nature Preserve, Oots-Aht-Ub and Tochhookwap Creeks connecting to Puget Sound at Port Madison. The watershed percentage impervious surface is 7 percent; it has 55 linear feet of roads per acre. Documented aquatic species habitat is present for winter steelhead, sand lance, surf smelt, herring, and pre-spawner herring holding area. There are three fish passage barriers. Water flow degradation is low, and water flow importance is low. There are seven public recreation areas.

Projects: No projects are currently planned.

SUMMARY

All watersheds were scored and ranked separately based upon the receiving water conditions assessment and then the stormwater management influence assessment. The scores were combined for a final cumulative score and ranking to assess relative conditions and contributions. Table 11 summarizes the results of the combined score. Prioritization will consider input from internal and external stakeholders, a broader scoring, criteria and weighting system, in tandem with rationale for protection and restoration goals targeting a receiving water and/or water resource use.

Table 11. Combined Results of Receiving Water Conditions Assessment and Stormwater Management Influence Assessment.

Watershed	Result
Manzanita	Retained for prioritization
North Eagle Harbor	
Eagledale	
Murden Cove	
Fletcher Bay	
Pleasant Beach	
Sunrise	
Blakely Harbor	
Port Madison	
Gazzam Lake	Set aside from prioritization process
Agate Pass	
South Beach	

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APPENDIX A

Receiving Water Conditions Assessment Tables

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

	Watershed Identification	Watershed Area		Receiving Waters				Basin Jurisdiction Control
Metric Name	**Watershed**	**AREA (SQ MI)**	**AREA (Acres)**	**Streams (Lushootseed name)**	**Stream Type**	**Lakes**	**Marine**	**% In City**
	Name	AREA (SQ MI)	AREA (Acres)	List of Streams	Primary type of main stem			% Area of basin in City Limits
	Agate Pass	**0.93**	**593**	Young Cedars Creek (Xexpai'yats)	N = non-fish		Agate Passage	**100%**
	Blakely Harbor	**2.14**	**1,371**	Mac's Dam Creek, Tani Creek, Sunny Hill Creek, Blakely Falls Creek, Toe Jam Hill Creek	F= fish		Blakely Harbor	**100%**
	Eagledale	**1.69**	**1,081**	Whiskey Creek, Cougar Creek, Creosote Creek, McDonald Creek, Ross Creek	F= fish		Eagle Harbor	**100%**
	Fletcher Bay	**3.33**	**2,129**	Springbrook Creek, Issei Creek, North Fletcher Bay Creek, Fosters Creek	F= fish		Fletcher Bay	**100%**
	Gazzam Lake	**1.39**	**892**	Gazzam Lake Creek, Lindquist Creek, Crystal Springs Creek	N = non-fish	Gazzam Lake	Port Orchard	**100%**
	Manzanita	**3.57**	**2,285**	Manzanita Creek (Lkwi'aup), Fairy Dell Creek	F= fish		Manzanita Bay	**100%**
	Murden Cove	**3.16**	**2,020**	Woodward Creek, Meigs Creek, Murden Creek (Doe Qud Sake Qub), Manitou Beach Creek	F= fish		Murden Cove	**100%**
	North Eagle Harbor	**3.37**	**2,158**	Cooper Creek, Hawley Creek, Ravine Creek, Sportsman's Club Creek	F= fish		Eagle Harbor	**100%**
	Pleasant Beach	**2.26**	**1,447**	Schel-Chelb Creek, Point White Creek, Lytle Creek	F= fish		Rich Passage	**100%**
	Port Madison	**2.16**	**1,380**	Coho Creek, Agate Pass Creek, Hidden Cover Creek(Scwa-qob), Nature Preserve Creek, Oots-Aht-Ub Creek, Tochhookwap Creek	F= fish		Port Madison	**100%**
	South Beach	**1.10**	**705**	South Beach Creek	N = non-fish		Rich Passage	**100%**
	Sunrise	**2.09**	**1,340**	Dripping Water Creek (C'txa), Heron Creek, Rolling Bay Creek,	F= fish		Rolling Bay	**100%**
Data Source	City of Bainbridge Island "BI_Wtrshd_Eng Update" layer shared 2020	GIS Calculation	From ShapeArea field / 43560	BI stream layer. Stream names derived from Open Street Map data and The Geographical Names Used by the Indians of the Pacific Coast, Waterman, T.T., 1922. American Geographical Society, Streams of Bainbridge Island, Elfendahl, Gerald 1997	BI stream layer	GIS, Documents	GIS, Documents	N/A
Other Notes		From ShapeArea field recalculated the geometry since the shp had the area hardcoded in			Derived from the Stream Type field from Bainbridge's stream data			Recommended metric in Ecology Guidance

Table A-2. Receiving Water Condition and Use Assessment.

Watershed	Water Quality Conditions							Water Flow	
	Benthic Index of Biotic Bntegrity (B-IBI)	Marine Water Quality - Bacteria, Nearshore Sampling	Water Quality Index	303(d) Listing Water	Metals in Mussel Tissue (percentile)	Sediment - Freshwater Copper/Zinc	Sediment - Marine Copper/Zinc	Water Flow Degradation	Water Flow Importance
Agate Passage	NA	All samples meet standard	No Data	None	No data	No Data	No Data	Moderate	Low
Blakely Harbor	NA	All samples meet standard	Mac's Dam Creek - 42	None	No data	No Data	No Data	Low	Moderate
Eagledale	Whiskey Creek - 26[1]	All samples meet standard	Whiskey Creek - 65	None	Cu->75th Zn >75th	No Data	No Data	Moderate High	Moderate High
Fletcher Bay	Issei Creek - 46[2] Springbrook -60[2]	All samples meet standard	Springbrook Creek - 55 Issei Creek - 55	None	Cu-25th to 75th Zn - 25th to 75th	23.5/39.8 Springbrook Creek	17.2/50.4 Fletcher Bay	Moderate	Moderate High
Gazzam Lake	NA	All samples meet standard	Lindquist Creek - 25 Gazzam Creek - 63	Dissolved oxygen - marine	No data	No Data	No Data	Low	Moderate
Manzanita	Manzanita Creek - 56[2] Fair	All samples meet standard	Manzanita Creek - 50	None	Cu-25th to 75th Zn - 25th to 75th	No Data	No Data	Moderate High	Highest
Murden Cove	Murden Creek - 27[2] Woodward Creek - 58[3]	All samples meet standard	Murden Creek - 44	None	Cu-25th to 75th Zn - 25th to 75th	6.1/36.7 Murden Creek	7.3/31.2 Murden Cove	Moderate High	Moderate High

Table A-2 (continued). Receiving Water Condition and Use Assessment.

Watershed	Water Quality Conditions							Water Flow	
	Benthic Index of Biotic Bntegrity (B-IBI)	Marine Water Quality - Bacteria, Nearshore Sampling	Water Quality Index	303(d) Listing Water	Metals in Mussel Tissue (percentile)	Sediment - Freshwater Copper/Zinc	Sediment - Marine Copper/Zinc	Water Flow Degradation	Water Flow Importance
Pleasant Beach	NA	All samples meet standard	Schel Chelb Creek - 9	Dissolved oxygen - marine	No data	7.1/36.4 Schel Chelb	6.7/28.2 Schel Chelb	Highest	Highest
Port Madison	NA	All samples meet standard	Coho Creek - 66	NA	No data	No Data	No Data	Low	Low
South Beach	NA	No data	NA	None	No data	No Data	No Data	Moderate	Low
Sunrise	NA	All samples meet standard	Dripping Water C'txa Creek - 69	None	Cu-25th to 75th Zn - <25th	No Data	No Data	Moderate	Low

Table A-2 (continued). Receiving Water Condition and Use Assessment.

Watershed	Water Quality Conditions							Water Flow	
	Benthic Index of Biotic Bntegrity (B-IBI)	**Marine Water Quality - Bacteria, Nearshore Sampling**	**Water Quality Index**	**303(d) Listing Water**	**Metals in Mussel Tissue (percentile)**	**Sediment - Freshwater Copper/Zinc**	**Sediment - Marine Copper/Zinc**	**Water Flow Degradation**	**Water Flow Importance**
Other Notes	Standard Rating for Scores is: Excellent (80-100), Good (60-80), Fair (40-60), Poor (20-40), Very Poor (<20); 3 most recent years data averaged	The standard is the WAC 173-201A shellfish water quality standard applied to annual average for Part 1 and Part 2	Standard Rating for Scores Is: Low Concern (80-100), Moderate Concern (40-80), High Concern (below 40)	None = No data found				Model 2=(degradation of timing of delivery)+ [(degradation of surface storage)+(degradation of areas for recharge + degradation of subsurface flow + degradation of discharge areas)] + (degradation of evapotranspiration)	Model 1=[(Precipitation + Timing of Water Delivery)] + [(Surface storage +Sub-surface flow + Recharge +Discharge)]

Table A-2 (continued). Receiving Water Condition and Use Assessment.

Watershed	Water Resource Uses						
	Shoreline Habitat	Shoreline Biological	Pocket Estuary	ESA Listed Salmon	Salmonid and Resident Fish Presence	Shellfish Classification	Public Recreation Opportunities (water access)
Agate Passage	Kelp, Eelgrass	Sand Lance Spawning Smelt Spawning Herring Spawning	None	No	None	Approved: 75% Prohibited: 5% Unclassified: 20%	Hidden Cove Road End, Reitan Road End, Sanwick Road End, Seabold Tidelands
Blakely Harbor	Eelgrass, Salt Marsh, Kelp	Smelt Spawning	CPS 15- Blakely Harbor	No	Coho (Mac's Dam) Resident Coastal Cutthroat (Mac's Dam)	Approved: 80% Closed due to other pollution: 15% Unclassified: 5%	Blakely Harbor Park
Eagledale	Eelgrass, Salt Marsh, Kelp	Smelt Spawning Sand Lance Spawning	None	No	Coho	Approved: 75% Unclassified: 25%	Joel Pritchard Park, Ward Ave Road End at Eagle Harbor Marina, South Eagle Harbor Tidelands, Rose Loop Beach Road End
Fletcher Bay	Salt Marsh - Moderate, Kelp	Sand Lance Spawning Smelt Spawning Herring Spawning	PM10 - Fletcher Bay PM8 - Battle Point	Yes - Steelhead	Coho (Issei, North Fletcher Bay, Springbrook Main) Resident Coastal Cutthroat (Issei, North Fletcher Bay, Springbrook Main, Springbrook Southfork) Fall Chum (Springbrook Main) Winter Steelhead (Springbrook Main)	Approved: 90% Closed due to other pollution: 5% Unclassified: 5%	Foster Street Road End, Springridge Road End, Fletcher Landing
Gazzam Lake	Kelp	Sand Lance Spawning Smelt Spawning Pre-spawner Herring Holding Area	None	No	None	Approved: 97% Prohibited: 3%	Fletcher Landing Rd End, Point White Dock, Gazzam Lake Nature Preserve, Gazzam Lake Trail
Manzanita	Salt Marsh Eelgrass	Sand Lance Spawning Smelt Spawning Herring Spawning	PM6 - Manzanita Bay 1 PM7 - Manzanita Bay 2	No	Coho (Manzanita Main/North Fork/South Fork) Resident Coastal Cutthroat (Manzanita Main/North Fork/South Fork) Fall Chum (Manzanita Main)	Approved: 90% Unclassified: 10%	Beach Drive Road End, Fairy Dell Park, Dock St. Road End, Woodland Dr. Road End, Williams-Olson Park
Murden Cove	Eelgrass, Salt Marsh	Sand Lance Spawning Smelt Spawning	CPS-18 Murden Cove	No	Resident Coastal Cutthroat (Woodward) Coho	Approved: 100%	Manitou Beach, Yaquina Point Road End

Table A-2 (continued). Receiving Water Condition and Use Assessment.

Watershed	Water Resource Uses						
	Shoreline Habitat	Shoreline Biological	Pocket Estuary	ESA Listed Salmon	Salmonid and Resident Fish Presence	Shellfish Classification	Public Recreation Opportunities (water access)
Pleasant Beach	Kelp Eelgrass	Sandlace Spawning Smelt Spawning	CPS 14 - Lynwood Center	No	Coho (Schel-Chelb) Resident Coastal Cutthroat (Schel-Chelb) Fall Chum (Schel-Chelb)	Unclassified: 100%	Pleasant Beach, Schel-Chelb Estuary, Lytle Road End Community Park, Beck Road End
Port Madison	Eelgrass, Salt Marsh - High	Sand Lance Spawning Smelt Spawning Herring Spawning Pre-spawner Herring Holding Area	None	Yes - Steelhead	Winter Steelhead Coho	Approved: 90% Unclassified: 10%	Lafayette St Road End, T choopwop Park, Hidden Cove Park, Skogen Lane Road End, Broom St. Road End, Grotle Rd Road End, Gordon Dr. Road End,
South Beach	Kelp Eelgrass	None	None	No	None	Approved: 75% Closed due to other pollution: 5% Unclassified: 20%	Wharf St. Road End, Fort Ward Park and Boat Launch, Nutes Pond Park
Sunrise	Eelgrass	Sand Lance Spawning Smelt Spawning Herring Spawning Pre-spawner Herring Holding Area	CPS19- Point Monroe	No	Coho (Dripping Water) Resident Coastal Cutthroat (Dripping Water)	Approved: 100%	Point Monroe Lagoon, Ocean Drive Road End, Fay Bainbridge Park,

Table A-2 (continued). Receiving Water Condition and Use Assessment.

Watershed	Water Resource Uses						
	Shoreline Habitat	Shoreline Biological	Pocket Estuary	ESA Listed Salmon	Salmonid and Resident Fish Presence	Shellfish Classification	Public Recreation Opportunities (water access)
Other Notes							

	Table A-3. Assess Stormwater Management Influence.						
	Existing Landscape Condition						
	% Total Impervious Area (TIA)	**Road Density**	**Road Density**	**Mapped WDFW Fish Barriers**		**% Canopy in Riparian Buffers**	**Average Age of Development**
Metric	*% Impervious Surface*	*Linear Feet of Road per Watershed, used for Calculation*	*Linear Feet of Road per Acre*	*Count Barriers in Watershed*	*Linear Feet of stream prior to first upstream full/total barrier*	*% Canopy in critical areas buffers (streams, lakes/ponds, wetlands)*	*% of Area Developed Prior to 2005*
Agate Pass	8.1%	33,628	56.7	0	Young Cedars Creek - No total barrier	79%	58%
Blakely Harbor	6.2%	72,793	53.1	10	Tani Creek - No total barrier Blakely Falls Creek - Barrier at mouth Sunny Hill Creek - 356 ft to first total barrier Toe Jam Hill Creek - 763 ft to first total barrier Mac's Dam Creek - 2,222 ft to first total barrier	88%	37%
Eagledale	9.7%	73,215	67.7	11	Rose Creek - No total barrier Creosote Creek - No total barrier Cougar Creek - 2,558 ft to first total barrier McDonald Creek - 1,296 ft tot first total barrier Whiskey Creek - 2,721 ft to first total barrier	76%	61%
Fletcher Bay	6.8%	97,941	46.0	17	Issei Creek - No total barrier Springbrook Creek - 7,390 ft to first total barrier Fosters Creek - 733 ft to first total barrier North Fletcher Bay Creek - 331 ft to first total barrier	81%	57%

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

	Existing Landscape Condition						
Metric	**% Total Impervious Area (TIA)**	**Road Density**	**Road Density**	**Mapped WDFW Fish Barriers**		**% Canopy in Riparian Buffers**	**Average Age of Development**
Gazzam Lake	6.0%	40,413	45.3	9	Gazzam Lake Creek - No total barrier Crystal Springs Creek - 803 ft to first total barrier Linquist Creek - 2,056 ft to first total barrier	85%	34%
Manzanita	8.9%	133,708	58.5	28	Meimois Creek - No total barrier Fairy Dell Creek - No total barrier Manzanita Creek - 7,019 ft to first total barrier Manzanita Creek North Fork - 7,163 ft to first total barrier	73%	55%
Murden Cove	10.1%	137,179	67.9	23	Manitou Beach Creek - No total barrier Woodward Creek + Meigs Creek - 7,171 ft to first total barrier	77%	53%
North Eagle Harbor	21.3%	213,199	98.8	15	Ravine Creek - 458 ft to first total barrier Hawley Creek - 993 ft to first total barrier Cooper Creek East Fork - 533 ft to first total barrier Copper Creek North Fork - 3,962 ft to first total barrier Sportsman's Club Creek - 744 ft to first total barrier	74%	51%
Pleasant Beach	10.3%	99,526	68.8	4	Point White Creek - No total barrier Lytle Creek - No total barrier Schel-Chelb Creek - 1,744 ft to first total barrier	72%	52%
Port Madison	7.4%	75,436	54.7	3	Coho Creek - No total barrier Oots-Aht-ub Creek - No total barrier Tochhookwap Creek - No total barrier Hidden Cove Creek - No total barrier Nature Preserve Creek - No total barrier Agate Pass Creek- Barrier at mouth	84%	55%
South Beach	9.2%	50,306	71.3	4	South Beach Creek - Barrier at mouth	82%	48%

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

	Existing Landscape Condition						
Metric	**% Total Impervious Area (TIA)**	**Road Density**	**Road Density**	**Mapped WDFW Fish Barriers**		**% Canopy in Riparian Buffers**	**Average Age of Development**
Sunrise	10.6%	98,254	73.3	5	Heron Creek - No total barrier Dripping Water Creek - 4,994 ft to first total barrier Rolling Bay Creek - 637 ft to first total barrier	75%	66%
GIS or Document Review, Other	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis
Data Sources	BI Land Cover 2015	Bainbridge Island GIS: "BIRD_Merge" layer; WSDOT mapping of HWY 305	Bainbridge Island GIS: "BIRD_Merge" layer; WSDOT mapping of HWY 305	WDFW Web Map Tool, extracted data January 2022	WDFW Web Map Tool, extracted data January 2022 BI stream layer, names populated from Open Street Map if value empty in original data	BI Land Cover 2015; stream and wetland buffer layers provided by City	Bainbridge Island GIS: parcel layer
Purpose		*Supporting information for Linear Feet of Road per Acre*	Highly correlated with BIBI (King County, MacNeale, 2019)	*Supporting information for Barriers per Stream Mile (focus on road-related barriers)*	Measure of stream habitat availability prior to first barrier. Watersheds with a 0% passable barrier at the stream mouth have limited value for habitat improvements unless barrier can be removed.	Riparian condition measurement	Development age indicates level of stormwater controls in place compared to current standard

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

	Existing Landscape Condition						
Metric	**% Total Impervious Area (TIA)**	**Road Density**	**Road Density**	**Mapped WDFW Fish Barriers**		**% Canopy in Riparian Buffers**	**Average Age of Development**
Notes/ Comments	Includes the following Classnames: Building Impervious Road TreeOverBuilding TreeOverRoad Calculation method: - Query land class by the impervious types list above - Intersect with Basins - Dissolve by Basin name OR aggregate via pivot table - Divide area of impervious by basin area to get impervious percentage	Manually added WSDOT HWY 305 mapping Calculation method: - Merge 305 line with BIRD_Merge layer - Intersect with Basins - Dissolve by Basin name OR aggregate via pivot table - Use resulting Shape Length to get the linear feet of road per basin	Calculation method: Linear Feet of Road / Basin Acreage	Barrier mapping is not aligned with stream mapping at all locations Excluded barriers mapped as dams, diversion, natural, unknown - focused on road crossings Calculation method: - after compiling and categorizing data, filter via pivot table, making sure to exclude "Natural Barrier - Not Field Verified", "Not a barrier" and "Unknown". The types used for counts in this calculation are: "Barrier, Unknown Percent Passable", "On a Non-Fish Bearing Stream", "Partial Fish Passage Blockage", and "Total Fish Passage Blockage"	Barrier mapping is not aligned with stream mapping at all locations Mainstem linear distance only to first full barrier, not a total inventory of currently-accessible fish habitat Calculation method: - No total barrier: no total barriers on the stream - Barrier at mouth: total barrier at the mouth of the stream - X ft to first total barrier: cut the stream line at the first total barrier. If the barrier appears along a fork, then the fork is included in the length. Otherwise, forks along the way to the first total barrier are ignored in the calculation.	Calculated for Classname = Tree, excludes all other class types (such as Shrub, Tree over Road, Tree over Building, etc.) Calculation method: - Intersect Canopy, Riparian Buffer and Basins - Dissolve by Basin OR aggregate via pivot table - Per basin, divide area of canopy by riparian buffer area to get canopy percentage in riparian	City GIS data is under development; year built is not available for all parcels. % of area developed before 2005 Calculation method: - Select parcels with YRBUILT < 2005, after excluding values of 0 and 3000 - Intersect with Basins - Dissolve by Basin name OR aggregate via pivot table - Divide area of the parcels by the area of basin to get percentage of area developed before 2005

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

	Future Development				
Metric	**Projected New Permit-Exempt Wells**		**% of Watershed that is Vacant, Under Utilized, or Partially Utilized**		
	Well Count	*Additional Dwellings*	*Partially Utilized*	*Under Utilized*	*Vacant*
Agate Pass	147	320	14%	0.0%	11%
Blakely Harbor	15	27	14%	0.0%	23%
Eagledale	107	146	11%	0.1%	9%
Fletcher Bay	145	252	14%	0.1%	12%

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

	Future Development				
Metric	Projected New Permit-Exempt Wells		% of Watershed that is Vacant, Under Utilized, or Partially Utilized		
Gazzam Lake	74	158	8%	0.0%	10%
Manzanita	162	283	16%	0.0%	10%
Murden Cove	130	216	9%	0.0%	6%
North Eagle Harbor	66	113	4%	1.4%	8%
Pleasant Beach	26	41	7%	0.0%	9%
Port Madison	181	356	11%	0.0%	14%
South Beach	2	5	12%	0.0%	6%

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

	Future Development				
Metric	**Projected New Permit-Exempt Wells**		**% of Watershed that is Vacant, Under Utilized, or Partially Utilized**		
Sunrise	24	30	18%	0.0%	9%
GIS or Document Review, Other	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis
Data Sources	WRIA 15 Watershed Planning: Potential Permit-Exempt Wells, layer shared by COBI in Dec 2021	WRIA 15 Watershed Planning: Potential Permit-Exempt Wells, layer shared by COBI in Dec 2021	Bainbridge Island Buildable Lands draft analysis, shared Dec 2021. "Buildinable_Lands_noplats_Dissolve" layer	Bainbridge Island Buildable Lands draft analysis, shared Dec 2021. "Buildinable_Lands_noplats_Dissolve" layer	Bainbridge Island Buildable Lands draft analysis, shared Dec 2021. "Buildinable_Lands_noplats_Dissolve" layer
Purpose	Projection of future development based on anticipated new domestic wells (well count)	Projection of future development based on anticipated new domestic wells (total number of anticipated dwellings)	Project of lands that may be redeveloped and upgraded to current stormwater standards	Project of lands that may be redeveloped and upgraded to current stormwater standards	Projection of future new development based on available buildable lands that are not fully developed

	Table A-3 (continued). Assess Stormwater Management Influence.				
	Future Development				
Metric	Projected New Permit-Exempt Wells		% of Watershed that is Vacant, Under Utilized, or Partially Utilized		
Notes/ Comments	Calculation method: - Intersect Wells with Basins - Aggregate via pivot table, getting counts of wells and additional dwellings per basin.	Calculation method: - Intersect Wells with Basins - Aggregate via pivot table, getting counts of wells and additional dwellings per basin.	Calculation method: - Intersect Buildable Lands with Basins - Aggregate via pivot table, getting areas per basin for Partially Utilized, Under Utilized and Vacant - Per basin, divide area of Partially Utilized, Under Utilized and Vacant by area of basin to get percentages	Calculation method: - Intersect Buildable Lands with Basins - Aggregate via pivot table, getting areas per basin for Partially Utilized, Under Utilized and Vacant - Per basin, divide area of Partially Utilized, Under Utilized and Vacant by area of basin to get percentages	Calculation method: - Intersect Buildable Lands with Basins - Aggregate via pivot table, getting areas per basin for Partially Utilized, Under Utilized and Vacant - Per basin, divide area of Partially Utilized, Under Utilized and Vacant by area of basin to get percentages

	Table A-3 (continued). Assess Stormwater Management Influence.				
	Equity				
Metric	**Combined Environmental Health Disparities Rank**	**Environmental Exposures**	**Environmental Effects**	**Socioeconomic Factors**	**Sensitive Populations**
	Composite score evaluating threat to and vulnerability of populations	*Environmental exposure refers to how a person comes into contact with an environmental hazard. Examples of exposure include breathing air, eating food, drinking water or living near to where environmental hazards are released or are concentrated*	*Environmental effect refers to adverse environmental quality generally, even when population contact with an environmental hazard is unknown or uncertain.*	*This category includes indicators related to intrinsic and extrinsic vulnerabilities in communities that can modify the environmental risk factors.*	*This category includes indicators related to intrinsic and extrinsic vulnerabilities in communities that can modify the environmental risk factors. 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*
Agate Pass	1.00	3.00	7.59	1.00	1.00
Blakely Harbor	2.00	4.00	8.00	1.00	2.00
Eagledale	2.00	4.00	8.00	1.00	2.00
Fletcher Bay	1.43	3.43	8.57	1.00	1.43

	Table A-3 (continued). Assess Stormwater Management Influence.				
	Equity				
Metric	Combined Environmental Health Disparities Rank	Environmental Exposures	Environmental Effects	Socioeconomic Factors	Sensitive Populations
Gazzam Lake	2.00	4.00	8.00	1.00	2.00
Manzanita	1.00	3.00	8.50	1.00	1.00
Murden Cove	1.00	3.00	7.56	1.00	1.00
North Eagle Harbor	1.27	3.27	5.81	1.00	1.27
Pleasant Beach	2.00	4.00	8.00	1.00	2.00
Port Madison	1.00	3.00	6.00	1.00	1.00
South Beach	2.00	4.00	8.00	1.00	2.00

	Table A-3 (continued). Assess Stormwater Management Influence.				
	Equity				
Metric	**Combined Environmental Health Disparities Rank**	**Environmental Exposures**	**Environmental Effects**	**Socioeconomic Factors**	**Sensitive Populations**
Sunrise	1.00	3.00	6.00	1.00	1.00
GIS or Document Review, Other	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis	GIS Analysis
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.

	Table A-3 (continued). Assess Stormwater Management Influence.				
	Equity				
Metric	Combined Environmental Health Disparities Rank	Environmental Exposures	Environmental Effects	Socioeconomic Factors	Sensitive Populations
Notes/ Comments	Data is available at the Census Tract scale, which does not align with watershed delineations; data processing involved area-weighting to assign watershed values Higher numbers indicate higher threat from environmental exposures.	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 Higher numbers indicate greater vulnerability of populations within the watershed	Data is available at the Census Tract scale, which does not align with watershed delineations; data processing involved area-weighting to assign watershed values Higher numbers indicate greater vulnerability of populations within the watershed

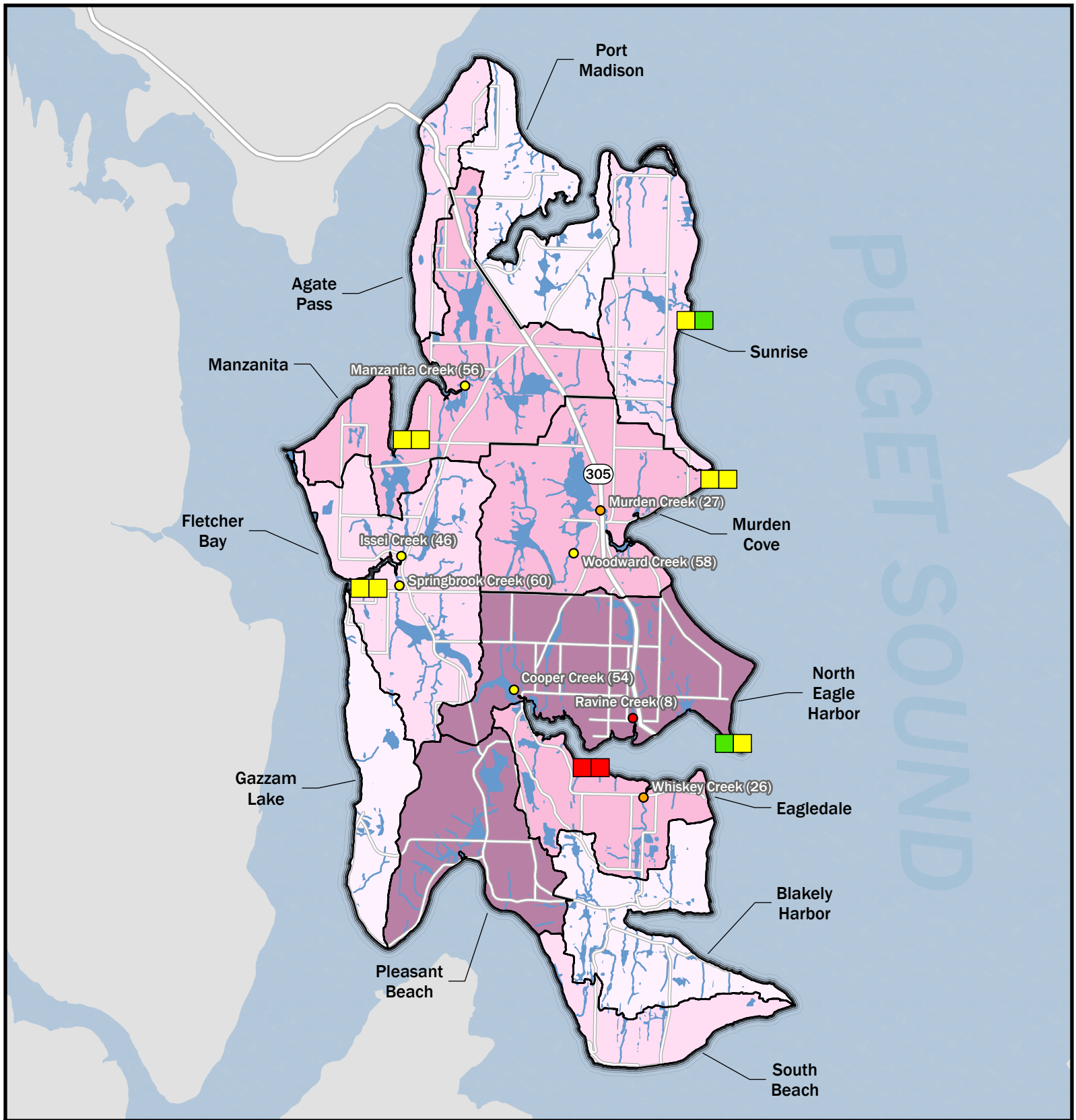
APPENDIX B

Detailed Scoring Matrix

Assessment Type	Metric	Agate Pass	Blakely Harbor	Eagledale	Fletcher Bay	Gazzam Lake	Manzanita	Murden Cove	North Eagle Harbor	Pleasant Beach	Port Madison	South Beach	Sunrise
Water Conditions	Water Quality Index	0	2	2	2	2.5	2	2	2	3	2	0	2
	Benthic Index of Biotic Integrity	0	0	3	2	0	2	2.5	2.5	0	0	0	0
	Mussel Study	0	0	3	2	0	2	2	1	0	0	0	1
	Water Flow Degradation	1	0	2	1	0	2	2	3	3	0	1	1
Water Resource Uses	Water Flow Importance	0	1	2	2	1	3	2	1	3	0	0	0
	Shoreline Habitat (Pocket estuary + forage fish)	1	2	1	2	1	2	2	1	2	2	0	3
	Salmon Species	0	2	1	3	0	3	2	3	3	2	0	2
	Public Recreation	2	1	2	1	2	2	1	3	1	3	1	1
Stormwater Impact	Percent Impervious Surface	1	1	1	1	1	1	1	3	1	1	1	2
	Percent Canopy in Buffer Areas	2	1	2	1	1	2	2	2	2	1	1	2
	Fish Passage Barriers	0	2	3	3	2	3	3	3	1	1	1	1
	Percent Area pre-2005	3	1	3	2	1	3	3	3	3	3	2	3
Future Growth	Vacant + Underutilized Buildable Lands	1	3	0	1	1	1	0	0	0	1	0	0

APPENDIX C

Water Conditions, Water Uses and Stormwater Influence Maps



Legend

Water Flow Degradation[1]
- High
- Moderate High
- Moderate
- Low

BIBI Score (0-100)[2]
- Fair (40-60)
- Poor (20-40)
- Very Poor (0-20)

Cu Zn Metals in Mussel Tissue[3]

Percentile
- >75th
- 25th to 75th
- <25th

- Watersheds
- Wetlands and Lakes
- Streams
- Roads

1. WA Dept. of Ecology Puget Sound Watershed Characterization (Bainbridge Island Results)
2. Puget Sound Stream Benthos database (Bainbridge Island samples)
3. WA Dept of Wildlife, 2017/2018 Mussel Survey

Appendix C-1.
Selected Water Conditions Metrics

N

0 0.38 0.75 1.5
Miles

HERRERA

City of Bainbridge

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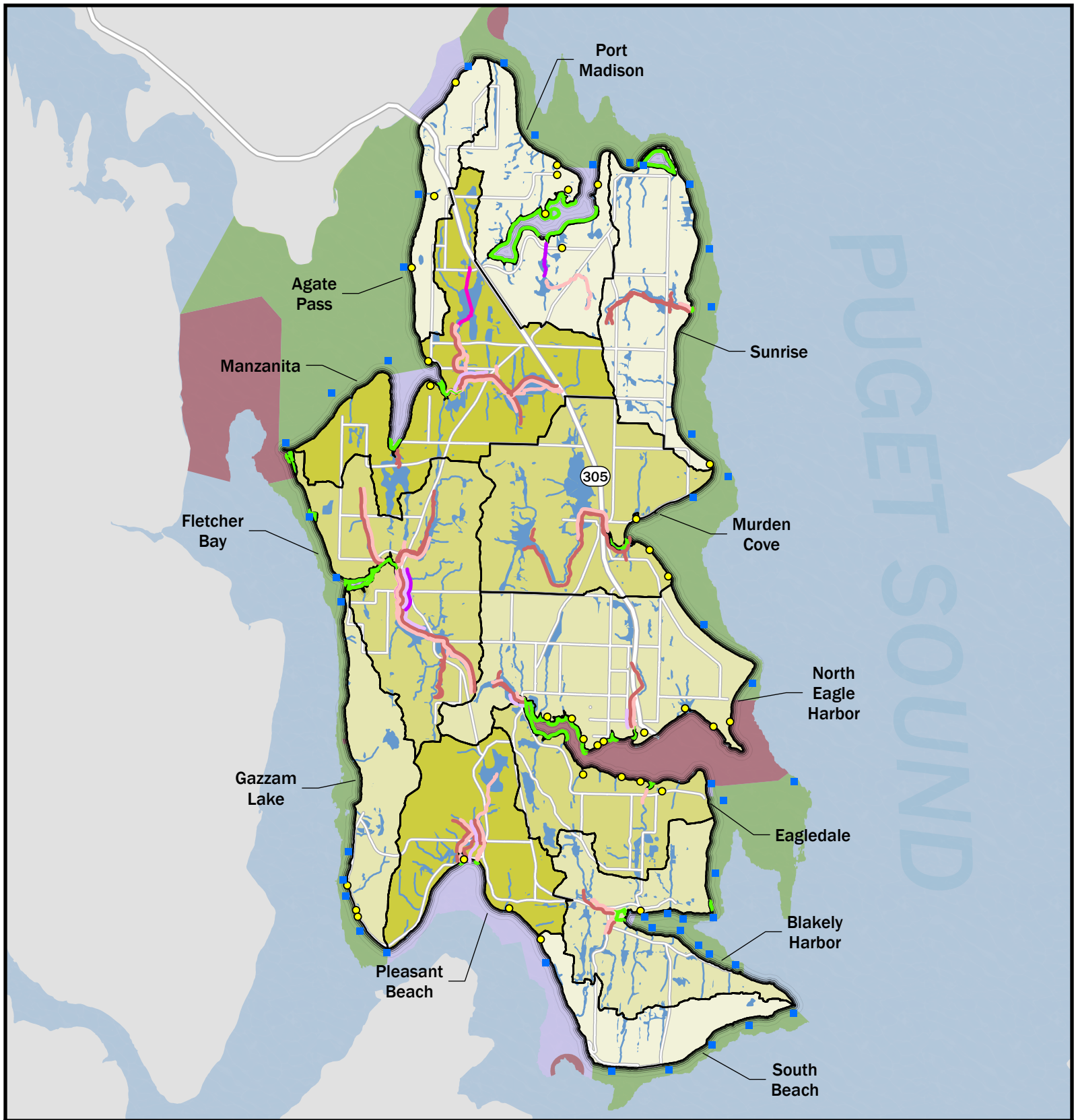

Legend

Water Flow Importance[1]
- High
- Moderate High
- Moderate
- Low

Salmonid/Trout Habitat[3/4/5]
- Coho
- Resident Coastal Cutthroat
- Fall Chum
- Winter Steelhead
- Coho
- Cutthroat

Shellfish Growing Areas[6]
- Approved
- Prohibited
- Unclassified

- State Shellfish Water Sampling Station[6]
- Public Beach Access[2]
- Pocket Estuaries[3/7/8]
- Watersheds
- Wetlands and Lakes
- Streams
- Roads

1. WA Dept. of Ecology Puget Sound Watershed Characterization (Bainbridge Island Results)
2. WA Dept. of Ecology
3. Statewide Integrated Fish Distribution (Northwest Indian Fisheries Commission & WDFW)
4. Wild Fish Conservancy
5. NMFS West Coast Region Endangered Species Act critical habitat geodatabase (NOAA Fisheries)
6. WA Dept. of Health (WA DOH)
7. Puget Sound Nearshore Ecosystem Recovery Project (PSNERP)
8. NOAA Fisheries West Coast Region

Appendix C-2.
Selected Water Resource Uses Metrics

N

0 0.38 0.75 1.5
Miles

HERRERA

City of Bainbridge

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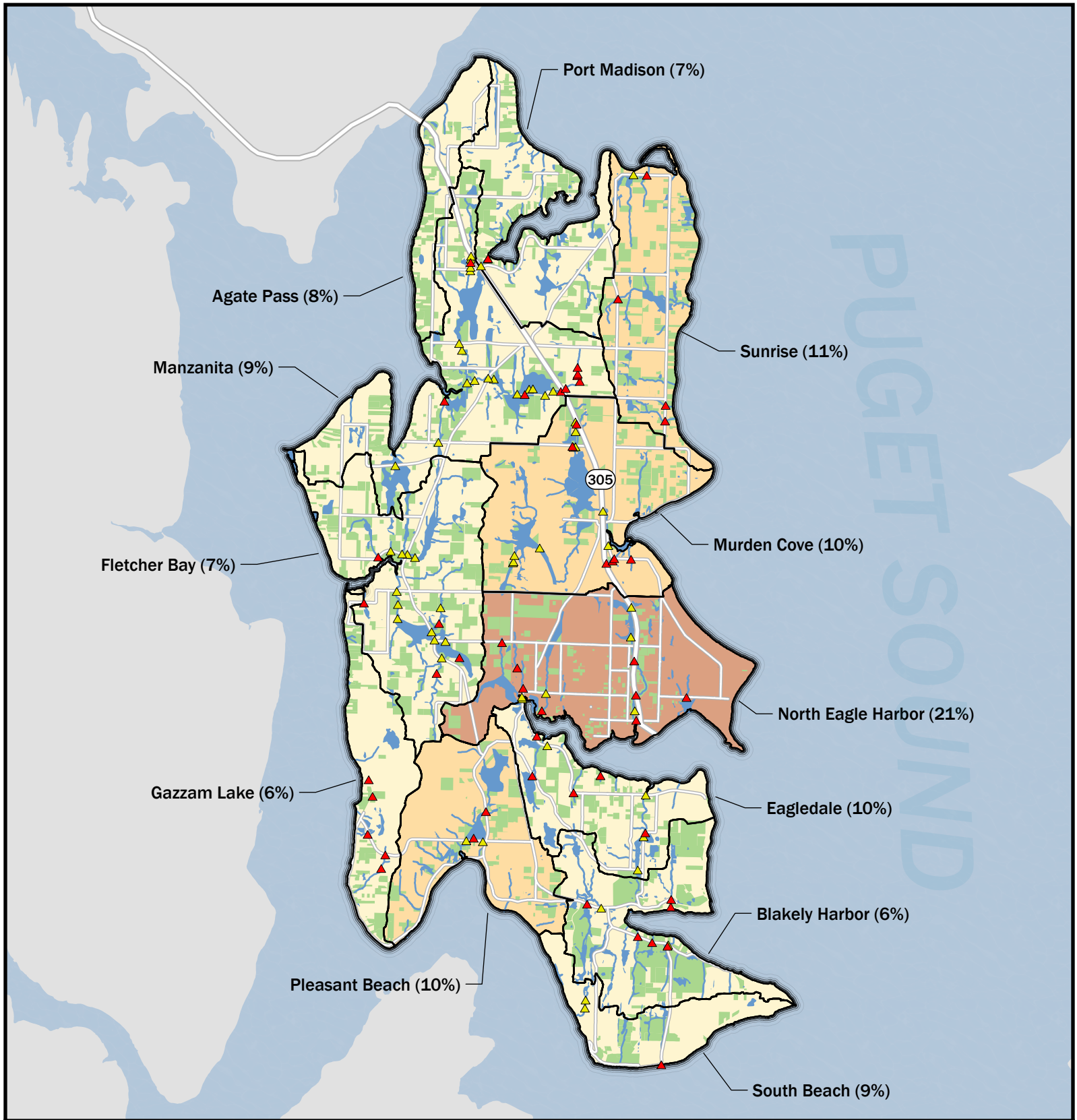

Legend

Impervious Surface Percentage

- <10%
- 10-15%
- >15%
- Partial Fish Passage Barrier[1]
- Total Fish Passage Barrier[1]
- Developable Land (Partially/ Under Utilized and Vacant)[2]
- Watersheds (% Impervious)
- Wetlands and Lakes
- Streams
- Roads

1. WA Dept. of Fish and Wildlife (WDFW)
2. Kitsap County/Bainbridge Island Buildable Lands Reports

Appendix C-3.
Selected Stormwater Influence Metrics

N

0 0.38 0.75 1.5
Miles

HERRERA

City of Bainbridge

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