

CITY OF SHORELINE

Shoreline Inventory and Characterization



December 2008, Revised November 2009 and April 2010

Prepared for:
City of Shoreline

17544 Midvale Avenue N., Shoreline, WA 98133

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INTRODUCTION

Background and Purpose

The City of Shoreline (City), Washington is undertaking a comprehensive update to its Shoreline Master Program (SMP) as required by the implementing guidelines in the Washington Administrative Code (WAC). To support this effort, the City applied for and received a grant issued by the Washington State Department of Ecology (Ecology) (G0800171). This shoreline inventory and characterization study supports the SMP update process by providing a baseline inventory of existing conditions within the shoreline jurisdiction of the City.

In 2003, the Washington State Legislature passed Substitute Senate Bill (SSB) 6012, which established timelines for all cities and counties to amend their local shoreline master programs (SMPs) consistent with the Shoreline Management Act (SMA), RCW 90.58 and its updated implementing guidelines, Washington Administrative Code (WAC) 173-26. The City of Shoreline is required to prepare an update to its SMP by the end of 2009. The City prepared the first draft of this shoreline inventory and characterization report in 2004; however, the report was not formally adopted or finalized. The City's first step towards a comprehensive SMP update involves revising the 2004 draft report to update technical information that has changed or been made available since 2004, and to be consistent with the current state shoreline guidelines. This report provides:

- Analysis and characterization of ecosystem-wide processes that affect the City's shoreline;
- Analysis and characterization of shoreline functions; and
- Opportunities for protection, restoration, public access and shoreline use.

The inventory and characterization documents current shoreline conditions and provides a basis for updating the City's SMP goals, policies and regulations. This report will help the City establish a baseline of conditions, evaluate functions and values of resources in its shoreline jurisdiction, and explore opportunities for conservation and restoration of ecological functions.

This inventory and characterization report also includes a map folio, located at the end of the document. All figures referenced in the document are found in the map folio.

Shoreline Jurisdiction and Study Area Boundary

Under the SMA, the shoreline jurisdiction includes all submerged lands waterward of the ordinary high water mark (OHWM) of waters that have been designated as "shorelines of statewide significance" or "shorelines of the state," as well as those areas that are 200 feet landward of the OHWM of these same waters. The shoreline jurisdiction criteria were established in 1972, and are described in Washington Administrative Code (WAC) 183-Generally, "shorelines of statewide significance" include portions of Puget Sound and other marine water bodies, rivers west of the Cascade Range that have a mean annual flow of 1,000 cubic feet per second (cfs) or greater, rivers east of the Cascade Range that have a mean annual flow of 200 cfs or greater, and freshwater lakes with a surface area of 1,000

acres or more. “Shorelines of the state” are generally described as all marine shorelines and shorelines of all other streams or rivers having a mean annual flow of 20 cfs or greater and lakes with a surface area greater than 20 acres.

The City’s shoreline jurisdiction includes the Puget Sound shore within both the city limits and its potential annexation area (PAA). The portion of Puget Sound seaward from the line of extreme low tide is considered a “shoreline of statewide significance” per RCW 90.58.030(2)(e). The remainder of the Puget Sound landward of the extreme low tide mark is considered a “shoreline of the state.” The City therefore includes approximately four miles of Puget Sound coastline. There are no rivers, streams or lakes in the City meeting the definition of “shorelines of the state.”

Under the SMA, the shoreline area to be regulated by the City’s Shoreline Master Program must include all shorelines of statewide significance, shorelines of the state, and their adjacent shorelands, which are defined as the upland area within 200 feet of the OHWM, as well as any associated wetlands (RCW 90.58.030) within its municipal jurisdiction. Since the SMP is in part a long-range planning document, this characterization report includes those marine shorelines within the city limits as well as the PAA. One-half mile of the Puget Sound is located in the City’s PAA. The City’s PAA is known as Point Wells, located directly north of the city in unincorporated Snohomish County (Maps 1 and 1-A).

The City’s shoreline jurisdiction extends to the landward edge of associated wetlands. “Associated wetlands” means those wetlands that are in proximity to and either influence or are influenced by tidal waters or a lake or stream subject to the SMA (WAC 173-22-030 [1]). These are typically identified as wetlands that physically extend into the shoreline jurisdiction, or wetlands that are functionally related to the shoreline jurisdiction through surface water connection and/or other factors. The specific language from the RCW describes the limits of shoreline jurisdiction as follows:

“those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all associated wetlands and river deltas” (RCW 90.58.030[2][f]).

Wetlands associated with SMA regulated waters are limited to intertidal wetlands, mapped throughout the city limits along Puget Sound, and smaller wetlands associated with the lower reaches and mouths of Barnacle and Coyote (also known as Innis Arden South) Creeks.

Shoreline Planning Segments

For the purposes of this study, the City’s shoreline jurisdiction was organized into five distinct segments (A through E) based broadly on the physical distinction along the shoreline, the level of ecological functions provided by each segment, as well as existing land uses and zoning designations. Shoreline Planning Segments are described in Table 1 and depicted on Map 1.

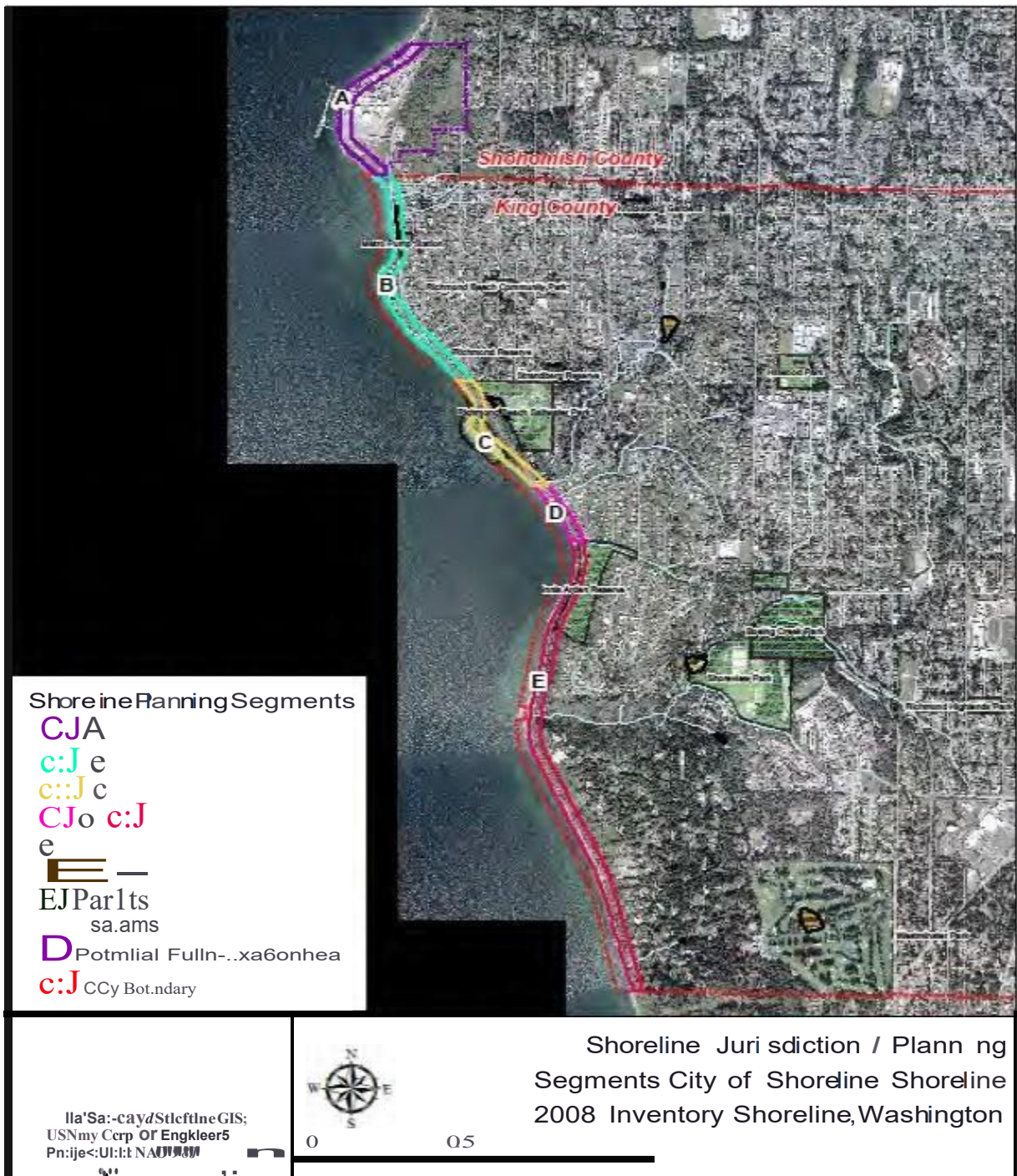
Table 1. Shoreline Planning Segments

Shoreline Segment	Approximate Length (feet)	Approximate Segment Acreage	General Boundaries
A	3,411	15.6	Potential Annexation Area / Point Wells: located directly north of the city limits in unincorporated Snohomish County.
B	4,724	21.7	Richmond Beach residential area: the Snohomish County line south to Richmond Beach Saltwater Park.
C	2,801	11.0	Richmond Beach Saltwater Park south to Storm Creek culvert.
D	1,295	5.7	Innis Arden residential area: south of Richmond Beach Saltwater Park to Innis Arden Reserve Park.
E	9,424	41.6	Innis Arden Reserve / Highlands: Innis Arden Reserve Park south to city limits.

Source: City of Shoreline, 2002

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Map 1: Shoreline Planning Segments



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CURRENT REGULATORY FRAMEWORK SUMMARY¹

City of Shoreline Regulations

Current Shoreline Management Act Compliance

The Shoreline Management Act is implemented through the development of local Shoreline Master Programs (SMPs). Local SMPs establish a system to classify shoreline areas into specific “environment designations.” The purpose of shoreline environment designations is to provide a uniform basis for applying policies and use regulations within distinctly different shoreline areas. In a regulatory context, shoreline environment designations provide the governing policy and regulations that apply to land within the SMP jurisdiction. Portions of individual parcels that are outside SMP jurisdiction are governed by zoning and other applicable land use regulations. Generally, environment designations should be based on existing and planned development patterns, biological and physical capabilities and limitations of the shoreline, and a community’s vision or objectives for its future development.

When the City of Shoreline incorporated in 1995, it adopted regulations outlined in Title 25 (Shoreline Management Plan) of the King County Code as the interim shoreline management code (Shoreline Municipal Code [SMC] 16.10). Shoreline properties within the City’s PAA are regulated under the Snohomish County SMP, until such properties are annexed and the City’s SMP is amended. During development of the City of Shoreline’s first comprehensive plan in 1998, the City evaluated the natural and built characteristics of its shoreline jurisdiction and developed five preliminary shoreline environment designations:

- Urban Railroad (for developed portions of the Burlington Northern Santa Fe [BNSF] Railway throughout the City’s shoreline jurisdiction),
- Urban - High Intensity,
- Suburban - High Residential,
- Suburban - Low Residential, and
- Conservation.

These preliminary shoreline environment designations have not been approved by Ecology, since they were not part of a comprehensive update to the City’s SMP. Therefore, they are not being implemented as part of Shoreline’s interim shoreline management code.

¹ The discussion of regulatory requirements included herein is not intended to be a complete list of all permits or approvals necessary for work within the City’s shoreline jurisdiction or other areas within the city or PAA. Other portions of local code and state and federal regulations may apply to development projects within the city. The permits and approvals necessary for construction may vary from parcel to parcel regardless of shoreline jurisdiction and may vary depending on the type and intensity of the work proposed. Prior to any construction within city limits, an applicant should contact the City and the applicable state and federal agencies to determine actual permit requirements. For development of parcels in the PAA outside of the city limits, an applicant should contact Snohomish County and the applicable state and federal agencies to determine actual permit requirements.

Comprehensive Plan, Zoning and Other City Regulations

- City of Shoreline *Comprehensive Plan* – The City’s existing *Comprehensive Plan* was adopted in 2001. The *Comprehensive Plan* establishes goals and policies that define the community’s vision for the physical, economic, and social development of the City for the next 20 years. The *Comprehensive Plan* land use designations in the Puget Sound shoreline planning area include Mixed Use (Point Wells), Low Density Residential, Public Facilities (e.g., the BNSF Railway right-of-way), Public Open Space, and Private Open Space (City of Shoreline, 2001). City land use designations are relevant to this shoreline inventory and characterization report as they establish the general land use patterns and vision of growth the City has adopted for areas both inside and outside the shoreline jurisdiction. The City’s SMP goals and policies are one element of the *Comprehensive Plan* (included as an appendix). During this update process, the City will update its SMP element goals and policies and integrate them with the GMA comprehensive plan requirements for administrative and regulatory reform.
- City of Shoreline Municipal Code, Chapter 20.40: Zoning – Chapter 20.40 of the SMC (Zoning and Use Provisions) establishes zoning designations. Zoning designations in the Puget Sound shoreline planning area include: Residential 4 units/acre (R-4) and Residential 6 units/acre (R-6) (City of Shoreline, 2006). Point Wells, located in the City’s PAA, is zoned Heavy Industrial (HI) by the Snohomish County Zoning Code (Snohomish County website, 2008).
- City of Shoreline Municipal Code, Chapter 20.80: Critical Areas – Chapter 20.80 of the SMC (Critical Areas) establishes development standards, construction techniques, and permitted uses in critical areas and their buffers (i.e., geologic hazard areas, fish and wildlife habitat conservation areas, wetlands, flood hazard areas, aquifer recharge areas, and stream areas) to protect these areas from adverse impacts. Designated critical areas are found throughout the City’s shoreline planning area, particularly wetlands and streams, flood hazard areas, and geologic hazard areas (City of Shoreline, 2007a).
- City of Shoreline *Surface Water Master Plan* – The City’s Surface Water Master Plan was adopted in 2005. The plan identifies surface water problems, prioritizes needs, and provides long-term solutions that reflect the community’s priorities and can be funded by the City. The Plan includes an analysis of vegetation and wildlife habitat and water resources in relation to the control and treatment of stormwater (City of Shoreline, 2005b).

State and Federal Regulations

A number of state and federal agencies may have jurisdiction over land or natural elements in the City's shoreline jurisdiction. Local development proposals most commonly trigger requirements for state or federal permits when they impact wetlands or streams; potentially affect fish and wildlife listed under the federal Endangered Species Act (ESA); result in over one acre of clearing and grading; or affect the floodplain or floodway. As with local requirements, state and federal regulations may apply throughout the City, but regulated resources are common within the City's shoreline jurisdiction. The state and federal regulations affecting shoreline-related resources include, but are not limited to:

- **Endangered Species Act:** The federal ESA addresses the protection and recovery of federally listed species. The ESA is jointly administered by the National Oceanic and Atmospheric Administration (NOAA) Fisheries (formerly referred to as the National Marine Fisheries Service), and the United States Fish and Wildlife Service (USFWS).
- **Clean Water Act (CWA):** The federal CWA requires states to set standards for the protection of water quality for various parameters, and it regulates excavation and dredging in waters of the U.S., including wetlands. Certain activities affecting wetlands in the City's shoreline jurisdiction or work in the adjacent rivers may require a permit from the U.S. Army Corps of Engineers and/or Washington State Department of Ecology under Section 404 and Section 401 of the CWA, respectively.
- **Hydraulic Project Approval (HPA):** The Washington Department of Fish and Wildlife (WDFW) regulates activities that use, divert, obstruct, or change the natural flow of the beds or banks of waters of the state and may affect fish habitat. Projects in the shoreline jurisdiction requiring construction below the OHWM of Puget Sound or streams in the city could require an HPA from WDFW. Projects creating new impervious surface that could substantially increase stormwater runoff to waters of the state may also require approval.
- **National Pollutant Discharge Elimination System (NPDES):** Ecology regulates activities that result in wastewater discharges to surface water from industrial facilities or municipal wastewater treatment plants. NPDES permits are also required for stormwater discharges from industrial facilities, construction sites of one or more acres, and municipal stormwater systems that serve populations of 100,000 or more.

WATERSHED AND DRAINAGE BASINS

Water flow drives many ecological processes; therefore a useful characterization study area is the watershed. In Washington State, watersheds at a large scale are organized into Water Resource Inventory Areas (WRIAs). The City of Shoreline is located within the

Lake Washington/ Cedar/ Sammamish Watershed (WRIA 8). The City is located the northwest portion of the watershed and includes two subareas: the Nearshore Subarea, which includes the 4 miles of shoreline in the City of Shoreline and another twenty miles north and south of the City, and the Lake Washington Subarea.

Surface water drainage basins in the City include portions of the McAleer Creek, Lyons Creek, West Lake Washington, Thornton Creek, Seattle Golf Course, Bitter Lake and two Middle Puget Sound drainage basins, and most of the Boeing Creek drainage basin (see Map 2 in Appendix C). McAleer, Lyons, West Lake Washington, and Thornton Creek, Lake Washington. Boeing Creek, Seattle Golf Course, Bitter Lake and the Middle Puget Sound basins drain to Puget Sound (City of Shoreline, 2005b). The features of the basins that drain to Puget Sound are discussed in more detail below:

Boeing Creek Basin: Boeing Creek is partially piped from its origin and discharges into Puget Sound, passing through the City's shoreline planning area.

Seattle Golf Course Basin: This 138 acre basin is located in the southwest portion of the city, with a small portion located in the City of Seattle. The runoff from the Seattle Golf Course Basin used to be collected in a wetland and infiltrated into the groundwater. The basin now discharges into Highlands Creek which then discharges into Puget Sound.

Bitter Lake Basin: Only 54 acres of this basin is located in the city, in its southwest portion. None of the basin's major watercourses are located within the city.

Middle Puget Sound Basins: The North and South basins enter Puget Sound through dozens of small creeks and storm drainage systems. The seven major drainage courses include: Highlands Creek, Blue Heron Creek (also known as Innis Arden North Creek), Coyote Creek (also known as Innis Arden South Creek), Storm Creek, Upper Barnacle Creek (also known as Upper Puget Sound North) and Lower Barnacle Creek (also known as South), Barnacle Creek, and Lost Creek. All the creeks originate from wetlands, urban runoff or hillside seeps, except that the headwaters of Upper and Lower Barnacle Creeks and Lost Creek are located to the north in Snohomish County.

Just two drainage basins drain to the shoreline planning area: Boeing Creek Basin and Middle Puget Sound Basin (see Map 4 in Appendix C). There are numerous surface water features conveyed through culverts into Puget Sound in addition to the creeks mentioned above. Drainages and streams are discussed in more detail in Section 5.8 *Streams* and include Lost Creek, Upper and Lower Barnacle Creeks, Barnacle Creek, Storm Creek, Blue Heron Creek, Coyote Creek, Boeing Creek, and Highlands Creek.

LAND USE PATTERNS

Land use in the City of Shoreline is largely influenced by the city's central geographical location and proximity to Puget Sound. The City is generally bounded by the City of Lake Forest Park to the east, the City of Seattle to the south, the Puget Sound shoreline to the west, and Snohomish County to the north, which includes the Cities of Edmonds and Mountlake Terrace, and the Town of Woodway. The City's shoreline jurisdiction is composed of a variety of natural and man-made characteristics that include natural

beaches, wooded slopes, single-family homes, the BNSF Railway, and in the annexation area of Point Wells, an industrial port. Point Wells, a 100-acre industrial site located directly north of the City along Puget Sound, is currently under Snohomish County jurisdiction and is a potential annexation area for the City of Shoreline (City of Shoreline, 2005a).

Historical Land Use

The first major development along the Puget Sound coastline in the City occurred when the Great Northern Railroad was built along the water in 1891 (HistoryLink.org website, 1999). The railroad line provided a direct transportation link to downtown Seattle. In 1901, the Portland Ship Building Company built a shipyard at what is now the Point Wells site. Another historical landscape alteration that occurred along the coastline was the processing of sand and gravel at the current location of Richmond Beach Saltwater Park (see background of the photograph below, ca 1910). Over time, continued logging and residential development resulted in the landscape as seen today (Shoreline Historical Museum website, 1999).



Source: Shoreline Historical Museum

Existing Land Use

Residential Land Use

The City of Shoreline is predominately occupied by residential land uses, which support commercial and retail uses, various institutional uses, and a few industrial uses. Residential single-family development occupies approximately 51 percent of the land use

in the community. Multi-family residential development occupies 4 percent and is primarily located near commercial areas along State Route 99 (also known as Aurora Avenue North) and in neighborhood centers (i.e., Richmond Beach, Echo Lake, North City, and Ballinger) (City of Shoreline, 2005a).

Several neighborhoods are located near the Puget Sound shoreline within the City. Neighborhoods include Richmond Beach (a portion of which is located immediately adjacent to the Puget Sound), Innis Arden, and the Highlands (City of Shoreline, 2005a). Residential development in the Puget Sound shoreline planning area is characterized by single-family properties, which occupy approximately 19 percent of the total shoreline planning area. Single-family residential uses which are located immediately adjacent to the Puget Sound about the City's shoreline for a length of 1,886 linear feet. That is approximately 9 percent of the total linear length of the City's Puget Sound shoreline, including the PAA (King County, 2007). With the exception of residential properties in Segment B, the extensive bluff system along Puget Sound (Photo E-3 in Appendix B) precludes extensive development within the City's shoreline jurisdiction.

Commercial and Industrial Land Uses

Commercial and industrial developments occupy approximately 4 percent of the land use within the City (City of Shoreline, 2005a). Point Wells is the only industrial property located along the Puget Sound shoreline and occupies approximately 20 percent of the total shoreline planning area (Photo A-1 in Appendix B). The Point Wells industrial facility abuts the City's Puget Sound shoreline for a length of 3,411 linear feet. That is approximately 16 percent of the total linear length of the City's Puget Sound shoreline (Snohomish County, 2007b). The City's 1998 *Comprehensive Plan*, adopted prior to the current 2005 *Comprehensive Plan*, indicated that the Point Wells property served as a petroleum product (gasoline and diesel fuel) marketing and distribution center for approximately 60 years or more (City of Shoreline, 1998b). The petroleum distribution center discontinued operation in 1994. An asphalt plant was operated at the site on a seasonal basis by the Chevron Corporation (Sound Transit, 1999b). The property was sold to Paramount of Washington in 2005 and is now used for petroleum products storage, processing and distribution. Soil and groundwater contamination are documented at the Point Wells facility (Snohomish County, 2007a).

Private and Public Utility Land Uses

Public facilities, institutions and right-of-way uses occupy approximately 29 percent of the City (City of Shoreline, 2005a). The BNSF Railway right-of-way extends in a north-south direction along the entire length of the city's shoreline planning area. It is the most dominant land use in the shoreline, occupying 48 percent of the total shoreline planning area. The BNSF Railway right-of-way abuts the City's Puget Sound shoreline (including the PAA) for a length of 15,398 linear feet. That is approximately 70 percent of the total linear length of the City's Puget Sound shoreline, including the PAA (King County, 2007).

There are two public facilities in the City's shoreline planning area, both of which are owned by King County. The first is right-of-way property located at the Point Wells site in Segment A. A conveyance system and marine outfall will be constructed on the

property to serve the regional King County Brightwater Treatment Plant currently being constructed. The second property is located in Segment B which houses a King County wastewater pump station, known as the Richmond Beach Pump Station. A recreation easement has been obtained by the City to develop a park on this property, as described in more detail in Section 7.3.2 *Richmond Beach Pump Station Park Project* (City of Shoreline website, 2008).

Parks, Open Space and Vacant Land Uses

Only 1 percent of the City of Shoreline is undeveloped land. Parks, recreation, and open space (including lakes) occupy approximately 10 percent of the City (City of Shoreline, 2005a). Within the Puget Sound shoreline planning area, 8 percent of the land is occupied by parks and open space including the Richmond Beach Saltwater Park in Segment C and the Innis Arden Reserve in Segment E (Photos C-2 and E-1 in Appendix B; Map 11 in Appendix C). Four percent (960 lineal feet) of the properties that abut the City's Puget Sound shoreline (including the PAA) are occupied by park and reserve. Vacant properties occupy 2 percent of the total shoreline planning area and are located in Segments B and E. (King County, 2007).

Comprehensive Plan / Zoning Designations

Comprehensive Plan

According to the City of Shoreline Comprehensive Plan Map (2001), the City's shoreline planning area is largely comprised of properties designated as Low Density Residential and Public Facilities (i.e., the BNSF Railway right-of-way). Public Open Space and Private Open Space designations occupy the remainder of the shoreline planning area. In addition, the annexation area currently occupied by the Paramount of Washington facility in unincorporated Snohomish County is discussed in the *Comprehensive Plan* (2005a) and is currently designated as Mixed Use (see Map 9a in Appendix C) (City of Shoreline, 2001). Snohomish County designates Point Wells as Urban Industrial (Snohomish County website, 2008). The property owner has petitioned the County to change the Comprehensive Plan designation to Urban Center (Snohomish County, 2007a).

General goals and policies established in the 2005 *Comprehensive Plan* related to the protection of natural features encourage the protection and improvement of the natural environment and environmentally critical areas, construction of surface water facilities that promote water quality and enhance and preserve natural habitat, identification and protection of wildlife corridors, and preservation of wetlands, aquatic and riparian habitats and Puget Sound buffers (City of Shoreline, 2005a).

The general goals and policies of the City's 1998 Shoreline Master Program are included in the 2005 *Comprehensive Plan* as an appendix. Water-oriented uses are encouraged but must be balanced with the protection of Puget Sound shoreline's natural resources (City of Shoreline, 2005a).

Zoning Designations

Zoning designations in the City of Shoreline generally follow land use designations as discussed above. There are only two zones within the City's Puget Sound shoreline

planning area; Residential 4 units/acre (R-4) and Residential 6 units/acre (R-6). The zones encompass the BNSF Railway right-of-way, parks, open space, and public facilities (see Map 8 in Appendix C) (City of Shoreline, 2002). Point Wells is zoned as Heavy Industrial (HI) in the Snohomish County Permit, Planning, and Zoning Map (Snohomish County website, 2008). The property owner has petitioned the County to change the zoning to Planned Community Business (Snohomish County, 2007a).

Table 2 identifies the relative percentage of existing land uses in each planning segment based on 2007 King County and Snohomish County Assessor land use records. Table 2 also includes the *Comprehensive Plan* land use and zoning designations for each segment.

Impervious Surface

Impervious areas in the City were analyzed based on the King County Impervious/Impacted Surface Interpretation dataset (see Map 14 in Appendix C) (King County, 2004). The dataset is based on high-resolution multispectral imagery from 2000. It includes mostly surfaces with high to complete impermeability, such as concrete, asphalt, roofing materials and other sealed surfaces that prevent the natural penetration of water into soil. Examples of impervious surfaces identified in this imagery include: building roof tops regardless of composition or construction; roadways, highways and parking lots constructed of concrete or asphalt; parking areas with a high density of parked vehicles as represented by the imagery; sidewalks, pedestrian walkways and malls constructed of concrete, asphalt or brick; and, other prepared surfaces such as bicycle paths, tennis courts and running paths.

Impervious surfaces reduce the potential for stormwater infiltration and increase stormwater runoff, including the rate of runoff and timing of peak flows. In general, higher percentages of impervious area are an indicator of development density and intensity which is tied to an increase in stormwater runoff. Impervious surfaces may contain pollutants that are harmful to water quality. Pollutants originating in the shoreline planning area likely originate from landscaped areas (e.g., parks and residential yards), BNSF Railway (e.g., creosote railroad ties and railroad cars), industrial facilities (e.g., overwater structures), and, to a lesser extent, vehicles and roadways. The approximate impervious area has been determined based on a qualitative assessment of the 2004 King County dataset and 2002 aerial photography, and from coordination with City staff in 2003. Impervious surface at the Point Wells facility in Segment A was estimated visually based on 2002 aerial photography of the site. Table 2 includes the approximate amount of impervious area within each shoreline planning segment. Overall, approximately 20 percent of the City's shoreline planning area is impervious due to concrete, asphalt, roofing surfaces or other sealed surfaces. The PAA contains the highest impervious area due to historic heavy industrial uses. Segment B contains 25 to 30 percent impervious area due to residential development near the shoreline. Segment E, which comprises nearly half of the shoreline planning area (43.5%) has fairly low impervious surface (approximately 5 to 15 percent). Thus, stormwater runoff and infiltration rates are not as altered in Segment E in comparison to Segments B and D.

Table 2. Percentages of Existing, Allowed and Planned Land Use and Impervious Surfaces by Segment in Puget Sound Shoreline Planning Area

Shoreline Segment	Existing Land Use (Includes approximate percentage within each segment)		Comprehensive Plan Land Use Designations	Existing Zoning (Includes approximate percentage of each zoned area within each segment)		Approximate Impervious Area ²
A	Petroleum Facility	95%	Mixed Use (City of Shoreline Comprehensive Plan)	Heavy Industrial (Snohomish County Zoning)	100%	60-70%
	King County Right-of-Way (ROW)					
B	Single Family Residential	42%	Public Facilities Low Density Residential Public Open Space	Residential, 6 units/acre (R-6) Residential, 4 units/acres (R-4)	98%	50-60%
	BNSF Railway	42%				
	ROW Utility	10%				
	Vacant	5%				
C	BNSF Railway	61%	Public Facilities Public Open Space Low Density	Residential, 4 units/acre (R-4)	100%	5-10%
	ROW Park	34%				
	Single-Family Residential	4%				
D	Single-Family Residential	52%	Low Density Residential	Residential, 4 units/acre (R-4)	100%	15-25%
	BNSF Railway ROW	48%				
E	BNSF Railway ROW	72%	Public Facilities Public Facilities Private Open Space Low Density	Residential, 4 units/acre (R-4)	100%	5-15%
	Single-Family Residential	17%				
	Open Space	10%				
	Vacant	1%				

Sources: City of Shoreline, 2002; Snohomish County 2007, King County 2004 and 2007

² Approximate impervious area is based on King County data (2004), aerial photo interpretation and coordination with City staff in 2003.

³ Impervious surface at the Point Wells facility in Segment A was estimated in 2003 based on aerial photography of the site showing the presence of a barge dock, rail lines, and tanks within the shoreline environment.

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Existing and Planned Public Access Sites

Public access to the Puget Sound shoreline in the City of Shoreline is restricted to existing parks. Rugged terrain characterized by steep bluffs occurs throughout most of the shoreline planning area, which limit physical access to the water. Further, the BNSF railroad tracks parallel the entire shoreline within city limits. Public access to the railroad right-of-way is prohibited. Waterward public access is restricted in some areas by privately owned tidelands (including BNSF, residential and industrial property owners). Existing parks and open space areas in the City's shoreline planning area include (see Map 11 in Appendix C) (City of Shoreline, 2005c):

Richmond Beach Saltwater Park (Public) – This regional 40-acre park located in Segment C provides active and passive uses including picnic areas, shelter buildings, a playground area, observation areas, trails, and Puget Sound shoreline beach access (Photos C-2 and C-3 in Appendix B). Park users occasionally use the shoreline access for swimming in Puget Sound during favorable weather conditions.

Blue Heron Reserve (Private) – This private tract is preserved as a natural area and is associated with Blue Heron Creek. It is located in the southern portion of Segment C. No public shoreline access is permitted along the tract.

Coyote Reserve (Private) – This private tract is preserved as a natural area and is associated with Coyote Creek. It is located in the northern portion of Segment D. No public shoreline access is permitted along the tract.

Innis Arden Reserve (Public) – This 23-acre natural open space area/greenway passive-use park is located in the northern area of Segment E along the bluffs overlooking Puget Sound. Hiking/walking trails represent the main activity of this passive-use reserve.

Although trails eventually lead to the shoreline, the public has to cross the BNSF railroad tracks and riprap to reach the Puget Sound shoreline beach (Photo E-1 in Appendix B).

Boeing Creek Reserve (Private) – Four acres of natural area associated with Boeing Creek along the Puget Sound shoreline in the center portion of Segment E is preserved as private open space. No public shoreline access is permitted from this reserve along the bluff (Photo E-2 in Appendix B).

Improvements and enhancements to existing park and open space resources along Puget Sound identified in the City's Parks, Recreation and Open Space Plan (2005c) include: Richmond Beach Saltwater Park - As outlined in the Plan, a Community Attitude and Interest Survey was conducted to establish priorities for the future development of parks and recreation facilities, programs and services within the city. The City surveyed 575 residents in the community. Thirty-one percent of the respondents selected upgrading Richmond Beach Saltwater Park as one of the four most important actions the City should take⁴. Largely in response to the survey, the City is currently in the process of adding viewpoints and interpretive signage, and improving trails (see Section 7.3.3 *Richmond Beach Saltwater Park Project* for more details). Additional improvements and enhancements identified by the Plan that would be implemented at a later date include developing an underwater marine park, a pier, and a trail along Puget Sound to connect the park to Innis Arden Reserve.

⁴ The other three actions were to upgrade existing neighborhood parks and play grounds (38%), upgrade natural areas and nature trails (30%), and improve shoreline and beach access.

Innis Arden Reserve - Improving trail system, developing overlook viewpoints and interpretive signage, stabilizing slopes, enhancing vegetation and developing safe access to Puget Sound across the BNSF Railway right-of-way.

As part of King County mitigation for impacts from the Brightwater Treatment Plant project, a new park will be installed at the King County Richmond Beach Pump Station. Improvements to the site will include construction of a small parking area, restroom, interpretive watchtower overlooking the BNSF railroad and Puget Sound, and play areas. No shoreline access west of the BNSF railroad is proposed (see Section 7.3.2 *Richmond Beach Pump Station Park Project* for more details) (City of Shoreline website, 2008).

The City of Shoreline's *Comprehensive Plan* provides a list of funded and unfunded parks, recreation, open space and city facility capital improvements. Opportunities for enhancing public access to the shoreline under consideration include development of a trail system along Puget Sound between Richmond Beach Saltwater Park and Innis Arden Reserve, amenity enhancements and development of overlooks, viewpoints, and interpretive signage, and habitat and native plant restoration at Innis Arden Reserve, construction of a pedestrian crossing from Richmond Beach Pump Station park site to the beach, and providing beach access at the Boeing Creek Reserve (City of Shoreline, 2004; City of Shoreline, 2005a).

Roads and Transportation Facilities

The BNSF railroad runs the length of the Puget Sound shoreline in the city abutting the shoreline for a length of 15,398 linear feet. That is approximately 70 percent of the total linear length of the City's Puget Sound shoreline, including the PAA (King County, 2007). The developed and undeveloped portions of the BNSF Railway right-of-way occupy approximately 48 percent of the City's shoreline planning area (King County, 2007), varying in width from 100 feet to greater than 300 feet. The rail line provides freight movement and intercity passenger rail. The rail line serves as the region's primary rail freight connection to the north, as well as a major connection to the east, and is an important link in the multimodal system supporting the Ports of Everett, Seattle, and Tacoma. An average of 36 freight trains, six Amtrak passenger trains and six Sound Transit Sounder passenger trains use the railway each day (Herrera Environmental Consultants, 2005). Unattached engines also traverse between cities along the rail line. The Sounder is operated by Sound Transit, the Central Puget Sound Regional Transit Authority. It is a commuter rail service located along a 35-mile corridor between Everett and Seattle that uses the existing BNSF Railway right-of-way. Amtrak trains use the existing right-of-way between Vancouver, BC and Portland, Oregon. (Sound Transit, 1999a; Sound Transit website, 2008; Amtrak website, 2008).

BNSF Railway is proposing to install a train traffic signal, utility bungalow, and retaining wall south of Richmond Beach Saltwater Park in Segment C. This would involve filling a minimal amount (less than ½ an acre) of freshwater wetland. BNSF Railway is also proposing to install train traffic signals, a utility bungalow, a train-switching mechanism, retaining wall, and a new access road north of Boeing Creek in Segment E. The improvements will involve filling 0.25 acres of freshwater wetland. BNSF Railway will

also be installing improvements in other locations along the BNSF rail line between Everett and Seattle outside of Shoreline city limits. Sound Transit will pay for the improvements in order to meet conditions established in a joint agreement between BNSF and Sound Transit. These conditions are required of Sound Transit in order to run a third daily Sounder commuter train between Everett and Seattle. Mitigation for the wetland fill and impacts from these improvements will occur off-site at the Qwuloolt restoration site in Marysville and Meadowdale Marina in Edmonds. Construction is expected to begin in 2009 (Herrera, 2005).

Due to the topography of the Puget Sound shoreline and the private ownership of the BNSF Railway along the extent of the shoreline, the only major roadway that falls within the City's shoreline planning area is Richmond Beach Drive NW (see Map 10 in Appendix C). Richmond Beach Drive NW is the primary roadway that allows access to thirty-two residences along the shoreline in the northwestern portion of the city. The residences span a total of 1,886 linear feet along the shoreline (King County, 2007). The homes are accessed from Richmond Beach Drive NW via the Richmond Beach Overcrossing Bridge which passes over the BNSF railroad tracks. The Bridge connects to 27th Avenue NW, a local road located behind the residences that runs parallel to the Puget Sound shoreline. 27th Avenue NW is also the only motor vehicle access west of the BNSF Railway right-of-way in the city via the Bridge (see Map 1B in Appendix C). The timber bridge was originally built in 1923 and rebuilt in 1956. The City is planning to replace it with a reinforced concrete bridge. Once the City finalizes negotiations with BNSF Railway on a temporary construction easement, project cost sharing and construction issues, construction will begin (City of Shoreline website, 2008).

Wastewater and Stormwater Utilities

The Ronald Wastewater District (RWD), formerly known as the Shoreline Wastewater Management District (SWMD), provides wastewater service to a majority of the City of Shoreline and includes the Point Wells property. Highlands Sewer District serves the Highlands Neighborhood in the southwest portion of the City. Wastewater collected from RWD is treated at two facilities under contract arrangements: King County Wastewater Treatment Division's (WTD) West Point Treatment Plant in Discovery Park, Seattle, and the City of Edmonds Wastewater Treatment Plant. Wastewater from the Highlands Sewer District is conveyed to RWD facilities (City of Shoreline, 2005b). Two RWD customers currently operate septic systems in the Richmond Beach Neighborhood; however, none of the properties fall within the City's shoreline planning area (Newman, personal communication, 2003).

Four RWD lift stations are located within the Puget Sound shoreline planning area. The King County Richmond Beach Pump Station is located in Segment B (King County, 2007). King County maintains a 30-inch diameter emergency overflow outfall pipe associated with the pump station. The outfall pipe is located in Segment B. King County also maintains an emergency overflow outfall pipe in Segment E. The pipe is associated with the Hidden Lake Pump Station located outside of shoreline planning area near Boeing Creek Shoreline Park (see Map 10 in Appendix C).

Upon the City's incorporation in 1995, the City of Shoreline inherited and assumed jurisdiction over the storm and surface water management system located in the roadways within the city limits. As of 1998, facilities located outside the roadways are under the City of Shoreline jurisdiction as well. Stormwater utilities generally consist of a mix of open ditches and channels, pipes, vaults and open retention/detention facilities.

Historical/Cultural Resources

Historic and cultural resources are documented through a variety of sources. Official registers include the National Register of Historic Places and the Washington State Heritage Register. In 1995, the City of Shoreline adopted Chapter 15.20 of the municipal code (Landmark Preservation) to provide for the designation, preservation, protection, enhancement, and perpetuation of designated historic resources within the boundaries of the City. The Landmark Preservation chapter adopts by reference several sections of the King County Code Chapter 20.62 (Protection and Preservation of Landmarks, Landmark Sites and Districts). None of the properties designated as landmarks in the City of Shoreline are located within the shoreline planning area (see Map 13 in Appendix C).

The Historical/Cultural Element of the 1998 Shoreline Master Program provides general goals and policies to ensure important archaeological, historical, and cultural sites located within the shoreline jurisdiction are identified, protected, preserved, and restored for educational and scientific purposes. It also aims to adopt standards that ensure the protection and preservation of historic and cultural sites (City of Shoreline, 1998b). Historic preservation is also addressed in the Community Design Element of the 2005 Shoreline *Comprehensive Plan*.

In 1996, the King County Historic Preservation Program conducted an inventory of historic resources in the City of Shoreline. It did not include an inventory of archaeological sites, traditional cultural properties, or historic landscapes. However, an analysis of documented research revealed Native American peoples traveled along the Puget Sound shoreline and stream drainages to collect resources such as tobacco at Richmond Beach. No buildings directly associated with railroad development in Richmond Beach, lumber production, agricultural production, or the interurban railroad remain today (Copass, 1996).

In 2001, Larson Anthropological Archaeological Services (LAAS) conducted a study of six potential wastewater treatment plant sites in Snohomish County as part of King County's Brightwater Treatment Plant project. The inventory included the Point Wells site. No archaeological sites or historic structures are recorded within 0.25 miles from the Point Wells industrial site. However, LAAS determined Point Wells has a high probability for hunter-fisher-gatherer archaeological resources based on the existence of a former sandspit and lagoon buried in fill in the western half of Point Wells beneath the steep bluffs along the shoreline. Further archaeological investigation is recommended to determine if archaeological deposits associated with the former sandspit and lagoon exist beneath fill (LAAS, 2001).

Sound Transit performed an inventory of historic, cultural, and archaeological resources along the commuter route between Seattle and Everett in a Final Environmental Impact Statement (EIS) for the Commuter Rail Project (1999). The inventory was based on existing documents, coordination, including contact with Native American tribal organizations, and the National Register of Historic Places. At the time the EIS was written, Sound Transit was considering developing a station near the City of Shoreline. Two station alternatives were considered in the EIS, Point Wells and Richmond Beach Saltwater Park. Sound Transit determined that no known historic, cultural, or archaeological resources areas were listed in, or eligible for, the National Register. While construction work at these two areas could affect undiscovered prehistoric or historic archaeological deposits, native soils have been previously disturbed; suggesting questionable integrity of any archaeological remains (Sound Transit, 1999a).

Site Contamination

According to Department of Ecology's Facility Site database, there is one known contaminated site in the shoreline planning area (Ecology website, 2008). The Point Wells site is listed on the Department of Ecology's Suspected and Confirmed Contaminated Sites List for soil, groundwater and surface water contamination associated with previous petroleum production. In 1999, documentation prepared for the King County Brightwater Treatment Plant examined potential soil and groundwater contamination at several sites under consideration at that time for a treatment facility, including Point Wells. When the Brightwater document was prepared, the long-term soil and groundwater remediation plans by Chevron, the property owner at that time, were unknown (CH2MHill and Associated Firms, 2001). However, as part of the Brightwater Treatment Plant conveyance project, a portion of Point Wells is undergoing a voluntary cleanup program with Ecology for suspected and confirmed soil and groundwater contamination.

NEARSHORE PHYSICAL CHARACTERIZATION

Nearshore Processes

The Puget Sound nearshore is defined as the area of marine and estuarine shoreline extending from the top of shoreline bluffs to the depth offshore where light penetrates the water thereby supporting plant growth (King County Department of Natural Resources and Parks [KCDNRP], 2001). The nearshore also includes estuaries and tidal rivers to the head of tidal influence. Landforms found in the Puget Sound nearshore environment include bluffs, beaches, mudflats, kelp and eelgrass beds, salt marshes, spits, and estuaries.

The processes occurring within the Puget Sound nearshore area are critical for maintaining habitats and health of the nearshore shoreline environment. Changes in the physical processes within the nearshore can negatively affect habitats by limiting food and nutrient sources for marine life, deteriorating beach sediment movement, accelerating erosion, and altering the flows of surface and groundwater. Nearshore processes are those actions which occur as a result of wind, tidal influence, waves, and surface and groundwater flow that result in sediment movement and affect habitat formation.

The City of Shoreline beaches are typical of Puget Sound and can be characterized by two distinct foreshore components: a high-tide beach and a low-tide terrace (Downing, 1983). The high-tide beach consists of a relatively steep beachface with coarse sediment and an abrupt break in slope at its waterward extent. Low wave energy beaches, such as those along the City's shoreline, have a high-tide beach composed of poorly sorted sediment, with intermittent intertidal vegetation and a relatively narrow backshore. Extending seaward from the break in slope, the low-tide terrace typically consists of a gently sloping accumulation of poorly sorted fine-grained sediment (Komar, 1976; Keuler, 1979). Considerable amounts of sand in a mixed sand and gravel beach are typically winnowed from the high-tide beach by waves and deposited on the low-tide terrace (Chu, 1985). The amount and composition of beach sediment generally follows a seasonal cycle. Under normal seasonal weather patterns, the stronger, wind-driven waves that occur in winter remove material from the beachface, while more gentle, summer wind-driven waves move sediment back onshore (Masselink and Hughes, 2003).

Puget Sound beach morphology and composition is dependent upon three main influences; wave energy, sediment sources, and relative position of the beach within a littoral cell. Wave energy is controlled by fetch; the open water over which winds blow without any interference from land. Wind-generated wave action gradually erodes beaches and the toe of coastal bluffs, leading to landslides. These coastal bluffs are the primary source of sediment for most Puget Sound beaches. In the City, coastal bluffs are separated from the shoreline by the BNSF railroad, thus completely removing bluff sediment sources. Fluvial sources of sediment are typically of only local significance in comparison to bluff sediment sources, which reportedly account for roughly 90% of beach material (Keuler 1988, Downing, 1983). Bluff composition and wave energy influence the composition of beach sediment. Waves sort coarse and fine sediment and large waves can transport cobbles that small waves cannot.

Wind-generated waves typically approach the shore at an angle, creating beach drift and longshore currents and transporting sediment by a process called littoral drift. Net shore-drift refers to the long-term, net result of littoral drift. Net shore-drift cells represent a sediment transport sector from source to deposition along a portion of coast. Each drift cell acts as a system consisting of three components: a sediment source (erosive feature) and origin of a drift cell; a transport zone where materials are moved alongshore by wave action with minimal sediment input; and an area of deposition (accretion area) that acts as the drift cell terminus (Jacobson and Schwartz, 1981). Deposition of sediment occurs where wave energy is no longer sufficient to transport the sediment in the drift cell. Drift cells in the Puget Sound region range in length from 46 feet to just under 19 miles, with the average drift cell just under 1.5 miles long (Schwartz, 1991). The Washington Coastal Atlas (Ecology website, 2008) maps net-shore drift direction, or the prominent drift direction, including divergence zones and areas of "no appreciable drift" (which include highly modified, protected harbor shorelines). Based on the wave regime, extensive fetch, and coastal geomorphology the net drift direction of all the shoreline planning segments is south to north (Schwartz, 1991). Divergence zones are present at the north end of Point Wells and south of the City boundary in the City of Seattle, but the City's shoreline is within a single drift cell.

The Washington Department of Natural Resources (WDNR) ShoreZone Inventory (2001) documents shoreline sediment stability as stable, erosional, or accretional, and sediment sources as fluvial, alongshore, and backshore (see Table 3). The City’s shoreline is homogeneous in terms of the sediment stability and source because of the BNSF railroad. The railroad results in a stable sediment characterization throughout the shoreline, with the exception of the shoreline adjacent to Innis Arden Reserve. Construction of the railroad buried much of upper foreshore beach, thereby locking up coarse sand and gravel in the littoral system. This limits or precludes longshore transport of sediment. Sediment sources in the City are limited and are characterized by the ShoreZone data as alongshore with the exception of some fluvial sediment released from Boeing Creek. As discussed previously, the railroad interrupts historic sediment supply from eroding bluffs.

The width of intertidal beach in the City’s shoreline is also relatively constant throughout the shoreline length, averaging 20 to 40 feet wide. The exception is within Segment B where some wider intertidal beaches are present near residential development along the shoreline. Additional details of ShoreZone data are contained in Appendix A. Table A-1 includes more detailed information within each of the planning segments. Map 2 in Appendix A depicts the individual ShoreZone segments.

Table 3. Shoreline Sediment Sources and Mobility

Shoreline Segment	Approximate Intertidal Width	Estimated Sediment Source	Sediment Stability	Net shore Drift Direction
A	20 - 37 feet	Alongshore (all of segment)	Stable	North
B	30 - 105 feet	Alongshore (all of segment)	Stable	North
C	27 - 36 feet	Alongshore (all of segment)	Stable	North
D	36 feet	Alongshore (all of segment)	Stable	North
E	21 - 46 feet	Alongshore (most of segment); Fluvial in relation to Boeing Creek	Stable (most of segment); Erosional from north end of segment (646.7 feet to south)	North

Source: WDNR, 2001; Schwartz, 1991.

Johannessen et al. (2005) inventoried current and historic shoreline erosion and accretion areas in the City of Shoreline. Drift cell “SN-3” generally corresponds with the shoreline within the City, beginning 1.5 miles south of Boeing Creek and extending north to Point Wells. Historically, this drift cell was comprised of 45% feeder bluff, 18% feeder bluff exceptional, and an additional 4% as potential feeder bluff. The remaining 67% of the shoreline was comprised of four scattered accretion areas. These accretion areas were characterized by delta lagoons, longshore lagoons and stream mouths. Along the Point

Wells shoreline, before it was developed as an industrial site, there was a longshore lagoon that connected to a larger delta lagoon to the north.

The construction of the BNSF railroad separated historic coastal feeder bluffs from the shoreline, resulting in a 100% loss of sediment sources (Johannessen et al., 2005). The City’s shoreline now consists of nine separate accretion shoreforms interrupted by railroad and residential modifications (Johannessen et al., 2005). No active feeder bluffs are currently present. Sixty-seven percent (67%) of the shoreline is classified as modified due to the railroad with the remainder (29%) classified as accretion shoreforms. From the north end of the City south to Richmond Beach (Segment B) there is a broad accretion shoreform, which corresponds with the slightly wider intertidal width shown earlier in Table 3. Table 4 is a summary of the information included in Johannessen et al. (2005).

Table 4. Current and Historic Beach Feeding Sources/Erosion and Accretion Areas in City of Shoreline (Drift Cell SN-3)

	Feeder Bluff (%)	Feeder Bluff Exceptional (%)	Potential Feeder Bluff (%)	Not Feeder Bluff (%)	Accretion Shore forms (%)	Modified (%)
Historic conditions	45%	18	4	5	18%	11%
Current Conditions	0%	0%	0%	0%	29%	71%
Change	-45%	-18%	-4%	-5%	+11%	+61 %

Source: Johannessen et al. 2005

Geologic Units

Geologic information was collected from two sources: the Tetra Tech/KCM Geology (Geographic Information Systems [GIS]) data used in basin characterization reports (2004a and 2004d) and King County/Booth Surficial Geology Mapping (2005). These two sources characterize the geology of the shoreline planning area as containing till, beach deposits, advance outwash deposits, transitional beds, recessional outwash deposits, possession drift, landslide, and Whidbey formations.

The City is located at the western edge of the Seattle drift plain, an irregular plateau that drops toward Puget Sound (TT/KCM, 2004a and 2004d). The glacial retreat left behind layers of silt/clay, till, and gravel. Steep bluffs are characteristic in shoreline planning Segment E (Highlands/Boeing Creek) and begin to diminish in a northerly direction through shoreline Segments D and C.

Soils

The Soil Survey for King County (United States Department of Agriculture, Soil Conservation Service [USDA SCS], 1973) does not include the City of Shoreline. The

Soil Survey for Snohomish County (USDA Natural Resources Conservation Service [NRCS], 1983) maps Point Wells (Segment A) as “Urban Land.” Soil information from a 1952 survey by the US SCS was reviewed for soil type by basin (TT/KCM, 2004a and 2004d). The survey indicates that the predominant soil type in the Middle Puget Sound South Basin is Everett gravelly sandy loam (75 percent) with the remainder being Alderwood gravelly sandy loam. The majority of the Boeing Creek Basin is Alderwood gravelly sandy loam. The predominant soil type in the Middle Puget Sound North Basin is split between the two major soil types already mentioned. The rest of the soils represent less than four percent of the total area in the City, including Carbondale muck, coastal beach and Norma fine sandy loam.

The Geotechnical Assessment Report prepared for the Sound Transit Everett to Seattle Commuter Rail Project (HWA GeoSciences, Inc., 1998) describes the typical soils and slope profile found along the waterfront from Everett to Seattle. In general, the ~~dominated~~ dominated by Pleistocene aged glacial soils associated with the Vashon Drift and consisting of recessional outwash deposits, glacial till, advance outwash and glacial lacustrine. Recent soil deposits include beach and colluvial deposits, some of which are associated with landslides. Where major landscape modifications have occurred, such as Point Wells, fill soils are typically present (HWA GeoSciences, Inc., 1998).

The waterfront bluffs found along the City’s shoreline (Segments B through E) are typically composed of a cap of very dense gravelly sand with scattered cobbles and boulders in a clay/silt matrix (glacial till), overlaying dense sand and gravel (glacial advance outwash), which overlies hard clay (glacial lacustrine). The thicknesses of these layers can vary substantially. However, the till cap is generally at the top of the bluffs, sometimes overlain by deposits of medium dense sand and gravel (glacial recessional outwash). The hard clays are typically at or near sea level. Streams draining the uplands dissect bluffs and flow into Puget Sound, depositing fine sand and silt in alluvial fans. Littoral drift, which is the accumulation or movement of foreshore sediments along the shore by littoral currents and oblique waves, reworks some of this material and becomes beach deposits (HWA GeoSciences, Inc., 1998).

Seismic Hazard Areas

Seismic hazard areas are defined in Chapter 20.80.220 of the SMC as “lands that, due to a combination of soil and ground water conditions, are subject to severe risk of ground shaking, subsidence or liquefaction of soils during earthquakes. These areas are typically underlain by soft or loose saturated soils (such as alluvium) and have a shallow ground water table.”

There are mapped liquefaction susceptibility areas along Segments A, B, C, D and a portion of E. All are mapped as having high liquefaction susceptibility (City of Shoreline, 2002).

Landslide Hazard Areas

The west-facing slopes along Puget Sound within the City have experienced recent and historical landslide activity. The contact zone between the hard clay layer and the

overlying sand layer is the source of many landslides along the coast of Puget Sound, which commonly occur after major storm events. In general, slope stability in the City's shoreline planning area is more stable in the northern portion, though containing some isolated unstable areas, and unstable in the southern portion (Segment E).

Baum et al. (2000) conducted an inventory of recent landslides that included the City of Shoreline. Significant storm events during 1996 and 1997 resulted in several major landslide episodes. The most common types of landslides were shallow earth slides and debris flows, some of which blocked culverts and overtopped the BNSF railroad track (locations are shown on Map 7). These landslides range in volume from 300 cubic yards to 40,000 cubic yards. The largest one occurred in Segment E north of Highlands Creek (Baum et al. 2000).

The seawall and stone revetments of the BNSF railroad protect the base of the bluff from wave erosion and have probably increased the stability of the bluff. Baum et al. (2000) suggests that the bluff retreat during the winters of 1995-96 and 1996-97 might have been greater had the seawall and embankment not been present.

In the City, regulated landslide hazard areas are classified in SMC Chapter 20.80.220. Hazard areas are based on percent slope, soil composition, and the presence of emergent water. Three categories are used and defined as:

Moderate Hazard: Areas with slopes between 15 percent and 40 percent and that are underlain by soils that consist largely of sand, gravel or glacial till.

High Hazard: Areas with slopes between 15 percent and 40 percent that are underlain by soils consisting largely of silt and clay.

Very High Hazard: Areas with slopes steeper than 15 percent with zones of emergent water (e.g., springs or ground water seepage), areas of landslide deposits regardless of slope, and all steep slope hazard areas sloping 40 percent or steeper."

No landslide hazard areas are identified in Segment A (Point Wells). The extreme north and south portions of Segments B and C contain landslide hazard areas in the extreme north and south portions of both segments. Landslide hazard areas exist throughout all of Segments D and E (King County iMAP, 1991). See Map 7 in Appendix C for landslide hazard area locations.

Erosion and Sedimentation Hazard Areas

Erosion hazard areas are defined in Chapter 20.80.220 of the SMC as "lands or areas underlain by soils identified by the U.S. Department of Agriculture Natural Resources Conservation Service (formerly the Soil Conservation Service) as having 'severe' or 'very severe' erosion hazards. This includes, but is not limited to, the following group of soils when they occur on slopes of 15 percent or greater: Alderwood-Kitsap (AkF), Alderwood gravelly sandy loam (AgD), Kitsap silt loam (KpD), Everett (EvD) and Indianola (InD)."

No erosion hazards currently exist within the City's shoreline planning area; however, erosion hazard areas are identified east of Segment E primarily in the upper Boeing Creek Basin (see Map 7 in Appendix C) (City of Shoreline, 2002).

Aquifer Recharge Areas

Within the City of Shoreline, including the Puget Sound shoreline planning area, there are no known critical aquifer recharge areas that supply potable water. Almost all the City's potable water comes from surface sources originating in the Cascade Mountains and is either operated by the Shoreline Water District or the City of Seattle. The City's lakes and wetlands may contribute to aquifer recharge (City of Shoreline, 2005a).

Streams

Streams provide valuable wildlife corridors, a source of fluvial sediments to the marine shoreline (moved along the shoreline by currents), and support a range of fish species. The City of Shoreline is located in Water Resource Inventory Area (WRIA) 8, the Cedar-Sammamish Watershed. Information on stream conditions was drawn in particular from the following documents: *City of Shoreline Surface Water Master Plan* (City of Shoreline, 2005b), *Salmonid Habitat Limiting Factors, Water Resource Inventory Area 8 Final Report* (Kerwin, 2001), *Boeing Creek Basin Draft Characterization Report and Middle Puget Sound Basin Characterization Report* (TT/KCM, 2004a, 2004d), and the *City of Shoreline Stream Inventory and Assessment* (TT/KCM, 2004b). Streams are depicted on Map 4 and Map 10 in Appendix C. A total of seven streams have been identified to flow into the Puget Sound within the PAA and the City limits. In general, the western portion of the City ultimately drains to Puget Sound through the following streams: 1) Lost Creek, 2) Barnacle Creek, 3) Storm Creek, 4) Blue Heron Creek, 5) Coyote Creek, 6) Boeing Creek, and 7) Highlands Creek.

Segment A has an unnamed tributary of Barnacle Creek that is located east of the BNSF railroad and south of Point Wells. It travels south where it connects to Barnacle Creek in Segment B. Lost Creek is located north of the city limits in the Town of Woodway. It flows southwest both in piped and open water sections towards Puget Sound. It appears to connect to Barnacle Creek before discharging into Puget Sound in Segment B. Barnacle Creek is formed by the confluence of Upper Barnacle Creek and Lower Barnacle Creek and discharges to Puget Sound in Segment B. The stream includes piped and open water sections along the BNSF railroad and flows through a wetland area downstream of Richmond Beach Drive NW (see Photo B-2 in Appendix B). The creek has three outlets to Puget Sound (including one near Lost Creek) via culverts beneath the BNSF railroad. The lower section of Barnacle Creek is tidally influenced upstream for a distance of about 20 feet (Photo B-6 in Appendix B). A stream evaluation letter was submitted to the City as part of a development permit for a residential property located near the intersection of Richmond Beach Drive NW and NW 196th Street. According to the letter, the portion of Barnacle Creek from NW 196th Street south to where it discharges to the Puget Sound may not meet the City's definition of a stream per SMC 20.80 (Critical Areas) (The Watershed Company, 2008). However, the findings of the letter were not verified by WDFW. Furthermore, WDFW has indicated to the City that they will defer to the City's stream inventory (see *City of Shoreline Stream Inventory and Assessment*) even when presented with a more recent report which concludes that a stream does not qualify as a stream per the City's regulations (Nammi, 2009).

Storm Creek, which begins upstream of NW 195th Street and includes several unnamed tributaries, is located at the very south end of Segment C. South of NW 191st Street, Storm Creek continues southwest for 3,000 feet through the privately owned Eagle Reserve in Innis Arden before entering Puget Sound. The stream is confined within a very steep ravine between the mouth and 17th Place NW. Severe erosion occurs in the lower sections of Storm Creek through the Eagle Reserve (Photo D-3 in Appendix B). Bank hardening and several weirs have been constructed to protect private property, a pump station, and a sewer line crossing Storm Creek (City of Shoreline, 2005b).

Blue Heron Creek and Coyote Creek discharge to Puget Sound (Photo D-1 in Appendix B) and are located within Segment D and E respectively. Blue Heron Creek begins as two tributaries that join near NW 185th Street. Much of the stream flows through the private Blue Heron Reserve. Coyote Creek begins as three or more branches that extend into ravines with relatively steep side slopes. These branches come together on private property near NW 175th Street. Below the confluence of these branches, the creek flows another 1,700 feet before entering Puget Sound. The lower portion of the creek flows through a private tract called the Coyote Reserve and through Innis Arden Reserve. In comparison, Blue Heron Creek drains a larger area than Coyote Creek and experiences larger flows.

Boeing Creek and Highlands Creek discharge to Puget Sound and are located within Segment E. There are also several short unnamed tributaries that occur within the Innis Arden Reserve and flow to Puget Sound (see Map 4). Boeing Creek begins as two large tributaries that are mostly contained within pipes and occur in developed commercial areas. From the confluence of the two tributaries, the main stem descends through forested ravines to Hidden Lake, a small, constructed lake that the City regulates as a storm detention facility. Downstream from Hidden Lake, the stream has steep gradients and incised channels with moderate-to severe erosion of the channel beds and banks. A steel-pile dam is present approximately 2,300 feet from the mouth, which acts as a barrier to upstream fish. Many sections below the dam have experienced slope failure, and the substrate is generally embedded having been filled in with sediment, providing poor spawning habitat for salmonids (King County 1994). Boeing Creek enters Puget Sound through a large box culvert under the BNSF railroad. The lower portion of the stream is tidally influenced at high tides.

Highlands Creek is located within the Highlands development near the southern City boundary. The stream flows west through private property and is mostly contained within a piped system. The approximate length of the watercourse is 1,200 feet, of which 850 feet is piped.

None of the streams are currently listed on the state Department of Ecology's 2004 303(d) list, which lists streams that do not meet water quality standards for one or more parameters (Ecology website, 2008). However, many small streams, such as those found within the City's shoreline planning area, may potentially be at risk for exceeding several water quality parameters.

As stated above, many of the streams discharge directly into Puget Sound through culverts. Culverts that are undersized and/or have a steep slope may increase water velocity, which may cause downstream scouring of nearshore areas during periods of significant water runoff (Parker, 2000).

Flood Hazard Areas

Flood hazard areas are defined in the Shoreline *Comprehensive Plan* as “those areas within the floodplain subject to a one percent or greater chance of flooding in any given year” (City of Shoreline, 2005a). These areas are typically identified on the Federal Emergency Management Agency (FEMA) flood insurance rate maps (FIRM) as the 100-year floodplain. The 100-year floodplain is regulated by two chapters of the SMC: Chapter 16.12, Flood Damage Prevention, and Chapter 20.80.380-410 of the CAO.

Portions of the shoreline in Segment B, C, D, and E are mapped as a 100-year floodplain on the King County FIRM series, Panels 20, 40, 310, and 330 (FEMA, 1995). Flood hazards for Segment A (Point Wells) are mapped on Snohomish County FIRM series and include panels 1294 and 1292 (FEMA, 1999). The stream corridor of Boeing Creek (Segment E) is also mapped as a 100-year floodplain (FEMA, 1995), but the stream is not large enough itself to be a shoreline of the state and only the mouth of the stream is located within the marine shoreline. The King County Sensitive Area Map Folio (King County iMAP, 1991) shows only the Boeing Creek stream corridor within Segment E as being a potential flood hazard area (see Map 4 in Appendix C). Typically, the areas south of stream mouths and the marine shoreline below the OHWM are indicated as flood hazard areas. Following the recommendations made in the Snohomish County FIRM series, Base Flood Elevation for shoreline in all Segments (A, B, C, D, and E) will be 10 feet National Geodetic Vertical Datum (NGVD).

Several existing houses are within the shoreline of Puget Sound along 27th Avenue NE in Segment B (see Map 4 in Appendix C). Most of the homes are protected by bulkheads, with the exception of those on the south end, which, based on a conversation in March 2006 between Juniper Nammi (City of Shoreline Planner) and Chuck Steele (Ecology Floodplain Specialist), were reported to have had flooding in the past (Chuck Steele, personal communication, 2008). The existing lots within the flood hazard areas along 27th Avenue NE are fully developed, therefore flood regulations in the SMC would be applied primarily to remodel and rebuilding on these sites.

Industrial facilities and a large dock associated with Point Wells exist within the shoreline of Puget Sound in Segment A. Portions of these facilities are within the mapped flood hazard area (see Map 4 in Appendix C). Flood regulations in the SMC would be applied to replacement or rebuilding of industrial facilities and to shoreline restoration projects. If the property were to be rezoned in the future, flood regulations in the SMC would be applied to platting, subdivision, and new construction on the site.

Shoreline Modifications

Three white papers prepared in recent years summarize the current knowledge and technology pertaining to marine and estuarine shoreline modifications in the Puget

Sound. These papers are: *Overwater Structures: Marine Issues* (Nightingale and Simenstad, 2001); *Marine and Estuarine Shoreline Modification Issues* (Williams and Thom, in King County Department of Natural Resources and Parks [KCDNRP], 2001); and *Beaches and Bluffs of Puget Sound* (Johannessen and MacLennan, 2007). These documents, along with *Reconnaissance Assessment of the State of the Nearshore Report: Including Vashon and Maury Islands (WRIAs 8 and 9)* (KCDNR, 2001) and the Washington Department of Natural Resources ShoreZone Inventory (2001) were summarized and incorporated into this section. A field visit in September 2003 verified modifications along portions of the shoreline providing public access. Table A-2, Appendix A contains additional information regarding shoreline modifications within the planning segments.

Shoreline modifications refer to structural alterations of the shoreline's natural bank, including levees, dikes, floodwalls, riprap, bulkheads, docks, piers or other in-water structures. Such modifications are typically used to stabilize the shoreline and prevent erosion. Shoreline armoring (i.e. riprap, bulkheads, and other shore parallel structures) is the most common type of shoreline modification. Shoreline armoring impedes sediment supply to nearshore habitats, and this sediment starvation can lead to changes in nearshore substrates from sand or mud to coarse sand, gravel, and finally hardpan. This may, in turn, decrease eelgrass and increase kelp abundance, as well as forage fish spawning habitats. Armoring also alters natural process dynamics by blocking or delaying the erosion of upland areas and bluffs that replenish the spawning substrate. Beach narrowing and lowering and decreased driftwood abundance also result from shoreline armoring (Johannessen and MacLennan, 2007).

Construction of shoreline armoring may cover or destroy eelgrass meadows, and overwater structures may deprive eelgrass of light. Dredging can excavate eelgrass or cause excessive turbidity and permanent filling of eelgrass meadows (KCDNR, 2001).

Bulkheads and piers may also affect fish life by diverting juvenile salmonids away from shallow shorelines into deeper water, thereby increasing their potential for predation (Nightingale and Simenstad, 2001). Piers also alter wave energy and current patterns and obstruct littoral drift and longshore sediment transport (Williams and Thom, 2001). Sewer outfalls introduce nutrients and pollutants to the nearshore area altering current cycles and food web interactions.

Shoreline Armoring

Approximately 97 percent of the City's shoreline adjacent to Puget Sound is modified with riprap and bulkheads (WDNR, 2001). The majority of this armoring is associated with the BNSF railroad bed (Map 12 in Appendix C). The WDNR ShoreZone Inventory (2001) indicates that approximately 23 percent of Segment A (approximately 796 feet; the southern portion of Point Wells) is unmodified beach. The remaining portion of Point Wells (approximately 2,694 feet) is highly modified with riprap and sheet pile, as well as a large barge dock. Segment B is entirely modified with riprap. A portion of Segment B (approximately 1,845 feet) is modified with concrete and wooden bulkheads along a residential area adjacent to Puget Sound (Photo B-2 in Appendix B). Approximately 73

percent of Segment C is unmodified, at Richmond Beach Saltwater Park where beach extends waterward of the railroad right-of-way. The north and south ends of Segment C are modified with riprap. All of Segments D and E (along the entire length of the City's shoreline south of Richmond Beach Saltwater Park) are modified with riprap (KCDNR,

Docks, Piers, and Over-Water Structures

There are no docks, piers, or over-water structures along Puget Sound within the City limits (Segments B through E) (Map 12 in Appendix C). However, within the PAA, Point Wells (Segment A) contains a large industrial dock originally used for loading oil when the site was operated as a bulk fuel terminal (Photo A-1 in Appendix B). The dock is currently used for both import and export of materials to and from the facility.

NEARSHORE BIOLOGICAL CHARACTERIZATION

Wetlands

Wetlands near the Puget Sound shoreline typically include tidal marshes and tidally influenced estuaries. Tidal marshes may contain both salt and freshwater habitats that experience tidal inundation (KCDNR, 2001). Several wetlands have been mapped by various sources in the City's shoreline planning area. According to the 1987 National Wetlands Inventory (NWI), the entire area of the City's shoreline planning area in the City limits and UGA boundary is designated as an "estuarine intertidal aquatic bed/unconsolidated shore" (E2AB/USN) wetland (US Department of the Interior [USDI], 1987a and 1987b). The King County Sensitive Areas Map Folio (King County, 1990) also identifies intertidal wetlands encompassing all segments within the City's shoreline planning area. Although mapped as wetland at a landscape level, many of these areas in the City are unvegetated beach or mudflat and therefore would not meet the state definition of wetland as per City code requirements.

The *Stream and Wetland Inventory and Assessment* conducted by Tetra Tech/KCM in 2004 for the City documented one non-tidal wetland within Segment B within the City's shoreline planning area (Map 4 in Appendix C). This palustrine forested wetland is less than one acre in size and is associated with Barnacle Creek. Priority Habitats and Species (PHS) data indicate that a small (less than one acre) scrub/shrub wetland is located at the northernmost extent of Segment E and is associated with Coyote Creek within the shoreline planning area (WDFW, 2008).

Critical Fish and Wildlife Areas

Critical fish and wildlife habitat areas are those areas identified as being of critical importance in the maintenance and preservation of fish, wildlife and natural vegetation. Critical fish and wildlife habitat areas are defined in SMC Chapter 20.80.260 as follows: Fish and wildlife habitat conservation areas include nesting and breeding grounds for State and Federal threatened, endangered or priority species as identified by the Washington State Department of Fish and Wildlife, including corridors which connect priority habitat, and those areas which provide habitat for species of local significance which have been or may be identified in the City of Shoreline Comprehensive Plan.

Critical fish and wildlife habitats in the City’s shoreline planning area are characterized in the following sections.

Marine Riparian Zones

Marine riparian vegetation is defined as vegetation overhanging the intertidal zone (KCDNR, 2001). Marine riparian zones function by protecting water quality; providing wildlife habitat; regulating microclimate; providing shade, nutrient and prey; stabilizing banks; and providing large woody debris (Anchor Environmental and People for Puget Sound, 2002).

The existing railroad bed, land clearing, and shoreline armoring have impacted the marine riparian zones of all the City’s shoreline segments. Marine riparian zones are not located within any of the shoreline planning segments (WDNR, 2001) (Table A-3 in Appendix A). The only marine riparian vegetation that occurs west of the BNSF railroad is located at Richmond Beach Saltwater Park (see Photo C-2 in Appendix B).

Banks and Bluffs

Banks and bluffs are part of the marine riparian zone and can be a source of sediment to adjacent beaches, providing habitat to bluff-dwelling animals, rooting area for riparian vegetation, and a source of groundwater seepage to marine waters (KCDNR, 2001). Shoreline development and armoring, vegetation clearing, and changes in hydrology, among others, can adversely impact the natural functions of bluffs.

The ShoreZone Inventory (WDNR, 2001) maps moderate height, inclined cliffs composed of fines/mud and sand in Segments B and C (Tables A-4 in Appendix A). These are described as erosional features, providing sediments to the beach.

Beaches and Backshore

Beaches are composed of generally loose, unconsolidated sediment that extends landward from the low water line (Johannessen and MacLennan, 2007). Backshore areas are immediately landward of beaches and are zones inundated by storm-driven tides. Beaches and backshores provide habitat for numerous organisms, including cutthroat trout, piscivorous birds (grebes, herons, and mergansers), and shorebirds (Dethier, 1990). A typical profile of an undisturbed shoreline in Central Puget Sound would include an upper backshore or storm berm area that collects logs, algae, and other debris during storms (Photo B-3 in Appendix B). The intertidal portion of the beach is typically relatively steep and composed of a mixture of cobbles and gravel in a sand matrix (KCDNR, 2001).

Sediment abundance throughout the shoreline segments is characterized predominantly as “moderate” (some mobile sediment, but not likely to rapidly move) (Table A-1 in Appendix A). Erosional areas are described in Segment E. Beach sediments in shoreline planning area are characterized in Table A-1 and A-4 in Appendix A.

The WDNR ShoreZone Inventory utilized the British Columbia ShoreZone Mapping System, which classifies the shoreline into homogeneous stretches (or units) based on key

physical controlling factors (WDNR, 2001). Table 5 summarizes the general beach or shoreline substrate composition, based on the British Columbia classification, for each shoreline planning segment (WDNR, 2001).

Table 5. ShoreZone Classification by Segment (WDNR, 2001)

Shoreline Segment	British Columbia Classification*
A	<ul style="list-style-type: none"> • Sand beach • Sand and gravel flat or fan
B	<ul style="list-style-type: none"> • Sand beach • Sand flat • Sand and gravel flat or fan
C	<ul style="list-style-type: none"> • Sand beach • Sand and gravel beach, narrow
D	<ul style="list-style-type: none"> • Sand beach
E	<ul style="list-style-type: none"> • Sand and gravel beach, narrow • Sand flat

*British Columbia Physical Mapping System (Howes et al., 1994 in WDNR, 2001)

Sobocinski (2003) conducted a comparative survey of beach fauna found on natural and altered beaches (i.e. where shoreline armoring was present) located above the mean high tide level. One of the four survey sites was located at Richmond Beach Saltwater Park. The study looked at vegetative wrack and invertebrate assemblages, among several other parameters. Vegetative wrack is comprised of natural organic marine material cast on the shore deposited during an ebbing or receding tide. Not surprisingly, the percent ~~wrack of~~ ~~wrack of~~ wrack was greater at natural beach stretches than at altered beaches at all sites. Wrack serves as important habitat for many beach-dwelling fauna. Fauna found along altered beaches were dominated by marine organisms, such as crustaceans, and ~~insects, collembolans~~ ~~insects, collembolans~~ and collembolans (organisms that are terrestrial-dependent) than the neighboring natural beach. The study suggests that a shift to more marine organisms is the result of lowering the land/sea interface and replacing sandy sediments with hard substrate. In addition, the removal of shoreline vegetation, which often accompanies shoreline armoring, also changes the physical structure of this zone by creating hotter, drier habitats, and removing vegetation-dependent organisms, such as insects and invertebrates which inhabit the intertidal zone (Sobocinski, 2003).

Flats

Flats generally include gently sloping sandy or muddy intertidal or shallow subtidal areas (KCDNR, 2001), and are used by juvenile salmonids, shorebirds, and shellfish, among other species. Flats are generally located at the mouths of streams where sediment transported downstream is deposited, and in areas of low wave and current energy where longshore waves and currents deposit sediment (Photo B-4 in Appendix B) (KCDNR, 2001). Sand flats are mapped in Segment B and much of Segment E (in the vicinity of

the Barnacle and Boeing Creek outlets). Sand and gravel flats are mapped in Segments A and B. No mud flats are present in the City's shoreline.

Shoreline activities that may impact tidal flats (KCDNR, 2001) include:
Unnatural erosion or deposition of sediment;
Harvesting of shellfish and other marine life;
Fecal and chemical contamination;
Physical disturbances from shoreline armoring, marina construction, and upland development practices;
Shading from overwater structures; and
Loss of emergent and riparian vegetation.

Eelgrass Meadows

Eelgrass is a perennial, marine aquatic vascular plant that is rooted in the substrate and can spread horizontally to produce new plants. Eelgrass requires fine-grained substrates and is particularly associated with low to moderate high-energy intertidal and shallow subtidal mud/sand substrates. The plants need sufficient light during summer to support growth and for nutrient storage over winter. Typically, eelgrass beds form between about two meters above mean lower low water (MLLW) to almost nine meters below MLLW depending on water quality. However, other factors such as extreme low or high nutrient levels, substrate composition, presence of other species, and toxic pollutants can affect eelgrass abundance and distribution.

The importance of eelgrass has been described in various sources, including the *Reconnaissance Assessment of the State of the Nearshore Environment* (KCDNR, 2001) and more recently in *Kelp and Eelgrass in Puget Sound* (Mumford, 2007). Eelgrass plants are important primary producers, fixing carbon that enters nearshore food webs and generating nutrients and substrate that form the base of the food chain. Eelgrass meadows provide refuge and foraging habitat for many salmonid species, other fish, invertebrates, birds and aquatic organisms.

Eelgrass beds have been documented in Puget Sound in the City's shoreline planning area including Point Wells (Woodruff et al., 2001 and WDNR, 2001). The occurrence of eelgrass is most dense in Segments D and E, north and south of the mouth of Boeing Creek (Table A-5, Appendix A).

Shoreline activities that may impact eelgrass (KCDNR, 2001) include:
Clam harvesting and other direct alteration by humans;
Propeller scour and wash;
Physical disturbances from shoreline armoring;
Shading from overwater structures; and
Physical disturbances from dredging and filling.

Kelp Forests

There are 23 species of kelp in Puget Sound, with only two species of floating kelp and 21 that are considered prostrate, or not-floating. The prostrate species are limited to shallower portions of the nearshore zone and comprise the majority of marine vegetation biomass in some areas (Mumford, 2007). Kelps are held to the substrate by holdfasts,

which unlike roots do not penetrate the bottom or carry nutrients. Unlike eelgrass, kelps are not rooted and must obtain nutrients directly from the water and require a hard substrate. They favor areas with high ambient light and low temperatures, which result in nutrient-rich waters, and moderate wave energy to circulate the nutrients.

Kelp provides habitat for many fish species, including rockfish and salmonids, potential spawning substrate for herring, and buffers shorelines from waves and currents, among other functions (KCDNR, 2001). A change in kelp distribution may indicate the coarsening of shallow subtidal sediments (such as that caused by erosion related to a seawall) or an increase in nutrient loading (such as from sewage effluent).

Kelp is found in all shoreline planning segments with the exception of Segment D. Kelp beds are sporadic throughout and limited in their lateral extent (Table A-5 in Appendix A) (Woodruff et al., 2001; KCDNR, 2001).

Shoreline activities that may impact kelp densities (KCDNR, 2001) include:
Physical disturbances from shoreline armoring, marina construction, and harvesting; Shading from overwater structures;
Beach nourishment; and
Nutrient loading.

Priority Habitats and Species

The Washington Department of Fish and Wildlife (WDFW) maintain priority habitat and species information for Washington State, including the status of species as threatened or endangered. The City of Shoreline occurs within the WDFW Region 4. Priority habitats within Region 4 include consolidated marine/estuarine shorelines, cliffs, caves, snags, riparian areas, old-growth/mature forests, and urban open spaces. These habitats may contain up to 13 species of invertebrates, 62 species of vertebrates, and 20 species of mammals (City of Shoreline, 1998a). The following sections discuss some of the priority species and species of local importance that occur within the City's shoreline planning area.

Shellfish

Geoduck clams are documented in subtidal areas adjacent to shoreline Segments A, B, C, and E and Dungeness crabs are also documented in subtidal areas adjacent to Segment E (WDFW, 2008). The King County 1996/1997 Beach Assessment (KCDNR Website, 2003) performed at Point Wells Beach in Segment A and Richmond Beach Park in Segment C documented shellfish use of these beach areas. Assessments of the Point Wells shoreline (Segment A) resulted in the identification of 31 species of invertebrates, including littleneck, butter, horse, and sand clams; purple shore crabs, pygmy rock crabs, red rock crabs, and graceful crabs; California green shrimp, and hairy hermit crabs (KCDNR, 2003). Littleneck and butter clams dominated the clam populations by number and biomass. Assessments of the Richmond Beach Park shoreline (Segment C) resulted in the identification of 37 species of invertebrates including cockle, softshell, horse, and bay mussels; black-clawed crab, graceful decorator crab, and red rock crab. Horse clams were the dominant species of clams at Richmond Beach Park.

The Washington State Department of Health has closed Richmond Beach in Segment C to recreational shellfish harvesting (Washington State Department of Health Website, 2008) due to the presence of biotoxins. None of the City's shoreline is currently used for commercial shellfish harvesting.

Salmonids

The *Salmonid Habitat Limiting Factors: Water Resources Inventory Area (WRIA) 8 Final Report* (Kerwin, 2001) identifies the known presence of salmon in local streams. Boeing Creek (Segment E) has documented salmonid use including Chinook (listed as threatened under the ESA), coho (Federal species of concern), chum salmon, searun cutthroat trout, and resident cutthroat trout. It is likely that many of the fish are products of the "Fish in the Classroom" program (Daley, 2004). Coho are listed by the WRIA 8 as occurring in Boeing Creek. Highlands Creek contains no salmonids. All other streams are likely to contain resident cutthroat trout in some portions of the stream (TT/KCM 2004b, and Daley, 2003).

The City of Shoreline Stream Inventory (TT/KCM, 2004b) notes that the flume under the BNSF railroad in the lowest reach of Boeing Creek likely prevents fish passage seasonally during low flows. The primary detriment to habitat quality in this reach is the significant amount of sediment from landslides in the ravine. The sediment fills in pools within the stream, clogging gravels with sand and/or silt thus reducing spawning suitability.

Nearshore habitat is an important environment for juvenile salmonids, where the shallow water depth obstructs the presence of larger, predator species (Kerwin, 2001). Juvenile salmon rely on the nearshore and estuarine marine habitats for food, migration corridors, protection from predators, and a transitional environment that supports the physiological changes that occur as they transition from a freshwater to a marine environment (Fresh, 2006). Spawn and migration timing, and the use of different marine habitats vary widely between salmonid species as well as stocks or subpopulations of the same species.

All shoreline segments within the City's shoreline planning area are known or expected to contain juvenile salmonids including bull trout (federally listed), Chinook, chum, coho, cutthroat, pink, sockeye, based on the knowledge of species life histories (KCDNR, 2001).

Forage Fish

Forage fish are key components of the marine food web and have important commercial and recreational value. They are generally characterized as small, schooling fish that prey upon zooplankton and are in turn preyed upon by larger predatory fish, birds and marine mammals (Penttila, 2007). The five forage fish species most likely to occur in the City's shoreline planning area include surf smelt, sand lance, Pacific herring, longfin smelt, and eulachon (Kerwin, 2001 and King County DNR, 2001). Different species utilize different parts of the intertidal and subtidal zones, with sand lance and surf smelt spawning primarily in the substrate of the upper intertidal zone, and Pacific herring spawning primarily on intertidal or subtidal vegetation (Lemberg et al., 1997; Penttila,

2007). Water quality and other conditions that affect food or predator abundance are important for all species of forage fish.

Four primary sources were referenced in compiling information on potential forage fish spawning areas within the City’s shoreline planning area: Marine Resource Species (MRS) data maintained by WDFW (2008), the *Water Resources Inventory Area (WRIA) 8 Final Report* (Kerwin, 2001), the *City of Shoreline, Fish Utilization in the City of Shoreline Streams* (Daley, 2003), and the *Reconnaissance Assessment of the State of the Nearshore Environment* (KCDNR, 2001). Information on the five potential forage fish species within the City’s planning area is summarized in Table 6.

Table 6. Forage Fish Species and Presence by Shoreline Segment

Species	Documented Presence	Spawning Timing	Preferred Spawning Substrate	Spawning Location
Pacific herring	None (nearest is Quartermaster Harbor on Vashon Island)	Quartermaster Harbor stock spawn February/March	Eelgrass	Upper high tide limits to depths of 40 feet (typically between 0 and -10 tidal elevation).
Sand lance	Segments A and B	November 1 to February 15	Fine sand, mixed sand and gravel, or gravel up to 3cm	From + 5 tidal elevation to higher high water line (from bays and inlets to current- swept
Eulachon	None	Late winter/ early spring	Unknown	Freshwater streams
Longfin smelt	None	Winter	Sand with aquatic	Freshwater streams
Surf smelt	Segments A and C	South Puget Sound stocks are fall-winter spawners (September to March)	Mix of coarse sand and fine gravel	Upper intertidal

Sources: (Kerwin, 2001; O’Toole, 1995; KCDNR, 2001; Lemberg et al., 1997)

Information on documented spawning activity was available from the WDFW (2008). No Pacific herring, sand lance, surf smelt, spawning areas are currently documented in any of the shoreline inventory segments (WDFW, 2008). However, it is fair to assume

that they all utilize the nearshore areas for feeding and migration. Both King County DNR (2001) and Kerwin (2001) document surf smelt spawning areas in Segment C, along Richmond Beach Park (Photo C-2 in Appendix B). A sand lance spawning area is mapped along the shoreline within the City of Shoreline, in the southern portion of Segment A (Photo A-1 in Appendix B) (Kerwin, 2001) and just north of Barnacle Creek in Segment B (KCDNR, 2001). Both sources cite the documented presence of surf smelt in planning Segment A (Point Wells). In addition, the mouth of Boeing Creek (Segment C) is identified as an important area for the feeding, migration, and spawning and rearing of all the forage fish mentioned above (Daley, 2004).

Nearshore modifications impact potential forage fish habitat in the following ways:
Development impacts the shoreline, particularly marinas and boat ramps, which introduce the potential for repeated disturbance and potentially alter nearshore hydrology;
Sewer outfalls introduce pollutants and nutrients to the nearshore;
Overwater structures shade intertidal vegetation and may alter nearshore hydrology; and
Riprap revetments and vertical bulkheads alter nearshore hydrology and may increase wave energy on intertidal areas.

The sand lance's habit of spawning in the upper intertidal zone of protected sand-gravel beaches throughout the increasingly populated Puget Sound basin makes it vulnerable to the cumulative effects of various types of shoreline development. The WAC Hydraulic Code Rules for the control and permitting of in-water construction activities in Washington State include consideration of sand lance spawning habitat protection.

Shorebirds and Upland Birds

A variety of waterfowl and shorebirds utilize the nearshore environment for wintering and breeding. Waterfowl and seaduck species include Canada goose, mallard, wigeon, shoveler, scaup, goldeneye, long-tailed duck, northern pintail, bufflehead, and mergansers. Diving birds such as loons, grebes, scoter, guilemot and cormorants use intertidal habitats for foraging. Approximately seventy-five species of birds are associated with marine nearshore environments in Washington (O'Neil et al., 2001).

Adjacent to the open waters of Puget Sound, the upland terrestrial environment provides habitat for birds, amphibians, reptiles, and insects. The WDFW PHS maps indicate the presence of purple martin nest structures on pilings at the mouth of Boeing Creek from 2000 to 2004. It is unknown whether martin are currently using the structures. Bald eagles use the shoreline and large trees for perching. No nests are currently documented within the City. Marbled murrelet (federal and state listed as threatened species) has also been documented in the shoreline vicinity, but no seabird colonies or waterfowl concentrations are documented within the City. Adolfson Associates (1999) also documented the use of interior uplands by two priority species including the pileated woodpecker and the band-tailed pigeon.

ASSESSMENT OF SHORELINE FUNCTIONS AND OPPORTUNITY AREAS

This section summarizes key findings concerning how functions of the Puget Sound shoreline have been impaired within the City of Shoreline, both by land use activities and alterations occurring at an ecosystem-wide scale, and by activities within the City, its PAA, and its shoreline planning area. This section also identifies opportunities for the protection or enhancement of areas where shoreline ecological functions are intact, and opportunities for restoration of impaired shoreline functions, at both a programmatic (i.e., City-wide) and site specific level. Opportunities for enhanced or expanded public access to the shoreline are also discussed.

Shoreline Ecological Functions

Shoreline ecological functions of the City of Shoreline planning segments are summarized in Table 7. The table is organized around Ecology’s list of processes and functions for shorelines using the landscape analysis methodology. It also provides a qualitative assessment of the function performance provided by each reach as Low, Medium or High. Due to the similarity of shoreline functions provided by Segments D and E, these segments are combined in this analysis.

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Table 7. Summary of Ecological Functions

Function	Shoreline Planning Segments			
	Segment A	Segment B	Segment C	Segments D & E
HYDROLOGY				
Transport & stabilize sediment	<p>Low – The burial of the upper foreshore (from industrial development) locked up coarse sand and gravel in the littoral system, preventing longshore transport of sediment.</p> <p>One area of exception on Point Wells is the natural beach within the southern half of Segment A. This natural sand flat and beach area would provide Low to Moderate sediment transport functions.</p>	<p>Low – The burial of the upper foreshore (from railroad construction) locked up coarse sand and gravel in the littoral system, preventing longshore transport of sediment. In addition, small stream mouth estuaries were buried by the railroad. Box culverts and pipes alter sediment dynamics at the mouths. The presence of residential bulkheads, some of which are below the mean high tide level, also interrupts longshore transport of sediment.</p>	<p>Low to Moderate – The area of undisturbed beach west of railroad at Richmond Beach Saltwater Park provides some sediment transport function. It is limited however by its short length (alongshore) and narrow width.</p>	<p>Low (similar to Segment B) Boeing Creek provides a localized fluvial sediment source, but this is limited to a small section of shoreline</p>
Attenuating wave energy	<p>Low – With the exception of the southern portion, the shoreline is armored with riprap that likely increases wave energy, thus affecting</p>	<p>Low – The rock revetment of railroad and residential</p>	<p>Moderate – The widest area of undisturbed beach west of railroad serves to attenuate</p>	<p>Low (similar to B segment)</p>

Function	Shoreline Planning Segments			
	Segment A	Segment B	Segment C	Segments D & E
	beach sediment composition.	bulkheads may result in increased wave energy along the shoreline, possibly affecting beach sediment composition.	wave energy more than any other portion of the shoreline.	
Removing excessive nutrients and toxic compounds	Low - Loss of wetlands has reduced shoreline potential for the filtering and cycling of pollutants. Sources of pollutants have increased as a result of urban and land uses, and increased impervious surface within the drainage basins.	Low to Moderate - Barnacle Creek and associated forested wetland provide some filtering of pollutants. However, the wetland is narrow and east of the railroad grade.	Low (similar to Segment A)	Low to Moderate – similar to Segment A, the loss of wetland has decreased the shorelines ability to perform water quality improvement functions. However, the intact portions of the Boeing Creek riparian corridor do provide filtering of pollutants generated upstream.
Recruitment of LWD and other organic material	Low – The industrial development of Point Wells removed sources of LWD and areas where driftwood could accumulate. The small area of undisturbed beach at the southern end of the Segment A provides a Low to Moderate function for recruitment of organic material.	Low (similar to Segment A) The presence of the railroad has resulted in beach narrowing and lowering, and thus decreased driftwood abundance on the	Low to Moderate – The undisturbed beach at Richmond Beach Saltwater Park allows for some recruitment of organic material, but LWD is limited due to the railroad. In addition, the beach gradient is too steep to	Low - Similar to B segment.

Function	Shoreline Planning Segments			
	Segment A	Segment B	Segment C	Segments D & E
		shore. Railroad maintenance includes physical removal of LWD from upstream sources and stream culverts under the railroad are too small to allow passage of woody debris.	have meaningful interaction between LWD and hydrology.	
VEGETATION				
Temperature regulation	Low – Overhanging vegetation in the nearshore environment is absent from the shoreline due to industrial development.	Low (Similar to Segment A) Overhanging vegetation is separated from the nearshore due to existing development on the beach and to the railroad.	Low (Similar to Segment B) Some vegetation is present at Richmond Beach Park but there are few trees and little to no overhang of vegetation due to the railroad.	Low – The railroad separates steep slopes and historic bluffs from nearshore environment.
Attenuating wave energy	Low – Lack of marine riparian vegetation and large woody debris in the nearshore results in no attenuation of wave energy.	Low (similar to Segment A)	Low – Some vegetation is present at Richmond Beach Saltwater Park, but the beach gradient is too steep to allow this function to be performed.	Low (similar to Segment A)
Sediment removal and	Low – Except for the southern portion of Segment A, no large woody debris	Low (similar to Segment A)	Moderate – Scattered and narrow vegetation	Low (similar to Segment A)

Function	Shoreline Planning Segments			
	Segment A	Segment B	Segment C	Segments D & E
bank stabilization	or vegetation is present to stabilize or reduce erosion.		provides some bank stabilization. Bank stabilization work has been conducted by the City in the southern portion of the segment.	

Function	Shoreline Planning Segments			
	Segment A	Segment B	Segment C	Segments D & E
Recruitment of LWD and other organic material	Low – Industrial development has removed all sources of organic material.	Low – Maintenance of the railroad results in complete interruption of LWD delivery and input from coastal bluffs. The absence of a back beach also significantly reduces accumulation of large wood on the beach.	Moderate – Driftwood is regularly burned by Park users. A small amount of vegetation west of the railroad is a source of organic material and a small amount of back beach is also present.	Low (similar to Segment B)
HABITAT				
Physical space and conditions for reproduction	Low to Moderate – Industrial development at Point Wells resulted in loss of historic sandspit and lagoon. Existing large pier and dock also reduces intertidal habitat. However, eelgrass is mapped off-shore which provides spawning habitat for forage fish. Shellfish beds are also documented in the southern portion of the segment.	Low to Moderate – Marine nearshore habitat for forage fish remains intact due to lack of overwater structures (piers and docks), but the railroad construction resulted in the loss of intertidal habitat (for beach spawning forage fish), longshore lagoon and small stream mouth estuaries.	Low to Moderate – Marine nearshore habitat for forage fish remains intact due to lack of overwater structures (piers and docks), but the railroad construction resulted in the loss of intertidal habitat (for beach spawning forage fish), longshore lagoon and small stream mouth estuaries. Similar to Segment A, eelgrass and shellfish beds are present. However, a sewer outfall is present that likely introduces	Low to Moderate – The sediment supplied at the mouth of Boeing Creek provides feeding, spawning and rearing habitat for several species of forage fish.

Function	Shoreline Planning Segments			
	Segment A	Segment B	Segment C	Segments D & E
			nutrients and pollutants to the nearshore area potentially altering current cycles and food web interactions.	
Resting and Foraging	Low to Moderate – Large pier shades nearshore habitat and limits the growth of vegetation. Industrial uses replace beach habitats. However, area of undisturbed beach provides habitat for shorebirds and has documented forage fish use.	Low – Residential land uses and bulkheads limit the use of nearshore habitat for resting and foraging.	Moderate- The lack of overwater structures (marinas, piers, etc) allows for the growth nearshore vegetation that ??? salmonids. The absence of a back beach habitat and marine riparian vegetation results in no habitat for piscivorous birds, shorebirds, and numerous other organisms.	Moderate - Similar to Segment C with the addition of dense eelgrass present to the north and south of Boeing Creek.
Migration	Low – The large pier at Point Wells may divert juvenile salmonids away from nearshore, resulting in increased predation.	Low – Bulkheads along the shoreline may divert juvenile salmonids away from nearshore, resulting in increased predation.	Moderate to High No impediments to salmon migration are present.	Moderate to High

Function	Shoreline Planning Segments			
	Segment A	Segment B	Segment C	Segments D & E
Food production and delivery	Low to Moderate – The disconnection of marine riparian vegetation from the nearshore has eliminated any biotic input or food for forage fish and salmon. Eelgrass beds are present off-shore.	Low – Residential land uses and bulkheads may disrupt biotic inputs from marine riparian vegetation. Eelgrass beds are present.	Low to Moderate – The small amount of vegetation at Richmond Beach Saltwater park likely supplies some biotic input, although small because only limited vegetation is present. Eelgrass beds are present off shore.	Low to Moderate – Similar to Segment A with the eelgrass beds that provide important food sources for forage fish and migrating salmonids.

Programmatic Restoration Opportunities

Table 8 provides a summary of shoreline ecological functions for the Coastal/Nearshore Environment. Causes of impairment and the relative scale at which impairments are occurring (e.g., watershed, shoreline segment scale, or multiple scales) are identified. General or programmatic restoration opportunities to address impairments are described. Individual residential bulkheads and railroad riprap constitute existing and necessary protection from wave energy and therefore are not included in any Programmatic Restoration Opportunities.

Table 8. Summary of Shoreline Functions and Programmatic Restoration Opportunities

Condition and Causes of Impairment	Scale of Alterations and Impairment	Shoreline Ecological Functions Affected	Programmatic Restoration Opportunities
Bulkheads on shoreline deflect wave action and disrupt natural coastal processes. Bulkheads disrupt natural delivery of sediment to the coastal areas, as well as increase beach scouring and wave deflection.	Watershed and Reach scale	Hydrologic Sediment transport and deposition	Potential redevelopment of Point Wells is an opportunity to replace hard armoring with soft-shore.
Alteration to and development on feeder bluffs reduce the potential of these areas to provide sediment delivery to coastal zones, disrupting natural coastal beach accretion.	Watershed scale	Sediment delivery	No active feeder bluffs in City due to BNSF railroad. Removal of bulkheads in Point Wells may reestablish some sediment delivery processes. Culverts conveying surface water flow from streams continue to be an important source of sediment delivery. Replace stream culverts with larger box culverts or other fish-friendly structures.

Condition and Causes of Impairment	Scale of Alterations and Impairment	Shoreline Ecological Functions Affected	Programmatic Restoration Opportunities
<p>Wetlands adjacent to the Puget Sound coast are altered due to development and land use and can no longer provide essential storage, recharge, or water quality functions.</p>	<p>Watershed and Reach scale</p>	<p>Hydrologic Hyporheic Water quality</p>	<p>Target local coastal wetland restoration and mitigation so they provide storage, detention, and water quality functions and reconnect wetlands adjacent to Puget Sound coast such as Barnacle Creek wetlands.</p> <p>Protect intact wetlands along the Puget Sound coast such as those associated with Coyote creek.</p>
<p>Riparian habitat along the coast has been impaired through land development and marine riparian vegetation is generally absent due to presence of the BNSF Railroad. Input of large wood from the bluffs is largely eliminated by BNSF railroad maintenance practices. The absence of a back beach significantly reduces accumulation of large wood on the beach.</p>	<p>Watershed and Reach scale</p>	<p>Riparian habitat structure</p>	<p>Protect and restore tributaries to the Puget Sound which provide riparian habitat and deliver woody debris and sediment, such as Boeing Creek.</p>

Condition and Causes of Impairment	Scale of Alterations and Impairment	Shoreline Ecological Functions Affected	Programmatic Restoration Opportunities
<p>Man-made debris and remnant structures in the coastal areas disrupt intertidal habitats and salmonid passage. Water quality in the nearshore environment is impaired due to remaining creosote pilings, runoff from creosote railroad ties, and other toxic debris and sewer outfalls. Sediment transport and accretion processes disrupted.</p>	<p>Watershed and Reach scale</p>	<p>Intertidal habitat Water quality</p>	<p>Target removal of abandoned man-made structures and dilapidated docks in Richmond Beach and Point Wells areas. Remove creosote pilings and debris at Point Wells, which harm intertidal habitats. Encourage BNSF to replace creosote railroad ties with non-toxic materials.</p>

Site-Specific Restoration Opportunities

A number of site-specific City and non-City projects that would occur in the City’s shoreline jurisdiction are in various stages of planning, as summarized in Table 9 below. The City could explore working with applicants, resource agencies, and permitting agencies to ensure that components or mitigation measures associated with these projects are consistent with the City’s shoreline management goals. Opportunities and projects identified in the table are described in more detail immediately following the table.

Table 9. Summary of Site-Specific Opportunities and Projects for Public Access and Restoration

Segment	Existing Public Access	Public Access Opportunities	Public Access Projects	Site-Specific Restoration Opportunities	Site-Specific Restoration Projects
A	Point Wells Beach (informal and limited access) at the south end of segment	South Point Wells Habitat Restoration	None	Point Wells Complete Site Restoration Wells Habitat Restoration Wells Lagoon Creation Creek Wetland Construction	King County Brightwater Treatment Plant project at Point Wells site. Project includes restoration plantings.
B	Point Wells Beach (informal and limited access) at the north end of segment	None identified	Richmond Beach Pump Station Park includes interpretive watchtower	None identified	None proposed
C	Richmond Beach Saltwater Park	None identified	Public access improvements at Richmond Beach Saltwater Park	Restore and protect native marine riparian vegetation at Richmond Beach Saltwater Park, west of BNSF railroad tracks.	Master Plan for Richmond Beach Saltwater Park. The plan includes native plant restoration and slope stability efforts.
D	None	None identified	None proposed	None identified	None proposed
E	Innis Arden Reserve (limited access)	None identified	None proposed	Boeing Creek Enhancement	Boeing Creek Park and Underground Storage Pipe project

Segment A

Point Wells Restoration Opportunities

The *Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan Volume II* (WRIA, 2005) identifies many potential restoration and protection projects as part of their Tier 1 Initial Habitat Project List for nearshore/estuary Reaches 8-12 and Sub-reaches. Three specific projects were identified at Point Wells, which is within Reach 10.

Point Wells Complete Site Restoration: Restore the entire Point Wells site by completely removing the sea wall, riprap dike, and fill. Regrade the site and reconnect local freshwater sources to re-create a tidal lagoon system with an opening at the north end of the point, which was probably the original mouth of the tidal lagoon system. Reestablish native riparian and backshore vegetation. Project categorized as “high” for benefits to Chinook and “low” for feasibility.

South Point Wells Habitat Restoration: Enhance the south shoreline by removing riprap dike, eliminating invasive plants, and reestablishing native riparian and backshore vegetation. The south shoreline is approximately 800 feet long, has sandy substrate, supports some beach grass and other herbaceous vegetation, and includes a fair amount of large woody debris. The south shoreline, with its proximity to nearby residential areas, has potential value for public access. Project categorized as “high/medium” for benefits to Chinook and “medium/low” for feasibility.

South Point Wells Lagoon Creation: Creation of a three acre inter-tidal lagoon at the south end of the Point Wells site that may have historically been a marsh (before it was filled). The south shoreline is approximately 800 feet long, has sandy substrate, supports some beach grass and other herbaceous vegetation, and includes a fair amount of large woody debris. Project categorized as “high/medium” for benefits to Chinook and “medium/low” for feasibility.

Barnacle Creek Wetland Construction Opportunity

The *Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan Volume II* (WRIA, 2005) also identifies one specific project within the Barnacle Creek drainage. The project involves creation of tidally influenced wetland habitat on the east side of the BNSF railroad tracks at Barnacle Creek. Project categorized as “low” for both benefits to Chinook and feasibility.

Brightwater Treatment Plant Project at Point Wells

The KCDNRP WTD is currently constructing a regional wastewater treatment plant called Brightwater in unincorporated Snohomish County. A conveyance line from the treatment plant to the Point Wells site is currently being built in order to convey treated wastewater to Puget Sound. A marine outfall will be installed offshore of the Point Wells site, extending approximately one mile along the sea bottom of Puget Sound. Following construction, King County will landscape a portion of the Point Wells site with Puget Sound coastal grasses and enhance the shoreline buffer. Eelgrass removed from the

outfall construction site will be replanted and monitored until 2019 to ensure effective recovery. The project is anticipated to be complete by the year 2010 (KCDNRP, WTD website, 2008).

Segment B

Richmond Beach Pump Station Park Project

A new park site is located in the Richmond Beach neighborhood at Richmond Beach Drive NW and NW 198th Street. The City obtained a 50-year recreation easement on a 2.3-acre parcel of land from King County as mitigation for impacts from the Brightwater Treatment Plant project. In the mitigation agreement between the City of Shoreline and King County, it was agreed that the County would provide \$750,000 of mitigation funding for City of Shoreline community improvements. Most of the mitigation funding has been designated for the creation of a new City park at the pump station site. This park is currently being called Richmond Beach Pump Station Park until it receives a new name following City and County naming policies. A 2005 Master Plan for the park includes a small parking area, restroom, interpretive watchtower overlooking the BNSF railroad and Puget Sound, and play areas. No shoreline access west of the BNSF railroad is proposed (City of Shoreline website, 2008).

Segment C

Richmond Beach Saltwater Park Project

The City's Master Plan for Richmond Beach Saltwater Park (City of Shoreline, 2007b) includes improvement of the park entrance and road; pedestrian sidewalks, stairs and trails; bridge access and safety; a new beach wash-down area; a new overlook parking area across from the caretaker's residence; a new mid-level terrace area with parking, picnic area and gathering space; and new entry, way-finding and interpretive educational signage. In addition, the plan includes selective site improvements and a program of restoration ecology to control erosion and eliminate invasive plant species in the Park and nearshore areas. Phase I improvements include slope stability efforts in specific areas that showed evidence of unstable soil conditions or erosion during geotechnical investigation. Improvements include controlling public access away from steep slope areas, improving access across steep slopes by constructing raised stairs and boardwalks in selected locations, and by implementing a community participation program of removing invasive plants and replacing them with native plant species tolerant of dry, sandy and gravelly soils. Future phases of the master plan propose beach and dune restoration.

Segment D

No site-specific projects or opportunities have been identified to provide public access or restore shoreline functions and processes. Opportunities in this segment are limited because properties along the shoreline are privately owned. There are also hazards along the shoreline including unstable slopes and landslide hazards.

Segment E

Boeing Creek Park and Underground Storage Pipe Project

In October 2007, King County completed construction of a new 500,000-gallon underground storage pipe in Boeing Creek Park to temporarily store wastewater during large storms and help reduce overflows to Puget Sound. The pipe replaced an existing 24-inch sewer in Boeing Creek Park owned by the Ronald Wastewater District. The new sewer is 12 feet in diameter and about 640 feet long. The new underground storage pipe is conveying normal wastewater flows toward the Hidden Lake Pump Station. At the request of the City of Shoreline, King County also graded the existing stormwater facility in Boeing Creek Park. The County grading increased the capacity of the facility and stabilized the area. The City then followed with their own park improvement project in 2008. Improvements to the park include new on street parking, ADA pathway improvements, new picnic areas, benches, stormwater detention pond upgrades including a cascading stone water feature, irrigation, native plant landscaping, and trail improvements including improvements to the lower log crossing. The suspension foot bridge will not be part of these improvements as the December storm caused erosion damage to the creek banks including the proposed site for the bridge (City of Shoreline website, 2008).

Boeing Creek Enhancement

The *City of Shoreline Stream Inventory* (TT/KCM, 2004b) notes that the foremost option for recovery within the City is enhancement of the lowest reach of Boeing Creek. The key habitat enhancement activity is to reduce stormwater runoff from developed areas adjacent to Boeing Creek. By reducing stormwater runoff, landslides will occur at more natural levels and sediment loading in the stream will be reduced.

DATA GAPS

This shoreline inventory and characterization report relies on data described in each technical section. In some cases, data identified as needed for the analysis and characterization were not available for incorporation in this report. The 2003 Ecology Guidelines require that data gaps or missing information be identified during the preparation of the shoreline inventory and analysis. The following are considered data gaps at this time:

Aerial photographs used in this analysis are dated 2002. More recent aerial photographs are not currently available or have not been purchased by the City.

Impervious surface information used in this report has been approximated using aerial photographs. Additional information may exist that needs to be explored.

Data related to impacts to shoreline resources from the operation and maintenance of the BNSF railroad tracks is not available. Coordination with BNSF Railway is desired to achieve cooperation between City activities in the shoreline jurisdiction and BNSF operation and maintenance activities.

Tribal information on fisheries or other marine shoreline resources is currently lacking.

Location of archaeological resources is unknown. Coordination with Native American tribal organizations would help to identify the probability or likelihood that intact archaeological resources may be present in the shoreline planning area.

SUMMARY

The City's shoreline jurisdiction includes approximately 4 miles of Puget Sound coastline within the city limits and in its PAA. Similar to other cities along the Puget Sound, existing development and infrastructure has affected the shoreline environment within the City of Shoreline. Ecosystem-wide processes and ecological functions that have been altered in the marine shoreline include sediment processes, large woody and organic debris recruitment and transport, water quality, riparian vegetation and habitat conditions.

Shoreline armoring to protect the BNSF railroad has most severely altered sediment processes in the City. Sediment delivery is limited to several streams that deliver sediment via culverts under the railroad right-of-way. Forage fish spawning still occurs at these limited points of sediment input (e.g. Boeing Creek) (Daley, 2004). In the Richmond Beach neighborhood, sediment processes have been altered by armoring to protect residential development in several areas, but still provide important habitat and sediment functions.

Clearing of riparian vegetation along the marine shoreline for the BNSF Railway construction and maintenance, and other shoreline armoring has resulted in a lack of large woody and organic debris available for recruitment to the system. The lack of debris in turn affects the stability of the beaches as the presence of beach logs and debris can reduce erosion by dissipating wave energy and trapping sediment.

Restoration and preservation activities that could improve ecological functions and ecosystem wide processes in the marine shoreline include: reduction of stormwater runoff to landslide-prone areas; revegetation of riparian areas to provide shade to cool water temperatures, filter run-off and to provide a source of large woody debris and organic materials; limiting shoreline armoring to allow for continued sediment delivery and to protect nearshore habitat; and improvements to water quality in adjacent upland areas.

Table 10 below summarizes the shoreline characterization for each planning segment. The segments are shown on Map 1. Overall, the Puget Sound shoreline in the City of Shoreline is uniform in its development pattern and biological diversity. The BNSF railroad extends the length of the shoreline. Segment breaks were primarily associated with changes in land use. Point Wells, located in the city's PAA, is the only industrial facility along the shoreline, contrasting with the residential nature of the city's shoreline. South of Point Wells, land use breaks along segment boundaries are primarily associated with varying densities of residential development, and parks and open space resources such as Richmond Beach Saltwater Park and Innis Arden Reserve. While Richmond Beach Saltwater Park provides recreational facilities and access to the Puget Sound shoreline, access at other open space and park resources are limited. Shoreline modifications associated with the railroad and residential development are found

throughout the majority the city's shoreline planning area, with the largest contiguous unmodified portion occurring at Richmond Beach Saltwater Park.

Biological resources and potential habitat areas along the Puget Sound shoreline are largely uniform throughout the city. Less developed areas along the shoreline such as Innis Arden Reserve and Boeing Creek Reserve offer greater habitat potential for wildlife. Areas regulated as critical areas are found throughout the shoreline planning area, primarily comprised of inter-tidal wetlands, streams discharging to Puget Sound, seismic hazards, flood hazards and landslide hazard areas associated with bluffs. Critical areas are listed in Table 10 under Hazard Areas and Habitat / Habitat Potential. Streams discharging to Puget Sound, many of which pass through culverts under the railroad, are listed under Stormwater Outfalls / Stream Discharges.

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Table 10. Shoreline Segment Summary Matrix, City of Shoreline

Shoreline Segment	Land Use / Transportation	Stormwater Outfalls / Stream Discharges	Public Shoreline Access	Hazard Areas	Habitat / Habitat Potential
A	Petroleum Facility King County Right-of-Way (ROW)	Combine stormwater and groundwater remediation outfall near south end of Richmond Beach dock	Point Wells Beach (informal and limited access) at the south end of Segment	Soil, Groundwater and Surface Water Contamination Seismic Hazard Areas	Wetlands Fish and Wildlife Areas (Forage Fish, Salmonids, shorebirds and piscivorous birds, shellfish, eelgrass and kelp)
B	Single Family Residential BNSF Railway ROW Utility Vacant	Wastewater Pump Station emergency overflow outfall; Stream Outfalls:	None	Flood Hazard Areas Seismic Hazard Areas Landslide Hazard Areas	Wetlands Fish & Wildlife Areas (Forage Fish, Salmonids, Banks/Bluffs, shorebirds and piscivorous birds, shellfish, eelgrass and kelp)
C	BNSF Railway ROW Park Single-Family Residential	Barnacle Creek	Richmond Beach Saltwater Park	Flood Hazard Areas Seismic Hazard Areas Landslide Hazard Areas	Wetlands Fish & Wildlife Areas (Forage Fish, Salmonids, Banks/Bluffs, shorebirds and piscivorous birds, shellfish, eelgrass and kelp)
D	Single-Family Residential BNSF Railway ROW	Stream Outfalls: Storm and Blue Heron Creeks	None	Flood Hazard Areas Seismic Hazard Areas Landslide Hazard Areas	Wetlands Fish & Wildlife Areas (Salmonids, shorebirds and piscivorous birds, shellfish, eelgrass and kelp)
E	BNSF Railway ROW Single-Family Residential Open Space Vacant	Stream Outfalls: Coyote, Boeing, and Highlands Creeks	Innis Arden Reserve (limited access)	Flood Hazard Areas Seismic Hazard Areas Landslide Hazard Areas	Wetlands Fish & Wildlife Areas (Forage Fish: Boeing Creek Mouth, Salmonids, shorebirds and piscivorous birds, shellfish, eelgrass and kelp)

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CUMULATIVE IMPACTS ASSESSMENT



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memorandum

date February 22, 2012, revised March 1, 2012

to Miranda Redinger, City of Shoreline Reema

from Shakra and Teresa Vanderburg, ESA

subject **City of Shoreline, Shoreline Master Program Update –Draft Cumulative Impacts Analysis**

The purpose of this memo is to assess the cumulative impacts of reasonably foreseeable future development in the shoreline that would result from development and activities over time under the proposed City of Shoreline SMP required by WAC 173-26-186(8)(d). This memorandum was first prepared in November 2010 based on the October 2010 Draft SMP. In February 2012, the memorandum was updated to reflect the changes since made to the SMP, and is based upon the February 2012 SMP (received by ESA on February 21, 2012). Minor revisions were made on March 1, 2012. This memorandum is intended to support the environmental review of the proposed SMP amendments under the State Environmental Policy Act (SEPA).

For the City of Shoreline, shorelines of the state in the city limits and potential annexation area (PAA) include approximately 5 miles of the Puget Sound shoreline.

The purpose of evaluating cumulative impacts is to insure that, when implemented over time, the proposed SMP goals, policies and regulations will achieve no net loss of shoreline ecological functions from current “baseline” conditions. Baseline conditions are identified and described in the City of Shoreline Inventory and Characterization Report (ESA Adolfson, 2008). The proposed Shoreline SMP provides standards and procedures to evaluate individual uses or developments for their potential to impact shoreline resources on a case-by-case basis through the permitting process. The purpose of this memorandum is to determine if impacts to shoreline ecological functions are likely to result from the aggregate of activities and developments in the shoreline that take place over time under the updated SMP.

The guidelines state that, “to ensure no net loss of ecological functions and protection of other shoreline functions and/or uses, master programs shall contain policies, programs, and regulations that address adverse cumulative impacts and fairly allocate the burden of addressing cumulative impacts among development opportunities. Evaluation of such cumulative impacts should consider:

- Current circumstances affecting the shorelines and relevant natural processes;
- Reasonably foreseeable future development and use of the shoreline; and
- Beneficial effects of any established regulatory programs under other local, state, and federal laws.”¹

This cumulative impacts assessment uses these three considerations as a framework for evaluating the potential long-term impacts on shoreline ecological functions and processes that may result from development or activities under the proposed SMP over time.

Current Circumstances

The City prepared the first draft of the shoreline inventory and characterization report in 2004. As part of the City’s current comprehensive SMP update process, the report and map folio were updated in the fall of 2008. The report was revised in December 2008 to address technical review comments and November 2009 and April 2010 to incorporate public review comments. The Shoreline Inventory and Characterization (ESA Adolfson, 2008) identifies existing conditions and evaluates the ecological functions and processes in the City’s shoreline jurisdiction. The inventory included all shoreline areas within the City and its Potential Annexation Area (PAA) and included a characterization of ecosystem processes functioning at a watershed scale. “Shoreline planning area” is a term used in this tech memo to refer to the approximate area within the City’s shoreline jurisdiction, or areas subject to SMP regulations.

For the purposes of the Inventory and Characterization Report, the Puget Sound shoreline was addressed in five shoreline planning segments, as shown on Map 1, and described below in Table 1. Reach breaks were assigned based upon land uses and existing shoreline conditions as described in the inventory report. The most ~~land use~~ ^{land use} in the shoreline is the Burlington Northern Santa Fe (BNSF) right-of-way, which extends in a north-south direction along the entire length of the shoreline area within city limits. The remaining portions of the shoreline planning area are occupied by industrial uses, residential uses, and parks and open space. Approximately 97 percent of the City’s shoreline adjacent to Puget Sound is modified with riprap and bulkheads (WDNR, 2001). The majority of this armoring is associated with the BNSF railroad bed.

Table 11. Shoreline Planning Segments

Shoreline Segment	Approximate Length (feet)	Approximate Segment Acreage	General Boundaries
A	3,411	15.6	Potential Annexation Area / Point Wells: located directly north of the city limits in unincorporated Snohomish County.
B	4,724	21.7	Richmond Beach residential area: the Snohomish County line south to Richmond Beach Saltwater Park.
C	2,801	11.0	Richmond Beach Saltwater Park south to Storm Creek culvert.
D	1,295	5.7	Innis Arden residential area: south of Richmond Beach Saltwater Park to Innis Arden Reserve Park.
E	9,424	41.6	Innis Arden Reserve / Highlands: Innis Arden Reserve Park south to city limits.

Source: City of Shoreline, 2002

¹ WAC 173-26-286(8)(d)

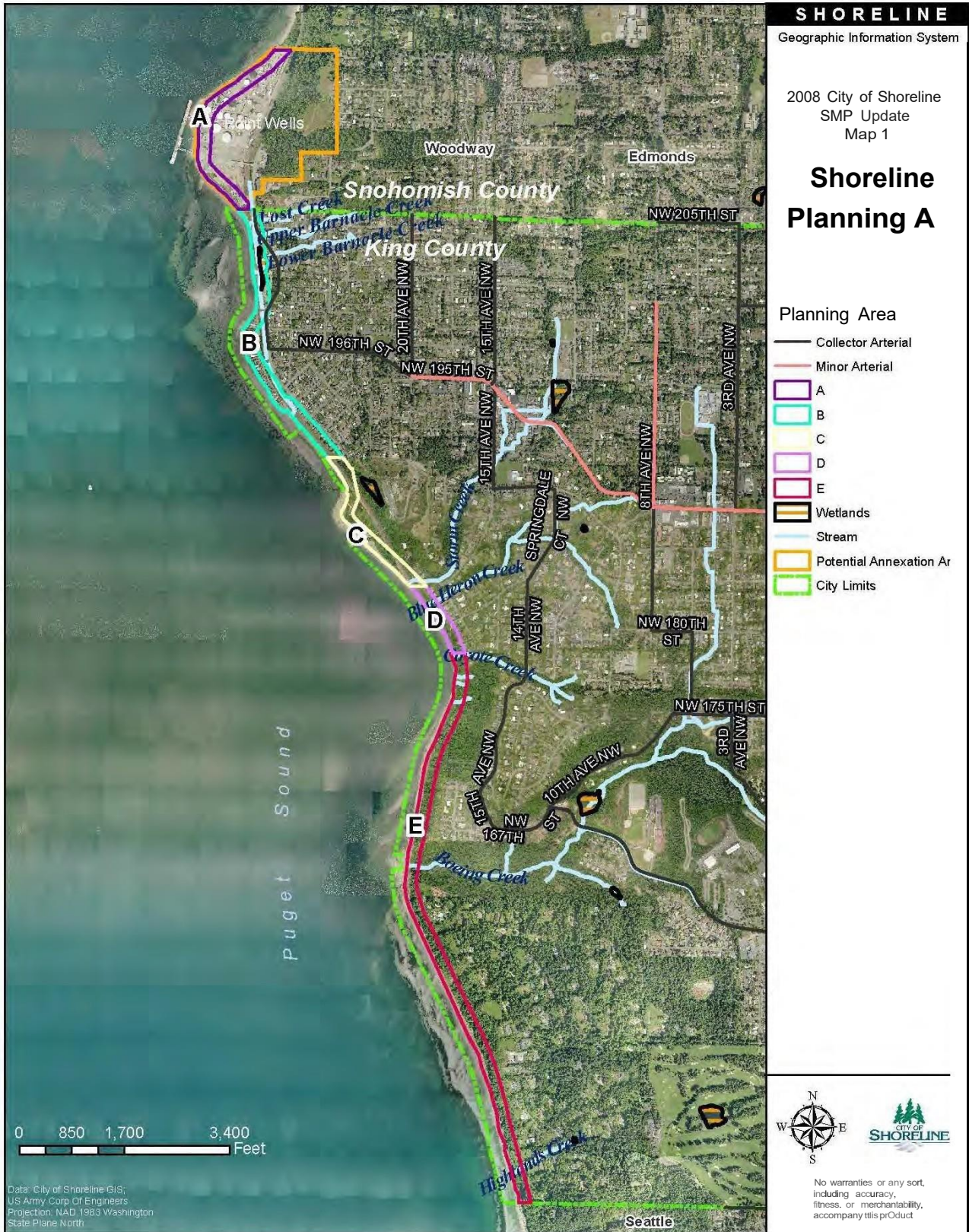
² Shoreline segments were developed in 2004 as part of the first draft inventory and characterization report. The shoreline segments were developed for the sole purpose of describing areas along the shoreline. Segments were created based on physical distinction along the shoreline, the level of ecological functions provided by each segment, as well as existing land

¹ WAC 173-26-286(8)(d)

uses and zoning. Shoreline segments should not be confused with shoreline environment designations. Shoreline environment designations were developed after the inventory and characterization report was completed. Environment designations are analogous to zoning designations and are incorporated directly into the City's Draft Shoreline Master Program. In the City's Draft Shoreline Master Program, there are 6 environment designations and each one has a distinct purpose statement and specific uses and modifications that are permitted, conditionally permitted or prohibited. Regulations specific to each environment designation are included as well.

The following sections further summarize baseline conditions, or current circumstances, with regard to the City's Puget Sound shoreline.

Map 1. Shoreline Planning Area



Physical and Coastal Processes

Puget Sound beach morphology and composition is dependent upon three main influences: wave energy, sediment sources, and relative position of the beach within a littoral cell. Wave energy is controlled by fetch, the open water over which winds blow without any interference from land. Wind-generated wave action gradually erodes beaches and the toe of coastal bluffs, leading to landslides. These coastal bluffs are the primary source of sediment for most Puget Sound beaches. In the city, coastal bluffs are separated from the shoreline by the BNSF Railway, thus completely removing bluff sediment sources. Although riparian vegetation is located along portions of the shoreline, the shore modifications associated with the BNSF Railway and BNSF maintenance activities prevent recruitment of large woody debris to the shoreline. These shore modifications also preclude net shore-drift along the Puget Sound. A small amount of sediment is delivered by fluvial sources (streams) in the city, although this process is also impaired by culvert systems and the BNSF Railway. Construction of the railroad buried much of upper foreshore beach, thereby locking up coarse sand and gravel in the littoral system. This limits or precludes longshore transport of sediment.

Shoreline Modifications

Approximately 97 percent of the City's shoreline adjacent to Puget Sound is modified with riprap and bulkheads (WDNR, 2001). The majority of this armoring is associated with the BNSF railroad bed. As a result, sediment delivery from upslope sources is limited to several streams that deliver sediment via culverts under the railroad ROW. Forage fish spawning still occurs at these limited points of sediment input.

There are no docks, piers, or over-water structures along Puget Sound within the City limits. However, within the PAA, Point Wells contains a large industrial dock used for both import and export of materials to and from the facility. Construction of the King County Wastewater Treatment Brightwater Conveyance pipeline and marine outfall project is currently underway at the Point Wells site.

Clearing of riparian vegetation along the marine shoreline for the BNSF Railway construction and maintenance, residential uses, bulkheads and other shoreline armoring has resulted in a lack of large woody and organic debris available for recruitment to the marine system. The lack of debris in turn affects the stability of the beaches as the presence of beach logs and debris can reduce erosion by dissipating wave energy and trapping sediment. Large woody debris also provides thermoregulation of sediment for spawning forage fish and detritus recruitment.

Habitat and Species

The Puget Sound nearshore environment is a highly productive zone that provides habitat for a variety of aquatic and terrestrial species. The "nearshore" is generally considered to be an area extending from a point underwater where light penetrates to the bottom (the "littoral zone"), across the intertidal zone and beach, up to the top of marine bluffs. Important documented features of the nearshore that provide habitat include:

- Banks, bluffs, beaches and backshore (sediment sources, substrate, and storm berms);
- Tidal flats (intertidal or shallow subtidal areas used by juvenile salmonids, shorebirds, and shellfish);
- Eelgrass meadows and kelp forests (feeding and rearing habitat for wide variety of marine organisms); and
- Stream mouths and pocket estuaries (fish and wildlife corridors and source of fluvial sediment to nearshore).

Within the City's shoreline planning area, there are seven streams that feed into the Puget Sound. Segment A has an unnamed tributary of Barnacle Creek that is located east of the BNSF railroad and south of Point Wells. It travels south where it connects to Barnacle Creek in Segment B. Lost Creek is located north of the city limits

in the Town of Woodway. It flows southwest both in piped and open water sections towards Puget Sound. It appears to connect to Barnacle Creek before discharging into Puget Sound in Segment B. Barnacle Creek is formed by the confluence of Upper Barnacle Creek and Lower Barnacle Creek and discharges to Puget Sound in Segment B. A palustrine forested wetland, less than one acre in size, is associated with Barnacle Creek. Storm Creek and Blue Heron Creek discharge to Puget Sound in Segment D. Coyote Creek, Boeing Creek, and Highlands Creek discharge to Puget Sound in Segment E. A scrub/shrub wetland is associated with Coyote Creek.

Aquatic and terrestrial species found in or near the City of Shoreline that utilize the nearshore or deep waters of Puget Sound include:

- Shellfish (clams, mussels, and crab);
- Salmonids (including listed species such as Chinook and bull trout);
- Forage fish (surf smelt, sand lance, and Pacific herring); and
- Shorebirds and waterbirds.

Land Use and Public Access

The BNSF Railway right-of-way (ROW) extends in a north-south direction along the entire length of the City's shoreline planning area. It is the most dominant land use in the shoreline, occupying 48 percent of the total shoreline planning area. Residential development occupies approximately 19 percent of the total shoreline planning area while Point Wells (in the PAA), the only industrial property located along the Puget Sound shoreline, occupies approximately 20 percent. The remaining land uses are parks and open space (8 percent) and vacant properties (2 percent).

Public access opportunity is provided at Richmond Beach Saltwater Park in Segment C. It is a regional 40-acre park that provides active and passive uses including picnic areas, shelter buildings, a playground area, observation areas, trails, and Puget Sound shoreline access. Kayu Kayu Ac Park, in Segment B, is a 2-acre city park recently opened near Richmond Beach Pump Station; this provides shoreline views. Innis Arden Reserve is a 23-acre natural open space area/greenway passive-use park located in Segment E along the bluffs overlooking Puget Sound. Hiking/walking trails represent the main activity of this passive-use reserve. Although trails eventually lead to the shoreline, the public has to cross the BNSF railroad tracks and riprap to reach the Puget Sound shoreline. Blue Heron Reserve (Segment C) and Coyote Reserve (Segment D) are privately owned tracts that are associated with Blue Heron Creek and Coyote Creek, respectively. No public shoreline access is permitted along these tracts. Boeing Creek Reserve is a private 4-acre natural area associated with Boeing Creek located along the Puget Sound shoreline in Segment E. It is preserved as private open space. No public shoreline access is permitted from this reserve along the bluff.

Reasonably Foreseeable Future Development and Use

Substantial development or redevelopment within the City's shoreline planning area is unlikely. However, limited development may occur on vacant parcels, residential parcels with potential for redevelopment and residential parcels that can be subdivided. Such parcels occupy 16.5 acres (17 percent) of the City's shoreline planning area. A majority of these properties is located in Segments B and E and is discussed in more detail below. Houses on existing single-family lots are also expected to grow larger through additions up to the maximum allowed building envelope under the zoning, SMP and CAO regulations and contingent upon receiving required City permit approvals. However, existing residential development along 27th Avenue NW are constrained by zoning and CAO regulations, making expansion of existing building footprints less likely.

Point Wells is the only commercial property that may have a major redevelopment. It is unknown if the redevelopment would take place under Snohomish County's, Woodway's or Shoreline's jurisdiction.

There are several factors which will inhibit major new development along the Puget Sound shoreline. One is the BNSF Railway which occupies 48 percent of the city's shoreline planning area, extending in a north-south direction along the entire length of the shoreline. This limits development potential because vehicular access across the BNSF tracks is limited. The City has received no indication that BNSF would sell their ROW property or provide new road crossings of the tracks. A second factor that contributes to limiting development is steep slopes and landslide hazard areas located throughout portions of Segments B - E.

Vacant Parcels

In order to evaluate the potential for shoreline development in the reasonably foreseeable future, King County Assessor records (2007) were examined to identify parcels classified as "vacant" that are located within the shoreline jurisdiction. While the term "vacant" may not always accurately reflect current conditions (such as protected open space, steep slopes, wetlands, or other lands with development restrictions), the classification generally indicates that no structural improvements have been made or assessed for taxes on the property. Depending on the land use and zoning designations, these areas may be subject to new development in the future.

Vacant parcels occupy only 2 percent of the City's shoreline planning area (including the PAA) and account for a total of 1.5 acres. The vacant properties are located in Segments B and E. This percentage value does not include BNSF property or City-owned right-of-way. Development of vacant lands is therefore not anticipated to cause a significant change in the existing condition of the City's shorelines.

Redevelopment Potential

In addition to the potential for development on vacant parcels, there is potential for underutilized lots along the Puget Sound to redevelop. For the purposes of this Cumulative Impacts Assessment, we based redevelopment potential on the assumption that parcels in a single-family zone (R-4 and R-6) with a land value assessed by King County at 50% or higher than building value are likely to redevelop some time in the future. Based on this assumption, 22 parcels of the City's shoreline planning area have the potential to redevelop. All 22 parcels are located in Segment B and account for a total of 3 acres or 3 percent of the City's shoreline planning area.

The only major commercial property that is likely to redevelop is Point Wells. Snohomish County, in response to a petition from the Point Wells property owner, changed the Comprehensive Plan designation and zoning designation of Point Wells from Urban Industrial to Urban Center. Urban Center allows for a mix of high-density residential, office and retail uses. The City of Shoreline has a Comprehensive Plan designation of Mixed Use, which is intended to encourage the development of pedestrian oriented places, with architectural interest,

that integrate a wide variety of retail, office and service uses with residential uses. It seems likely that the property would redevelop based on the recent changes to the County's designations. However, the property would need to be remediated to address soil and groundwater contamination. Vehicular access to the property is severely limited and poses considerable challenges to developing high-intensity land uses.

Subdivision Potential

A third approach to determining potential development along the Puget Sound was to determine whether there are residential parcels that have the potential for subdividing. We based subdivision potential on the assumption that parcels in single-family zone (R-4 and R-6) that are at least 2 times larger than the minimum lot size allowed in the zone are likely to subdivide sometime in the future. Fifty-three parcels have the potential to subdivide, 9 of which are located in Segment B, 5 in Segment C, 12 in Segment D, and 27 in Segment E. The total acreage amount within the City's shoreline planning area is 12 acres or 12 percent of the City's shoreline planning area.

Changes to Shoreline Environment Designations

SMPs establish a system of "shoreline environment designations" that provide a uniform basis for applying policies and use regulations within distinctly different shoreline areas. Shoreline environment designations function like zoning overlays. That is, they do not replace the underlying zoning regulations for density, setbacks, etc., but they may impose additional development standards or regulations for portions of property within the shoreline jurisdiction. Generally, environment designations are based on existing and planned development patterns, biological and physical capabilities and limitations of the shoreline, and a community's vision or objectives for its future development.

When the City of Shoreline incorporated in 1995, it adopted regulations outlined in Title 25 (Shoreline Management Plan) of the King County Code as the interim shoreline management code (Shoreline Municipal Code [SMC] 16.10). Three shoreline environment designations are established in the King County Shoreline Management Master Program and were applied to the City's shorelines:

1. Urban,
2. Rural, and
3. Conservancy

Since the City's Potential Annexation Area is located in Snohomish County, the shoreline environment designation that currently applies to Point Wells is Urban.

The proposed SMP environment designations per the October 2010 Draft SMP include the following:

- "Point Wells Urban" environment to accommodate higher density uses while protecting existing ecological functions and restoring ecological functions that have been degraded.
- "Point Wells Urban Conservancy" environment to provide a specific designation unique to an industrial use or mix of uses that can be developed.
- "Urban Conservancy" environment to protect and restore relatively undeveloped or unaltered shorelines to maintain open space, floodplains or habitat, while allowing a variety of compatible uses.
- "Waterfront Residential" environment to distinguish between the residential portions of the coastline where natural and manmade features preclude building within the shoreline jurisdiction and the section

along 27th Avenue NW where residential structures lie westerly of the BNSF railroad ROW and directly abut the Puget Sound.

- “Shoreline Residential” environment to accommodate residential development and accessory structures that are consistent with the City’s Shoreline Master Program.
- “Aquatic” environment to protect, restore, and manage the unique characteristics and resources of the areas waterward of the ordinary high-water mark.

The proposed environment designations are consistent with both the existing land use pattern and Comprehensive Plan future land use designations.

Changes to Development Standards and Use Regulations

The proposed SMP offers several changes to the development regulations that encourage shoreline conservation and prohibit activities that would cause adverse impact to shoreline functions and processes. Many of these changes deal with shoreline modification such as bulkheads and riprap revetments along much of the City’s shoreline. These shoreline modifications have significantly altered the natural net-shore drift direction and the availability and local distribution of beach sediment. Other changes related to specific uses in the shoreline are also designed to protect shoreline ecological functions and processes, while continuing to allow legal uses, public access, and appropriate development.

This section describes in general terms how the proposed SMP protects shoreline functions and processes to achieve no net loss. Appendix A cites specific provisions in the proposed SMP (City of Shoreline, 2010) and Draft Restoration Plan (ESA Adolfson, 2009) that serve to protect and enhance shoreline ecological functions. For each proposed shoreline environment designation, Appendix A provides the current conditions, likely future changes, potentially impacted shoreline processes and functions, effects of proposed SMP provisions, existing regulatory controls, and an assessment of expected future performance.

The proposed SMP offers several changes to the development regulations that encourage shoreline conservation and prohibit activities that would cause adverse impact to shoreline functions and processes. One of the most significant changes is the application of a vegetation conservation area on the Puget Sound and accompanying requirements for vegetation enhancement. Most of the City’s Puget Sound shoreline was developed under King County development standards prior to city incorporation. Puget Sound is not considered a critical area under the City’s Critical Areas Ordinance (Shoreline Municipal Code Chapter 20.80) and did not have buffer standards or requirements. Current King County standards require a 25-foot setback from the ordinary high water mark (OHWM) for single-family development in Urban and Rural environments and a 50-foot setback from the OHWM in the Conservancy environment. The proposed SMP standards and regulations would establish a 20-150 foot vegetation conservation area. Only 9 percent of the total linear length of the City’s Puget Sound shoreline would be regulated with a 20-foot vegetation conservation area. The northern portion of the PAA would be regulated with a 50-foot vegetation conservation area (with accompanying restoration). The remainder of the City’s shoreline will be classified as Shoreline Residential and Urban Conservancy with a 115 to 150 foot vegetation conservation area. Extensive land disturbing activities that require a permit are required to implement a plan that involves revegetation (See 20.230.200.B.4 of Draft SMP).

Regulation of shoreline modifications, such as bulkheads and riprap revetments, will be updated as well. New development and land divisions would be required to be located and designed to avoid the need for shoreline stabilization measures. Further, the conservation of shoreline vegetation has been emphasized in the new shoreline regulations for the City to further stabilize shorelands and increase habitat functions. Updated policies

and development standards establish a preference for alternative “soft-shore” erosion control or stabilization designs. In most cases, project applicants would be required to demonstrate why a “soft-shore” design would not provide adequate protection of existing development. Over time these changes will likely have a net beneficial effect on shoreline ecological processes as properties are redeveloped.

The proposed changes to development standards and use regulations are, in general, more protective than the existing SMP. New development would be required to meet standards contained in the CAO and meet the policy intent and development standards of the SMP. As redevelopment occurs, the policies and regulations in the SMP require that development be located and designed in a manner that avoids impacts to ecological functions and/or enhances functions where they have been degraded. For example, the vegetation conservation measures may require that, as part of a redevelopment proposal, non-native or invasive species be replaced with native vegetation.

Changes to the Treatment of Non-conforming Uses

Much of the development in the City of Shoreline along the Puget Sound predates incorporation of the City in 1995. Several properties and developments in the City’s shoreline do not conform to current zoning or SMP regulations. The proposed SMP includes regulations that are designed to increase protection of shoreline resources over time by prohibiting redevelopment that would result in a greater degree of non-conformity for existing development.

Under the proposed SMP the following standards apply:

- Structures that were legally established and are used for a conforming use, but which now do not conform with regard to setbacks, buffers or yards, area, bulk, height, or density may continue as long as they do not increase the extent of non-conformity by further encroaching upon or extending into areas where construction or use would not be allowed for new development or uses.
- Uses and developments that were legally established and are nonconforming with regard to the use regulations of the SMP may continue as legal nonconforming uses. Such uses cannot be enlarged or expanded without an approved conditional use permit, except that nonconforming single-family residences that are located landward of the OHWM may be enlarged or expanded in conformance with applicable bulk and dimensional standards by the addition of space to the main structure or by the addition of normal appurtenances.
- Structures that are or have been used for non-conforming uses may be used for a different non-conforming use but only upon the approval of a Shoreline Conditional Use permit.
- If a non-conforming use is discontinued or abandoned for twelve (12) consecutive months the non-conforming rights expire and any subsequent use must comply with the SMP.

Restoration Planning

The draft SMP Restoration Plan (ESA Adolfson, 2009) represents the shoreline restoration element of the SMP. The plan identifies opportunities for restoration activities or efforts that include programmatic opportunities (e.g., investigate a beach nourishment program; reduce overwater structures; protect remaining riparian marine vegetation), site-specific opportunities (such as replacing Boeing Creek culvert with a larger box culvert), regional plans and policies for Puget Sound restoration, and potential funding and partnership opportunities. The SMP’s restoration planning is focused on areas where shoreline functions have been degraded by past development activities. The areas with impaired functions were identified in the City’s Shoreline Inventory and Characterization. Recognizing that much impairment to shoreline processes and functions are the result of the

railroad tracks along the coast and armoring associated with single-family residences along 27th Avenue NW (both of which are assumed to remain), the implementation of the Restoration Plan will improve shoreline ecological functions incrementally over time.

Beneficial Effects of Any Established Regulatory Programs Under Other Local, State, and Federal Laws

A variety of other regulatory programs, plans, and policies work in concert with the City's SMP to manage shoreline resources and regulate development near the shoreline. The City's Comprehensive Plan establishes the general land use pattern and vision of growth and development the City has adopted for areas both inside and outside the shoreline jurisdiction. Various sections of the Shoreline Municipal Code (SMC) are relevant to shoreline management, such as zoning (SMC Chapter 20.40), stormwater management (SMC Chapter 13.10), and flood damage prevention (SMC 16.12). The City's development standards and use regulations for environmentally critical areas (SMC Chapter 20.80) are particularly relevant to the City's SMP. Designated environmentally critical areas are found throughout the City's shoreline jurisdiction, including geologic hazard areas, wetlands, flood hazard areas, and streams areas. Standards and regulations in the critical areas regulations have been adopted by reference in the proposed SMP.

A number of state and federal agencies may have jurisdiction over land or natural elements in the City's shoreline jurisdiction. Local development proposals most commonly trigger requirements for state or federal permits when they impact wetlands or streams; potentially affect fish and wildlife listed under the federal Endangered Species Act (ESA); result in over one acre of clearing and grading; or affect the floodplain or floodway. As with local requirements, state and federal regulations may apply throughout the city, but regulated resources are common within the City's shoreline jurisdiction. The state and federal regulations affecting shoreline-related resources include, but are not limited to:

Endangered Species Act (ESA): The federal ESA addresses the protection and recovery of federally listed species. The ESA is jointly administered by the National Oceanic and Atmospheric Administration (NOAA) Fisheries (formerly referred to as the National Marine Fisheries Service), and the United States Fish and Wildlife Service (USFWS).

Clean Water Act (CWA): The federal CWA requires states to set standards for the protection of water quality for various parameters, and it regulates excavation and dredging in waters of the U.S., including wetlands. Certain activities (i.e., fill or dredge) affecting wetlands in the City's shoreline jurisdiction or work waterward of the ordinary high water mark in the Puget Sound or streams may require a permit from the U.S. Army Corps of Engineers and/or Washington State Department of Ecology under Section 404 and Section 401 of the CWA, respectively.

Hydraulic Project Approval (HPA): The Washington Department of Fish and Wildlife (WDFW) regulates activities that use, divert, obstruct, or change the natural flow of the beds or banks of waters of the state and may affect fish habitat. Projects in the shoreline jurisdiction requiring construction below the ordinary high water mark of Puget Sound or streams in the city could require an HPA from WDFW. Projects creating new impervious surface that could substantially increase stormwater runoff to waters of the state may also require approval.

National Pollutant Discharge Elimination System (NPDES): Ecology regulates activities that result in wastewater discharges to surface water from industrial facilities or municipal wastewater treatment plants. NPDES permits are also required for stormwater discharges from industrial facilities, construction sites of one or more acres, and

municipal stormwater systems that serve census-defined Urbanized Areas, which include any urbanized areas with more than 50,000 people and densities greater than 1,000 people per square mile.

Conclusion

This draft cumulative impacts analysis is based upon the Draft Shoreline SMP dated February 2012 (received by ESA on February 21, 2012). The City of Shoreline's Puget Sound coastline is largely developed. There are nearly no major opportunities for new development within the shoreline jurisdiction in the City limits. Therefore, change within the shoreline will primarily be the result of redevelopment activities with the Point Wells site expected to be the most extensive. The system of shoreline environment designations and use regulations in the proposed SMP is consistent with the established land use pattern, as well as the land use vision planned for in the City's comprehensive plan, zoning, and other long-range planning documents. Based on this consistency, it is unlikely that substantial changes in shoreline land uses will occur within the City limits in the future. However, should the Point Wells site be annexed into the City of Shoreline, substantial changes in shoreline land use could occur on this specific site.

The proposed SMP provides a new system of shoreline environment designations that establishes more uniform management of the City's shoreline. The updated development standards and regulation of shoreline modifications provides more protection for shoreline processes. The updated standards and regulations are more restrictive of activities that would result in adverse impacts to the shoreline environment. The restoration planning effort outlined in the proposed SMP provides the City with opportunities to improve or restore ecological functions that have been impaired as a result of past development activities. In addition, the proposed SMP is meant to compliment several city, state and federal efforts to protect shoreline functions and values.

The cumulative actions taken over time in accordance with the City of Shoreline's proposed SMP are not likely to result in a net loss of shoreline ecological functions from existing baseline conditions. This conclusion is based on an assessment of the three factors identified in the Ecology guidelines for evaluating cumulative impacts:

- Current circumstances affecting the shorelines and relevant natural processes;
- Reasonably foreseeable future development and use of the shoreline; and
- Beneficial effects of any established regulatory programs under other local, state, and federal laws.

Changes in subsequent drafts of the SMP may result in a need for revisions to the cumulative impact analysis.

References

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General Cumulative Impact Analysis

Shoreline Segment & Existing	Likely Future Development	Functions or Processes Potentially Impacted	Effects of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
<p>Point Wells Urban</p> <p>Includes the northern portion of Segment A</p> <p>This area is in the City's Potential Annexation Area (PAA) and includes the Point Wells industrial port, a petroleum products storage, processing and distribution site.</p>	<p>Snohomish County, in response to a petition from the Point Wells property owner, changed the Comprehensive Plan designation and zoning designation of Point Wells from Urban Industrial to Urban Center. Urban Center allows for a mix of high-density residential, office and retail uses. The City of Shoreline has a Comprehensive Plan designation of Mixed Use, which is intended to encourage the development of pedestrian oriented places, with architectural interest, that integrate a wide variety of retail, office and service uses with residential uses. It seems likely that the property would redevelop based on the recent changes to designations.</p>	<p>Segment A: The portion of Segment A located within Point Well Urban is completely developed. All shoreline functions are considered low, except that eelgrass is mapped off-shore which provides spawning habitat for forage fish. The shoreline is modified with overwater structures and hard armoring.</p> <p>Shoreline functions would remain at low performance levels and would continue to be impaired unless redevelopment occurs. Soil and groundwater contamination would be remediated and the nearshore habitat would be restored as mitigation for the redevelopment.</p>	<p>20.230.080: The purpose of the "Point Wells Urban" environment is to accommodate higher density uses while protecting existing ecological functions and restoring ecological functions that have been degraded.</p> <p>SMP regulations and standards include:</p> <p>Table 20.230.082: A 50-foot vegetation conservation area with restoration is required for development in the Point Wells Urban environment. The term "Native Conservation Area" (NVCA) applies to areas where the shoreline is not armored, such as the PWUC environment designation, and Richmond Beach Saltwater Park. NVCAs should be maintained in a predominantly natural, undisturbed, undeveloped, and vegetated condition, except where necessary to accommodate appurtenances to a permitted water-dependent use. The term "Building Setback" applies in areas where the railroad or bulkheads prohibit natural sediment transfer. In those areas, it is necessary to maintain hard-armored conditions, but further encroachment or vegetative clearing are not permitted.</p> <p>20.230.20A: Development must:</p> <ul style="list-style-type: none"> • apply the mitigation sequence in WAC 173-26-201(2)(e) • ensure no net loss of shoreline ecological functions by being consistent with SMC 20.80 Critical Areas, avoiding or minimizing the need for shoreline stabilization, substantial land disturbance and dredging, and minimizing interference with natural shorelines processes <p>20.230.20. B: Development that alters topography may be approved if:</p> <ul style="list-style-type: none"> • Flood events will not increase in frequency or severity • Alteration would not impact natural habitat forming processes and would not reduce ecological functions <p>20.230.020.C: Alternatives to the use of chemical fertilizers, herbicide and pesticides is the preferred BMP.</p> <p>Vehicle refueling and vehicle maintenance must occur outside of regulated shoreline areas.</p> <p>The bulk storage of oil, fuel, chemicals or other hazardous materials is prohibited except for uses allowed by the zoning classification.</p> <p>20.230.040.B: Public access on or over the water must be constructed as far landward as possible to avoid interference with views.</p> <p>Physical public access must be designed to prevent significant impacts to natural systems employing LID techniques.</p> <p>Table 20.230.081: Boating facilities including boat launch ramps open to the public are permitted uses. Marinas are prohibited uses. Breakwaters, jetties, groins and weirs are conditionally permitted provided they are limited to water-dependent, public access or shoreline stabilization activities. Existing piers and docks associated with industrial use and public piers and docks are permitted. Expansion of existing piers and docks associated with water-oriented industrial use is conditionally permitted.</p> <p>20.230.090B: Boating facilities are allowed only if they do not adversely impact fish or wildlife habitat areas and associated wetlands and there is adequate mitigation to ensure no net loss.</p> <p>20.230.090C: Boat launch ramps must be located on stable shorelines where water depth is adequate to eliminate/minimize need for channel maintenance activities.</p> <p>Boat launch ramps are allowed on stable non-eroding banks where need for shore stabilization structures is minimized.</p> <p>Ramp structures must be placed near flush with foreshore slope to minimize interruption of geohydraulic processes.</p> <p>20.230.090D: Dry boat storage must comply with the required setback except that water-dependent components are allowed within the setback.</p> <p>20.230.095: Groins are permitted in conjunction with a professionally designed public beach management program. Jetties and breakwaters are permitted as an integral component of a professionally designed harbor or port. Floating, portable or submerged breakwater structures, or smaller discontinuous structures are preferred where physical conditions make such alternatives with</p>	<p>City's Surface Water Management Program: Shoreline development must be designed in conformance with the current DOE Storm Water Management Manual (urban environments only) and Chapter 20.60, subchapter 3 of the SMC and the City of Shoreline</p> <p>Surface Water Design Code</p> <p>Critical Areas Regulations:</p> <p>Chapter 20.80 of the Shoreline Municipal Code (Critical Areas) establishes development standards, construction techniques, and permitted uses in critical areas and their buffers (i.e., geologic hazard areas, fish and wildlife habitat conservation areas, wetlands, flood hazard areas, aquifer recharge areas, and stream areas) to protect these areas from adverse impacts. Designated critical areas are found throughout the City's shoreline planning area, particularly wetlands and streams, flood hazard areas, and geologic hazard areas</p> <p>Clean Water Act (CWA): The federal CWA requires states to set standards for the protection of water quality for various parameters, and it regulates excavation and dredging in waters of the U.S., including wetlands. Certain activities affecting wetlands in the City's shoreline jurisdiction or work in the Puget Sound waters may require a permit from the U.S. Army Corps of Engineers and/or Washington State Department of Ecology under Section 404 and Section 401 of the CWA, respectively.</p> <p>Hydraulic Project Approval (HPA): The Washington Department of Fish and Wildlife (WDFW) regulates activities that use, divert, obstruct, or change the natural flow of the beds or banks of waters of the state and may affect fish habitat. Projects in the shoreline jurisdiction requiring construction below the ordinary high water mark of Puget Sound or stream mouths in the city could require an HPA from WDFW. Projects creating new impervious surface that could substantially increase stormwater runoff to waters of the state may also require approval.</p> <p>Over-water structures: Any in- or over-water (including wetlands) proposals would require review not only by the City, but also by the Washington Department of Fish and Wildlife (WDFW), the U.S. Army Corps of Engineers (Corps), and/or the Washington Department of Ecology. Each of these agencies is charged with regulating and/or protecting streams and wetlands, and would impose certain design or mitigation requirements on applicants. A project that includes stream or wetland fill would require Corps review and permitting.</p>	<p>No Change</p> <p>Native Vegetation Conservation Areas are limited to areas that are not currently armored. Therefore, Building Setback applies to most areas within the city. Given the extent of armoring associated with the railroad, most impacts to existing vegetation are expected to be limited to railroad-related activities. However, such activities must comply with policies in the SMP that conserve vegetation in a manner that ensures no net loss.</p>

Shoreline Segment & Existing Condition	Likely Future Development	Functions or Processes Potentially Impacted	Effects of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
			<p>less impact feasible.</p> <p>Table 20.230.081: Nonresidential development is permitted. Existing industrial development is permitted while expansion is conditionally permitted.</p> <p>20.230.100: Over-water construction of nonresidential uses is prohibited, with the exception of boat facilities. Water-dependent, nonresidential development must maintain a shoreline setback of either 25 feet from the OHWM or 10 feet from the edge of the base flood elevation, whichever is greater. If public access is provided to the shoreline, the setback may be reduced to 10 feet from the OHWM or the edge of the base flood elevation, whichever is greater. Nonwater-dependent, nonresidential development shall maintain a minimum setback from the OHWM consistent with Table 20.230.082.</p> <p>Table 20.230.081: In-stream structures are permitted as part of fish habitat enhancement or a watershed restoration project.</p> <p>20.230.110 B: Existing natural in-stream features are to remain in place. New structures must allow for normal ground water movement and surface runoff.</p> <p>Table 20.230.081: Recreational facilities are a permitted use.</p> <p>20.230.130: No recreational buildings or structures can be built waterward of the OHWM, except water-dependent and/or water-enjoyment public structures such as bridges and viewing platforms. Such uses may be permitted as a Shoreline Conditional Use.</p> <p>Table 20.230.081: Residential development is a permitted use.</p> <p>20.230.160B: Residential development is prohibited waterward of the OHWM and within setbacks defined for each shoreline environment designation.</p> <p>Residential development must assure no net loss of shoreline ecological functions.</p> <p>Residential development will not be approved if a geotechnical analysis indicates that flood control or shoreline protection measures are necessary to create a residential lot or site area. Development must be located to avoid the need for structural shore defense and flood protection works.</p> <p>Residential units must be clustered in order to avoid impacts to wetlands or other critical areas.</p> <p>One accessory structure is allowed in the vegetation conservation area provided that structures cover no more than 200 square feet.</p> <p>Table 20.230.081: Dredging is permitted for activities associated with shoreline/aquatic restoration, remediation, and navigation. , Dredge spoil disposal is permitted for shoreline habitat and natural systems enhancement, fish habitat enhancement, and watershed restoration projects.</p> <p>20.230.160.B: Dredging/disposal allowed only when actions will not result in significant damage to water quality, biological elements, circulation patterns, floodwater capacity, and properly functioning conditions for threatened / endangered species.</p> <p>Depositing dredge spoil material in the Puget Sound allowed as a CUP for wildlife habitat improvements and correcting problems of material distribution that affect fish resources.</p> <p>Table 20.230.081: Existing piers and docks associated with industrial use and public piers or docks are permitted. Expansion of existing piers or docks associated with water-oriented industrial use are conditionally permitted.</p> <p>20.230.170: Piers and docks must include mitigation to ensure no net loss to critical saltwater habitat.</p> <p>Width of docks, piers, floats and lifts must be no wider than 6 feet unless authorized by WDFW and USACE. The length of docks and piers must be the minimum necessary to prevent grounding of floats and boats on the substrate during low tide. Decking shall have a minimum open space of 40% and after installation at least 60% ambient light beneath the structure shall be maintained.</p> <p>20.230.175: Repair or replacement of 50% or more of an existing over-water deck structure must include the replacement of the entire decking with grated material to achieve a minimum open space of 40% and must result in at least 60% ambient light beneath the structure. Repair or replacement of</p>	<p>Restoration Plan (2009): The restoration plans identifies a restoration opportunity in Point Wells that would completely remove the sea wall, riprap dike, and fill, regrade the site and reconnect local freshwater sources to re-create a tidal lagoon system with an opening at the north end of the point, and reestablish native riparian and backshore vegetation. Such actions would improve sediment transport and deposition, nearshore habitat forming processes, beach erosion and accretion of sediments and mineral particulate material, and intertidal fish and wildlife habitat.</p>	

Shoreline Segment & Existing Condition	Likely Future Development	Functions or Processes Potentially Impacted	Effects of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
			<p>less than 50% of the over-water deck structure must use grated decking in the area to be replaced.</p> <p>Table 20.230.081: New hard shoreline armoring is conditionally permitted. Soft-shore stabilization and maintenance of existing is permitted.</p> <p>20.230.180B: New bulkheads allowed when there is serious erosion threatening an established use or existing primary use or when they are necessary for the operation and location of a water-oriented use. A new bulkhead can be constructed to retain landfill in conjunction with a water-dependent use, bridge/navigational structure, or for a wildlife/fish enhancement project.</p> <p>Bulkheads must use stable, nonerodable, homogeneous materials such as concrete, wood, and rock that are consistent with the preservation and protection of ecological habitat.</p> <p>Table 20.230.081: Land Disturbing activities and landfill are permitted for activities associated with restoration or remediation, public access improvement, and allowed shoreline development. Landfilling waterward of the OHWM is conditionally permitted for activities associated with shoreline/aquatic restoration or remediation.</p> <p>20.230.200.B: Land disturbing activities limited to minimum necessary for intended development. Tree and vegetation removal in required Native Vegetation Conservation Areas is prohibited. All significant trees in the Native Vegetation Conservation Areas shall be designated as protected trees consistent with existing development code standards (SMC 20.50.340) and removal of hazard trees is regulated pursuant to SMC 20.50.310(A)(1).</p> <p>Extensive land clearing that requires a permit must revegetate, irrigate, and establish erosion and sedimentation control.</p> <p>20.230.210.B: Landfill is allowed as a CUP for:</p> <ul style="list-style-type: none"> • Water-dependent use • Bridge/utility/navigational structure <p>Landfill perimeters must be designed with silt curtains, vegetation retaining walls or other methods to prevent material movement.</p>		
Point Wells Urban Conservancy					
<p>Includes the southern portion of Segment A</p> <p>This area is in the City's Potential Annexation Area (PAA) and includes the Point Wells industrial port, a petroleum products storage, processing and distribution site.</p>	<p>As described under Point Wells Urban, the Point Wells property owner has indicated interest in redevelopment by petitioning a change to the Snohomish County Comprehensive Plan and zoning designations. However, this portion of segment A retains its Urban Industrial designation.</p>	<p>Similar to conditions described under Point Wells Urban, this property has been extensively modified. However, due to the lack of overwater structures, the presence of Lost Creek, and no hard armoring, some shoreline functions are present. The shoreline contains eelgrass meadows and kelp forests, forage fish spawning area, 31 species of shellfish, a sand and gravel flat, and habitat for shorebirds. Lost Creek provides for pocket estuary habitat.</p> <p>No change in shoreline functions is expected unless redevelopment occurs. Soil and groundwater contamination would be remediated and the nearshore habitat would be restored as mitigation for the redevelopment. A change to a higher land-use intensity and increased public access would likely disrupt wildlife and shore bird habitat.</p>	<p>20.230.080: The purpose of the "Point Wells Urban Conservancy" environment is to distinguish between differing levels of potential and existing ecological function within the Point Wells environment, and regulate uses and public access requirements appropriately.</p> <p style="text-align: center;">SMP regulations and standards include:</p> <p>Table 20.230.082: A 115-foot vegetation conservation area is required for development in the Point Wells Urban Conservancy environment. The term "Native Conservation Area" (NVCA) applies to areas where the shoreline is not armored, such as the PWUC environment designation, and Richmond Beach Saltwater Park. NVCA's should be maintained in a predominantly natural, undisturbed, undeveloped, and vegetated condition, except where necessary to accommodate appurtenances to a permitted water-dependent use. The term "Building Setback" applies in areas where the railroad or bulkheads prohibit natural sediment transfer. In those areas, it is necessary to maintain hard-armored conditions, but further encroachment or vegetative clearing are not permitted. The same regulations under 20.230.020, 20.230.030, and 20.230.040 for Point Wells Urban apply to Point Wells Urban Conservancy as well.</p> <p>Table 20.230.081: In addition to uses and modifications prohibited in Point Wells Urban, boating facilities, breakwaters, jetties, groins and weirs, piers and docks, and new hard shoreline armoring, are also prohibited.</p> <p>20.230.090-20.230.270:</p> <p>The regulations for nonresidential development, in-stream structures, recreational facilities, residential development, dredging, dredge material disposal, land disturbing activities, and landfilling for Point Wells Urban apply to Point Wells Urban Conservancy as well with the exception that recreational facilities are limited to low-intensity uses and passive uses and soft-shore stabilization is limited to those associated with utilities .</p>	<p>Same as items above in Point Wells Urban.</p> <p>Restoration Plan (2009): The restoration plans identifies a restoration opportunity in Point Wells that would enhance the shoreline by removing riprap dike, eliminate invasive plants, reestablish native riparian and backshore vegetation, and create a three acre intertidal lagoon. Similar to the restoration opportunity in Point Wells Urban, such actions would improve sediment transport and deposition, nearshore habitat forming processes, beach erosion and accretion of sediments and mineral particulate material, and intertidal fish and wildlife habitat.</p>	<p>No Change</p> <p>Native Vegetation Conservation Areas are limited to areas that are not currently armored. Therefore, Building Setback applies to most areas within the city. Given the extent of armoring associated with the railroad, most impacts to existing vegetation are expected to be limited to railroad-related activities. However, such activities must comply with policies in the SMP that conserve vegetation in a manner that ensures no net loss.</p>

Shoreline Segment & Existing Condition	Likely Future Development	Functions or Processes Potentially Impacted	Effects of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
Urban Conservancy					
<p>Includes the northern portion of Segment B, portion of Segment C that is Richmond Beach Saltwater Park, and Segment E.</p> <p>This area is characterized by several parks, public and private greenways, the Highlands residential neighborhood, and the Burlington Northern Santa Fe (BNSF) railroad right-of-way (ROW).</p>	<p>Future development would likely be limited to redevelopment of existing single-family homes, few new residences, and park development. Development is inhibited by the presence of the BNSF ROW, landslide hazard areas, and streams and their associated greenways.</p>	<p>Shoreline functions within this area are low to moderate, with the following functions moderately intact:</p> <ul style="list-style-type: none"> ▪ Northern portion of Segment B has eelgrass meadows and kelp forests, a sand flat, forage fish spawning area, and a forested wetland at Barnacle Creek. The wetland provides some filtering of pollutants; however, it is narrow and east of the railroad grade. ▪ Richmond Beach Saltwater Park in Segment C provides some sediment transport function, attenuates wave energy although it is limited due to its length (alongshore) and narrow width, has some potential for large woody debris recruitment, and some vegetation, although it does not overhang the intertidal zone. Eelgrass meadows and kelp forests, forage fish spawning area, and 37 species of shellfish are present. ▪ Segment E contains eelgrass meadows and kelp forests, a sand flat, and the Boeing Creek outlet which serves as an important area for feeding, migration, spawning, and rearing of forage fish. Although the shoreline is modified by the BNSF railroad tracks, riparian vegetation is prevalent upslope of the tracks throughout the entire length of Segment E. This segment is also characterized by landslide hazard areas and has recently seen numerous slide activities. <p>Because no significant new development is anticipated, new impacts are anticipated to be limited.</p>	<p>20.230.080: The purpose of the “Urban Conservancy” environment is to protect, restore and manage relatively undeveloped or unaltered shorelines to maintain open space, floodplains or habitat, while allowing a variety of compatible uses.</p> <p style="text-align: center;">SMP regulations and standards include:</p> <p>Table 20.230.082: A 150-foot or 50-foot from the top of a landslide hazard area, whichever is greater, vegetation conservation area is required for development in the Urban Conservancy environment. The term “Native Conservation Area” (NVCA) applies to areas where the shoreline is not armored, such as the PWUC environment designation, and Richmond Beach Saltwater Park. NVCAs should be maintained in a predominantly natural, undisturbed, undeveloped, and vegetated condition, except where necessary to accommodate appurtenances to a permitted water-dependent use. The term “Building Setback” applies in areas where the railroad or bulkheads prohibit natural sediment transfer. In those areas, it is necessary to maintain hard-armored conditions, but further encroachment or vegetative clearing are not permitted.</p> <p>The same regulations under 20.230.020, 20.230.030 and 20.230.040 for Point Wells Urban apply to Urban Conservancy as well.</p> <p>In addition, 20.230.020D requires properties located in the UC designation to retain trees that are 12 inches or more in diameter. Trees determined by a certified arborist to be hazardous or diseased may be removed. When healthy or non-hazardous trees are removed, each removed tree must be replaced with at least three (3) six-foot tall trees, one (1) 18-foot tall tree, or one (1) 12-foot plus one (1) six-foot tall tree. Trees must be of the same species removed, or equivalent native tree species.</p> <p>Table 20.230.081: In addition to uses and modifications prohibited in Point Wells Urban, breakwaters, jetties, groins and weirs, nonresidential development, and industrial development are also prohibited.</p> <p>20.230.090-20.230.270:</p> <p>The regulations for boat launching ramps, in-stream structures, recreational facilities, residential development, dredging, dredge material disposal, piers and docks, bulkheads, land disturbing activities, and landfilling for Point Wells Urban apply to Urban Conservancy as well, with the exception that only public piers and docks are allowed in Urban Conservancy.</p>	<p>Same as items above in Point Wells Urban.</p> <p>Restoration Plan (2009): The restoration plan identifies a restoration opportunity that would replace all stream culverts with larger box culverts or other fish-friendly structures to allow fish access during low flows and allow opportunity for more sediment to reach the nearshore. Such actions would improve nearshore habitat forming processes and intertidal fish and wildlife habitat.</p> <p>A second restoration opportunity would be to create tidally influenced wetland or restore wetland habitat on the east side of the BNSF railroad tracks NW of the pump station. Such actions would improve nearshore habitat forming processes, intertidal fish and wildlife habitat, and hydrologic, hyporheic and water quality functions.</p> <p>A third restoration opportunity would be to implement the Richmond Beach Saltwater Park Vegetation Management Plan to remove non-native invasive plants and reestablish native plant communities within wetlands east of railroad and on beach area west of railroad. Such actions would improve freshwater wetland and intertidal wildlife habitat and stabilize beach substrates.</p> <p>A fourth restoration opportunity would be to protect intact wetlands and their associated uplands adjacent to Puget Sound and develop and implement a vegetation management plan for the Innis Arden Reserve. Such actions would improve nearshore habitat forming processes, hydrologic, hyporheic and water quality functions, riparian habitat structure and function, and fish and wildlife habitat.</p> <p>A fifth restoration opportunity would be to reduce stormwater flow down steep slopes along Boeing Creek to stabilize banks and control sediment loading of the stream and extend recommendations of Vegetation Management Plan for Boeing Creek Park to include entire stream corridor downslope to Puget Sound. Such actions would improve exchange of aquatic organisms, sediment delivery to nearshore from fluvial sources, source of detritus and particulate organic matter, riparian habitat structure and function, freshwater input, and fish and wildlife habitat.</p> <p>A sixth restoration opportunity would be to protect intact uplands and native vegetation communities adjacent to Puget Sound along Boeing Creek Reserve. Such actions would improve source of detritus and particulate organic matter, riparian habitat structure and function, and fish and wildlife habitat.</p>	<p>No Change</p> <p>Native Vegetation Conservation Areas are limited to areas that are not currently armored. Therefore, Building Setback applies to most areas within the city. Given the extent of armoring associated with the railroad, most impacts to existing vegetation are expected to be limited to railroad-related activities. However, such activities must comply with policies in the SMP that conserve vegetation in a manner that ensures no net loss.</p>

Shoreline Segment & Existing Condition	Likely Future Development	Functions or Processes Potentially Impacted	Effects of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
Waterfront Residential					
<p>Includes the southern portion of Segment B, where the Richmond Beach residential neighborhood is located waterward of the BNSF ROW.</p>	<p>Future development would likely be limited to redevelopment of existing single-family homes and one or two new residences. Development is inhibited by shallow lots and limited vehicular access. Bulkheads likely to be maintained and replaced due to severe weather storms.</p>	<p>Shoreline functions are low in this portion of the Segment B. The bulkheads, some of which are below the mean high tide level, interrupt longshore transport of sediment, increase wave energy, and preclude the use of nearshore habitat for resting and foraging.</p> <p style="padding-left: 40px;">Vegetation is limited to ornamental landscaping, including lawn areas.</p> <p>Because no significant new development is anticipated, new impacts are anticipated to be limited.</p>	<p>20.230.080: The purpose of the “Waterfront Residential” environment is to distinguish between the residential portions of the coastline where natural and manmade features preclude building within the shoreline jurisdiction and the section along 27th Avenue NW where residential properties directly abut the Puget Sound.</p> <p style="text-align: center;"><u>SMP regulations and standards include:</u></p> <p>Table 20.230.082: A 20-foot vegetation conservation area is required for development in the Waterfront Residential environment. The term “Native Conservation Area” (NVCA) applies to areas where the shoreline is not armored, such as the PWUC environment designation, and Richmond Beach Saltwater Park. NVCAs should be maintained in a predominantly natural, undisturbed, undeveloped, and vegetated condition, except where necessary to accommodate appurtenances to a permitted water-dependent use. The term “Building Setback” applies in areas where the railroad or bulkheads prohibit natural sediment transfer. In those areas, it is necessary to maintain hard-armored conditions, but further encroachment or vegetative clearing are not permitted.</p> <p>The same regulations under 20.230.020, 20.230.030 and 20.230.040 for Point Wells Urban apply to Waterfront Residential as well.</p> <p>Table 20.230.081: In addition to uses and modifications prohibited in Point Wells Urban, nonresidential development, industrial development, and breakwaters, jetties, groins and weirs are prohibited.</p> <p>20.230.090-20.230.270:</p> <p>The regulations for boat launching ramps, in-stream structures, recreational facilities, residential development, dredging, dredge material disposal, piers and docks, bulkheads, land disturbing activities, and landfilling for Point Wells Urban apply to Waterfront Residential as well, with the following exceptions:</p> <ul style="list-style-type: none"> • only joint-use boat launching ramps and joint-use piers and docks are allowed in Waterfront Residential; and • landfill in Waterfront Residential does not have to be limited to activities associated with restoration or remediation or public access improvement, but must still be associated with allowed shoreline development per 20.230.210B. 	<p>Same as items above in Point Wells Urban.</p> <p><u>Restoration Plan (2009):</u> The restoration plans identifies restoration opportunities that while residences are present, would protect intertidal area by limiting additional traditional bulkheads or overwater structures and reduce impact of shore armoring through replacement of existing traditional bulkheads with soft-shore alternatives, except where they are necessary to protect property from high energy systems. Such actions would improve sediment transport and deposition, nearshore habitat forming processes, beach erosion and accretion of sediments and mineral particulate material, and intertidal fish and wildlife habitat.</p>	<p><u>No Change</u> Native Vegetation Conservation Areas are limited to areas that are not currently armored. Therefore, Building Setback applies to most areas within the city. Given the extent of armoring associated with the railroad, most impacts to existing vegetation are expected to be limited to railroad-related activities. However, such activities must comply with policies in the SMP that conserve vegetation in a manner that ensures no net loss.</p>
Shoreline Residential					
<p>Includes the southern portion of Segment B, where the Richmond Beach residential neighborhood is located landward of the BNSF ROW.</p>	<p>Future development would likely be limited to redevelopment of existing single-family homes and few new residences. Development is inhibited by the presence of the BNSF ROW.</p>	<p>Shoreline functions are low in this portion of the segment due to the presence of the BNSF ROW and limited upland vegetation.</p> <p>Because no significant new development is anticipated, new impacts are anticipated to be limited.</p>	<p>20.230.080: The purpose of the “Shoreline Residential” environment is to accommodate residential development and accessory structures that are consistent with this Shoreline Master Program SMP regulations and standards include:</p> <p>Table 20.230.082: A 115-foot vegetation conservation area is required for development in the Shoreline Residential environment. The term “Native Conservation Area” (NVCA) applies to areas where the shoreline is not armored, such as the PWUC environment designation, and Richmond Beach Saltwater Park. NVCAs should be maintained in a predominantly natural, undisturbed, undeveloped, and vegetated condition, except where necessary to accommodate appurtenances to a permitted water-dependent use. The term “Building Setback” applies in areas where the railroad or bulkheads prohibit natural sediment transfer. In those areas, it is necessary to maintain hard-armored conditions, but further encroachment or vegetative clearing are not permitted.</p> <p>The same regulations under 20.230.020, 20.230.030 and 20.230.040 for Point Wells Urban apply to Shoreline Residential as well.</p> <p>Table 20.230.081: In addition to uses and modifications prohibited in Point Wells Urban, nonresidential development, industrial development, and breakwaters, jetties, groins and weirs are prohibited.</p> <p>20.230.090-20.230.270:</p> <p>The regulations for boat launching ramps, in-stream structures, recreational facilities, residential development, dredging, dredge material disposal, piers and docks, bulkheads, land disturbing activities, and landfilling for Point Wells Urban apply to Shoreline Residential as well, with the following exceptions:</p> <ul style="list-style-type: none"> • only joint-use launching ramps and joint-use piers and docks are allowed in Waterfront Residential; and • landfill in Shoreline Residential does not have to be limited to activities associated with restoration or remediation or but must still be associated with allowed shoreline development 	<p>Same as items above in Point Wells Urban.</p> <p><u>Restoration Plan (2009):</u> The restoration plan identifies restoration opportunities that would replace all stream culverts with larger box culverts or other fish-friendly structures to allow fish access during low flows and allow opportunity for more sediment to reach the nearshore. Such actions would improve nearshore habitat forming processes and intertidal fish and wildlife habitat.</p>	<p><u>No Change</u> Native Vegetation Conservation Areas are limited to areas that are not currently armored. Therefore, Building Setback applies to most areas within the city. Given the extent of armoring associated with the railroad, most impacts to existing vegetation are expected to be limited to railroad-related activities. However, such activities must comply with policies in the SMP that conserve vegetation in a manner that ensures no net loss.</p>

Shoreline Segment & Existing Condition	Likely Future Development	Functions or Processes Potentially Impacted	Effects of SMP Provisions	Effect of Other Development and Restoration Activities / Programs	Net Effect
Aquatic					
<p>Includes all lands waterward of the marine ordinary high-water mark in the City of Shoreline.</p> <p>Areas designated Aquatic in the City of Shoreline are all areas within the tidal and open waters of the Puget Sound. The only area that has overwater structures is in Segment A, associated with the Point Wells development.</p>	<p>Hard armoring is expected to be maintained for the BNSF railroad ROW and the residential bulkheads located along Richmond Beach. New hard armoring could occur in Segment A although soft-shore stabilization methods would likely be utilized as mitigation for redevelopment.</p> <p>New overwater structures may occur at publicly owned properties, such as Richmond Beach Saltwater Park or in Segment A as part of redevelopment.</p> <p>Dredging may occur in Segment A but only as part of shoreline or aquatic restoration or remediation.</p>	<p>Existing functions and processes have been characterized above.</p> <p>Impacts are anticipated to be limited since no new significant development is anticipated. Any impacts would have to be mitigated.</p>	<p>per 20.230.210B.</p> <p>20.230.080: The purpose of the “Aquatic” environment is to protect, restore, and manage the unique characteristics and resources of the areas waterward of the ordinary high-water mark.</p> <p style="text-align: center;">SMP regulations and standards include:</p> <p>The same provisions under 20.230.020, 20.230.030 and 20.230.040 for Point Wells Urban apply to Aquatic as well.</p> <p>Table 20.230.081: Most allowed uses and modifications in this environment must meet the use and permit limitations of the upland designation. In addition to uses and modifications prohibited in Point Wells Urban, nonresidential development, industrial development, residential development, hard shoreline armoring, and land disturbing activities are prohibited.</p> <p>20.230.090-20.230.270:</p> <p>The regulations for boating facilities, breakwaters, jetties, groins and weirs, in-stream structures, recreational facilities, dredging, dredge material disposal, piers and docks and landfilling for Point Wells Urban apply to Aquatic as well, with the following exceptions:</p> <ul style="list-style-type: none"> • recreational facilities are limited to water-dependent and water-enjoyment and are conditionally permitted; • landfilling is limited to activities associated with shoreline or aquatic restoration or remediation and is conditionally permitted; and • piers and docks are only limited to the extent of the use and permit requirements of the upland designation. <p>Table 20.230.081: Transportation facilities (railroads) are allowed.</p> <p>20.230.250: Bridge abutments and necessary approach fills must be located landward of the OHWM, except bridge piers may be permitted in a water body as a Shoreline Conditional Use. Landfilling activities for transportation facilities are prohibited in wetlands and on accretion beaches, except when all structural and upland alternatives have proven infeasible. Shoreline transportation facilities shall be located and designed to avoid steep or unstable areas and fit the existing topography in order to minimize cuts and fills.</p> <p>Table 20.230.081: Aquaculture is a conditionally permitted use.</p> <p>20.230.115: Aquaculture is limited to geoduck harvesting within DNR tracts or for recovery of native aquatic population in accordance with a government and/or tribal approved plan.</p>	<p>Same as items above in Point Wells Urban.</p> <p>Restoration Plan (2009): The restoration plans identifies a restoration opportunity in Point Wells (Segment A) that would remove creosote pilings and in-water debris. Such actions would improve water and sediment quality and intertidal fish and wildlife habitat.</p> <p>A second restoration opportunity would be to protect forage fish spawning, rearing, migration, and feeding areas and protect eelgrass beds and kelp beds. Such actions would improve food web support and intertidal fish and wildlife habitat.</p> <p>A third restoration opportunity would be to explore the potential to restore the connection between feeder bluffs and nearshore areas. Such actions would improve sediment delivery to the nearshore.</p>	<p>No Change or Potential Improvement</p> <p>Substantial development is currently limited to Segment A in the aquatic environment. Any future in-water work would likely be associated with the Richmond Beach Saltwater Park and Point Wells. Any of these developments would have to mitigate impacts to ecological functions and achieve project-specific no net loss.</p> <p>Redevelopment would require replacement with improved materials, and compliance with Critical Areas and Stormwater Regulations, HPA, and federal CWA. Improved stormwater management and bulkhead removal / improvement projects would also improve functions overtime.</p>

Appendix B

Cumulative Impacts Analysis Addendum

Final

**CITY OF SHORELINE
2019 SHORELINE MASTER PROGRAM PERIODIC UPDATE
Cumulative Impacts Analysis Technical Addendum**

**March 2019
Prepared for
City of Shoreline**



Final

**CITY OF SHORELINE
2019 SHORELINE MASTER PROGRAM PERIODIC UPDATE
Cumulative Impacts Analysis Technical Addendum**

March 2019

**Prepared for
City of Shoreline**

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Cumulative Impacts Analysis Addendum

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1. INTRODUCTION

In May 2013, the City of Shoreline (City) adopted an updated Shoreline Master Program (SMP) to comply with the Washington State Shoreline Management Act (SMA) and the state's shoreline guidelines. As part of the update effort, the City was required to evaluate the cumulative impacts of "reasonably foreseeable" future development to verify that the proposed policies and regulations for shoreline management are adequate to ensure *no net loss* of shoreline ecological functions. In 2012, the City completed an assessment of cumulative impacts from the SMP, and concluded that anticipated development and use occurring under the SMP would not result in cumulative impacts and would meet the no net loss standard (ESA Adolfson, 2012). A key component of protecting shoreline ecological functions under the adopted SMP was integration of the City's Critical Areas regulations (Shoreline Municipal Code Chapter 20.80) into the SMP documentation. The SMP incorporated the version of the critical areas regulations that was adopted in 2006.

The City completed a comprehensive update to critical areas regulations, with City Council adoption occurring on December 7, 2015. In an effort to maintain consistent standards and protections for critical areas throughout Shoreline, the City intends to incorporate the updated critical areas standards into the SMP. This will require an amendment to the SMP to incorporate the new critical area standards.

This document provides a planning level assessment of the potential cumulative impacts that would occur if the updated critical areas standards are incorporated into the SMP. The analysis is an addendum to the cumulative impact analysis (CIA) that was prepared in support of the SMP in 2012 (ESA Adolfson 2012). This addendum is limited in scope to focus only on the integrated critical area regulations as presented to the Planning Commission on January 17, 2019 and February 21, 2019. These critical area regulations are based on the City Council Final Critical Areas Development Code, Attachment A to Ordinance No. 723, adopted by City Council on December 7, 2015 but have been amended to apply within shoreline jurisdiction.

As with the 2012 CIA, this addendum is limited to cumulative impacts of reasonably foreseeable future development in areas subject to SMA jurisdiction. For the City of Shoreline, shorelines of the state include approximately 3.46 linear miles of the Puget Sound shoreline within the city and 0.65 linear miles of Puget Sound shoreline within the area commonly referred to as Point Wells, which is part of the City's potential future service annexation area.

1.1 Overview of Revisions

The 2013 SMP synthesizes the City's critical areas regulations (SMC 20.80), as adopted in 2006, with Washington State Department of Ecology (Ecology) best available science (BAS) guidance available in 2013. Critical areas standards for protection of geologic hazard areas, flood hazard areas, wetlands, fish and wildlife habitat conservation areas, stream areas, and critical aquifer recharge areas all apply within shoreline jurisdiction.

The City initiated the critical areas review process in 2015 and contracted with AMEC Foster Wheeler, who subcontracted with Wood Environment & Infrastructure Solutions, Inc. (Wood), to provide a new review of BAS for the geologic hazard areas section of the critical areas regulations. City staff relied on synthesis and guidance documents provided by Ecology to determine current BAS for the wetlands, streams, and fish and wildlife habitat sections of the critical areas regulations. The flood hazard areas and aquifer recharge areas sections of the critical areas regulations were not updated in the 2015 review process. Using Wood's geologic hazard recommendations and City staff recommendations based on BAS, as well as input from citizens and other stakeholders, the City developed a Proposed Critical Areas Ordinance Development Code Regulations Draft (dated October 2015) for City Council review. The City Council reviewed proposed critical areas amendments, made limited additional code revisions, and on December 7, 2015 adopted the new critical areas regulations.

This CIA addendum supports the City's 2019 SMP periodic review, which is required by Ecology. This is a minor update to address changes in state law as well as locally-identified issues. As part of the SMP periodic review, the critical areas regulations adopted by the City in 2015 will be integrated into the critical areas protections within the SMP. Some of the amendments would alter the standards for geologic hazard areas, streams, and fish and wildlife habitat areas, and wetlands – all of which play an important role in maintaining shoreline ecological functions. Revisions to the regulations that have the greatest potential effect on shoreline ecological functions are discussed in Chapter 4.

2. GENERAL SHORELINE CONDITIONS

The City's shoreline jurisdiction is composed of a variety of natural and man-made characteristics that include natural beaches, wooded slopes, single-family homes, the BNSF Railway, and in the potential future service annexation area of Point Wells, an industrial port. Point Wells, a 100-acre industrial site located directly north of the city along Puget Sound, is currently under Snohomish County jurisdiction and is a potential future service annexation area for the City of Shoreline (City of Shoreline, 2012).

Key basin-wide and reach-specific circumstances affecting the City's shoreline are documented in the 2012 CIA (ESA Adolfson, 2012) and the *Shoreline Inventory and Characterization Report* (ESA Adolfson, 2010). Based upon a review of existing information, these circumstances have not changed substantially in the last seven years. Table 1 below describes the shoreline planning segments used in the *Shoreline Inventory and Characterization Report* (Figure 1). The segments are based broadly on the physical distinction along the shoreline, the level of ecological functions provided by each segment, as well as existing land uses and zoning designations.

- The BNSF Railway right-of-way (ROW) extends in a north-south direction along the entire length of the City's shoreline planning area. It is the most dominant land use in the shoreline, occupying 48 percent of the total shoreline planning area. Residential development occupies approximately 19 percent of the total shoreline planning area while Point Wells (in the potential future service annexation area), the only industrial property located along the Puget Sound shoreline, occupies approximately 20 percent. The remaining land uses are parks and open space (8 percent) and vacant properties (2 percent).
 - o Public access opportunity is provided at Richmond Beach Saltwater Park in Segment C, Kayu Kayu Ac Park, in Segment B, and Innis Arden Reserve in Segment E.
 - o Blue Heron Reserve (Segment C), Coyote Reserve (Segment D) and Boeing Creek Reserve (Segment E) are privately owned. No public shoreline access is permitted from these reserves along the bluff.
- There are no existing docks, piers, or over-water structures along Puget Sound within the city limits. Point Wells contains a large industrial dock used for both import and export of materials to and from the facility.
- In the city, coastal bluffs are separated from the shoreline by the BNSF Railway, thus completely removing bluff sediment sources. These shore modifications also preclude net shore-drift along the Puget Sound. A small amount of sediment is delivered by fluvial sources (streams) in the city, although this process is also impaired by culvert systems and the BNSF Railway. Forage fish spawning still occurs at these limited points of sediment input.

- Clearing of vegetation along the marine shoreline for the BNSF Railway construction and maintenance, residential uses, bulkheads and other shoreline armoring has resulted in a lack of large woody and organic debris available for recruitment to the marine system. The lack of debris in turn affects the stability of the beaches as the presence of beach logs and debris can reduce erosion by dissipating wave energy and trapping sediment. Large woody debris also provides thermoregulation of sediment for spawning forage fish and detritus recruitment.
- The Puget Sound nearshore environment is a highly productive zone that provides habitat for a variety of aquatic and terrestrial species. Important documented features of the city's nearshore that provide habitat include:
 - o Banks, bluffs, beaches and backshore (sediment sources, substrate, and storm berms);
 - o Tidal flats (intertidal or shallow subtidal areas used by juvenile salmonids, shorebirds, and shellfish);
 - o Eelgrass meadows and kelp forests (feeding and rearing habitat for wide variety of marine organisms); and
 - o Stream mouths and pocket estuaries (fish and wildlife corridors and source of fluvial sediment to nearshore).
- Within the City's shoreline planning area, there are seven streams that feed into the Puget Sound: an unnamed tributary of Barnacle Creek in Segment A; Barnacle Creek and Lost Creek in Segment B; Storm Creek in Segment C; Blue Heron Creek in Segment D; and Coyote Creek, Boeing Creek, and Highlands Creek in Segment E.

Table 1. Shoreline planning segments

Shoreline Segment	Approximate Length (feet)	Approximate Segment Acreage	General Boundaries
A	3,579	15.6	Potential Future Service Annexation Area / Point Wells: located directly north of the city limits in unincorporated Snohomish County.
B	4,551	21.7	Richmond Beach residential area: the Snohomish County line south to Richmond Beach Saltwater Park.
C	2,659	21.6	Richmond Beach Saltwater Park south to Storm Creek culvert.
D	1,128	5.7	Innis Arden residential area: south of Richmond Beach Saltwater Park to Innis Arden Reserve Park
E	9,286	44.1	Innis Arden Reserve / Highlands: Innis Arden Reserve Park south to city limits.

The following data sources were consulted to see if ecological changes occurred since the preparation of the City's 2010 Shoreline Inventory and Characterization.

The National Oceanic and Atmospheric Administration's Coastal Change Analysis Program (C-CAP) Land Cover Atlas was used to find the change in impervious surface in the city's shoreline planning area. The data is acquired from 30 meter Landsat imagery. No change in the amount of

impervious surface (high, medium, low intensity development) occurred in the shoreline planning area between 2011 and 2016 (NOAA 2011, 2016). No land use data was available for 2008.

Biodiversity corridors are documented within Innis Arden Reserve Park and Boeing Creek Reserve that were not previously identified in the Shoreline Inventory and Characterization Report (WDFW PHS, 2019). Boeing Creek Reserve is now recognized for including a large stand of old growth forest, a forested riparian corridor, shrub-savannah habitat, and marine shoreline. Innis Arden Reserve Park is now included as a biodiversity corridor for the variety of forested, wetland and riparian habitat present. Biodiversity corridors is a new Priority Habitat and Species (PHS) designation developed by WDFW to recognize large undeveloped habitat patches and open spaces as part of planning and building habitat corridors (WDFW, 2009). The updated critical areas standards include biodiversity areas and corridors in Innis Arden Reserve Park and Boeing Creek as state priority habitats (SMC 24.240.270.B.2).

In 2015, Washington Department of Fish and Wildlife mapped the presence of a great blue heron rookery within the city's shoreline just south of Richmond Beach Saltwater Park (WDFW PHS, 2019). The bald eagle nesting area and buffer present near Point Wells in 2008 is no longer mapped as a Priority Habitat and Species area (ESA Adolfson, 2008; WDFW, 2019). While bald eagle nests are still protected under the Migratory Bird Treaty Act and through US Fish and Wildlife Service guidelines, nest locations are no longer tracked or documented by state wildlife biologists.

Coho salmon and coastal cutthroat have been known to use Boeing Creek for breeding and this did not change between 2008 and 2019 (WDFW PHS, 2019). Documented presence of salmonids and forage fish using the Puget Sound nearshore did not change between 2008 and 2019 (ESA Adolfson, 2008; NOAA, 2019; WDFW, 2019). Eelgrass was sampled in 2015 which showed that native eelgrass remains stable and continuous along the shoreline (WDNR, 2015; WDNR, 2019). Kelp forests are mapped as remaining present along the shoreline (WDNR, 2019). Mapped presence of geoduck shifted slightly south between 2008 and present. Geoduck presence now begins at the top of Segment E where it occurred from Segment B to Segment C in 2008

(WDFW, 2019). No change in Dungeness crab presence occurred between 2008 and present (WDFW, 2019).

The City relies on the National Wetland Inventory data and maintains a separate wetland inventory at the local level viewed on the City's Property Information Interactive Map. Two wetlands were identified by Ecology along either side of the railway alignment in Segment C at Richmond Saltwater Beach Park between 2008 and present (City of Shoreline, 2019).

ESA Adolfson (2008) reported that the ShoreZone Inventory stated 97 percent of the City's shoreline was modified, mostly associated with the BNSF railroad bed (WDNR, 2001). The current Coastal Atlas Map uses WDNR data from 2000 to show approximately 85 percent of the City's shoreline as modified (Ecology, 2019). Although there is a discrepancy between the amount of shoreline modification in the city between 2008 and present, it is clear there has not been an increase in modification along the shoreline. It is possible that ESA Adolfson

inaccurately reported the 97 percent shoreline modification or the amount of modification along the shoreline was re-evaluated by WDNR.

3. REASONABLY FORESEEABLE FUTURE DEVELOPMENT

Reasonably foreseeable future development in the City’s shoreline jurisdiction is generally unchanged since preparation of the City’s original CIA in 2012. The only uses that presently occur within shoreline jurisdiction are transportation (including railroad), single-family residences, park or public recreation (on public and private park lands), and utility facilities. Future development is likely to maintain these uses, with no industrial, commercial or mixed uses expected within the city limits in the foreseeable future.

Minimal new shoreline residential development or significant redevelopment has occurred over the last seven years (since the 2012 CIA). There is one lot that was replatted and a new duplex was constructed on the lot (Table 2). Seven other existing residential single family homes completed additions or remodels; all seven are located in Segment B. Table 2 identifies the number of vacant properties present in the City’s shoreline jurisdiction and Future Service Annexation Area in 2012 and the number of properties that underwent remodels or additions by shoreline segment.

Table 2. General land use characteristics of shoreline properties on the Puget Sound shoreline within City of Shoreline limits and potential annexation area of Point Wells

Shoreline Segment	Total Number of Parcels	2012 Vacant Parcels		Change: 2012 - 2019			Shoreline Parks and Open Spaces
		Number	% of total	New Development (#)	Remodel/ Addition (#)	% of total	
A	7	2	0.1	0	0	0	None
B	84	9	3.4	1	7	4.5	Kayu Kayu Ac Park (public)
C	20	4	3.4	0	0	0	Richmond Beach Saltwater Park (public); Storm Creek Reserve
D	17	0	0	0	0	0	Point Wells Reserve (private)
E	38	9	3.7	0	0	0	Innis Arden Reserve (public); Boeing Creek Reserve (private)

Source: King County, 2019; City of Shoreline, 2019

Houses on existing single-family lots could continue to grow larger through additions; however, zoning density restrictions, the presences of steep slope and landslide hazard areas located throughout portions of Segments B-E, and covenants restricting redevelopment in the Innis Arden and Highlands neighborhoods constrain opportunities for additions, making expansion of existing building footprints less likely. Furthermore, the BNSF Railway restricts development potential because vehicular access across the BNSF tracks is limited. Therefore, general patterns of anticipated future development remain consistent with the 2012 CIA.

Point Wells is the only property that may undergo a major redevelopment. Development of the City’s existing SMP began years before its final approval in 2013. At the start of this process, Point Wells was designated and zoned by Snohomish County as Industrial. This changed in 2009/2010 when Snohomish County redesignated and rezoned Point Wells from Industrial to an

Urban Center. Under Snohomish County's regulations, an Urban Center provides for mixed-use, dense development that could produce upwards of 2.6 million square feet of residential and commercial development. The City has included Point Wells as a Future Service Annexation Area and adopted a subarea plan to establish a less intense vision for the site.

In 2012, Snohomish County removed the Urban Center designation and zoning, reducing it to the Urban Village designation with Planned Community Business zoning. Under an Urban Village designation, the site has the potential to develop at least 1,800 residential units, 20,000 square feet of retail, and 115,000 square feet of office space. However, in 2011, prior to reducing the designation and zoning of the site, a developer submitted applications and became vested to the Urban Center designation.

Snohomish County stopped processing the developer's applications in 2018, effectively terminating an Urban Center development at Point Wells, after more than 7 years of review time. The developer appealed Snohomish County's decision to King County Superior Court, which was recently denied. Thus, at this point it is unknown whether such an intense mixed use development could be built at Point Wells. At the minimum, development consistent with an Urban Village designation is still possible. As stated in the 2012 CIA, if Point Wells were to redevelop, soil and groundwater contamination would be remediated and the nearshore habitat would be restored as mitigation for the redevelopment

4. POTENTIAL IMPACTS OF REVISED STANDARDS

This chapter describes the substantial changes made to the 2006 critical area standards as part of the 2015 update. A discussion of the potential effect on shoreline ecological function is also provided. The critical areas regulation language as presented to the Planning Commission is attached to this addendum in strikethrough / underline format for each topic that is described (see Appendix A). Outside of these major critical areas standards revisions no other substantial changes to the SMP have been evaluated.

4.1 Combine Streams with Fish & Wildlife Habitat section

The City updated the critical areas standards to combine the stream critical areas section with the fish and wildlife critical areas section based on the state model code provisions. Streams and other “waters of the state” are a type of fish and wildlife habitat as defined by the Washington Administrative Code (WAC). This amendment is consistent with state guidance for fish and wildlife habitat protection (CTED, 2007). This change is outlined in Section 20.240.270.

See A-1 of Appendix A for redline/strikeout versions of City adopted critical areas standards revisions for Fish and Wildlife Habitat.

Likely Effects on Shoreline Ecological Functions

The updated approach will have no effect on shoreline ecological functions. As long as streams and fish and wildlife habitat critical areas are regulated by local jurisdictions, there will be no particular positive or negative impacts to protections of streams or fish and wildlife habitat by integrating the two critical area types.

4.2 Adopt State Water Typing System

State agencies such as Washington Department of Fish and Wildlife (WDFW) and Ecology recommend use of the Washington State Department of Natural Resources (WDNR) stream typing system in Title 222 WAC, the forest practices regulations. The latest stream typing by WDNR classifies streams into Type S (shoreline), Type F (fish-bearing), Type Np (non-fish-bearing, perennial flow) and Type Ns (non-fish-bearing, seasonal flow). The City updated their water typing system to the State Water Typing System. This change resulted in a 10-foot buffer increase for Type Ns habitat streams. This change is outlined in Section 20.240.270(B) (5).

Likely Effects on Shoreline Ecological Functions

This update provides a consistent system that maintains a basis in key physical and ecological differences across streams. The system identifies whether or not streams are used by fish and whether or not they experience perennial or seasonal flow, which is important for protecting

ecological functions of the stream and shoreline. Although the City’s previous typing system was an outdated state stream typing system, the updated approach will have no effect on shoreline ecological functions as the protections (such as buffer requirements for each stream type) were nearly the same.

See A-1 of Appendix A for redline/strikeout versions of City adopted critical areas standards revisions for stream typing.

4.3 Development Allowances in Separated and Isolated Stream and/or Wetland Buffer

This update addresses sites where existing, legally established roadways, railroads, paved areas, or other structures occur between the site and the stream and/or wetland. Development proposals are allowed in buffer areas isolated by roads or constructed features, if a critical area report determines and the Director of Community Development concurs, that it is a physically separated and functionally isolated stream and/or wetland buffer. This updated language is outlined in Section 20.240.280(D)(6) and 20.240.330(G)(10).

Likely Effects on Shoreline Ecological Functions

Riparian and wetland buffers offer various ecological functions, such as providing shade to the stream in summer and serving as sources of large woody debris. These functions can only exist if the buffer abuts and lies adjacent to the stream or wetland critical area. Physical separation of a stream or wetland from its buffer by an existing road, railroad, or paved area eliminates the protective function of the buffer for the critical area. Therefore, an allowance for development in separated or functionally isolated streams or wetland buffers will have no effect on shoreline ecological functions.

See A-2 of Appendix A for redline/strikeout versions of City adopted critical areas standards revisions for development in stream and wetland buffers that are separated or isolated from the development.

4.4 Updated Wetland Rating and Buffer Standards

The City updated the wetland rating standards to be consistent with the Ecology 2014 Wetland Rating System for Western Washington. The updated wetland rating standards, found in Section 20.240.320(B), include the wetland rating manual scoring range (i.e., between 9 and 27 under the updated manual versus 1 to 100 in the 2004 manual) that is based on a qualitative scale of functions from high, medium, or low. Wetland buffer widths were updated to be consistent with state guidance and offer both a combined fixed-width and variable-width approach, with a minimum buffer prescribed based on a wetland’s category and an additional buffer based on increasing habitat points (Bunten et al., 2016; “Table XX.1” revised July 2018). The City also updated mitigation ratios in Table 20.240.350(G) based on the type of compensatory mitigation being performed as recommended by current BAS (Bunten et al, 2016).

The updated wetland standards simplify and standardize the mitigation and buffer requirements for projects that need approval at the local and state or federal level.

Likely Effects on Shoreline Ecological Functions

Wetlands in Washington State – Vol. 1 A Synthesis of the Science (Sheldon et al., 2005) confirmed that buffers perform an important water quality function by trapping pollutants before they reach a wetland and can serve as critical habitat for some species in uplands surrounding wetlands and streams. The updated buffer table includes habitat scores and emphasizes the requirement to provide wildlife corridors which may provide additional protection for shoreline ecological functions.

A successful mitigation project often requires the amount of mitigation to be larger than the impact being mitigated for. The updated mitigation ratios will be beneficial to the shoreline as they make up for the spatial and temporal loss of functions associated with development.

See A-3 of Appendix A for redline/strikeout versions of City adopted critical areas standards revisions for wetlands.

4.5 Clarified Report Content Requirements for Assessment of Geological Characteristics

The City clarified that geotechnical reports (now referenced as hazards assessments) include an evaluation of the geologic characteristics of the soils, sediments, and/or rock of the project area and potentially affected adjacent properties, and a review of the site history regarding landslides, erosion, and prior grading. The revised requirements outlined in SMC Section 20.240.240(D) encourage use of BAS when evaluating geological hazard areas.

Likely Effects on Shoreline Ecological Functions

Clarified report requirements guarantee clear and standardized implementation of regulations. The assessment of geological characteristics also requires applicants to conduct site-specific tests, evaluate historic and existing conditions, and evaluate vulnerability of the site to seismic or other geologic events based on scientifically valid methods. Ultimately, this update ensures better protection of shoreline ecological functions.

See A-4 of Appendix A for redline/strikeout versions of City adopted critical areas standards revisions for hazards assessments.

4.6 Standards for Very High Risk and Moderate to High Risk Landslide Hazard Areas

According to the updated geologically hazardous areas regulations, alteration in very high risk landslide hazard areas or associated 50-foot buffers may be permitted with geotechnical analysis and recommendations, assuming consistency with code requirements and design criteria. Buffers for moderate to high risk landslide hazard areas are based on a recommendation by a qualified geotechnical professional (with potential for no buffer), rather than providing a minimum buffer. The qualified professional would also recommend any additional setbacks for buildings and stormwater facilities adequate to certify no increase in the risk of the hazard. The revision to these

standards, summarized in SMC Sections 20.240.224 (E) and 20.240.230 (D), was evaluated by AMEC Foster Wheeler and approved by Ecology during the City’s 2015 Critical Areas Ordinance update (AMEC Foster Wheeler, 2015; City of Shoreline, 2015a).

Likely Effects on Shoreline Ecological Functions

Geologic hazards standards are designed to reduce risks to human health and safety. The updated standards will continue to focus on the protection of life and property. Alteration to and development on coastal feeder bluffs may reduce the potential of these areas to provide sediment delivery to coastal zones, potentially disrupting natural coastal beach accretion. However, the bluffs within the city are somewhat isolated from the shoreline because of the presence of the BNSF railway and associated shoreline armoring, altering the natural delivery of bluff sediment sources.

To better understand the implication of these changes on coastal feeder bluffs, ESA completed a parcel analysis using the City’s GIS data for geohazards to identify potential future development in very high risk landslide hazard areas, and moderate to high risk landslide hazard areas. Based on the parcel analysis, a large portion of the parcels within the City’s shoreline jurisdiction are within mapped landslide hazard areas (Table 3). Most of the parcels are already developed with residential uses. The majority of the undeveloped parcels within landslide hazard areas are located on the upland side of the BNSF railway. Many of these undeveloped parcels are too narrow to provide sufficient area for new development.

Developed parcels within landslide hazards areas that are located on large lots could have the potential for more extensive additions or, in a few cases, subdivisions. These large parcels are mainly located in the Highlands and Innis Arden neighborhoods. The Innis Arden neighborhood maintains covenants that include a number of mechanisms that limit the potential for subdivision, including access and setback standards (Innis Arden 3, 1949). The Highlands neighborhood also maintains covenants that limit the potential for subdivision, including minimum lot size standards and minimum lot area with a slope less than 20 percent (Amended By-laws of the Highlands, 2017). Although these covenants are not administered or enforced by the City of Shoreline, they serve to constrain the development potential of large lots within landslide hazard areas.

Table 3. Parcels within landslide hazard areas in shoreline jurisdiction

Mapped Landslide Hazard Areas	Total Parcels (#)	Total Area (Acres)	Undeveloped Parcels (#)	Undeveloped Parcels (% of total parcels in shoreline jurisdiction)
Very High Risk + 50-foot Buffer	97	71.4	11	7.6
Moderate to High Risk (no buffer)	62	5.1	4	2.8
Parcels without Landslide Hazard Areas	19	31.5	9	13.2

Source: City of Shoreline, 2015; King County, 2014

Due to the requirements for a detailed geologic hazard analysis by a qualified geotechnical expert and the low potential for foreseeable future development within the very high and moderate to

high risk landslide areas, it appears that the changes to the regulations will not result in an overall net loss of shoreline ecological functions.

See A-4 of Appendix A for redline/strikeout versions of City adopted critical areas standards revisions for Landslide Hazard Areas.

4.7 General Critical Areas Standards

New critical areas report standards outlined in SMC Sections 20.240.040, 20.240.080 and 20.240.082 must address several topics including: reconnaissance, delineation, analysis, mitigation, and maintenance and monitoring. Contents should include general project information, such as names, location, and site plan, as well as critical areas characterization, impacts, and mitigation plan. Geologic hazards, fish and wildlife habitat, and wetlands each have critical areas report requirements specific to the type of assessment being conducted and mitigation plan requirements specific to the type of impact. Along with the new critical areas report standards, the City requires third-party review of critical areas reports by a qualified professional when the project requires a shoreline variance application or when it is required by the shoreline provisions or Director of Community Development.

Likely Effects on Shoreline Ecological Functions

Detailed report, allowed activities, and review process standards guarantee clear and standardized implementation of regulations. These standards also require applicants to evaluate the condition and function of each critical area based on scientifically valid methods. Ultimately, this update ensures better protection of shoreline ecological functions.

See A-5 of Appendix A for redline/strikeout versions of City adopted critical areas standards revisions for new overall critical areas standards.

5. INTEGRATED CRITICAL AREAS PROVISIONS AND NO NET LOSS

As with the 2012 CIA, this analysis was guided by the three factors identified in the Ecology guidelines for evaluating cumulative impacts and no net loss:

- Current circumstances affecting the shorelines and relevant natural processes;
- Reasonably foreseeable future development and use of the shoreline; and
- Beneficial effects of any established regulatory programs under other local, state, and federal laws.

Existing shoreline conditions and relevant natural processes are consistent with those documented in the 2012 CIA with the exception of biodiversity corridors mapped within Innis Arden Reserve Park and Boeing Creek Reserve and the heron rookery south of Richmond Beach Saltwater Park that were not previously identified in the Shoreline Inventory and Characterization Report. Development proposals within State Priority Habitats and Species areas, such as biodiversity corridors and heron rookeries, are required to prepare a critical areas report and habitat management plan to assess potential impacts and propose mitigation measures. Likewise, reasonably foreseeable future shoreline development and use is generally the same. The adopted critical areas regulation changes, once integrated into the SMP, will maintain protection of shoreline ecological functions.

Several critical areas standards revisions clarify approaches to critical areas mitigation and protection—namely by revising the wetland buffer widths, wetland mitigation ratios, and critical areas report standards. The updated wetland buffer table emphasizes the requirement to provide wildlife corridors that may provide additional protection for shoreline ecological functions. A successful mitigation project often requires the amount of mitigation to be larger than the impact being mitigated for, which is beneficial to the shoreline. Detailed report standards require applicants to evaluate the condition and function of each critical area based on scientifically valid methods. These amendments would improve protection of shoreline ecological functions.

Geologic hazards standards revisions do not include a requirement to assess the functions associated with coastal bluffs which typically positively contribute towards the shoreline ecosystem. However, the bluffs where landslide hazards occur within the City's shoreline jurisdiction are somewhat isolated from the nearshore because of the presence of the BNSF railway bed and associated armoring. Development potential is limited within these landslide hazard areas due to the limited number of vacant parcels and covenants associated with the Innis Arden and Highlands neighborhoods that limit the potential for subdividing large, developed properties. Therefore, geologic hazard standards would result in no net loss of shoreline ecological functions from development.

Conclusions on the future performance of key shoreline functions as a result of the incorporation of the revised critical area standards are summarized as follows:

Hydrology: Loss in hydrological function from baseline is not expected; anticipated change from the current adopted SMP with previous critical areas standards are neutral. In most areas along the City's shoreline, modifications and development have resulted in alterations to natural hydrological functions. The updated critical areas standards would not change major protections for remaining hydrologic functions that are provided by the SMP.

Water Quality: No loss in water quality is expected. The program and critical areas revisions include many criteria to ensure that potential impacts from any allowed development are avoided or minimized.

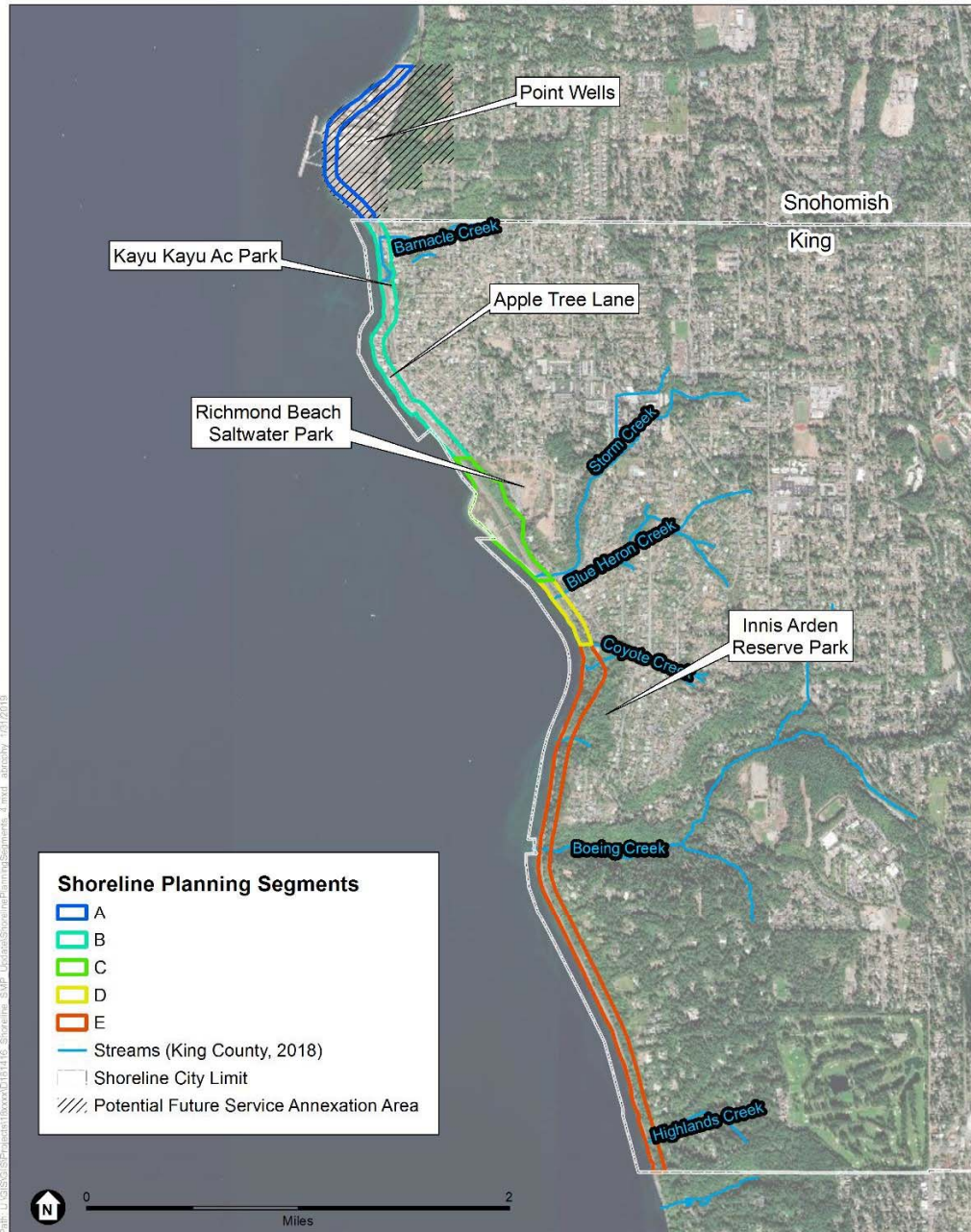
Habitat: No loss in habitat functions is expected. Habitat elements such as riparian vegetation, associated wetland and tributary stream connectivity, and organic contributions have been altered along the City's shoreline, while localized areas of high value, intact habitat remain (Boeing Creek Reserve and Innis Arden Reserve Park). Additionally, mitigation of any wetland impact would be improved by new buffer and mitigation provisions pursuant to the updated critical areas standards.

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SOURCE: City of Shoreline, 2019; ESA, 2019; King County, 2018

D181416 City of Shoreline SMP Update

Figure 1
City of Shoreline Shoreline Planning Segments
Shoreline, Washington



Appendix A

Excerpts of proposed SMC 20.240 SMP Critical Areas

A-1 Fish & Wildlife Habitat Critical Areas Section

Revised Critical Areas sections combining streams with fish and wildlife habitat and adopted State Water Typing system.

20.240.270 Fish and wildlife habitat – Classification and designation.

A. The City designates the following fish and wildlife habitat conservation areas that meet one or more of the criteria in subsection B of this section, regardless of any formal identification, as critical area, and, as such, these areas are subject to the provisions of this chapter. These areas shall be managed consistent with best available science; including WDFW's Management Recommendations for Priority Habitat and Species. The following fish and wildlife habitat conservation areas are specifically designated, and this designation does not preclude designation of additional areas as consistent with the criteria in subsection B of this section:

1. All regulated streams and wetlands and their associated buffers as determined by a qualified specialist.
2. The waters, bed and shoreline of Puget Sound up to the OHWM.

B. Fish and wildlife habitat conservation areas are those areas designated by the City based on review of the best available science; input from WDFW, the Department of Ecology, USACE, and other agencies; and any of the following criteria:

1. Areas Where State or Federally Designated Endangered, Threatened, and Sensitive Species Have a Primary Association.

a. Federally designated endangered and threatened species are those fish and wildlife species identified by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service that are in danger of extinction or threatened to become endangered. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service should be consulted for current listing status. Federally designated endangered and threatened species known to be identified and mapped by the Washington State Department of Wildlife in Shoreline include, but may not be limited to, the following:

- i. Chinook (*Oncorhynchus tshawytscha*);

ii.Southern resident orca or killer whales (*Orcinus orca*).

b.State designated endangered, threatened, and sensitive species are those fish and wildlife species native to the State of Washington that are in danger of extinction, threatened to become endangered, vulnerable, or declining and are likely to become endangered or threatened in a significant portion of their range within the State without cooperative management or removal of threats as identified by WDFW. State designated endangered, threatened, and sensitive species are periodically recorded in WAC 232-12-014 (State endangered species) and WAC 232-12-011 (State threatened and sensitive species), as amended from time to time. WDFW maintains the most current listing and should be consulted for current listing status. State designated endangered, threatened, and sensitive species known to be identified and mapped by WDFW in Shoreline include, but may not be limited to, the following:

i.Northern goshawk (*Accipiter gentilis*);

ii.Purple martin (*Progne subis*).

2.State Priority Habitats and Species. Priority habitats and species are considered to be priorities for conservation and management. Priority species require protective measures for their perpetuation due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority habitats are those habitat types or elements with unique or significant value to a diverse assemblage of species. A priority habitat may consist of a unique vegetation type or dominant plant species, a described successional stage, or a specific structural element. Priority habitats and species are identified by WDFW in the Priority Habitats and Species List. Priority habitats and species known to be identified and mapped by WDFW in Shoreline include, but may not be limited to, the following:

a.Biodiversity areas and corridors identified and mapped along Boeing Creek and in and around Innis Arden Reserve Park;

b.Chinook/fall chinook (*Oncorhynchus tshawytscha*);

c.Coho (*Oncorhynchus kisutch*);

- d. Dungeness crab (*Cancer magister*);
- e. Estuarine intertidal aquatic habitat;
- f. Geoduck (*Panopea abrupta*);
- g. Northern goshawk (*Accipiter gentilis*);
- h. Pacific sand lance (*Ammodytes hexapterus*);
- i. Purple martin (*Progne subis*);
- j. Resident coastal cutthroat (*Oncorhynchus clarki*);
- k. Surf smelt (*Hypomesus pretiosus*); and
- l. Winter steelhead (*Oncorhynchus mykiss*).

3. **Commercial and Recreational Shellfish Areas.** These areas include all public and private tidelands or bedlands suitable for shellfish harvest, including shellfish protection districts established pursuant to Chapter 90.72 RCW, as amended from time to time.

4. Kelp and eelgrass beds and herring and smelt spawning areas.

5. **Waters of the State.** Waters of the State include lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the State of Washington, as classified in WAC 222-16-030, as amended from time to time. Streams are those areas where surface waters produce a defined channel or bed, not including irrigation ditches, canals, storm or surface water runoff devices or other entirely artificial watercourses, unless such watercourses are used by fish or are used to convey streams naturally occurring prior to construction. A channel or bed need not contain water year-round; provided, that there is evidence of at least intermittent flow during years of normal rainfall. Streams shall be classified in accordance with the DNR water typing system (WAC 222-16-030) hereby adopted in its entirety by reference and summarized as follows:

a. Type S: streams inventoried as “shorelines of the State” under the SMA and the rules promulgated pursuant to the SMA, as amended from time to time;

b. Type F: streams which contain fish habitat. Not all streams that are known to exist with fish habitat support anadromous fish populations, or have the potential for anadromous fish occurrence because of obstructions, blockages or access restrictions resulting from existing conditions. Therefore, in order to provide special consideration of and increased protection for anadromous fish in the application of development standards, shoreline streams shall be further classified as follows:

i. **Anadromous Fish-Bearing Streams (Type F-Anadromous).** These streams include:

(A) Fish-bearing streams where naturally recurring use by anadromous fish populations has been documented by a government agency;

(B) Streams that are fish passable or have the potential to be fish passable by anadromous populations, including those from Lake Washington or Puget Sound, as determined by a qualified professional based on review of stream flow, gradient and natural barriers (i.e., natural features that exceed jumping height for salmonids), and criteria for fish passability established by WDFW; and

(C) Streams that are planned for restoration in a six-year capital improvement plan adopted by a government agency or planned for removal of the private dams that will result in a fish-passable connection to Lake Washington or Puget Sound; and

ii. **Nonanadromous Fish-Bearing Streams (Type F-Nonanadromous).** These include streams which contain existing or potential fish habitat, but do not have the potential for anadromous fish use due to natural barriers to fish passage, including streams that contain resident or isolated fish populations.

The general areas and stream reaches with access for anadromous fish are indicated in the City of Shoreline Stream and Wetland Inventory and Assessment

(2004) and basin plans. The potential for anadromous fish access shall be confirmed in the field by a qualified professional as part of a critical area report;

c.Type Np: perennial nonfish habitat streams;

d.Type Ns: seasonal nonfish habitat streams; and

e.Piped stream segments: those segments of streams, regardless of their type, that are fully enclosed in an underground pipe or culvert.

A-2 Physically Separated and Functionally Isolated Stream and/or Wetland Buffer

Revised Critical Areas section allowances for development in stream and wetland buffers that are separated or isolated from the development.

20.240.280 Fish and wildlife habitat – Required buffer areas.

6. Development Proposals within Physically Separated and Functionally Isolated Stream Buffers. Consistent with the definition of “buffers” (SMC 20.20.012), areas that are functionally isolated and physically separated from stream due to existing, legally established roadways and railroads or other legally established structures or paved areas eight feet or more in width that occur between the area in question and the stream shall be considered physically isolated and functionally separated stream buffers. Once determined by the Director, based on a submitted critical area report to be a physically separated and functionally isolated stream buffer, development proposals shall be allowed in these areas..

20.240.330 Wetlands – Required buffer areas.

10. Development Proposals within Physically Separated and Functionally Isolated Wetland Buffers. Consistent with the definition of “buffers” (SMC 20.20.012), areas that are functionally isolated and physically separated from wetland due to existing, legally established roadways, paved trails eight feet or more in width, or other legally established structures or paved areas eight feet or more in width that occur between the area in question and the wetland shall be considered physically isolated and functionally separated wetland buffers. Once determined by the Director, based on a submitted critical area report to be a physically separated and functionally isolated wetland buffer, development proposals shall be allowed in these areas.

A-3Wetland Standards

Revised Critical Areas section allowances for development in stream and wetland buffers that are separated or isolated from the development..

20.240.320 Wetlands – Designation and rating.

A. **Designation.** All areas meeting the definition of a wetland and identification criteria as wetlands pursuant to SMC 20.240.322, regardless of any formal identification, are hereby designated critical areas and are subject to the provisions of this chapter.

B. **Rating.** All wetlands shall be rated by a qualified professional according to the current Department of Ecology wetland rating system, as set forth in the Washington State Wetland Rating System for Western Washington 2014 (Department of Ecology Publication No. 014-06-029, or as revised). Wetland rating categories shall be applied as the wetland exists on the date of adoption of the rating system by the City, as the wetland naturally changes thereafter, or as the wetland changes in accordance with permitted activities.

1. **Category I.** Category I wetlands are those that represent unique or rare wetland types, are more sensitive to disturbance than most wetlands, are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime, or provide a high level of functions. The following types of wetlands are Category I:

a. Relatively undisturbed estuarine wetlands larger than one acre;

b. Wetlands of high conservation value that are identified by scientists of the Washington Natural Heritage Program/DNR;

c. Bogs;

d. Mature and old-growth forested wetlands larger than one acre;

e. Wetlands in coastal lagoons; and

f. Wetlands that perform many functions well (scoring 23 points or more based on functions).

2. **Category II.** Category II wetlands are those that are difficult, though not impossible, to replace and provide high levels of some functions. The following types of wetlands are Category II:

- a. Estuarine wetlands smaller than one acre, or disturbed estuarine wetlands larger than one acre;
- b. Interdunal wetlands larger than one acre or those found in a mosaic of wetlands; and
- c. Wetlands with a moderately high level of functions (scoring between 20 and 22 points).

3. **Category III.** Category III wetlands are those with a moderate level of functions, generally have been disturbed in some ways, can often be adequately replaced with a well-planned mitigation project, and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands. The following types of wetlands are Category III:

- a. Wetlands with a moderate level of functions (scoring between 16 and 19 points); or
- b. Interdunal wetlands between 0.1 and one acre.

4. **Category IV.** Category IV wetlands are those with the lowest levels of functions (scoring below 16 points) and are often heavily disturbed. These are wetlands that should be able to replace, or in some cases to improve. However, experience has shown that replacement cannot be guaranteed in any specific case. These wetlands may provide some important functions, and also need to be protected.

C. **Illegal Modifications.** Wetland rating categories shall not change due to illegal modifications or alterations. A wetland's category shall be based on the pre-modification/alteration analysis of the wetland.

D. At the time of adoption of the critical area amendments to this Master Program, Ordinance 856, there were no identified Category I wetlands identified within the City. If this category of wetland is subsequently identified, any applicable standards may temporarily be used on an

interim basis by the Director based on Washington State guidance on protection of the identified type of resource until such time as permanent shoreline regulations can be established.

20.240.324 Wetlands – Development standards.

A. Activities and uses shall be prohibited in wetlands and wetland buffers, except as provided for in this chapter.

B. **Activities Allowed in Wetlands.** The activities listed below are allowed in wetlands pursuant to SMC 20.240.040, Allowed activities, and subject to applicable permit approvals. These activities do not require submission of a critical area report, except where such activities result in a net loss of the shoreline ecological function provided by a wetland or wetland buffer. These activities include:

1. Conservation or preservation of soil, water, vegetation, fish, shellfish, and/or other wildlife that does not entail changing the structure or functions of the existing wetland.
2. The harvesting of wild crops in a manner that is not injurious to natural reproduction of such crops and provided the harvesting does not require tilling of soil, planting of crops, chemical applications, or alteration of the wetland by changing existing topography, water conditions, or water sources.
3. Drilling for utilities/utility corridors under a wetland, with entrance/exit portals located completely outside of the wetland buffer; provided, that the drilling does not interrupt the ground water connection to the wetland or percolation of surface water down through the soil column. Specific studies by a hydrologist are necessary to determine whether the ground water connection to the wetland or percolation of surface water down through the soil column will be disturbed.
4. Enhancement of a wetland through the select removal of nonnative invasive plant species. Removal of invasive plant species shall be restricted to hand labor and handheld equipment unless permits from the appropriate regulatory agencies have been obtained for approved biological or chemical treatments. Not more than 500 square feet of area may be cleared, as calculated cumulatively over one year, on private property without a permit. All

removed plant material shall be taken away from the site and disposed of appropriately. Plants that appear on the Washington State Noxious Weed Control Board list of noxious weeds or the King County Noxious Weed List shall be handled and disposed of according to a noxious weed control plan appropriate to that species. Revegetation with appropriate native species at natural densities is allowed in conjunction with removal of invasive plant species.

5. Permitted alteration to a legally constructed structure existing within a wetland or wetland buffer that does not increase the footprint of the development or hardscape or increase the impact to a wetland or wetland buffer, consistent with SMC 20.220.150.

C. **Category I Wetlands.** Development activities and uses that result in alteration of Category I wetlands and their associated buffers shall be prohibited subject to the shoreline variance provisions of SMC 20.220.040.

D. **Category II and III Wetlands.** Development activities and uses that result in alteration of Category II and III wetlands shall be prohibited subject to the shoreline variance provisions of SMC 20.220.040 and the following criteria:

1. The basic project proposed cannot reasonably be accomplished on another site or sites in the general region while still successfully avoiding or resulting in less adverse impact on a wetland;

2. All on-site alternative designs that would avoid or result in less adverse impact on a wetland or its buffer, such as a reduction to the size, scope, configuration, or density of the project are not feasible; and

3. Full compensation for the loss of acreage and functions and values of wetland and buffers due to unavoidable impacts shall be provided in compliance with the mitigation performance standards and requirements of this chapter.

E. **Category IV Wetlands, Except Small Hydrologically Isolated Wetlands.** Development activities and uses that result in unavoidable impacts may be permitted in Category IV wetlands and associated buffers in accordance with an approved critical area(s) report and compensatory mitigation plan, and only if the proposed activity is consistent with the purpose and intent of the SMA, this Master Program, and this chapter. Full compensation for the loss of

acreage and functions and values of wetland and buffers shall be provided in compliance with the mitigation performance standards and requirements of these regulations.

F. Small, Hydrologically Isolated Category IV Wetlands. The Director may allow small, hydrologically isolated Category IV wetlands to be exempt from the avoidance sequencing provisions of SMC 20.240.053 and subsection D of this section and allow alteration of such wetlands; provided, that a submitted critical area report and mitigation plan provides evidence that all of the following conditions are met:

1. The wetland is less than 1,000 square feet in area;
2. The wetland is a low quality Category IV wetland with a habitat score of less than three points in the adopted rating system;
3. The wetland does not contain habitat identified as essential for local populations of priority species identified by WDFW or species of local importance which are regulated as fish and wildlife habitat conservation areas in Chapter 20.240, Subchapter 3;
4. The wetland is not associated with riparian areas or buffers;
5. The wetland is not part of a wetland mosaic; and
6. A mitigation plan to replace lost wetland functions and values is developed, approved, and implemented consistent with SMC 20.240.350.

G. Subdivisions. The subdivision and/or short subdivision of land in wetlands and associated buffers are subject to the following:

1. Land that is located wholly within a wetland and/or its buffer may not be subdivided; and
2. Land that is located partially within a wetland and/or its buffer may be subdivided; provided, that an accessible and contiguous portion of each new lot is:
 - a. Located outside of the wetland and its buffer; and
 - b. Meets the minimum lot size requirements of SMC 20.50.020.

20.240.330 Wetlands – Required buffer areas.

A. **Buffer Requirements.** The standard buffer widths in Table 20.240.330(A)(1) have been established in accordance with the best available science. The buffer widths shall be determined based on the category of wetland and the habitat score as assigned by a qualified wetland professional using the Washington State Wetland Rating System for Western Washington.

1. The use of the standard buffer widths requires the implementation of the mitigation measures in Table 20.240.330(A)(2), where applicable to the development type, to minimize the impacts of the adjacent land uses.

2. If an applicant chooses not to apply the appropriate mitigation measures in Table 20.240.330(A)(2), then a 33 percent increase in the width of all buffers is required. For example, a 75-foot buffer with the mitigation measures would be a 100-foot buffer without them.

3. The standard buffer widths assume that the buffer is a relatively intact native plant community in the buffer zone adequate to protect the wetland functions and values at the time of the proposed activity. If the existing buffer is bare ground, sparsely vegetated, or vegetated with nonnative or invasive species that do not perform needed functions, then the applicant shall either develop and implement a wetland buffer restoration or enhancement plan to maintain the standard width to create the appropriate plant community or the buffer shall be widened to ensure that adequate functions of the buffer are provided.

Table 20.240.330(A)(1) Wetland Buffer Requirements

Wetland Category	Buffer Width According to Habitat Score			
	Habitat Score	Habitat Score	Habitat Score	Habitat Score
	of 3 – 4	of 5	of 6 – 7	of 8 – 9
Category I: Based on total score or Forested	75 ft	105 ft	165 ft	225 ft
Category I: Estuarine	150 ft (no change based on habitat scores)			
Category II: Based on total score	75 ft	105 ft	165 ft	225 ft

Category III (all)	60 ft	105 ft	165 ft	225 ft
Category IV (all)	40 ft (no change based on habitat scores)			

Table 20.240.330(A)(2) Required Measures to Minimize Impacts to Wetlands (Measures are required, where applicable to a specific proposal)

Disturbance	Activities and Uses That Cause Disturbances	Required Measures to Minimize Impacts
Lights	<ul style="list-style-type: none"> • Parking lots • Warehouses • Manufacturing • Residential 	<ul style="list-style-type: none"> • Direct lights away from wetland.
Noise	<ul style="list-style-type: none"> • Manufacturing • Residential 	<ul style="list-style-type: none"> • Locate activity that generates noise away from wetland. • If warranted, enhance existing buffer with native vegetation plantings adjacent to noise source. • For activities that generate relatively continuous, potentially disruptive noise, such as certain heavy industry or mining, establish an additional 10 ft heavily vegetated buffer strip immediately adjacent to the outer wetland buffer.
Toxic runoff*	<ul style="list-style-type: none"> • Parking lots • Roads • Manufacturing • Residential areas • Application of agricultural pesticides • Landscaping 	<ul style="list-style-type: none"> • Route all new, untreated runoff away from wetland while ensuring wetland is not dewatered. • Establish covenants limiting use of pesticides and fertilizers within 150 ft of wetland. • Apply integrated pest management.
Stormwater runoff	<ul style="list-style-type: none"> • Parking lots • Roads • Manufacturing 	<ul style="list-style-type: none"> • Retrofit stormwater detention and treatment for roads and existing adjacent development.

Change in water regime	<ul style="list-style-type: none"> • Residential areas • Commercial • Landscaping • Impermeable surfaces • Lawns • Tilling 	<ul style="list-style-type: none"> • Prevent channelized flow from lawns that directly enters the buffer. • Use low intensity development techniques (per PSAT publication on LID techniques). • Infiltrate or treat, detain, and disperse into buffer new runoff from impervious surfaces and new lawns.
Pets and human disturbance	<ul style="list-style-type: none"> • Residential areas 	<ul style="list-style-type: none"> • Use privacy fencing OR plant dense vegetation to delineate buffer edge and to discourage disturbance using vegetation appropriate for the ecoregion. • Place wetland and its buffer in a separate tract or protect with a conservation easement.
Dust	<ul style="list-style-type: none"> • Tilled fields 	<ul style="list-style-type: none"> • Use best management practices to control dust.
Disruption of corridors or connections		<ul style="list-style-type: none"> • Maintain connections to off-site areas that are undisturbed. • Restore corridors.

* These examples are not necessarily adequate for minimizing toxic runoff if threatened or endangered species are present at the site. Additional mitigation measures may be required based on recommendation of a qualified professional, third party review, or State agency recommendations.

4. Increased Wetland Buffer Area Width. Buffer widths shall be increased, on a case-by-case basis as determined by the Director, when a larger buffer is necessary to protect the shoreline ecological functions provided by the wetland's functions and values. This determination shall be supported by a critical area report, prepared by a qualified professional at the applicant's expense, showing that it is reasonably related to protection of the functions and values of the wetland and the shoreline. The critical area report shall include, but not be limited to, the following criteria:

a. The wetland is used by a plant or animal species listed by the Federal government or the State as endangered, threatened, candidate, sensitive, monitored, or documented priority species or habitats, or the wetland is essential or outstanding habitat for those species or has unusual nesting or resting sites such as heron rookeries or raptor nesting trees; or

b. The adjacent land has slopes greater than 15 percent and is susceptible to severe erosion, and erosion-control measures will not effectively prevent adverse wetland impacts; or

c. The adjacent land has minimal vegetative cover. In lieu of increasing the buffer width where existing buffer vegetation is inadequate to protect the wetland functions and values, development and implementation of a wetland buffer restoration/enhancement plan in accordance with SMC 20.240.350 may be substituted.

5. Buffer averaging to improve wetland functions and values may be permitted when all of the following conditions are met:

a. The wetland has significant differences in characteristics that affect its habitat functions, such as a wetland with a forested component adjacent to a degraded emergent component or is a “dual-rated” wetland with a Category I area adjacent to a lower rated area;

b. The buffer is increased adjacent to the higher functioning area of habitat or more sensitive portion of the wetland and decreased adjacent to the lower functioning or less sensitive portion as demonstrated by a critical areas report from a qualified wetland professional;

c. The total area of the buffer after averaging is equal to the area required without averaging; and

d. The buffer width is not reduced by more than 25 percent in any location.

6. Buffer averaging, through a shoreline variance consistent with 20.220.040, may be permitted when all of the following are met:

- a. There are no feasible alternatives to the site design that could be accomplished without buffer averaging;
- b. The averaged buffer will not result in degradation of the wetland's functions and values as demonstrated by a critical areas report from a qualified wetland professional;
- c. The total buffer area after averaging is equal to the area required without averaging; and
- d. The buffer at its narrowest point is never less than either three-fourths of the required width or 75 feet for Category I and II, 50 feet for Category III, and 25 feet for Category IV, whichever is greater.

B. Measurement of Wetland Buffers. All buffers shall be measured perpendicular from the wetland boundary as surveyed in the field. The buffer for a wetland created, restored, or enhanced as compensation for approved wetland alterations shall be the same as the buffer required for the category of the created, restored, or enhanced wetland.

C. Buffers on Mitigation Sites. All mitigation sites shall have buffers consistent with the buffer requirements of this chapter. Buffers shall be based on the expected or target category of the proposed wetland mitigation site.

D. Buffer Maintenance. Except as otherwise specified or allowed in accordance with this chapter, wetland buffers shall be retained in an undisturbed or enhanced condition. In the case of compensatory mitigation sites, removal of invasive nonnative weeds is required for the duration of the required monitoring period.

E. Impacts to Buffers. Requirements for the compensation for impacts to buffers are outlined in SMC 20.240.350.

F. Overlapping Critical Area Buffers. If buffers for two contiguous critical areas overlap (such as buffers for a stream and a wetland), the wider buffer applies.

G. Allowed Wetland Buffer Uses. The following uses may be allowed within a wetland buffer in accordance with the review procedures of this chapter; provided such uses are not

prohibited by any other applicable law and such uses are conducted in a manner so as to minimize impacts to the buffer and adjacent wetland:

1. Conservation and Restoration Activities. Conservation or restoration activities aimed at protecting the soil, water, vegetation, or wildlife.

2. Passive Recreation. Passive recreation facilities designed and in accordance with an approved critical area report, including:

a. Walkways and trails; provided, that those pathways are limited to minor crossings having no adverse impact on water quality. Pathways should be generally parallel to the perimeter of the wetland, located only in the outer 25 percent of the wetland buffer area, and located to avoid removal of significant trees. Pathways should be limited to pervious surfaces no more than five feet in width for pedestrian use only. Raised boardwalks utilizing nontreated pilings may be acceptable;

b. Wildlife viewing structures.

3. Educational and scientific research activities.

4. Normal and routine maintenance and repair of any existing public or private facilities within an existing right-of-way, provided, that the maintenance or repair does not increase the footprint or use of the facility or right-of-way.

5. The harvesting of wild crops in a manner that is not injurious to natural reproduction of such crops, and provided the harvesting does not require tilling of soil, planting of crops, chemical applications, or alteration of the wetland by changing existing topography, water conditions, or water sources.

6. Drilling for utilities/utility corridors under a buffer, with entrance/exit portals located completely outside of the wetland buffer boundary; provided, that the drilling does not interrupt the ground water connection to the wetland or percolation of surface water down through the soil column. Specific studies by a hydrologist are necessary to determine whether the ground water connection to the wetland or percolation of surface water down through the soil column is disturbed.

7. Enhancement of a wetland through the select removal of nonnative invasive plant species. Removal of invasive plant species shall be restricted to hand labor and handheld equipment unless permits from the appropriate regulatory agencies have been obtained for approved biological or chemical treatments. Not more than 1,500 square feet of area may be cleared, as calculated cumulatively over one year, on private property without a permit. All removed plant material shall be taken away from the site and disposed of appropriately. Plants that appear on the Washington State Noxious Weed Control Board list of noxious weeds or the King County Noxious Weed List shall be handled and disposed of according to a noxious weed control plan appropriate to that species. Revegetation with appropriate native species at natural densities is allowed in conjunction with removal of invasive plant species.

8. **Stormwater Management Facilities.** Stormwater management facilities are limited to stormwater dispersion outfalls, bioswales, and other low-impact facilities consistent with the adopted stormwater manual. Stormwater management facilities are not allowed in buffers of Category I or II wetlands. Facilities may be allowed within the outer 25 percent of the buffer of Category III or IV wetlands only; provided, that:

a. No other location is feasible; and

b. The location of such facilities will not degrade the functions or values of the wetland.

9. **Nonconforming Uses or Structures.** Repair and maintenance of nonconforming uses or structures, where legally established within the buffer, provided such uses or structures do not increase the degree of nonconformity, consistent with SMC 20.220.150.

10. **Development Proposals within Physically Separated and Functionally Isolated Wetland Buffers.** Consistent with the definition of “buffers” (SMC 20.20.012), areas that are functionally isolated and physically separated from wetland due to existing, legally established roadways, paved trails eight feet or more in width, or other legally established structures or paved areas eight feet or more in width that occur between the area in question and the wetland shall be considered physically isolated and functionally separated wetland buffers. Once determined by the Director, based on a submitted critical area report

to be a physically separated and functionally isolated wetland buffer, development proposals shall be allowed in these areas.

H. **Signs and Fencing of Wetlands and Buffers.**

1. **Temporary Markers.** The outer perimeter of the wetland buffer and the clearing limits identified by an approved permit or authorization shall be marked in the field with temporary “clearing limits” fencing in such a way as to ensure that no unauthorized intrusion will occur. The marking is subject to inspection by the Director prior to the commencement of permitted activities during the preconstruction meeting required under SMC 20.50.330(E). This temporary marking and fencing shall be maintained throughout construction and shall not be removed until permanent signs, if required, are in place.

2. **Permanent Signs.** As a condition of any permit or authorization issued pursuant to this chapter, the Director may require the applicant to install permanent signs along the boundary of a wetland or buffer, when recommended in a critical area report or otherwise required by the provisions of this chapter.

a. Permanent signs shall be made of an enamel-coated metal face and attached to a metal post or another nontreated material of equal durability. Signs shall be posted at an interval of one per lot or every 50 feet, whichever is less, and shall be maintained by the property owner in perpetuity. The signs shall be worded consistent with the text specified in SMC 20.240.110 or with alternative language approved by the Director.

b. The provisions of subsection (H)(2)(a) of this section may be modified as necessary to assure protection of sensitive features.

3. **Fencing.** Fencing installed as part of a proposed activity or as required in this subsection shall be designed so as to not interfere with species migration, including fish runs, and shall be constructed in a manner that minimizes impacts to the wetland and associated habitat. Permanent fencing shall be required at the outer edge of the critical area buffer under the following circumstances; provided, that the Director may waive this requirement:

a. As part of any development proposal for subdivisions, short plats, multifamily, mixed use, and commercial development where the Director determines that such

fencing is necessary to protect the functions of the critical area; provided, that breaks in permanent fencing may be allowed for access to permitted buffer uses (subsection G of this section);

b. As part of development proposals for parks where the adjacent proposed use is active recreation and the Director determines that such fencing is necessary to protect the functions of the critical area;

c. When buffer averaging is part of a development proposal; or

d. At the Director's discretion to protect the values and functions of a critical area as demonstrated in a critical area report. If found to be necessary, the Director shall condition any permit or authorization issued pursuant to this chapter to require the applicant to install a permanent fence at the edge of the habitat conservation area or buffer, when fencing will prevent future impacts to the habitat conservation area;

e. The applicant shall be required to install a permanent fence around the wetland buffer when domestic grazing animals, only as allowed under SMC 20.40.240, are present or may be introduced on site.

20.240.340 Wetlands – Critical area report requirements.

A. Report Required. If the Director determines that the site of a proposed development includes, is likely to include, or is adjacent to, a wetland, a wetland critical area report shall be required. Critical area report requirements for wetland areas are generally met through submission to the Director of one or more wetland critical area reports. In addition to the general critical area report requirements of SMC 20.240.080, critical area reports for wetlands shall meet the requirements of this section. Critical area reports for two or more types of critical areas shall meet the report requirements for each relevant type of critical area.

B. Preparation by a Qualified Professional. Critical area reports for wetlands shall be prepared and signed by a qualified professional who is a certified wetland scientist or a noncertified wetland scientist with the minimum required experience, per SMC 20.20.042, in the field of wetland science and with experience preparing wetland delineation, impact assessments, and mitigation plans.

C. Third Party Review Required. Critical areas studies and reports on wetland areas shall be subject to third party review consistent with SMC 20.240.080(C) and in any of the additional following circumstances:

1. Compensatory mitigation is required for impacts to Category I, II, or III wetlands and or buffers; or
2. Compensatory mitigation is required for impacts to Category IV wetlands.

D. Minimum Report Contents for Wetlands. The written critical area report(s) and accompanying plan sheet(s) shall contain the following information, at a minimum:

1. The minimum report contents required per SMC 20.240.080(E);
2. Documentation of any fieldwork performed on the site, including field data sheets for delineations, rating system forms, baseline hydrologic data, site photos, etc.;
3. A description of the methodologies used to conduct the wetland delineations, ratings, or impact analyses including references;
4. **Site Plans.** A copy of the site plan sheet(s) for the project shall be included with the written report and shall include, at a minimum:
 - a. Maps (to scale) depicting delineated and surveyed wetland(s) and required buffers on site, including buffers for off-site critical areas that extend onto the project site; the development proposal; other critical areas; clearing and grading limits; areas of proposed impacts to wetlands and/or buffers (include square footage estimates); and
 - b. A depiction of the proposed stormwater management facilities and outlets (to scale) for the development, including estimated areas of intrusion into the buffers of any critical areas. The written report shall contain a discussion of the potential impacts to the wetland(s) associated with anticipated hydroperiod alterations from the project;
5. For each wetland identified on site and off site within 300 feet of the project site provide: the wetland rating, including a description of and score for each function, per wetland ratings (SMC 20.240.320(B)); required buffers (SMC 20.240.330); hydrogeomorphic classification; wetland acreage based on a professional survey from the

field delineation (acres for on-site portion and entire wetland area including off-site portions); Cowardin classification of vegetation communities; habitat elements; soil conditions based on site assessment and/or soil survey information; and to the extent possible, hydrologic information such as location and condition of inlet/outlets (if inlets/outlets can be legally accessed), estimated water depths within the wetland, and estimated hydroperiod patterns based on visual cues (e.g., algal mats, drift lines, flood debris, etc.). Provide acreage estimates, classifications, and ratings based on entire wetland complexes, not only the portion present on the proposed project site;

6.A description of the proposed actions, including an estimation of acres of impacts to wetlands and buffers based on the field delineation and survey and an analysis of site development alternatives, including a no-development alternative;

7.An assessment of the probable cumulative impacts to the wetlands and buffers resulting from the proposed development;

8.A description of reasonable efforts made to apply mitigation sequencing pursuant to SMC 20.240.053(A) to avoid, minimize, and mitigate impacts to critical areas and a discussion of measures, including avoidance, minimization, and compensation, proposed to preserve existing wetlands and restore any wetlands that were degraded prior to the current proposed land-use activity;

9.A conservation strategy for habitat and native vegetation that addresses methods to protect and enhance on-site habitat and wetland functions; and

10.An evaluation of the functions of the wetland and adjacent buffer. Include reference for the method used and data sheets.

E. **Additional Information.** When appropriate due to the proposed impacts or the project area conditions, the Director may also require the critical area report to include:

1.Where impacts are proposed, mitigation plans consistent with the requirements of SMC 20.240.082 and the wetland mitigation performance standards and requirements of SMC 20.240.350;

2. A request for consultation with WDFW, the Department of Ecology, local Native American Indian tribes, and/or other appropriate agency;
3. Copies of the joint aquatic resource permit application (JARPA) and related approvals, such as a hydraulic project approval (HPA) from the DFW, when applicable to the project; and
4. Detailed surface and subsurface hydrologic features both on and adjacent to the site.

20.240.350 Wetlands – Compensatory mitigation performance standards and requirements.

A. Requirements for Compensatory Mitigation.

1. Compensatory mitigation for alterations to wetlands shall be used only for impacts that cannot be avoided or minimized and shall achieve equivalent or greater shoreline ecological and biologic functions. Compensatory mitigation plans shall be consistent with Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1), (Department of Ecology Publication No. 06-06-011b, March 2006, or as revised).
2. Mitigation ratios shall be consistent with subsection E of this section.
3. Mitigation requirements may also be determined using the credit/debit tool described in “Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington: Operational Draft” (Department of Ecology Publication No. 10-06-011, February 2011, or as revised) consistent with subsection E of this section.

B. Compensating for Lost or Impacted Functions. Compensatory mitigation shall address the shoreline ecological functions and the wetland or wetland buffer functions and values affected by the proposed project, with an intention to achieve functional equivalency or improvement of functions and values. The goal shall be for the compensatory mitigation to provide similar shoreline ecological functions and wetland functions and values as those lost, except when either:

1. The lost wetland provides minimal functions and values, and the proposed compensatory mitigation action(s) will provide equal or greater functions and values or

will provide functions and values shown to be limiting within a watershed through a formal Washington State watershed assessment plan or protocol; or

2. Out-of-kind replacement of wetland type or functions and values will best meet watershed goals formally identified by the City, such as replacement of historically diminished wetland types.

C. **Preference of Mitigation Actions.** Methods to achieve compensation for wetland functions and values shall be approached in the following order of preference:

1. **Restoration.** Restoration of wetlands.

2. **Creation.** Creation (establishment) of wetlands on disturbed upland sites, such as those with vegetative cover consisting primarily of nonnative species. This should be attempted only when there is an adequate source of water and it can be shown that the surface and subsurface hydrologic regime is conducive to the wetland community that is anticipated in the design.

3. **Enhancement.** Enhancement of significantly degraded wetlands in combination with restoration or creation. Enhancement alone will result in a loss of wetland acreage and is less effective at replacing the functions and values lost. Enhancement should be part of a mitigation package that includes replacing the impacted area and meeting appropriate ratio requirements.

4. **Preservation.** Preservation of high-quality, at-risk wetlands as compensation is generally acceptable when done in combination with restoration, creation, or enhancement; provided, that a minimum of 1:1 acreage replacement is provided by reestablishment or creation. Preservation of high-quality, at-risk wetlands and habitat may be considered as the sole means of compensation for wetland impacts when the following criteria are met:

a. Wetland impacts will not have a significant adverse impact on habitat for listed fish, or other ESA-listed species;

b. There is no net loss of habitat functions within the watershed or basin;

c. Mitigation ratios for preservation as the sole means of mitigation shall generally start at 20:1. Specific ratios should depend upon the significance of the preservation project and the quality of the wetland resources lost;

d. The impact area is small (generally less than one-half acre) and/or impacts are occurring to a low-functioning system (Category III or IV wetland); and

e. All preservation sites shall include buffer areas adequate to protect the habitat and its functions from encroachment and degradation.

D. Type and Location of Compensatory Mitigation. Unless it is demonstrated that a higher level of ecological functioning would result from an alternative approach, compensatory mitigation for ecological functions shall be either in kind and on site, or in kind and within the same stream reach, sub-basin, or drift cell (if estuarine wetlands are impacted). Compensatory mitigation actions shall be conducted within the same sub-drainage basin and on the site of the alteration, except when all of the following apply:

1. There are no reasonable opportunities on site or within the sub-drainage basin (e.g., on-site options would require elimination of high-functioning upland habitat), or opportunities on site or within the sub-drainage basin do not have a high likelihood of success based on a determination of the capacity of the site to compensate for the impacts.

Considerations should include:

a. Anticipated replacement ratios for wetland mitigation;

b. Buffer conditions and proposed widths;

c. Available water to maintain anticipated hydrogeomorphic classes of wetlands when restored; and

d. Proposed flood storage capacity, and potential to mitigate riparian fish and wildlife impacts (such as connectivity);

2. Off-site mitigation has a greater likelihood of providing equal or improved wetland functions than the impacted wetland;

3. Off-site locations shall be in the same sub-drainage basin, unless watershed goals for water quality, flood storage or conveyance, habitat, or other wetland functions have been established by the City and strongly justify location of mitigation at another site; and

4. The design for the compensatory mitigation project needs to be appropriate for its location (i.e., position in the landscape). Therefore, compensatory mitigation should not result in the creation, restoration, or enhancement of an atypical wetland. An atypical wetland refers to a compensation wetland (e.g., created or enhanced) that does not match the type of existing wetland that would be found in the geomorphic setting of the site (i.e., the water source(s) and hydroperiod proposed for the mitigation site are not typical for the geomorphic setting). Likewise, it should not provide exaggerated morphology or require a berm or other engineered structures to hold back water. For example, excavating a permanently inundated pond in an existing, seasonally saturated or inundated wetland is one example of an enhancement project that could result in an atypical wetland. Another example would be excavating depressions in an existing wetland on a slope, which would require the construction of berms to hold the water.

E. Wetland Mitigation Ratios¹.

Table 20.240.350(G). Wetland mitigation ratios apply when impacts to wetlands cannot be avoided or are otherwise allowed consistent with the provisions of this chapter.

Category and Type of Wetland²	Creation or Reestablishment (Area – in square feet)	Rehabilitation (Area – in square feet)	Enhancement (Area – in square feet)	Preservation (Area – in square feet)
Category I: Based on total score for functions	4:1	8:1	16:1	20:1
Category I: Mature forested	6:1	12:1	24:1	24:1
Category I: Estuarine	Case-by-case	6:1	Case-by-case	Case-by-case

Category II: Based on total score for functions	3:1	6:1	12:1	20:1
Category III (all)	2:1	4:1	8:1	15:1
Category IV (all)	1.5:1	3:1	6:1	10:1

¹ Ratios for rehabilitation and enhancement may be reduced when combined with 1:1 replacement through creation or reestablishment. See Table 1a or 1b, Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance – Version 1 (Department of Ecology Publication No. 06-06-011a, March 2006, or as revised).

² Category and rating of wetland as determined consistent with SMC 20.240.320(B).

F. **Buffer Mitigation Ratios.** Impacts to buffers shall be mitigated at a 1:1 ratio. Compensatory buffer mitigation shall replace those buffer functions lost from development.

G. **Mitigation Performance Standards.** The performance standards in this section shall be incorporated into mitigation plans submitted to the City for impacts to wetlands. The following performance standards shall apply to any mitigations proposed within Category I, II, III and IV wetlands and their buffers. Modifications to these performance standards consistent with the guidance in Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1) (Department of Ecology Publication No. 06-06-011b, March 2006, or as revised) may be considered for approval by the Director as alternatives to the following standards:

- 1.Plants indigenous to the region (not introduced or foreign species) shall be used.
- 2.Plant selection shall be consistent with the existing or projected hydrologic regime, including base water levels and stormwater event fluctuations.
- 3.Plants should be commercially available or available from local sources.
- 4.Plant species high in food and cover value for fish and wildlife shall be used.

5. Mostly perennial species should be planted.
6. Committing significant areas of the site to species that have questionable potential for successful establishment shall be avoided.
7. Plant selection shall be approved by a qualified professional.
8. The following standards shall apply to wetland design and construction:
 - a. Water depth shall not exceed six and one-half feet (two meters).
 - b. The grade or slope that water flows through the wetland shall not exceed six percent.
 - c. Slopes within the wetland basin and the buffer zone shall not be steeper than 3:1 (horizontal to vertical).
 - d. The wetland (excluding the buffer area) should not contain more than 60 percent open water as measured at the seasonal high water mark.
9. Substrate should consist of a minimum of one foot, in depth, of clean (uncontaminated with chemicals or solid/hazardous wastes) inorganic/organic materials.
10. Planting densities and placement of plants should be determined by a qualified professional and shown on the design plans.
11. The planting plan shall be approved by the City.
12. Stockpiling soil and construction materials should be confined to upland areas and contract specifications should limit stockpiling of earthen materials to durations in accordance with City clearing and grading standards, unless otherwise approved by the City.
13. Planting instructions shall be submitted which describe placement, diversity, and spacing of seeds, tubers, bulbs, rhizomes, sprigs, plugs, and transplanted stock.
14. Controlled release fertilizer shall be applied (if required) at the time of planting and afterward only as plant conditions warrant as determined during the monitoring process.

15. An irrigation system shall be installed, if necessary, for the initial establishment period.

16. All construction specifications and methods shall be approved by a qualified professional and the City.

17. Construction management shall be provided by a qualified professional. Ongoing work on site shall be inspected by the City.

H. **Compensatory Mitigation Plan.** When a project involves wetland and/or buffer impacts, a compensatory mitigation plan shall be included as part of the required critical area report. Compensatory wetland mitigation plans shall meet the minimum requirements SMC 20.240.82 and demonstrate compliance with SMC 20.240.053. Full guidance can be found in Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1) (Department of Ecology Publication No. 06-06-011b, March 2006, or as revised). The mitigation plan shall meet the following additional standards:

1. Description of the existing wetland and buffer areas proposed to be impacted. Include acreage (or square footage), water regime, vegetation, soils, landscape position, surrounding land uses, and functions. Also describe impacts in terms of acreage by Cowardin classification, hydrogeomorphic classification, and wetland rating, based on wetland ratings (SMC 20.240.320(B));

2. Description of the compensatory mitigation site, including location and rationale for selection. Include an assessment of existing conditions: acreage (or square footage) of wetlands and uplands, water regime, sources of water, vegetation, soils, landscape position, surrounding land uses, and functions. Estimate future conditions in this location if the compensation actions are not undertaken (i.e., how would this site progress through natural succession);

3. A description of the proposed actions for compensation of wetland and upland areas affected by the project. Include overall goals of the proposed mitigation, including a description of the targeted functions, hydrogeomorphic classification, and categories of wetlands;

4. A description of the proposed mitigation construction activities, construction/installation notes, and timing of activities;

5. A discussion of ongoing management practices that will protect wetlands after the project site has been developed, including proposed monitoring and maintenance programs (for remaining wetlands and compensatory mitigation wetlands);

6. Proof of establishment of notice on title for the wetlands and buffers on the project site, including the compensatory mitigation areas; and

7. The scaled plan sheets for the compensatory mitigation shall contain, at a minimum:

a. Surveyed edges of the existing wetland and buffers, proposed areas of wetland and/or buffer impacts, location of proposed wetland and/or buffer compensation actions;

b. Existing topography, ground-proofed, at two-foot contour intervals in the zone of the proposed compensation actions if any grading activity is proposed to create the compensation area(s). Also existing cross-sections of on-site wetland areas that are proposed to be impacted and cross-section(s) (estimated one-foot intervals) for the proposed areas of wetland or buffer compensation;

c. Surface and subsurface hydrologic conditions, including an analysis of existing and proposed hydrologic regimes for enhanced, created, or restored compensatory mitigation areas. Also, illustrations of how data for existing hydrologic conditions were used to determine the estimates of future hydrologic conditions;

d. Conditions expected from the proposed actions on site, including future hydrogeomorphic types, vegetation community types by dominant species (wetland and upland), and future water regimes;

e. Required wetland buffers for existing wetlands and proposed compensation areas. Also, identify any zones where buffers are proposed to be reduced or enlarged outside of the standards identified in this chapter;

f. A plant schedule for the compensation area, including all species by proposed community type and water regime, size and type of plant material to be installed,

spacing of plants, typical clustering patterns, typical plant installation details and notes, total number of each species by community type, timing of installation; and

g. Performance standards (measurable standards reflective of years post-installation) for upland and wetland communities, monitoring plan, contingency plan, and maintenance schedule, and actions. Standards for success shall be established based on the performance standards identified and the functions and values being mitigated based on the guidance in Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1) (Department of Ecology Publication No. 06-06-011b, March 2006, or as revised).

A-4 Geologic Hazards Standards

Revised Critical Areas section allowances for development in stream and wetland buffers that are separated or isolated from the development..

20.240.224 Geologic hazards – Development standards.

E. Alteration of Very High Risk Landslide Hazard Areas. Alterations of a very high risk landslide hazard area and/or buffer may only occur for activities for which a critical area report with a hazards analysis is submitted and certifies that:

1. The development will not increase surface water discharge or sedimentation on site or to adjacent properties beyond pre-development conditions;
2. The development will not decrease slope stability on the site or on adjacent properties;
3. Such alterations will meet other critical areas regulations; and
4. The design criteria in subsection F of this section are met.

F. Design Criteria for Alteration of Very High Risk Landslide Hazard Areas.

Development within a very high risk landslide hazard area and/or buffer shall be designed to meet the following basic requirements unless it can be demonstrated that an alternative project design provides greater short- and long-term slope stability while meeting all other provisions of this chapter. The requirement for long-term slope stability shall exclude designs that require regular and periodic maintenance to maintain their level of function. The basic development design criteria are:

1. The proposed development shall not decrease the factor of safety for landslide occurrences below the limits of 1.5 for static conditions and 1.2 for dynamic conditions. Proposed alteration of natural slopes, that does not include structures, shall not decrease the factor of safety for landslide occurrences below the limits of 1.3 for static conditions and 1.0 for seismic. Where the existing conditions are below these limits, the proposed development shall increase the factor of safety to these limits or will not be permitted. Analysis of dynamic conditions shall be based on the seismic event as established by the current version of the International Building Code;

2. New structures and improvements shall be clustered to avoid geologic hazard areas and other critical areas;
3. New structures and improvements shall minimize alterations to the natural contour of the slope, and foundations shall be tiered where possible to conform to existing topography;
4. New structures and improvements shall be located to preserve the most critical portion of the site and its natural landforms and vegetation;
5. The proposed development shall not result in greater risk of the hazard or a need for increased buffers on neighboring properties;
6. Where the existing natural slope area cannot be retained undisturbed with native vegetation, the use of retaining walls that allow the maintenance of existing natural slope area is preferred over graded artificial slopes; and
7. Development shall be designed to minimize impervious lot coverage and preserve native vegetation and trees to the maximum extent practicable.

G. Additional Requirements for Alteration of Very High Risk Hazard Landslide Areas.

1. Prior to application, the applicant shall meet the requirements of and conduct a neighborhood meeting consistent with SMC 20.30.090. The notification area shall be limited to:
 - a. All property owners whose properties adjoin the subject property; and
 - b. Properties that include part of the subject property's very high risk landslide hazard area and the standard 50-foot buffer, but not to exceed a maximum of 200 feet from the project clearing limits.
2. Prior to permit issuance, the property owner shall sign and record on title, at the owner's sole expense, a covenant in a form acceptable to the City, which:
 - a. Acknowledges and accepts the risks of development in the landslide hazard area;

b. Waives any rights to claims against the City;

c. Indemnifies and holds harmless the City against claims, losses, and damages;

d. Informs subsequent owners of the property of the risks and the covenant; and

e. Advisability of obtaining added insurance.

3. Prior to permit issuance, the piling and excavation contractors shall submit insurance bonding documentation that includes coverage for subsidence and underground property damage, listing the City as an additional insured. The Director may require adequate bonds and/or insurance to cover potential claims for property damage that may arise from or be related to the following:

a. Excavation or fill within a landslide-prone area when the depth of the proposed excavation exceeds four feet and the bottom of the proposed excavation is below the 100 percent slope line (45 degrees from a horizontal line) from the property line; or

b. In other circumstances where the Director determines that there is a potential for significant harm to any type of critical area or a critical area buffer during the construction process.

4. If the Building Official has reasonable grounds to believe that an emergency exists because significant changes in geologic conditions at a project site or in the surrounding area may have occurred since a permit was issued, increasing the risk of damage to the proposed development, to neighboring properties, or to nearby surface waters, the building official may, by letter or other reasonable means of notification, suspend the permit until the applicant has submitted a letter of certification. The letter of certification shall be based on such factors as the presence of known slides, indications of changed conditions at the site or the surrounding area, or other indications of unstable soils and meet the following requirements:

a. The letter of certification shall be from the current project qualified professional geotechnical engineer of record stating that a qualified professional geotechnical engineer has inspected the site and area surrounding the proposed development within the 60 days preceding submittal of the letter; and that:

i. In the project geotechnical engineer's professional opinion no significant changes in conditions at the site or surrounding area have occurred that render invalid or out-of-date the analysis and recommendations contained in the technical reports and other application materials previously submitted to the City as part of the application for the permit; or that

ii. In the project geotechnical engineer's professional opinion, changes in conditions at the site or surrounding area have occurred that require revision to project criteria and that all technical reports and any necessary revised drawings that account for the changed conditions have been prepared and submitted.

5. The letter of certification and any required revisions shall be reviewed and approved by the City's third party qualified professional, at the applicant's expense, before the Building Official may allow work to continue under the permit.

20.240.230 Geologic hazard areas – Required buffer areas.

A. Buffers for geologic hazard areas shall be maintained as undisturbed native vegetation consistent with SMC 20.240.090. Building and other improvement setbacks will be required in addition to buffers as recommended by the qualified professional to allow for landscaping, access around structures for maintenance, and location of stormwater facilities at safe distances from geologic hazard areas where native vegetation is not necessary to reduce the risk of the hazard.

B. Required buffer widths for geologic hazard areas shall reflect the sensitivity of the hazard area and the risks associated with development and, in those circumstances permitted by these regulations, the type and intensity of human activity and site design proposed to be conducted on or near the area.

C. In determining the appropriate buffer width, the City shall consider the recommendations contained in a geotechnical critical area report required by these regulations.

D. For moderate to high risk landslide hazard areas, the qualified professional shall recommend whether buffers should be required and the width of those buffers, as well as recommending any additional setbacks for buildings and stormwater facilities adequate to certify no increase in the risk of the hazard.

E. For very high risk landslide hazard areas, the standard buffer shall be 50 feet from all edges of the landslide hazard area. Larger buffers may be required as needed to eliminate or minimize the risk to people and property based on a geotechnical critical area report. The standard buffer may be reduced when geotechnical studies demonstrate, and the qualified professional certifies, that the reduction will not increase the risk of hazard to people or property, on or off site; however, the minimum buffer shall be 15 feet.

F. Landslide hazard areas and associated buffers shall be placed either in a separate tract on which development is prohibited, protected by execution of an easement, dedicated to a conservation organization or land trust, or similarly preserved through a permanent protective mechanism acceptable to the City. The location and limitations associated with the critical landslide hazard and its buffer shall be shown on the face of the deed or plat applicable to the property and shall be recorded with the King County Recorder's Office.

20.240.240 Geologic hazards – Critical area report requirements.

A. **Report Required.** If the Director determines that the site of a proposed development includes, is likely to include, or is adjacent to a geologic hazard area, a critical area report shall be required, at the applicant's expense. Critical area report requirements for geologic hazard areas are met through submission to the Director of one or more geologic hazard critical area reports (also referred to as geotech or geotechnical engineering reports). In addition to the general critical areas report requirements of SMC 20.240.080, critical areas reports for geologic hazard areas shall meet the requirements of this section. Critical areas reports for two or more types of critical areas shall meet the report requirements for each relevant type of critical area.

B. **Preparation by a Qualified Professional.** Critical areas reports for potential geologic hazard areas shall be prepared, stamped, and signed by a qualified geotechnical engineer or engineering geologist licensed in the State of Washington, with minimum required experience, per SMC 20.20.042, analyzing geologic, hydrologic, and ground water flow systems, and who has experience preparing reports for the relevant type of hazard. If mitigation measures are necessary, the report detailing the mitigation measures and design of the mitigation shall be prepared by a qualified professional with experience stabilizing geologic hazard areas with similar geotechnical properties and by a qualified vegetation ecologist, landscape architect, or

arborist with experience designing and monitoring vegetative stabilization of geologic hazard areas.

C. Third Party Review Required. Critical areas studies and reports on geologically hazardous areas will be subject to third party review at the owner's sole expense as provided in SMC 20.240.080(C) and in the following circumstances:

1. A buffer reduction or alteration of the critical area or buffer is proposed for a very high risk landslide hazard areas.

D. Minimum Report Contents for Geologic Hazard Areas. A critical area report for geologic hazard areas shall include a field investigation, contain an assessment of whether or not each type of geologic hazard identified in SMC 20.240.210 is present or not present, and determine if the proposed development of the site will increase the risk of the hazard on or off site. The written critical area report(s) and accompanying plan sheet(s) shall contain the following information at a minimum:

1. The minimum report contents required per SMC 20.240.080(E);

2. Documentation of any fieldwork performed on the site, including field data sheets for soils, test pit locations, baseline hydrologic data, site photos, etc.;

3. A description of the methodologies used to conduct the geologic hazard areas delineations, classifications, hazards assessments and/or analyses of the proposal impacts including references;

4. Site and Construction Plans. The report shall include a copy of the site plans for the proposal, drawn at an engineering scale, showing:

a. The type and extent of geologic hazard areas, any other critical areas, and buffers on, adjacent to, off site within 200 feet of, or that are likely to impact or be affected by the proposal;

b. Proposed development, including the location of existing and proposed structures, fill, significant trees to be removed, vegetation to be removed, storage of materials, and drainage facilities;

- c. The topography, in two-foot contours, of the project area and all hazard areas addressed in the report;
- d. Height of slope, slope gradient, and cross-section of the project area;
- e. The location of springs, seeps, or other surface expressions of ground water on or off site within 200 feet of the project area or that have the potential to affect or be affected by the proposal;
- f. The location and description of surface water on or off site within 200 feet of the project area or that has the potential to be affected by the proposal; and
- g. Clearing limits, including required tree protection consistent with SMC 20.50.370.

5. Stormwater Pollution Prevention Plan (SWPPP). For any development proposed with land-disturbing activities on a site containing a geologic hazard area, a stormwater pollution prevention plan (also known as an erosion and sediment control plan) shall be required. The SWPPP, in compliance with the requirements of Chapter 13.10 SMC, shall be included in the critical area report or be referenced if it is prepared separately.

6. Assessment of Geological Characteristics. The report shall include an assessment of the geologic characteristics of the soils, sediments, and/or rock of the project area and potentially affected adjacent properties, and a review of the site history regarding landslides, erosion, and prior grading. Soils analysis shall be accomplished in accordance with accepted classification systems in use in the region. The assessment shall include, but not be limited to:

- a. A detailed overview of the field investigations, published data, and references; data and conclusions from past assessments of the site; and site-specific measurements, tests, investigations, or studies that support the identification of geologically hazardous areas; and
- b. A summary of the existing site conditions, including:
 - i. Surface topography, existing features, and vegetation found in the project area and in all hazard areas addressed in the report;

ii. Surface and subsurface geology and soils to sufficient depth based on data from site-specific explorations;

iii. Geologic cross-section(s) displaying the critical design conditions;

iv. Surface and ground water conditions; and

c. A description of the vulnerability of the site to seismic and other geologic events.

7. Analysis of Proposal. The report shall contain a hazards analysis including a detailed description of the project, its relationship to the geologic hazard(s), and its potential impact upon the identified hazard area(s), the subject property, and affected adjacent properties. The hazards analysis component of the critical areas report shall include the following based on the type(s) of geologic hazard areas identified:

a. Recommendations for the minimum buffer consistent with SMC 20.240.230 and recommended minimum drainage and building setbacks from any geologic hazard based upon the geotechnical analysis. Buffers shall be maintained consistent with SMC 20.240.090; however, the qualified professional may recommend additional setbacks for drainage facilities or structures which do not have to be maintained as undisturbed native vegetation; and

b. An analysis of proposed surface and subsurface drainage, and the vulnerability of the site to erosion.

E. Additional Technical Information Requirements for Landslide Hazard Areas. The technical information required in a critical area report for a project within a landslide hazard area shall also include the following:

1. An estimate of the present stability of the subject property, the stability of the subject property during construction, the stability of the subject property after all development activities are completed, and a discussion of the relative risks and slide potential relating to adjacent properties during each stage of development, including the effect construction and placement of structures, clearing, grading, and removal of vegetation will have on the slope over the estimated life of the structure;

2. An estimate of the bluff retreat rate that recognizes and reflects potential catastrophic events such as seismic activity or a 100-year storm event;
3. Consideration of the run-out hazard of landslide debris and/or the impacts of landslide run-out on downslope properties;
4. A study of slope stability including an analysis of proposed cuts, fills, and other site grading;
5. Compliance with the requirements of SMC 20.240.224(D) for alterations proposed in moderate to high risk landslide hazard areas;
6. Compliance with the requirements of SMC 20.240.224(E) through (G) for alterations proposed in very high risk landslide hazard areas;
7. Parameters for design of site improvements including appropriate foundations and retaining structures. These should include allowable load and resistance capacities for bearing and lateral loads, installation considerations, and estimates of settlement performance;
8. Recommendations for drainage and subdrainage improvements;
9. Earthwork recommendations including clearing and site preparation criteria, fill placement and compaction criteria, temporary and permanent slope inclinations and protection, and temporary excavation support, if necessary; and
10. Mitigation of adverse site conditions including slope stabilization measures and seismically unstable soils, if appropriate.

A-5 General Critical Areas Standards

Revised Critical Areas section critical areas reports and review process.

20.240.080 Critical area report – Requirements.

A. **Report Required.** If uses, activities, or developments are proposed within, adjacent to, or are likely to impact critical areas or their buffers, an applicant shall provide site-specific information and analysis in the form of critical area report(s) as required in this chapter.

Critical area reports are required in order to identify the presence, extent, and classification/rating of potential critical areas, as well as to analyze, assess, and mitigate the potential adverse impact to or risk from critical areas for a development project. Critical area reports shall use standards for best available science in SMC 20.240.060. Critical area reports for two or more types of critical areas shall meet the report requirements for each type of critical area. The expense of preparing the critical area report(s) shall be borne by the applicant. This provision is not intended to expand or limit an applicant's other obligations under WAC 197-11-100, as amended from time to time.

B. **Preparation by Qualified Professional.** Critical area report(s) shall be prepared by qualified professional(s) as defined in SMC 20.20.042, with the required training and experience specific to the type(s) of critical area(s) present consistent with the requirements of SMC 20.240.240, 20.240.290, and 20.240.340. Proof of licensing, credentials, and resume of the qualified professional(s) preparing the report shall be submitted for review by the City to determine if the minimum qualifications are met.

C. **Third Party Review of Critical Area Reports.** Review of required critical area reports by a qualified professional under contract with or employed by the City will be required by the Director at the applicant's expense in any of the following circumstances:

1. The project requires a shoreline variance application or a shoreline conditional use permit; or
2. Third party review is specifically required by the provisions of this chapter for the critical area(s) or critical area buffer(s) potentially being impacted; or
3. When the Director determines such services are necessary to demonstrate compliance with the standards and guidelines of this chapter.

D. Critical Area Report Types or Sections. Critical area reports may be met in stages through multiple reports or combined in one report. A critical area report shall include one or more of the following sections or report types unless exempted by the Director based on the extent of the potential critical area impacts. The scope and location of the proposed project will determine which report(s) alone or combined are sufficient to meet the critical area report requirements for the impacted critical area type(s). The typical sequence of required sections or reports that will fulfill the requirements of this section include:

1.Reconnaissance. The existence, general location, and type of critical areas in the vicinity of a project site (off site within 300 feet for wetlands and fish and wildlife habitat conservation areas and off site within 200 feet for geologic hazards, shorelines, floodplains, and aquifer recharge areas) of a project site (if allowed by the adjoining property owners). Determination of whether the project will adversely impact or be at risk from the potential critical areas based on maximum potential buffers and possible application of SMC 20.240.220(A)(3), 20.240.280(D)(7) or 20.240.330(G)(10) should be addressed;

2.Delineation. The extent, boundaries, rating or classification, and applicable standard buffers of critical areas where the project area could potentially impact the critical area or its buffer including an assessment of the characteristics of or functions and values of the critical area and buffers identified;

3.Analysis. The proposal and impact assessment report documenting the potential project impacts to the critical area and buffers including a discussion of the efforts taken to avoid, minimize, and reduce potential impacts to those areas;

4.Mitigation. The measures that prevent or compensate for the potential impacts of the project designed to meet the requirements of this chapter, in SMC 20.240.082, Mitigation plan requirements, and the standards for the specific critical areas impacted. Mitigation includes, but is not limited to, adjustments to required buffer sizes, best practices to minimize impacts, and critical area or buffer enhancement, restoration, or preservation plans. Mitigation plans include habitat management plans, revegetation, or replanting plans, and restoration plans;

5. Maintenance and Monitoring. The goals of the mitigation proposed, performance standards for success, monitoring methods and reporting schedule, maintenance methods and schedule, and contingency actions. Maintenance and monitoring plans shall be consistent with the mitigation performance standards and requirements of this chapter, including SMC 20.240.250, 20.240.300, and 20.240.350.

E. **Minimum Report Contents.** At a minimum, critical area reports shall contain the following:

1. The name and contact information of the applicant;
2. Adequate information to determine compliance with the requirements of the critical area regulations, this chapter, including critical area report, impact and hazard assessment, and mitigation requirements specific to each critical area type, as indicated in the corresponding sections of this chapter;
3. The dates, names, and qualifications of the qualified professional(s) preparing the report and documentation of any fieldwork performed on the site;
4. A description of the proposal, proposal location including address and parcel number(s), and a vicinity map for the project;
5. Identification of the development permit(s) requested and all other local, State, and/or Federal critical area-related permits required for the project;
6. A copy of the site plan for the development proposal including:
 - a. A map to standard engineering scale depicting critical areas, buffers, the development proposal, and any areas to be altered. In addition to plan size site plans, a legible, reduced (eight and one-half inches by 11 inches) copy will be required if noticing is required for the project; and
 - b. A scaled depiction and description of the proposed stormwater pollution prevention plan, consistent with the adopted stormwater manual, for the development and consideration of impacts to critical areas due to drainage alterations;

7. Identification and characterization of all critical areas, wetlands, water bodies, shorelines, and buffers within the vicinity of the proposed project area (off site within 300 feet for wetlands and fish and wildlife habitat conservation areas and off site within 200 feet for geologic hazards, shorelines, floodplains, and aquifer recharge areas);

8. A statement specifying the accuracy of the report and all assumptions made and relied upon;

9. A description of the methodologies used to conduct the critical areas investigation, including references;

10. An assessment of the probable impacts to the critical areas resulting from the proposed development of the site based upon identified findings;

11. A description of reasonable efforts made to apply mitigation sequencing pursuant to SMC 20.240.053, Mitigation requirements, to avoid, minimize, and mitigate impacts to critical areas; and

12. Plans for mitigation required to offset any critical areas impacts, in accordance with SMC 20.240.082, Mitigation plan requirements, and the corresponding mitigation performance standards sections of this chapter, including a discussion of the applicable development standards and cost estimates for determination of financial guarantee requirements.

F. **Existing Reports.** Unless otherwise provided, a critical areas report may incorporate, be supplemented by, or composed of any reports or studies required by other laws and regulations or previously prepared for and applicable to the development proposal site, as approved by the Director. At the discretion of the Director, reports previously compiled or submitted as part of a proposal for development may be used as a critical areas report to the extent that the requirements of this section and the report requirements for each specific critical area type are met. Critical areas reports shall be considered valid for five years; after such date the City shall determine whether a revision or additional assessment is necessary. Supplemental critical area report(s) may be required to provide information and analysis to address changes to the project scope and potential impacts or to changes to applicable regulations that have been made subsequent to existing, valid critical area reports.

G. Modifications to Report Requirements.

1.Limitations to Study Area. The Director may limit the required geographic area of the critical areas report as appropriate if:

- a.The applicant, with assistance from the City, cannot obtain permission to access properties adjacent to the project area; or
- b.The proposed activity will affect only a limited part of the subject site.

2.Modifications to Required Contents. The applicant may consult with the Director prior to or during preparation of the critical areas report to obtain approval of modifications to the required contents of the report where, in the judgment of a qualified professional, more or less information is required to adequately address the potential critical area impacts and required mitigation. In some cases, such as when it is determined that no geologic hazard area is present, a full report may not be necessary to determine compliance with the critical area regulations, this chapter, and in those cases a letter or reconnaissance only report may be required.

3.Additional Information Requirements. The Director may require additional information to be included in the critical areas report when determined to be necessary to the review of the proposed activity in accordance with this chapter. Additional information that may be required includes, but is not limited to:

- a.Historical data, including original and subsequent mapping, aerial photographs, data compilations and summaries, and available reports and records relating to the site or past operations at the site;
- b.Grading and drainage plans; and
- c.Information specific to the type, location, and nature of the critical area.

20.240.082 Mitigation plan requirements.

When mitigation is required, the applicant shall submit for approval by the City a mitigation plan as part of the critical area report. Mitigation plans shall meet the minimum requirements of SMC 20.240.080 and the applicable mitigation performance standards and requirements for

the impacted type(s) of critical area(s) and buffer(s), including but not limited to SMC 20.240.250, 20.240.300, and 20.240.350. When the mitigation plan is submitted separately from other types or sections of the required critical area report(s), the mitigation plan shall meet the minimum content requirements of SMC 20.240.080(E) by inclusion or reference to other existing report(s). The mitigation plan shall include, at a minimum:

A. Environmental Goals and Objectives. The mitigation plan shall include a written report identifying environmental goals and objectives of the mitigation proposed and including:

1. A description of the anticipated impacts to the critical areas, the mitigating actions proposed, and the purposes of the compensation measures, including the site selection criteria; identification of compensation goals; identification of shoreline ecological functions; and dates for beginning and completion of site compensation construction activities. The goals and objectives shall be related to the shoreline ecological functions provided by the impacted critical area; and

2. A review of the best available science supporting the proposed mitigation and a description of the report author's experience to date in restoring or creating the type of critical area proposed.

B. Performance Standards. The mitigation plan shall include measurable specific criteria for evaluating whether or not the goals and objectives of the mitigation project have been successfully attained at the end of the required monitoring period and whether or not the requirements of this chapter, this Master Program, and the SMA have been met.

C. Detailed Construction Plans. The mitigation plan shall include written specifications and descriptions of the mitigation proposed, such as:

1. The proposed construction sequence, timing, and duration;

2. Site plans showing grading and excavation details with minimum two-foot contour intervals;

3. Erosion and sediment control features;

4.A planting plan specifying plant species, quantities, locations, size, spacing, and density; and

5.Measures to protect and maintain plants until established.

These written specifications shall be accompanied by detailed site diagrams, scaled cross-sectional drawings, topographic maps showing slope percentage and final grade elevations, and any other drawings appropriate to show construction techniques or anticipated final outcome.

D. Monitoring Program and Contingency Plan.

1.A monitoring program shall be included in the mitigation plan and implemented by the applicant to determine the success of the mitigation project and any necessary corrective actions. This program shall determine if the original goals and objectives of the mitigation plan are being met.

2.A contingency plan shall be established for indemnity in the event that the mitigation project is inadequate or fails. Contingency plans include identification of potential courses of action, and any corrective measures to be taken if monitoring or evaluation indicates project performance standards are not being met. Corrective measures will be required by the City when the qualified professional indicates, in a monitoring report, that the contingency actions are needed to ensure project success by the end of the monitoring period. A performance and maintenance bond, or other acceptable financial guarantee, is required to ensure the applicant's compliance with the terms of the mitigation agreement consistent with SMC 20.240.120, Financial guarantee requirements.

3.Monitoring programs prepared to comply with this section shall include, at a minimum, the following requirements:

a.Best available scientific procedures shall be used to establish the success or failure of the mitigation project. A protocol outlining the schedule for site monitoring (for example, monitoring shall occur in years zero (as-built), one, three, and five after site construction), and how the monitoring data will be evaluated to determine if the performance standards are being met.

b.For vegetation determinations, permanent sampling points shall be established.

c. Vegetative success shall, at a minimum, equal 80 percent survival of planted trees and shrubs and 80 percent cover of desirable understory or emergent plant species at the end of the required monitoring period. Alternative standards for vegetative success, including (but not limited to) minimum survival standards following the first growing season, may be required after consideration of recommendations provided in a critical area report or as otherwise required by the provisions of this chapter.

d. A monitoring report shall be submitted as needed to document milestones, successes, problems, and contingency actions of the mitigation project. Monitoring reports on the current status of the mitigation project shall be submitted, consistent with subsection E of this section, to the City on the schedule identified in the monitoring plan, but not less than every other year. The reports are to be prepared by a qualified professional and reviewed by the City, or a qualified professional retained by the City, and should include monitoring information on wildlife, vegetation, water quality, water flow, stormwater storage and conveyance, and existing or potential degradation, as applicable.

e. Monitoring programs shall be established for a period necessary to establish that performance standards have been met, but not for less than a minimum of five years without approval from the Director.

f. If necessary, failures in the mitigation project shall be corrected.

g. Dead or undesirable vegetation shall be replaced with appropriate plantings.

h. Damage caused by erosion, settling, or other geomorphological processes shall be repaired.

i. The mitigation project shall be redesigned (if necessary) and the new design shall be implemented and monitored, as in subsection (D)(3)(d) of this section.

j. Correction procedures shall be approved by a qualified professional and the City.

k. If the mitigation goals are not obtained within the initial monitoring period, the applicant remains responsible for restoration of the impacted shoreline ecological

functions provided by the critical areas or hazard risk reduction until the mitigation goals agreed to in the mitigation plan are achieved.

E. **Monitoring Reports.** Monitoring reports shall be submitted to the City consistent with the approved monitoring plan.

1. The as-built report, required prior to final inspection, shall, at a minimum, include documentation of the following to establish the baseline for monitoring:

- a. Departures from the original approved plans;
- b. Construction supervision provided by the qualified professional;
- c. Approved project goals and performance standards;
- d. Baseline data for monitoring per the approved monitoring methods;
- e. Photos from established photo points; and
- f. A site plan showing final mitigation as constructed or installed, monitoring points, and photo points.

2. Subsequent monitoring reports shall, at a minimum, include:

- a. Monitoring visit observations, documentation, and analysis of monitoring data collected;
- b. Photos from photo points;
- c. Determination whether performance standards are being met; and
- d. Maintenance and/or contingency action recommendations to ensure success of the project at the end of the monitoring period.

3. The applicant shall be responsible for the cost (at the current hourly rate) of review of monitoring reports and site inspections during the monitoring period, which are completed by the City or a qualified professional under contract with or employed by the City.

F. **Cost Estimates.** The mitigation plan shall include cost estimates that will be used by the City to calculate the amounts of financial guarantees, if necessary, to ensure that the mitigation plan is fully implemented. Financial guarantees ensuring fulfillment of the mitigation project, monitoring program, and any contingency measures shall be posted in accordance with SMC 20.240.120, Financial guarantee requirements.

G. **Approved Mitigation Projects – Signature.** On completion of construction, an as-built report for any approved mitigation project shall be prepared and signed off by the applicant’s qualified professional and approved by the City. Signature of the qualified professional on the required as-built report and approval by the City will indicate that the construction has been completed as planned.