Appendix B
City of Sequim
Inventory and Characterization Report
Prepared for the City of Sequim
152 W, Cedar St.
Sequim, WA 98382

Prepared by Kristina Nelson-Gross
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INTRODUCTION

The City of Sequim (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) (G1000054).

The purpose of the Inventory and Characterization Report is to review existing conditions and establish a baseline, against which the impacts of future development actions in the shoreline will be measured. The report also engages in a regional environmental analysis, though this will be limited as Clallam County is also updating its SMP concurrent with the City, and the County will be engaging in a more comprehensive regional analysis. In order to best use limited grant resources, this Inventory and Characterization is focused on reach-scale analysis of conditions and opportunities within the City shorelines. This report also analyzes specific segments or “reaches” of the shoreline, which includes the level of function, impairment, development, or other conditions affecting the reach. Finally, it also analyzes opportunities for environmental restoration, increased public access and shoreline use, and data gaps. As such, the Inventory and Characterization Report provides the basis for City’s Shoreline Master Program designations and regulations.

The Inventory and Characterization Report relies heavily on existing information and analyses of City shorelines. New data gathering and extensive re-analysis of existing data are outside of the scope of the City’s SMP update. This report also includes a map folio, located at the end of the document. Because the Shoreline Master Program is a long-range planning document, this report includes those shorelines within the City limits and within the Urban Growth Area (UGA). The City has chosen to pre-designate those areas within the UGA, though they will continue to be regulated by the Clallam County Shoreline Master Program until annexed into the City.

Shoreline Jurisdiction

Under the Shoreline Management Act (SMA), RCW 90.58, the shoreline area regulated by the City’s Shoreline Master Program must include all shorelines of statewide significance, shorelines of the state, and their adjacent shorelands. The portion of Puget Sound seaward from the line of extreme low tide is considered a “shoreline of statewide significance”. Submerged lands below extreme low tide mark extending to mid-channel are also shorelines of the statewide significance.

“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 cubic feet per second (cfs) or greater and lakes with a surface area greater than 20 acres. Adjacent shorelands are defined as the upland area a minimum of 200 feet of the ordinary high water mark (OWHM), as well as any associated wetlands within its municipal jurisdiction. (RCW 90.58.030).

“Associated wetlands” means those wetlands that are in proximity to and 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. Ecology guidance states that an entire wetland is associated if any part of the wetland lies within the area 200 feet from the ordinary high water mark (OWHM) of a state shoreline.
The City’s shoreline jurisdiction includes all the submerged lands from the mid-channel to the adjacent shorelands located within 200 feet of the OWHM. The City does not have any streams or rivers that meet the 20 cfs requirement, though the portion of Johnson Creek tidally influenced by Sequim Bay falls within the shoreline jurisdiction. They City’s shoreline jurisdiction also includes “shorelines of statewide significance, which are those submerged lands extending from extreme low tide to mid-channel. One associated wetland falls within the City’s shoreline jurisdiction.

The wetland commonly known as “Pitship Marsh” is within 200 feet of the OHWM and hydrologically connected to Sequim Bay; as such, the entire wetland falls within the city's shoreline jurisdiction. Similarly, the wetland in Washington Harbor along the inner portion of South Spit near PNNL/Battelle is an “associated wetland”, but is not yet within the City’s jurisdiction because it lies within the City’s Urban Growth Area (UGA).

Figure 1 - Pitship Marsh

Study Area
The City of Sequim (population 6,606 as of 2010) is located in east Clallam County. The City has no other incorporated cities adjacent to its jurisdiction. Approximately 27,000 of Clallam County’s 70,100 residents live in the vicinity. State Route (SR) 101 passes through the City from east to west in the southern portion of the City.

According to the 2000 U.S. Census Bureau, the City has a total area of approximately 5.28 square miles, none of which is water. The study area for this report includes all land and waters currently within the City’s proposed shoreline jurisdiction, as well as minimal treatment of shorelines in the UGA currently regulated under Clallam County’s SMP. The City’s updated SMP encompasses approximately 5,359 lineal feet of marine shoreline within the City limits. The UGA shoreline area, although discussed in this report, will continue to be regulated by Clallam County’s SMP until these areas are annexed by the City of Sequim. The UGA encompasses approximately 8,342 lineal feet of shoreline.
Methodology

A number of City of Sequim, Clallam County, state, tribal, and federal agency data sources and technical reports were reviewed to compile this inventory and characterization, including but not limited to the following:

- City of Sequim Comprehensive Plan (2006)
- City of Sequim Wastewater Comprehensive Plan (2003)
- City of Sequim Water Comprehensive Plan (2006)
- City of Sequim Wetlands Inventory, Westech (2011)
- Clallam County Dept. of Community Development, Clallam County
- Jamestown S’Klallam Tribe, West Sequim Bay Shoreline Inventory (2006)
- Point No Point Treaty Council, Historical Changes to Estuaries, Spits, and Associated Tidal Wetland Habitats in Hood Canal and Strait of Juan de Fuca Regions of Washington State (2006)

A number of sources were also reviewed to characterize overall watershed and Puget Sound nearshore conditions and to assess the ecological function of Sequim’s shorelines in an ecosystem-wide context. Watershed, eastern Strait, and Puget Sound level condition sources reviewed for this report include, but are not limited to the following:

- Soil Survey of Clallam County Area, Washington (1979)
- WRIA 17 Salmon and Steelhead Limiting Factors Analysis (2002)
- WRIA 18 Salmon and Steelhead Limiting Factors Analysis (1999)
- WRIA 18 Watershed Plan, Chapters 2.1 – Natural Environment, 2.9- East Strait Clallam Independent Drainages, 2.10 – Sequim Bay and Drainages, 3.5 – Stormwater Recommendations, and 3.15 – Sequim Bay and Drainages Recommendations (2005)

CURRENT REGULATORY FRAMEWORK SUMMARY

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:
Federal Rivers and Harbors Appropriation Act of 1899 (FRHA): Section 10 of the Act provides the U.S. Army Corps of Engineers (Corps) with authority to regulate activities that may affect navigation of “navigable” waters. Puget Sound and the Eastern Strait of Juan de Fuca are designated navigable water-bodies. Accordingly, proposals to construct new or modify existing in-water structures (including piers, marinas, bulkheads, breakwaters), to excavate or fill, or to “alter or modify the course, location, condition, or capacity of” marine waters must be reviewed and approved by the Corps.

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).

Section 9 of the ESA prohibits “take” of listed species. Take has been defined in Section 3 as: “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” The take prohibitions of the ESA apply to everyone, so any action of the City that results in a take of listed fish or wildlife would be a violation of the ESA and exposes the City to risk of lawsuit. Per Section 7 of the ESA, activities with potential to affect federally listed or proposed species and that either require federal approval, receive federal funding, or occur on federal land must be reviewed by the National Marine Fisheries Service (NOAA Fisheries) and/or U.S. Fish and Wildlife Service (USFWS) via a process called “consultation.”

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.

Section 404 provides the Corps, under the oversight of the U.S. Environmental Protection Agency, with authority to regulate “discharge of dredged or fill material into waters of the United States, including wetlands” (http://www.epa.gov/owow/wetlands/pdf/reg_authority_pr.pdf). The extent of the Corps’ authority and the definition of fill have been the subject of considerable legal debate. As applicable to the City of Sequim’s shoreline jurisdiction, however, it generally means that the Corps must review and approve most activities in streams, wetlands, and lakes. These activities may include wetland fills, stream and wetland restoration, and culvert installation or replacement, among others. Similar to SEPA requirements, the Corps is interested in avoidance, minimization, restoration, and compensation of impacts.

Section 401, Water Quality Certification, of the Act allows states to review, condition, and approve or deny certain federal permitted actions that result in discharges to state waters, including wetlands. In Washington, the Department of Ecology conducts that review, with their primary review criteria of ensuring that state water quality standards are met. Actions within marine waters, streams, lakes or wetlands within the shoreline zone that require a FHRA Section 10 or CWA Section 404 permit (see above), will also need to be reviewed by Ecology.

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 10,000 or more.
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. RCW 77.55 (the Hydraulic Code) gives the WDFW the authority to review, condition, and approve or deny “any construction activity that will use, divert, obstruct, or change the bed or flow of state waters.” As applicable to the City of Sequim’s shoreline jurisdiction, however, it generally means that WDFW must review and approve most activities in marine and fresh waters. These activities may include pier and bulkhead repair or construction, stream alteration, and culvert installation or replacement, among others. WDFW can condition projects to avoid, minimize, restore, and compensate adverse impacts. Projects creating new impervious surface that could substantially increase stormwater runoff to waters of the state may also require approval.

Other relevant federal laws include the National Environmental Policy Act, Anadromous Fish Conservation Act, Clean Air Act, and the Migratory Bird Treaty Act. State laws which address shoreline issues include the Growth Management Act, State Environmental Policy Act, tribal agreements and case law, Watershed Planning Act, Water Resources Act, Salmon Recovery Act, and the Water Quality Protection Act.

A variety of agencies (e.g., U.S. Army Corps of Engineers, National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Ecology, Washington Department of Fish and Wildlife) are involved in implementing these regulations, but review by these agencies of shoreline development in most cases would be triggered by in- or over-water work, discharges of fill or pollutants into the water, or substantial land clearing. Depending on the nature of the proposed development, state and federal regulations can play an important role in the design and implementation of a shoreline project, ensuring that impacts to shoreline functions and values are avoided, minimized, and/or mitigated.

City of Sequim Regulations

City of Sequim Shoreline Master Program

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.

In 1996, the City of Sequim adopted its SMP and submitted it to the Dept. of Ecology in 1997. Pursuant to RCW 90.58.050, which states “local governments shall primary responsibility for initiating the planning required... and administering the regulatory program...” and RCW 90.58.070, which states “If any local government... fails to adopt a master program” the Dept. of Ecology will adopt and implement a program for the local jurisdiction. The City has locally adopted an SMP and administered the program accordingly.

Under the 1996 SMP, the City had three environmental designations within their jurisdiction:
City of Sequim Comprehensive Plan
The City's Comprehensive Plan was last updated in 2006. The Growth Management Act requires local governments to periodically update their Comprehensive Plans. The City will begin the process of updating their Comprehensive Plan in 2011.

The Comprehensive Plan is a long-range planning document that establishes the goals and policies, which reflect the community's vision for the City over a 20-year period. The current Comprehensive Plan land use designations on the shoreline include Residential, Public Facilities, Commercial, and Research and Development Park. These land use designations are important because they reflect the general land use patterns and vision the City has adopted for areas both inside and outside the shoreline jurisdiction. The City’s Shoreline Master Program goals and policies are adopted by reference as one element of the Comprehensive Plan.

City of Sequim Municipal Code, Title 15: Buildings and Construction
Title 15 establishes and regulates the City’s building and construction practices.

City of Sequim Municipal Code, Title 18: Zoning
Title 18 establishes and regulates the City’s zoning districts; districts within the shoreline area include Residential, Commercial, Public Facilities, and Research and Development Park.

City of Sequim Municipal Code, Chapter 18.70: Wetlands Protection
Chapter 18.70 sets out the provisions, restrictions, and regulations regarding wetlands within the City’s jurisdiction. Two wetlands fall within the shoreline jurisdiction. The City is currently revising this chapter and the Environmentally Sensitive Areas, Chapter 18.80. Chapter 18.70, however, will be repealed and incorporated into 18.80.

City of Sequim, Municipal Code, Chapter 18.80: Environmentally Sensitive Areas
Chapter 18.80 establishes the development standards, permitted uses, and restrictions for environmentally sensitive areas, such as critical aquifer recharge areas, geologically hazardous areas, flood hazard areas, streams, and fish and wildlife conservation areas. Designated environmentally sensitive areas are found throughout the shoreline area, including geologically hazardous areas, fish and wildlife conservation areas, critical aquifer recharge areas, and streams.

WATERSHED NATURAL CHARACTERISTICS
The City of Sequim lies within Water Resource Inventory Area (WRIA) 18 for the Dungeness River Basin and WRIA 17 for the Quilcene-Snow River Basins. The City’s marine shoreline in WRIA 17 runs from Johnson Creek south to the southernmost end of Reach 1, and WRIA 18 runs from Johnson Creek north to the westernmost end of Reach 5. Johnson Creek and Bell Creek drain into Sequim Bay, but only Johnson Creek is within the City’s shoreline jurisdiction.
The Sequim Bay watershed drains an area of approximately 35,813 acres, from Mt. Zion to the south, the Strait of Juan de Fuca to the north, the Discovery Bay watershed to the east, and to the Dungeness watershed to the west. Mt. Zion, at an elevation of 4,273 feet, is the highest point within the watershed. Topography is steep in the upper, forested portions of the watershed with more gentle and flatter slopes toward Sequim Bay. Water used for domestic and farmland irrigation from the Dungeness River enters Sequim Bay through two ditches and a pipe outfall. Streams, creeks and irrigation ditches drain the upland watershed flowing in and out of each other, diverting and re-charging streams, tributaries, wetlands, and groundwater.

Johnson Creek is the third largest stream within the watershed, flowing northeast from the foothills of the Olympic Mountains into the west side of Sequim Bay at Pitship Point (near the John Wayne Marina). The east branch originates near the top of Burnt Hill, at an elevation of approximately 2200 ft. The west branch drains an unnamed pond/lake located at an approximate elevation of 400 ft. The total length of Johnson Creek is about 7.4 miles. Five river miles are attributed to the mainstem, while two miles consist of tributaries. The upper creek flows through a substantial ravine, while the lower two miles are low gradient, rising about 400 feet in two miles. The lower gradient section of Johnson Creek (below Highway 101) has been channelized, heavily armored, and is disconnected from its floodplain. Development has eliminated sinuosity and instream structure.

Bell Creek, an independent drainage into Sequim Bay, flows from the uplands of Happy Valley and the north flank of Burnt Hill through the eastern portion of the City of Sequim. It enters into a lagoon in Washington Harbor on the marine shoreline just north of the mouth of Sequim Bay and drains a watershed of over 3100 acres. During at least one time in its geologic history, it is believed to be the location of an old route ("paleo-channel") taken by the Dungeness River several thousands of years ago. In more recent times, it probably operated as an ephemeral stream fed by precipitation runoff. Historically, Bell Creek has served as a conveyance channel for irrigation water. Much of the creek has been heavily altered by rural and urban development. The lower 2.0 miles of Bell Creek are channelized and the lower 0.25 mile is diked. The creek is thought to be primarily spring fed, with stable flows and a limited floodplain.

**Climate**

The watershed lies in the rain shadow of the Olympic Mountains. The rain shadow effect of the Olympic lessens the impact of major storms to the Sequim Bay area. Sequim Bay's location exposes it to marine air masses that have been conditioned for extended periods over the open ocean.

Sequim Bay experiences prevailing winds from the west, which is common for much of middle North America. The climate is mild with cool winters and warm summers, reflecting the moderating influence of winds from the Pacific Ocean. In winter, the average wind speed is eight miles per hour, though strong and sometimes damaging winds are not uncommon.

Precipitation averages 28 inches over the Sequim Bay watershed and varies from 35 inches in the upper watershed (Mt. Zion) to 15 inches at the lower elevations to less than 10 inches at Sequim Bay. The lowlands average 20 inches per year south of Sequim, and less in the lower Dungeness Valley, Sequim and the Miller Peninsula. Total annual precipitation in Sequim is approximately 16 inches. Summer storms must produce in excess of 1 inch of rainfall to show up as runoff in area streams.
Most precipitation falls in the winter. Winter precipitation is primarily rain up to 1,500 feet elevation, with mixed rain and snow between 1,500 and 2,500 feet, and primarily snow above 2,500 feet. Much of the higher elevation precipitation, which accounts for the bulk of the precipitation that does fall in this area, accumulates as snowpack and subsequently contributes to sustained spring and summer runoff. Average seasonal snowfall in Sequim is 6-8 inches, but the number of days of snow cover varies greatly from year to year.

Geology and Soils
The Olympic Peninsula is geologically very young; its oldest rocks are dark, oceanic crustal basalt common throughout the region. Glaciers have been the primary sculptors of the mountains, foothills, and coastal lowlands. Repeated episodes of glacial advance and recession, called glaciations, resulted in thick accumulations of glacial and interglacial deposits throughout the region. The retreat of the huge and heavy ice sheets of the cordilleran glaciations carved the inland waterways of Puget Sound. The glacial ice penetrated upland into the Olympic Mountains and covered most of the northwestern end of the Olympic Peninsula.

Stratigraphic deposits include the Everson sand, Everson glaciomarine drift, Vashon recessional deposits, Vashon till, and Vashon advance outwash. These heterogeneous deposits of clay, silt, sand, and gravel form the aquifers and aquitards that comprise the regional groundwater flow system in the Sequim-Dungeness region. The volcanic and marine sedimentary rocks that underlie the unconsolidated glacial deposits form the bottom-most unit of the groundwater flow system. Beach deposits, alluvium, peat, and marsh deposits, and older alluvium deposits comprise the nonglacial surficial deposits in the region.

Surface and Groundwater
Precipitation falling within the watershed is conveyed directly to lakes and streams by surface runoff or travels in the subsurface as groundwater flow. Groundwater typically flows from south to north-northeast, discharging into Sequim Bay. Small amounts of rainfall soak into the ground, but during heavy rainfall, the ground quickly becomes saturated, inhibiting further infiltration. Water that is unable to infiltrate travels down slope across the ground surface as stormwater runoff.

Impermeable surfaces, such as pavement, rooftops, or compacted ground increase stormwater runoff. Conversely, vegetation promotes infiltration by intercepting rainfall, effectively spreading precipitation events over longer periods of time and reducing peak flows and associated sediment transport. Vegetation also reduces erosion by holding soil in place and reducing splash erosion.

Coastal Processes
Sediment transport, or littoral drift, is primarily influenced by prevailing winds and waves, so the drift may change seasonally, or even daily. Eroding bluffs deposit sediment to the water, which is transported by littoral drift. The sediment is deposited onto beaches and replenishes the sediment lost during wave activity, or the sediment forms spits.

Gibson and Travis spits, which flank the opening to Sequim Bay, are formed by sediment drift from the west and the east, respectively. There are relatively short stretches of south-to-north drift along both northwest and northeast shorelines of Sequim Bay, while the dominant drift direction tends to be north-to-south in the remainder of the bay. A much shorter spit (South Spit) originates at the southeast base of Washington Harbor and extends north nearly joining the
south end of Gibson Spit, though a large opening between the two spits remains. See Map 4 in the Map Folio.

**Water Quality**

Section 303(d) of the Federal Clean Water Act requires Washington State to periodically prepare a list of all surface waters in the State for which beneficial uses of the water, such as drinking, recreation, aquatic habitat, and industrial use are impaired by pollutants. The Washington Department of Ecology maintains a 303(d) list, composed of waterbodies where tested pollutants have exceeded thresholds established by the state surface water quality standards (WAC 173-201A).

Water quality, particularly fecal coliform, in Sequim Bay has been an issue for some time. Fecal coliform develops in the intestinal tract of warm-blooded animals; as such the primary sources are human and animal waste introduced into the waterbody. Several irrigation ditches in the Bell Creek and Johnson Creek subbasins have been found to contribute to fecal coliform loads entering Sequim Bay. Bell Creek was estimated to contribute 90 percent of the fecal coliform load entering Sequim Bay. A study performed by Ecology indicated that Bell Creek was the single largest source of bacteria to Sequim Bay. Studies have identified two major contributors of fecal coliform to Sequim Bay: large-scale beef and dairy farms along the lower two miles of Bell Creek and Highland Irrigation ditches and associated land uses for Johnson Creek.

Johnson Creek, which travels through John Wayne Marina, is on the Dept. of Ecology's water quality 303(d) list for fecal coliform. Bell Creek, which drains into Washington Harbor, is not within the City’s shoreline jurisdiction, but the creek is also listed on Ecology's 303(d) list for fecal coliform, dissolved oxygen, and bioassessment at the creek mouth.

<table>
<thead>
<tr>
<th>Waterbody Name</th>
<th>Pollutant</th>
<th>Year</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell Creek</td>
<td>Dissolved Oxygen</td>
<td>2008</td>
<td>Water</td>
</tr>
<tr>
<td></td>
<td>Bioassessment</td>
<td>2008</td>
<td>Other</td>
</tr>
</tbody>
</table>

Despite these listings, much of the Bay is approved for shellfish harvest. The area around John Wayne Marina and within and near Washington Harbor (at the mouth of Bell Creek), however, remains closed. In the 1999 Sanitary Survey of Sequim Bay, prepared by the Washington State Dept. of Health, the reasons for closures were due to boat traffic, contributions from John Wayne Marina, and non-point source pollution from Bell Creek and Johnson Creek. A 2007 National Oceanic and Atmospheric Administration/National Marine Fisheries Service Community Profile Report, however, indicated that there is no evidence that the Marina currently affects water quality in Sequim Bay.

**NEARSHORE LAND USE PATTERNS**

Land use in shoreline areas is a major factor in the preparation of master programs for two reasons. First, the Shoreline Management Act (SMA), Chapter 90.58 RCW, establishes a policy that gives preference to uses that are unique to or dependent upon a shoreline location.
Consequently, WAC 173-26-201(2)(d) calls for master program provisions to give higher priority to the following types of uses, in the order presented below:

1. Areas for protecting and restoring ecological functions.
2. Water-dependent and associated water-related uses.
3. Other water-related and water-enjoyment uses.
4. Single-family residential uses where they are appropriate and can be developed without significant impact to ecological functions and displacement of water-dependent uses.
5. Non-water-oriented uses where the uses described in 1-4 are inappropriate or where non-water-oriented uses demonstrably contribute to the objectives of the SMA.

A second important reason for inventorying shoreline and adjacent land uses is that this inventory information is critical for assigning environment designations as called for in WAC 173-26-211. As noted in subsection (3), the SMP and the comprehensive plan must be mutually consistent, and shoreline and adjacent land use is very relevant to the criteria for individual environments in the WAC section.

The City of Sequim is located in eastern Clallam County and borders the western edge of Sequim Bay. Shoreline areas fall within the City limits and the Urban Growth Area (UGA). These areas contain a variety of land use modifications, such as roads, bulkheading and armoring, overwater structures, and John Wayne Marina.

**Historical Land Use Changes**

**Johnson Creek**

The Johnson Creek/Pitship Point stream-delta complex historically entered the bay through a tiny lagoon at Pitship Point and never supported tidal marsh habitat. John Wayne Marina now sits on the site of this former lagoon. Johnson Creek still enters the bay, now immediately south of a large jetty, and much of the former tide flat directly associated with the stream is now filled. A fan-shaped delta occurs where Johnson Creek empties into the Bay at the John Wayne Marina.

*Figure 2 - John Wayne Marina & Johnson Creek*
Washington Harbor
North of the City's shoreline jurisdiction, a 1250 foot-long east-west road crosses the lagoon and tidal marsh in Washington Harbor. This road alters much of the north section of tidal lagoon and marsh habitats and has substantially impaired the lagoon's historical habitat connectivity. This road, built sometime after 1965, supports the Sequim Wastewater Treatment Plant outfall. The two culverts under the roadbed provide inadequate tidal exchange to the north of the road, as this area is reportedly filling in with sediment. There is a plan in the works, facilitated by the Jamestown S'Klallam Tribe, that would remove the culverts and replace the road with a bridge to improve tidal exchange and habitat connectivity.

Figure 3 – Washington Harbor

The south spit and associated tidal marsh and lagoon was the site of a long building structure, the Bugge Clam Cannery. By 1926, a small lagoon and marsh at the base of the spit were filled to accommodate a line of buildings along the shore at what is now the site of the Pacific Northwest National Laboratory (PNNL)/Battelle building complex. A dock and shoreline bulkheading fronts much of the laboratory facility along the base of the spit. Away from its base, much of the spit itself appears relatively unchanged.

Current Land Use
During the inventory process, the City of Sequim divided the shoreline into segments or “reaches” based upon the existing development patterns along the shoreline (Table 2). These segments were not defined based on shoreline drift cells; however, because land use often develops as a function of conditions driven by shoreline physical processes, these segments correspond relatively well with the shoreline drift.

Current land use is a mix of residential, commercial, public facilities, and research and development. Interestingly, the commercial zoning in this area is not shoreline commercial, though the City has this designation in its zoning code. The commercial zoning in this area is designated “C-III, regional commercial”. This designation is designed for regional commercial uses, meaning those that attract a regional clientele. These uses typically include larger-scale
retail and shopping centers, though residential uses are conditionally allowed. There are no water-dependent or water-related use requirements associated with this zoning designation.

Table 2. Shoreline Reaches

<table>
<thead>
<tr>
<th>Reach</th>
<th>Description</th>
<th>Zoning</th>
<th>Approx. Length in Feet</th>
<th>Acres/Parcels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S of Pitship Marsh, N to Whitefeather Way/ W. Sequim Bay Rd.</td>
<td>City: Residential-II (3-5 du/ac) approx. 75% of Reach UGA: SRII approx. 25% of Reach</td>
<td>1478</td>
<td>24.85/4</td>
</tr>
<tr>
<td>2</td>
<td>Whitefeather Way to N end of John Wayne Marina</td>
<td>Public Facilities approx. 39% of Reach City: CII – General Commercial approx. 46% of Reach City: Residential-II (3-5 du/acre) approx. 15% of Reach</td>
<td>2429</td>
<td>20.97/10</td>
</tr>
<tr>
<td>3</td>
<td>N of John Wayne Marina to Forest Rd.</td>
<td>City: Residential-II (3-5 du/acre) approx. 30% of Reach UGA: SRII approx. 70% of Reach</td>
<td>3379</td>
<td>39.79/25</td>
</tr>
<tr>
<td>4</td>
<td>N of Forest Rd. to end of South Spit</td>
<td>City: Research and Development Park 0% before annexation UGA: SRII 100% before annexation</td>
<td>4171</td>
<td>*59.9/5</td>
</tr>
<tr>
<td>5</td>
<td>Tip of South Spit into Wa. Harbor</td>
<td>City: Research and Development Park 0% before annexation UGA: SRII 100% before annexation</td>
<td>2244</td>
<td>*16.73/1</td>
</tr>
</tbody>
</table>

* Reach 5 is comprised of one parcel also included in Reach 4

The entire shoreline area consists of approximately 145 acres and 44 parcels. Of these, approximately 27% are vacant parcels. A number of parcels not included in this figure, however, are under-utilized, e.g., one single-family residence located on a 2.5 acre lot designated Residential-II, which allows three to five dwelling units per acre. Nonetheless, it is unlikely that these lots would be developed to their full build-out because of their lot configuration. Most of the parcels are long and thin, making access for multiple homes more difficult.

Table 3. Parcel Summary

<table>
<thead>
<tr>
<th>Reach</th>
<th>Number of Parcels</th>
<th>Number of Vacant Parcels</th>
<th>Percent Vacant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>*5</td>
<td>4</td>
<td>80</td>
</tr>
</tbody>
</table>
Most of the shoreline’s current land use is for single family residences. The residential development along the shoreline has remained relatively stable. Much of the residential development occurred prior to passage of the Shoreline Management Act in 1972. The oldest structures, cabins at Sequim Bay Resort, were built in 1910, and the oldest single family residence was built in 1930. The table below breaks down the number of single-family residences built before the Shoreline Management Act (1972) and after its passage. Commercial buildings and accessory structures were not included in this data. Because of the large number of homes built before 1972, several of these homes are located close to the bluff line, sometimes as little as 25 feet from the bluff, though exact data is not available.

<table>
<thead>
<tr>
<th>Total of Residences</th>
<th>Residences, post-1972</th>
<th>Percent pre-1972</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>13</td>
<td>57%</td>
</tr>
</tbody>
</table>

John Wayne Marina is the largest single facility within the shoreline jurisdiction. The marina was built in 1985 on 22 acres of land donated by the Wayne family. The facility has restrooms, shower and laundry facilities, a restaurant, a boat launch, a public meeting room with kitchen, and moorage space for approximately 300 boats. Moorage may be temporary or permanent, and the marina also offers fueling, waste oil disposal, and sewage pump-out services.

The research and development park zoning designation is relatively new and is not yet within the City’s jurisdiction. Uses in this district include those associated with environmental, and marine and coastal security research, among others. This area is located within the City’s UGA, but Pacific Northwest National Laboratories/Battelle (PNNL/Battelle), currently located in this area, is annexing into the City. With annexation, city services may be extended to the site, which would allow Battelle to expand and attract similar campus-style research facilities to its property.

**Roads and Transportation Facilities**

West Sequim Bay Road runs parallel to Sequim Bay from just north of John Wayne Marina to the southern end of Reach, just south of Pitship Marsh. John Wayne Marina is accessed via W. Sequim Bay Rd. and the Marina currently provides the only public shoreline access. At the Marina, there are walking trails and a beach access point.

The City is currently exploring ways in which to improve W. Sequim Bay Rd., which may include widening, signalization, or other traffic calming mechanisms. Conceptual plans also include bicycle lanes and sidewalks, which would enhance public access opportunities along the shoreline and further the City’s goal of “re-thinking” transportation.

**Utilities**

The City operates a wastewater reclamation facility near Bell Creek which was originally constructed in 1966. Over the years, concerns about the effluent outfall and the subsequent effects on shellfish beds prompted the City to upgrade the facility. The wastewater facility now
produces Class A reclaimed water, which is released just north of mouth of Sequim Bay. The City also recently completed an $11 million upgrade to the facility, which was specifically designed according to the National Water Research Institute’s pathogen-removal criteria to produce nearly pathogen-free recycled water. The project doubled the plant’s current capacity and converted the facility from an oxidation ditch to a conventional activated sludge plant that allows enhanced nitrogen removal. It also included construction of aeration blowers, clarifiers, ultraviolet disinfection facilities, and other means of ensuring that the water is treated to the highest standards. These upgrades provide increased reliability and pathogen removal, which allowed the Washington Department of Health to conclude that enlarging the existing 300-yard radius shellfish closure zone would not need to be enlarged, despite doubling flow capacity. Further, the increased capacity allows the City to extend its service area, which could replace some of the existing on-site septic systems within the area.

Currently, the City does not have utility services located in this area, so utility services are limited to on-site septic systems and private wells. The table below provides a summary of the on-site septic systems within the shoreline area:

<table>
<thead>
<tr>
<th>Earliest known installation</th>
<th>Total number of known systems</th>
<th>Total number of known repairs</th>
<th>Total number of known expansions</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>25</td>
<td>14</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

The “unknown” category represents those parcels with known residential structures but no information on the installation and status of on-site septic systems. In addition, the Dept. of Health, Sanitary Survey 1999 identified four parcels, all within Reach 3, as “suspected pollution sites”. Of these parcels, three lack any record of repair since the 1999 survey. Because most of the septic systems are located within Reach 3, a more in-depth discussion of the septic systems in the shoreline area will be discussed in the “Reach 3 Summary”.

Also, there are no stormwater facilities in the area. Infiltration is the primary method of addressing stormwater. Areas cleared of vegetation are susceptible to erosion, which can significantly increase sediment loading to nearby drainage courses and water bodies. Without detention or retention, the volume of stormwater runoff can also generally increase during and following construction as vegetative cover is removed and replaced with impervious surfaces such as roads and rooftops. Increased stormwater runoff could lead to erosion of stream banks and accelerated channel scouring from increased flow rates, which eventually can adversely impact the quality of stormwater eventually draining into marine waters adjacent to Sequim Bay and the City’s UGA.

Utility services will likely be expanded throughout the region in the coming years. PNNL/Battelle is scheduled for major expansion in 2012, and the City must provide water and sewer to the site by the end of 2011 to accommodate this growth. Further, a large development (the Wayne project) is planned in and near Reach 1 and upland of Reach 2. Under the current plan, though it is still conceptual, the developer plans to construct some single family residences above Pitship Marsh, which is located in Reach 1. The City is exploring ways in which stormwater facilities could be managed as part of a regional infrastructure improvement.
Existing and Potential Public Access Points

Most of the tidelands within the shoreline area are privately owned. John Wayne Marina is the only existing portion of the shoreline available for public use. The Marina has a variety of facilities and a beach access point located on the premises.

Figure 4 – John Wayne Marina

1) Boat Launch
2) Fueling facilities
3) Harbormaster
4) Parking Lot
5) Marina Entrance
6) Picnic Area

Photo courtesy of John Wayne Marina website

Other existing public access points are limited to view access. View access is available along W. Sequim Bay Rd. and a small portion of Washington Harbor Rd. These areas, however, are also areas of anticipated future development.

The Marina currently has enough room to add some additional slips, but market demand has not made the addition necessary. Further, expanding the current breakwater is highly unlikely, though there has been some discussion about adding mooring buoys outside the breakwater. There has also been some discussion of constructing a fishing pier in conjunction with the Jamestown Tribe. All of these proposals, however, are purely conceptual with no target date or timeline for project initiation.

The Wayne project is one of the anticipated future development areas. The primary location of this development is within Reach 1 and upland of Reach 2. A major aspect of this development is increased public access opportunities. Increased public access to the beach and the associated wetland (Pitship Marsh) would be obtained via access trails, some of which would be ADA accessible, in addition to providing new view access points.

The Pacific Northwest National Laboratories/Battelle (PNNL/Battelle), located in Reaches 4 and 5, is another area of anticipated future growth, which may provide public access. Because of the nature of PNNL/Battelle’s research and clientele, public access within the City’s shoreline
jurisdiction is unlikely; however, PNNL/Battelle also owns Travis Spit, located across Sequim Bay. PNNL/Battelle has indicated a willingness to allow future public access to Travis Spit, which is located under Clallam County’s jurisdiction. See Figure 5 below.

![Figure 5 - PNNL/Battelle & Travis Spit](image)

Another possible public access site is currently in private ownership just above the Marina on W. Sequim Bay Road. This vacant parcel is quite small, encompassing only about .3 acres, but provides views overlooking the entire area. Neighboring property owners said that the parcel is a natural scenic viewpoint and that people often stop there to admire the views.

**Historical/Cultural Resources**

Washington State’s Department of Archeological and Historic Preservation (DAHP) maintains the Washington State Inventory of Cultural Resources. A review of this inventory for Clallam County indicates only one site may fall within the shoreline area. The Suxtickwi’in Village Site lies within the Washington Harbor vicinity, and its actual location was confirmed on a field visit. However, because the DAHP lists the site as “address restricted”, this report will not identify the location of the site.

**NEARSHORE PHYSICAL CHARACTERIZATION**

**Soils**

The coastal geology of Sequim Bay is dominated by glacial till and outwash, with alluvial deposits occurring at the head of the bay and where small streams enter the bay. The dominant
soils in shoreline area are beaches, hoypus, and yeary. Hoypus soils, consisting of deep, somewhat excessively drained soils, are formed from glacial outwash. Permeability in hoypus soils is rapid and water capacity is low. Yeary soils are formed by compact glacial till, over which lies reworked marine sediment. Yeary soils are moderately well drained, though permeability is moderately slow until it reaches the compact glacial till, when it becomes very slow.

**Soil Erosion and Sediment Load**

Sequim Bay has an accelerated sedimentation rate, which appears to be originating from the Johnson Creek watershed. Bacterial and viral contaminants adhere to sediment and then transported to the waterbody. The sediment particles concentrate the effects of the bacterial and viral contaminants in the waterbody. Increased sedimentation can reduce shellfish and anadromous fish production.

**Geologic Hazard Areas**

In the City of Sequim, geologic hazards include areas subject to landslides, erosion, earthquakes, or other geological hazards. Geologic evidence suggests that at least six subduction earthquakes (magnitude 8 or greater) have occurred on the Olympic Peninsula. Earthquakes typically involve ground shaking, which causes most structural damage, and ground failure.

Liquefaction and landslides are forms of ground failure. Liquefaction occurs when water-saturated sands, silts, or (less commonly) gravels are shaken so violently that the grains rearrange and the sediment loses strength, begins to flow out as sand boils (also called sand blows or volcanoes), or causes lateral spreading of overlying layers. Ground failures, such as ground cracking or lateral spreads (landslides on very shallow slopes) commonly occur above liquefied layers. The Department of Natural Resources Soil Liquefaction Map for Clallam County shows that, overall, the risk of liquefaction is very low. Small portions of land along Johnson Creek and at the base of South Spit, however, are at an increased risk of liquefaction.

Landslide and erosion hazards information was obtained from Clallam County. The Department of Ecology Coastal Zone Atlas maps provide an additional source of documented landslide areas and characterize slope stability of the entire shoreline along Puget Sound. This mapping should not be considered comprehensive and does not include landslides that have occurred since the late 1970s.

Areas designated as landslide and erosion hazards are found in Reaches 3, 4, and 5, as shown in Map 3 located at the end of this document. The Dept. of Ecology’s Coastal Atlas slope stability supports these landslide and erosion designations, with intermediate and unstable slopes dominating these reaches. Reach 1 is considered stable, and Reach 2 has been modified at the southern end of John Wayne Marina.

<table>
<thead>
<tr>
<th>Table 6. Dept. of Ecology Slope Stability Map Designations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Slope Stability</strong></td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Stable</td>
</tr>
<tr>
<td>Category</td>
</tr>
<tr>
<td>------------------------------</td>
</tr>
<tr>
<td>Intermediate</td>
</tr>
<tr>
<td>Unstable</td>
</tr>
<tr>
<td>Unstable Recent Landslide</td>
</tr>
<tr>
<td>Unstable Old Landslide</td>
</tr>
<tr>
<td>Modified</td>
</tr>
</tbody>
</table>

**Aquifer Recharge Areas**

All of the shoreline area, except for approximately half of Reach 4, is in a critical aquifer recharge area. The City is in the process of updating its Critical Areas Ordinance, at which time the City will make its susceptibility designations.

**Figure 6- City of Sequim Critical Aquifer Recharge Area**

![Aquifer Recharge Areas](image)

The areas shaded in purple, as illustrated by Clallam County Critical Areas mapping, indicate critical aquifer recharge areas.

**Frequently Flooded Areas**

The Sequim Municipal Code defines frequently flooded areas as follows:
lands in the floodplain subject to a one-percent or greater chance of flooding in any given year (the 100-year storm flood). These areas include but are not limited to the floodplains of streams, rivers, lakes, coastal areas, wetlands, and the like.

The Federal Emergency Management Agency (FEMA) flood insurance maps identify areas that fall within the 100-year floodplain. The FEMA Map for the shoreline area (1989) indicates that all marine beaches, much of John Wayne Marina, Pitship Marsh, and all of South Spit fall within the 100-year floodplain.

**Shoreline Modifications**

Shoreline modification refers to structural changes to the shorelines' natural bank. Examples include shoreline armoring (bulkheads, rip-rap, etc.), overwater structures (dock and piers), or dredging and filling. The following assessment of the extent of shoreline modification is based on the Washington State Department of Natural Resources ShoreZone Inventory (2001). Information was also obtained from the Jamestown Tribe and the Point No Point Treaty Council’s Sequim Bay Shoreline Inventory (2006). Field visits were also used to verify the reported shoreline modifications in accessible areas.

**Armoring**

Shoreline armoring is typically used to protect upland property from wave-induced erosion, to retain or stabilize unstable banks, create areas of calm water, stabilize entrances to harbors, or establish moorage for vessels. However, shoreline armoring also has adverse effects on the nearshore physical processes necessary to maintain native species habitats and shoreline functions. These effects include the loss of beach areas, sediment impoundment, modification of groundwater regimes, lowering of beach elevations, redirection of wave energy, alteration of substrate, and loss of riparian vegetation and associated functions. Increased wave action also causes beach sediment to coarsen because the steep slopes do not dissipate wave energy and removes fine material away from the beaches. Coarser sediment interferes with eelgrass propagation, forage fish spawning, and may also interfere with hardshell clam habitat.

Despite the perceived benefits and protections of shoreline armoring, it has detrimental effects on the shoreline environment and may increase shoreline erosion. Armoring interferes with littoral drift (sediment transport). Transported sand and gravel accumulate on the updrift side of shore obstructions and deplete the downdrift side of obstructions by blocking sediment transport. Further, armoring eroding bluffs prevents downshore beaches from being replenished. In areas where the beach is depleted, erosion accelerates.

One form of armoring, bulkheads, increases wave energy at the face of the bulkhead, which causes downcutting or lowering of the beach. Bulkheads fail when a beach has been lowered below the face of the bulkhead. Armoring is the most significant cause of changes in beach size, shape, and substrate character.

Most of the shoreline area is heavily modified and has been for many years. Riprap and wooden bulkheads, likely creosote, appear to be the dominant armoring types, though concrete bulkheads are also used. One property owner in Reach 3, however, participated in the Washington Dept. of Fish and Wildlife bulkhead removal program in 2004. The Table below displays the amount and type of armoring per reach segment.

**Table 7. Shoreline Armoring**
<table>
<thead>
<tr>
<th>Reach</th>
<th>Length</th>
<th>Modification Type</th>
<th>Length</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1478</td>
<td>Riprap/wood bulkhead</td>
<td>700</td>
<td>47</td>
</tr>
<tr>
<td>2</td>
<td>2429</td>
<td>Riprap</td>
<td>2429</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>3379</td>
<td>Wood/concrete bulkhead</td>
<td>2180</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>4171</td>
<td>Wood bulkhead</td>
<td>600</td>
<td>14</td>
</tr>
<tr>
<td>5</td>
<td>2244</td>
<td>Riprap</td>
<td>100</td>
<td>4</td>
</tr>
</tbody>
</table>

Estimates based upon Jamestown Tribe 2006 Shoreline Inventory Map and field observation

**Overwater Structures**

Overwater structures include floating or fixed docks, covered moorage, piers, breakwaters, or marinas. Overwater structures are typically located in the nearshore. These structures change the levels of light, shoreline energy regimes, substrate type and stability, and water quality. They also restrict light needed by eelgrass, which used by forage fish and other marine life for spawning, foraging, and refuge. Overwater structures can also alter wave energy and sediment dynamics. These changes may result in alterations in the abundance and diversity of species in the nearshore.

Additionally, construction materials associated with overwater structures, such as treated wood, can leach contaminants into the nearshore environment. Treated wood releases poly-aromatic hydrocarbons (PAHs) from creosote-treated wood and other chemicals such as ammoniacal copper zinc arsenate and chromated copper arsenate. (Hanson et al. 2003). PAHs can cause cancer, reproductive anomalies, immune dysfunction, and growth and development impairment to exposed fish. (Id.) Concrete or steel, on the other hand, are relatively inert and do not leach contaminants into the water.

Other contaminants, such as stormwater run-off, fuel/sewage spills, household cleaning, pesticide or herbicides, may also enter marine waters from houseboats, covered moorages, and boat houses.

John Wayne Marina has approximately 10 docks, including the fueling dock, containing 300 moorage slips. Of these 300 moorage slips, approximately 10 percent of these boats are used as primary residences.
Overwater structure information was obtained from Washington Dept. of Natural Resources ShoreZone Inventory (2001), Clallam County records, and the Jamestown Tribe’s Shoreline Inventory (2006). This data indicates that, for the rest of the shoreline area, there are three docks and three private access points. The longest dock, located in Reach 3, stretches approximately 300 ft. into the Bay. Originally, two adjacent property owners constructed the dock, but it is unknown if the dock still serves both lots. All of these structures are located within Reach 3, except one dock in Reach 4, which is at the Pacific Northwest National Laboratory (PNNL)/Battelle Marine Research facility.

Dredging and Fill
The shoreline of Puget Sound is shorter than it was historically (1850s-1890s), declining by approximately 15%. Much of this shortening is because of artificial fill in the nearshore at the expense of barrier estuaries, barrier lagoons, closed lagoon marshes, and open coastal inlets. Once filled, the ecological value of these areas is impaired or lost.

Two areas within the shoreline region have been artificially filled: John Wayne Marina and the Pacific Northwest National Laboratory (PNNL)/Battelle Marine Research Facility site. The John Wayne Marina site historically contained a small spit (Pitship Point) and lagoon at the mouth of Johnson Creek, but never supported tidal marsh habitat. During construction of the Marina, the area was dredged and filled. This area is also a drift-cell divergence zone, which means that sediment is transported south of the Marina and north toward the southern spit at Gibson Spit.

The southern spit at Gibson Spit is the other area affected by artificial fill. This region historically supported tidal marsh habitat and a small backshore lagoon. This spit has been shortened approximately 580 feet (33% of its historical length) by artificial fill at the base. This area was entirely altered by 1926, probably to accommodate the cannery located at the base of the spit. PNNL/Battelle Marine Sciences Laboratory is now located at this site. Construction of the lab facilities required a significant amount of additional fill, approximately three to four feet, because of the underlying peat-bog.
NEARSHORE BIOLOGICAL CHARACTERIZATION

Wetlands

Wetlands near the shoreline typically include tidal marshes and tidally influenced estuaries. Since achieving statehood in 1889, Washington State has lost an estimated 70% of its estuarine wetlands. Estuarine wetlands are important for juvenile salmon rearing.

There are two estuarine wetlands located within the shoreline area. One wetland is approximately four to six acres in size, though the far northeast portion was filled to accommodate a building and parking by 1977. This wetland, also known as Pitship Marsh, had its tidal connection significantly impaired when W. Sequim Bay Rd. (formerly Old Olympic Highway) was constructed prior to 1926. Until recently, the only tidal connection from the marsh to Sequim Bay was through a small culvert.

![Figure 8 – (Reach 1) Pitship Marsh Before/After](image)

The culvert likely adversely affected fish passage; it also may have converted some of the salt marsh to freshwater marsh because of the freshwater input from the east side of the marsh. In 2009, however, the undersized culvert was removed and replaced with a bridge. Now, the wetland has high salinity on the east side of the wetland, gradually changing to low salinity in the west. The bridge will increase tidal exchange, which will enhance juvenile salmon habitat and passage.

Despite this restoration effort, the Water Resource Inventory and Analysis (WRIA) report for the WRIA 18 region indicates that upland development poses a threat to ecological functions. The upland area behind the marsh is an area of anticipated future growth.

The second wetland is located in the City’s Urban Growth Area, along the inner edge of the southern spit in Washington Harbor. This tidally-influenced estuarine wetland is approximately 1.5 acres and is covered almost entirely by American Glasswort, a plant that thrives in saline environments. At the base of the spit, the glasswort ends and transitions to other beach plants to the western edge outside the UGA.
Critical Fish and Wildlife Areas

Critical fish and wildlife habitat areas are those areas identified as critically important in maintaining and preserving fish, wildlife, and natural vegetation. These areas include shellfish beds on private and public lands suitable for recreational and commercial harvest; eelgrass and kelp beds, primary habitats associated with endangered, threatened, or sensitive species, and forage fish spawning areas.

In 2006, the City of Sequim conducted a preliminary wildlife study, based upon the Washington Dept. of Fish and Wildlife data. Information was also obtained from Clallam County’s critical areas map. The shoreline and upland areas have a considerable amount of waterfowl, shellfish, and forage fish spawning areas. Reaches 4 and 5 also contain bald eagle habitat. The Table below shows the types of habitats located in the shoreline and upland areas.

### Table 8. Critical Fish and Wildlife Habitat Areas

<table>
<thead>
<tr>
<th>Reach</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Waterfowl, herring, sand lance, surf smelt, hardshell intertidal clam, approved shellfish harvest areas, eelgrass, bald eagle zone 2 habitat</td>
</tr>
<tr>
<td>2</td>
<td>Anadromous/resident fish, waterfowl, eelgrass/kelp beds, approved shellfish beds in southern tip of the reach</td>
</tr>
<tr>
<td>3</td>
<td>Subtidal geoduck, eelgrass/kelp beds, bald eagle zone 1 and 2 habitat on northern tip of reach, approved shellfish beds on northern half of reach</td>
</tr>
<tr>
<td>4</td>
<td>Eelgrass/kelp beds, subtidal geoduck, approved shellfish beds to base of spit, bald eagle zone 1 and 2 habitat, wildlife corridors, sand lance, hardshell subtidal clam, hardshell intertidal clam, pandalid shrimp, waterfowl</td>
</tr>
<tr>
<td>5</td>
<td>Falcon, waterfowl, bald eagle zone 1 and 2 habitat, eelgrass</td>
</tr>
</tbody>
</table>

Marine Riparian Vegetation

Riparian vegetation along marine shorelines serves a variety of critical ecological functions. Coastal trees and other vegetation on backshore areas, banks, and bluffs help stabilize the soil, control pollution entering marine waters, provide fish and wildlife habitat, and modify stressful physical conditions along shorelines. Riparian areas are transitional, providing connections between and affecting both adjacent aquatic and terrestrial systems.

Marine riparian vegetation has been adversely affected by the road along Reach 1, the marina in Reach 2, and residential development in Reach 3. Marine vegetation in Reaches 1 and 2 are absent because of armoring, which includes wooden and concrete bulkheads, riprap, and boat ramps. The vegetation in Reach 3, while still present, appears to be a mix of native and nonnative landscaping, though some areas appear to be relatively untouched. Reaches 4 and 5 have been minimally affected by PNNL/Battelle Marine Research facilities. On a field visit in Reach 4, however, the facilities manager for PNNL/Battelle, mentioned that several large fir trees along the bluff line had been removed because they were dying from water saturation and were presenting a hazard to buildings and parking areas.
Beaches, Banks, and Bluffs

Beaches and bluffs provide critical nearshore habitat functions and values for fish and wildlife. Coastal bluffs are the primary source of beach sediment along the marine shore, and their natural erosion is essential for maintaining beaches and associated nearshore habitats. Bulkheads and other shore-parallel structures along coastal bluffs impound potential beach sediment, commonly bury upper beach spawning habitat and fundamentally alter the beach and backshore. These changes result in a decrease in the amount of drift sediment available for maintenance of down-drift beaches.

Sediment is deposited into the water from eroding bluffs, which is then carried by the drift cell to another location. As discussed in the “Coastal Processes” section, sediment transport is responsible for beach replenishment and spit formation. Sediment deposition seaward of the original coastline forms barrier beaches, which are characterized by relatively continuous ridges of sand and gravel rising slightly above high tide. Barrier beaches often form across embayments and at drift cell convergence zones or distinct bends in the shoreline.

The beaches throughout this region primarily consist of barrier beaches in Reaches 1 and 2. Reach 3 is comprised of a barrier beach with a low, forested bluff. High-bank, feeder bluffs (bluffs that erode and deposit sediment into the water) dominate much of Reach 4. Areas along the Reach are continuously eroding and dropping off into Sequim Bay.

Figure 9 – Reach 4 Feeder Bluffs

A recent field visit to the PNNL/Battelle facilities revealed a relatively large section of the bank had sloughed off and fallen onto the adjacent beach.

Reach 4 also has a barrier beach spit formation (South Spit). This spit is formed by the sediment transported and deposited at the termination point of the drift cell that runs north along the shoreline in Reaches 3 and 4. The termination of this drift cell forms the tip of South Spit. See Map 4 in the Map Folio.

The opening between South Spit and Gibson Spit form the entrance into Washington Harbor; Reach 5 runs along the southern portion of the Harbor. Washington Harbor is a barrier estuary/salt marsh complex with freshwater input from Bell Creek. Barrier beaches may create protected embayments on their landward sides that may evolve into lagoons and salt marshes, as illustrated in Washington Harbor. Washington Harbor is subject to wave and fluvial sediment deposition, as well as tidal erosion. Each of these processes plays an important role in
maintaining this habitat, and each has been impaired by dikes along Bell Creek, shoreline armoring and modifications, and impaired water quality from irrigation ditches, dairy operations, and other upland uses.

Kelp and Eelgrass Beds
Kelp provides habitat for many fish species, including rockfish and salmonids, potential spawning substrate for herring, and buffers the shoreline from waves and currents, among other functions. Kelp is largely dependent upon the type of substrate; it prefers a rocky substratum for attachment. Kelp is more likely to be found in areas where there is a coarsening of substrate in the low intertidal and shallow subtidal zones. Changes in kelp distribution may indicate the coarsening of shallow subtidal sediments (such as that caused by erosion related to shoreline armoring) or an increase in nutrient loading (such as from sewage effluent). The Dept. of Ecology’s Coastal Atlas indicates that patchy kelp beds are found from the tip of Pitship Point (John Wayne Marina) to the southern tip of Reach 3. Patchy kelp beds are also present along most of Reach 4.

Eelgrass beds are found in intertidal areas and provide feeding and rearing habitat for a large number of marine organisms. Juvenile salmonids seek refuge from predators in eelgrass and macroalgae (kelp and marine alga). Eelgrass slows water currents and dampens waves, thereby trapping sediments, detritus and larvae. The roots of eelgrass stabilize the sediment. Eelgrass is limited to low-moderate wave energy inter-tidal and shallow subtidal areas with mud/sandy substrate, and is therefore highly sensitive to actions or activities that affect their distribution and availability. Reach 1 contains continuous eelgrass fringe and extends to the southern most tip of Reach 2. From there, patchy eelgrass fringe extends from the tip of Pitship Point (John Wayne Marina) to the end of the Reach. Beginning at Reach 3, the eelgrass fringe is again continuous, running the entire length of Reach 3 to approximately mid-reach in Reach 4. At mid-reach, patchy eelgrass fringe extends to the end of the Reach. Eelgrass beds are located off-shore of Reach 4, approximately mid-reach, and throughout Washington Harbor in Reach 5.

Stressors that affect kelp and eelgrass include those that affect the amount of light available to the plant, the direct and indirect effects of high or low nutrient levels, toxics, and physical disturbances. Nutrient levels can affect kelp and eelgrass by being insufficient for growth. Elevated nutrient levels associated with stormwater runoff and septic systems can cause excessive macroalgae or phytoplankton growth or increase competition from invasive species that reduce the amount of light and substrate available. One form of opportunistic macroalgae is the *ulva*, which form dense mats that reduce light and oxygen. These mats have been identified throughout Washington Harbor (Reach 5) and immediately outside the mouth of the Harbor (northern-most tip of Reach 4). These mats may prevent access to benthic prey organisms by creating a barrier over the substrate, which may smother benthic organisms and shellfish, causing low oxygen/anoxic conditions. Armoring alters wave energy, which can also change the composition of nearshore substrates.

Priority Habitats and Species
The Washington Dept. of Fish and Wildlife maintains priority habitat and species information for Washington State. *Priority species* require protective measures for their survival due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance. Priority species include State Endangered, Threatened, Sensitive, and Candidate species; animal aggregations (e.g., heron colonies, bat colonies) considered vulnerable; and
species of recreational, commercial, or tribal importance that are vulnerable. Priority habitats are 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 (e.g., shrub-steppe) or dominant plant species (e.g., juniper savannah), a described successional stage (e.g., old-growth forest), or a specific habitat feature (e.g., cliffs). The following sections discuss some of the priority species and species of local importance that occur within the shoreline jurisdiction.

Shellfish
Sequim Bay has a long history of commercial, subsistence, and ceremonial harvesting, but also has the longest documented history of paralytic shellfish poisoning toxins (PSTs) in Washington State. Over the past fifty years, shellfish PST levels and the number of associated shellfish closures have been increasing in Puget Sound. Sequim Bay in particular has the longest history of paralytic shellfish poisoning blooms, which regularly occur during August and September.

Along with producing Class A water, the City also extended its outfall in 1999 into deeper water and farther away from the mouth of the Bay. These efforts allowed the Dept. of Health to reopen some shellfish areas that had been closed for many years, though there is still a 300 foot closure area around the outfall.

In 1999, the Washington Dept. of Health Sanitary Survey identified several sites within Sequim Bay as pollution hazards: the City of Sequim wastewater treatment plant outfall, Washington Harbor, Bell Creek, John Wayne Marina, Johnson Creek, and Sequim Bay State Park. Of these, Washington Harbor, John Wayne Marina, and Johnson Creek fall within the City's shoreline jurisdiction.

This year, however, the City completed an $11 million wastewater treatment plan expansion, which was specifically designed to meet pathogen removal criteria developed by the National Water Research Institute to produce nearly pathogen-free reclaimed water. This was done in part to protect and restore nearby shellfish beds.

Areas closed to commercial shellfish harvesting include all of Washington Harbor, located in Reach 5; the southern Spit located in Reach 4; and the area stretching from the southern tip of Pitship Point (John Wayne Marina), located in Reach 2, to approximately 2/3 of Reach 3. Other areas remain approved for commercial shellfish harvest.

Salmonids
Marine intertidal, nearshore, and subtidal areas provide critical habitat for salmonids, particularly juvenile salmonid smolts as they migrate from the freshwater to marine environments. Shallow nearshore areas are known to provide rearing habitat and shallow-water migration corridors that offer protection from predators. Subtidal areas also provide rearing support for salmonids, including production of benthic prey items.

According to the Biological Assessment for the City of Sequim’s Water Reclamation Plant Facility, (September 2008), Bell Creek has not been designated as critical habitat for any listed anadromous fish. It is, however, spawning ground for winter steelhead and coho. Bull trout use of Bell Creek is likely only for foraging. Bell Creek, however, lies outside of the City’s shoreline jurisdiction, but the creek drains into Washington Harbor (Reach 5).
Johnson Creek is within the City’s shoreline jurisdiction (Reach 2). The Washington Department of Fish and Wildlife's Salmonscape program indicates that winter steelhead and coho are present in Johnson Creek. Summer chum have a historical presence within the creek and may return because they have recently been found in the recently restored Pitship Marsh (Reach 1).

**Forage Fish**

Forage fishes are small, schooling fishes that are key prey items for larger predatory fish and wildlife in a marine food web. In Puget Sound, forage fish species occupy every marine and estuarine nearshore habitat. Because of their role as critical prey species, including for economically important predators such as salmon, recent attention has been paid to their conservation and protection. Nearshore habitats are of special concern and are considered “priority habitats” by Washington Dept. of Fish and Wildlife because many species use these habitats for spawning.

The forage fish species most likely to occur in the shoreline jurisdiction include surf smelt, sand lance, and Pacific herring. Different species use 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, such as eelgrass.

Sand lance are present in Reaches 1 and 4; Reach 1 also contains surf smelt and herring spawning grounds. Herring spawning grounds are also found offshore of Reach 4, just south of Travis Spit, which is within Clallam County’s shoreline jurisdiction. Information on the forage fish species is summarized in the Table below.

<table>
<thead>
<tr>
<th>Species</th>
<th>Documented Presence</th>
<th>Spawning Period</th>
<th>Preferred Spawning Substrate</th>
<th>Critical Substrate Factors</th>
<th>Spawning Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific herring</td>
<td>Reaches 1 and 4</td>
<td>Mid-January to the end of March</td>
<td>Suitable for eelgrass and other marine vegetation</td>
<td>Water depth Substrate composition Overwater structures</td>
<td>Shallow subtidal and lower half of intertidal zones</td>
</tr>
<tr>
<td>Sand lance</td>
<td>Reaches 1 and 4</td>
<td>November to February</td>
<td>Fine-grained sand and gravel, .2-.4 mm in diameter</td>
<td>Shoreline armoring, Changes in beach composition</td>
<td>Upper third of intertidal zone</td>
</tr>
<tr>
<td>Surf smelt</td>
<td>Reach 1</td>
<td>Coastal/ Strait stocks are summer spawners (late May- end of October)</td>
<td>Sand-gravel mix, ranging from 1-7 mm in diameter</td>
<td>Shoreline armoring, availability of a suitable amount of appropriately textured spawning substrate</td>
<td>Upper third, approx. 7+ feet from extreme high water mark</td>
</tr>
</tbody>
</table>
Nearshore modifications, such as armoring and overwater structures, threaten forage fish habitat because these modifications change the substrate composition. Overwater structures limit the light needed by eelgrass and other marine vegetation, which impairs herring spawning habitat. Armoring interrupts sediment drift, which may cause beaches to coarsen because of the lack of replacement sediments, and increases wave energy. Beaches that become too coarse may become unsuitable for sand lance and surf smelt spawning.

**Shorebirds and Upland Birds**

Adjacent to the open waters of Puget Sound, the upland terrestrial environment provides habitat for birds, amphibians, reptiles, and insects. Seventy-five species of birds are associated with marine nearshore environments in Washington. Bald eagles are among these birds, preferring to nest along freshwater and marine shorelines. Bald eagle zones 1 and 2 occur within and adjacent to the shoreline area; these zones act as buffers to protect eagle habitat because eagles are sensitive to human disturbance. Zone 1 is the primary zone in which eagles reside and typically contain nesting areas. Zone 2 is the secondary zone and acts as an additional screen for nesting sites. The size and shape of each zone will depend on screening vegetation, prevailing winds, topography, and the sensitivity of the nesting eagles to human activities.

Other birds within the shoreline area include Peregrine falcons, merlins, great blue herons, nonbreeding concentrations of plovers, sandpipers, and phalaropes, and other shorebirds and waterfowl. The Table below summarizes the bird distribution in the shoreline area.

**Table 10. Bird Distribution by Reach**

<table>
<thead>
<tr>
<th>Reach</th>
<th>Bird</th>
<th>Habitat Protection Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bald Eagle Waterfowl</td>
<td>Zone 2 – 800’ or to shoreline</td>
</tr>
<tr>
<td>2</td>
<td>Bald Eagle Waterfowl</td>
<td>Zone 2 – 800’ or to shoreline</td>
</tr>
<tr>
<td>3</td>
<td>Bald Eagle</td>
<td>Zone 1 – 400’&lt;br&gt;Zone 2 – 800’ or to shoreline</td>
</tr>
<tr>
<td>4</td>
<td>Bald Eagle</td>
<td>Zone 1 – 400’&lt;br&gt;Zone 2 – 800’ or to shoreline</td>
</tr>
<tr>
<td>5</td>
<td>Bald Eagle Falcons&lt;br&gt;Shorebird Waterfowl</td>
<td>Zone 1 – 400’; Zone 2 800’ or to shoreline</td>
</tr>
</tbody>
</table>
REACH SUMMARIES, ASSESSMENT, AND OPPORTUNITY AREAS

The following section summarizes the shoreline characterization for each shoreline reach, addresses whether ecological functions have been impaired, and discusses opportunity areas within each reach.

“Opportunity areas” are those areas in the shoreline jurisdiction that may be appropriate for protection and/or restoration, including elements such as wetlands, habitat, riparian (streamside) vegetation, and riverbanks/shoreline modified by riprap or bulkheads. The City could explore opportunities for protection, restoration, or increased public access through a variety of ways, including regulatory and non-regulatory methods. Publicly owned lands provide the greatest flexibility in implementing protection or restoration efforts by the City. Restoration opportunities on privately owned land may be pursued through the development of an incentive-based redevelopment program, and/or a public education program. Other opportunities throughout the City include extension of City services like sewer and water, and developing a comprehensive stormwater management program. These types of projects will affect shoreline conditions and may have beneficial effects on habitat and natural shoreline functions.

Reach 1 – Pitship Marsh

<table>
<thead>
<tr>
<th>Land Use and Zoning</th>
<th>Habitat</th>
<th>Hazards</th>
<th>Public Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use Residential</td>
<td>Drift cell (R to L) and divergence zones Eelgrass Forage fish Bald Eagle Zone 2 Shellfish Salt marsh/wetland Barrier beach</td>
<td>Critical Aquifer Recharge Area</td>
<td>View</td>
</tr>
<tr>
<td>Zone Residential 75% Commercial, regional 25% Area of future growth</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reach 1 is comprised of four parcels totaling approximately 24.85 acres. Pitship Marsh is located within the fourth and largest parcel, which encompasses about 18.45 acres. Residential
use is the dominant land use in this reach, though the fourth parcel is partially zoned commercial. It, along with several other upland parcels, is also the site of future development.

The future development planned at this site encompasses approximately 166 acres, and may include more than 250 single family residences and 120 transient accommodations. (See Map 2 in the Map Folio located at the end of this report.) Of these accommodations, 75 may be located in a lodge, while others may be stream-side vacation cabins. Public access trails, some of which would be ADA accessible, to the beach and behind Pitship Marsh are also planned.

Plans also include single family residences located upland of Pitship Marsh; this area is comprised primarily of marine fill that was dredged during construction of John Wayne Marina. Because of the presence of the dredged material and its effect on infiltration, there are plans to collect the stormwater runoff and deliver it to a regional wastewater treatment facility that would be located at the south end of this reach. Multiple commercial lots may also be located within this development.

As discussed in the Current Land Use section, the shoreline commercial zoning designation does not currently exist on the City’s zoning map; the commercial zoning is designated as regional commercial. Higher density and intensity commercial uses could cause a conflict adjacent residential uses, as well as Shoreline Management Act preferred uses because of the “regional” zoning designation. A more in-depth analysis will need to take place when the development plans move beyond the conceptual stage.

Existing development consists of approximately five residential uses and associated outbuildings. The oldest residence was constructed in 1946 and the newest was constructed in 2005. All of these residences rely on septic systems. One parcel is vacant.

Currently, the only public access available is view access while driving down W. Sequim Bay Rd. There are some places along the road where the shoulder is wide enough for a vehicle to stop, but beach access is prohibited and posted with “No Trespassing” signs.

A recent restoration project in this area removed a small culvert that previously provided the only tidal exchange between Sequim Bay and Pitship Marsh. The culvert was removed and has since been replaced with a bridge. This restoration is discussed more fully in the “Wetlands” section of the Nearshore Physical Characterization.

<table>
<thead>
<tr>
<th>Shoreline Processes &amp; Functions</th>
<th>Alterations</th>
<th>Function Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrologic</td>
<td>Armoring</td>
<td>Low</td>
</tr>
<tr>
<td>Sediment transport</td>
<td>Septic systems and other alterations associated with land uses</td>
<td></td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td>Impervious surfaces associated with W. Sequim Bay Rd. and residential land uses</td>
<td></td>
</tr>
<tr>
<td>Nutrient/toxic compounds removal</td>
<td>Habitat</td>
<td></td>
</tr>
<tr>
<td>Maintaining temperature</td>
<td>Low/Moderate</td>
<td></td>
</tr>
<tr>
<td>Large woody debris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical space and conditions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Food production and delivery
Resting and foraging
Migration

Shoreline processes and functions within Reach 1 have been impacted by the following activities:
- Shoreline armoring, including wooden/concrete bulkheads and riprap, and W. Sequim Bay Rd.;
- Removal of marine riparian vegetation;
- Increased impervious surfaces and vegetation removal at a watershed scale;
- Reliance on septic systems in an area with soils of limited absorption/filtration capabilities; and
- Construction of John Wayne Marina (Reach 2).

Effects upon the nearshore environment include:
- Sediment supply to nearshore areas impaired by riprap, bulkheads, road, and Marina.
- Marine riparian vegetation provides wildlife habitat, microclimates (shade/prey), source of large woody debris, bank stability, improvements to water quality;
- Subestuaries and deltas depend upon rainfall to bring sediments from upstream to the nearshore area. High flow rates and volumes resulting from increased runoff from impervious surfaces can alter the formation and function of these features.
- Increased wave energy from armoring coarsens beach substrate. Forage fish, such as sand lance and surf smelt, require certain beach substrate composition to spawn, and herring rely on the presence of eelgrass, which is also affected by substrate composition.
- Excessive nutrients found in the soil from septic systems or other nonpoint source pollution can cause an overgrowth of algae, which can block light and cause an imbalance in nutrient and gas exchange.
- Insufficient tidal exchange in Pitship Marsh is harmful to juvenile salmonids; maintenance of proper tidal flux and flow is essential for proper salmon habitat.
- Soils are predominantly hoypus, which have a high infiltration rate. Hoypus soils are poor filters and do not effectively remove excessive nutrients, toxins, or other pollutants.

Opportunity areas may include:
- Removing riprap and bulkheads and replace with “soft” armoring; “soft” armoring includes using techniques that more closely mimic natural processes and functions, such as using logs and/or other large woody debris to act as a bulkhead.
- Explore incorporating public access into future development.
- Continue monitoring the effects of the recent restoration to the Pitship Marsh culvert removal (described in the “wetlands” section), including its effect on juvenile salmon.
- Explore opportunities to limit/prohibit new overwater structures and/or improve habitat functions with structures.
- Amending the City’s Comprehensive Plan Zoning Map to properly identify C-II(S), shoreline commercial, zones in areas within the Shoreline Management Act jurisdiction to avoid use conflicts.
Reach 2 – John Wayne Marina

Reach 2 consists of the John Wayne Marina, as well as Sequim Bay Resort and three single family residences, located on ten parcels. These parcels total approximately 21 acres. The largest land use within the shoreline area is the John Wayne Marina.

John Wayne Marina was constructed in 1985 on land donated by the John Wayne family. In 2003, it was featured in the June issue of SEA Magazine as “Best of the West” for small marinas. The Marina has approximately 300 boat slips, a restaurant, showers and restrooms, fueling dock, and pump out facilities. It is also the only area within the shoreline jurisdiction that provides public access. It has picnic areas and a ramp providing beach access. The boat ramp and hand launch also provide opportunities for recreational activities, such as fishing, boating, sailing, and canoeing. There are also commercial kitchen and meeting room facilities available for public use.

Table 13. Reach 2 - Shoreline Summary

<table>
<thead>
<tr>
<th>Land Use and Zoning</th>
<th>Habitat</th>
<th>Hazards</th>
<th>Public Access</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land Use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequim Bay Resort</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>John Wayne Marina</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Zone</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial, regional</td>
<td>39%</td>
<td></td>
<td>Plane</td>
</tr>
<tr>
<td>Public Facilities</td>
<td>46%</td>
<td></td>
<td>View</td>
</tr>
<tr>
<td>Residential</td>
<td>15%</td>
<td></td>
<td>Boat launch</td>
</tr>
<tr>
<td><strong>Area of future development</strong></td>
<td></td>
<td></td>
<td>Beach access</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Picnic areas</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Hand launch</td>
</tr>
<tr>
<td><strong>Habitat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drift cell divergence zone</td>
<td></td>
<td>100-yr floodplain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bald Eagle Zone 2</td>
<td>Modified slope stability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kelp/eelgrass</td>
<td>Intermediate slope stability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Anadromous fish</td>
<td>Critical Aquifer Recharge Area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barrier beach</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hazards</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Public Access</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>View</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boat launch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beach access</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Picnic areas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand launch</td>
<td></td>
<td></td>
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</tbody>
</table>
According to NOAA’s Community Profiles Report (2007), construction of the Marina resulted in a loss of sand lance spawning areas and eelgrass habitat. The report also indicates that there is no evidence to suggest that the Marina contributes to Sequim Bay’s water quality issues.

Sequim Bay Resort is the other dominant land use in this area, and is also part of the area of future development as described in the summary for Reach 1 above. Currently, the Resort has several cabins, seven ranging from 355 to 654 square feet and one large cabin at 1004 square feet. Most of these cabins were built in 1910. The Resort also has 41 recreational vehicle sites with full hook-ups available, including water, sewer, and power. The water and sewer facilities are provided by the Resort and Marina water and septic system. According to the Dept. of Health’s 1999 Sanitary Survey, the Resort/Marina septic system is located approximately 100 feet from the shoreline and 50 feet from Johnson Creek. The water system is supplied by three wells; the deepest is approximately 44 feet deep.

One residential parcel consists of approximately one acre and contains a 720 square foot residence built in 1970, located on the bluff less than 120 feet from Sequim Bay. The other two parcels are not located on the water front; one parcel has a 2,200 square foot home that was built in 1999, and the other has a 2,900 square foot home that was built in 1990.

The upland portion of this reach is also part of the area proposed for future development described in Reach 1. Some of the proposed commercial buildings, however, may be located within the shore line jurisdiction. As noted in Reach 1, this may be an area of potential use conflicts, due to the City’s current lack of C-II(S), shoreline commercial, zoning. The City intends to begin updating its Comprehensive Plan in 2011, however, which may be an opportune time to correct this conflict before development plans move beyond the conceptual stage.

<table>
<thead>
<tr>
<th>Shoreline Processes &amp; Functions</th>
<th>Alterations</th>
<th>Function Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrologic</td>
<td>Armoring</td>
<td>Hydrologic</td>
</tr>
<tr>
<td>Sediment transport</td>
<td>Docks, piers and other overwater structures</td>
<td>LOW</td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td>Impervious surfaces associated with parking lots, boat ramps, and other commercial/marina uses</td>
<td>Vegetative</td>
</tr>
<tr>
<td>Nutrient/toxic compounds removal</td>
<td>Fill/other shoreline modifications to accommodate Marina construction</td>
<td>LOW</td>
</tr>
<tr>
<td>Vegetative</td>
<td>Septic systems for commercial/public facilities’ uses, including restaurant, laundry, and showers</td>
<td>Habitat</td>
</tr>
<tr>
<td>Maintaining temperature</td>
<td></td>
<td>LOW</td>
</tr>
<tr>
<td>Large woody debris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat</td>
<td></td>
<td></td>
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<tr>
<td>Physical space and conditions</td>
<td></td>
<td></td>
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<tr>
<td>Food production and delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resting and foraging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Shoreline processes and functions within Reach 2 have been impacted by the following activities:
• Riprap surrounds the entire Marina;
• Floating concrete docks and creosote pilings;
• Extensive fill and other modifications, including straightening Johnson Creek, during construction of the Marina;
• Highest percentage of impervious surfaces because of extensive paving associated with the Marina’s parking lots and buildings;
• Removal of marine vegetation;
• Nonpoint source pollution entering Johnson Creek from Highland Irrigation ditches upland and within the watershed area; and
• Steam incision and other modifications of Johnson Creek upland.

Effects on the nearshore environment include:
• Interference with sediment transport to the north and to the south of the Marina because the Marina is located within a divergence zone. The Point No Point Treaty Council’s Shoreline Alterations Study (2003) rate the Marina’s impact on drift cell erosion and accretion as “severe” and sediment transport as “moderate”.
• Beach coarsening from increased wave energy and disrupted sediment transport to replenish the beaches.
• Light restriction from overwater structures, impairs growth of eelgrass and other marine vegetation, though floating docks secured by anchors and chains demonstrated no appreciable decline on eelgrass.
• Floating docks are known to support prey resources for intertidal resident fish, though salmonids are likely disadvantaged.
• Increased sediment and fecal coliform and other pollutants in Johnson Creek.
• The habitat function of the tidally-influenced area of Johnson Creek is considered “lost” by WRIA 17 and WRIA 18 Salmon Limiting Factors Analysis and by the Point No Point Treaty Council’s Historical Changes to Estuaries, Spits, and Associated Tidal Wetland Habitats in Hood Canal and Strait of Juan de Fuca Regions of Washington State (2006).
• High flow rates and volumes resulting in increased runoff from impervious surfaces can alter the formation and function of nearshore features and functions.

Opportunity areas may include:
• Restoring marine vegetation and habitat diversity.
• Replacing creosote pilings.
• Improving and/or restoring tidal connectivity between Johnson Creek and Sequim Bay.
• Increasing public access through better signage to the beach access ramp.
• Reducing and/or limiting new overwater structures and/or improve habitat function with overwater structures.
• Reducing nonpoint source pollution from parking lots, marina activities, and stormwater runoff.
• Studying and/or monitoring the effects of overwater structures within the Marina.
• Amending the City’s Comprehensive Plan Zoning Map to properly identify C-II(S), shoreline commercial, zones in areas within the Shoreline Management Act jurisdiction to avoid use conflicts.
Reach 3 – Single-Family Residential Development

Table 15. Reach 3 - Shoreline Summary

<table>
<thead>
<tr>
<th>Land Use and Zoning</th>
<th>Habitat</th>
<th>Hazards</th>
<th>Public Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use Residential Zone Residential 100%</td>
<td>Drift cell (L to R) and divergence zone Bald Eagle Zones 1 and 2 Kelp/eelgrass Shellfish Wildlife corridor Barrier beach/low Forested bluff</td>
<td>Intermediate slope stability Unstable slopes Landslide areas Critical Aquifer Recharge Areas</td>
<td></td>
</tr>
</tbody>
</table>

Reach 3 is comprised entirely of single family residential uses and associated out-buildings, located on 25 parcels, consisting of approximately 40 acres. Of these parcels, four are vacant, including one home that was demolished. The homes have an average age of 46 years, with build dates ranging from 1930 to 2006; of these homes, 13 homes were built before 1970. Several homes are located less than 50 feet from the bluff.

There are three docks and overwater structures, and a significant portion (65%) of the reach has bulkheads. The largest dock is approximately 300 feet in length and is constructed with creosote pilings. County records indicate that this dock is shared between neighboring property owners and includes a 20 x 25 foot float. Another large dock is approximately 200 feet long and also appears to be made of creosote pilings. Most of the bulkheads appear to be made of creosote wood or concrete, though some riprap is present. One property owner has participated in Washington Dept. Fish and Wildlife’s bulkhead removal incentive program.

Currently, the City has no available utilities in the area, so the residents rely on private wells and septic systems. The well logs supplied by the Dept. of Ecology are incomplete, largely due to incomplete information provided by the well driller; the earliest well log was completed in 1966 and the most recent in 2006. Because of the age of many homes, a few of the wells may be located too close to existing septic drainfields. In at least one instance, County septic system records indicate that the well is located only about 30 feet from the septic drainfield.

The on-site septic system records received from Clallam County are also incomplete, though the County has some records associated with most of the parcels. Septic repairs and indications of failure are fairly common in this area. The Washington Dept. of Health Sanitation Survey (1999) noted that several homes in this area appeared to have failed or failing systems and a
A number of homes have had their systems repaired or replaced. Other systems are completely undocumented. The Table below summarizes the on-site septic system data for 18 parcels with County septic record information within this reach. The County has no records for five parcels located within this reach, and the rest are vacant.

Table 16. Reach 3 - Septic System Summary

<table>
<thead>
<tr>
<th>Number of Systems</th>
<th>Number of Repairs</th>
<th>Repair Percentage</th>
<th>Percent Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>10</td>
<td>56%</td>
<td>28%</td>
</tr>
</tbody>
</table>

Of these five parcels without septic records, one was listed as a “suspected pollution site” in the 1999 Sanitary Survey of Sequim Bay conducted by the Dept. of Health. Four other sites were listed as “suspected pollution sites” in the Survey, and one parcel had records indicating that 2004 loan certification inspection document that indicated drainfield or pump/timer failure. The County has no records that the homeowner has taken steps to repair the system.

The soils in this area are rated as “very limited” by the U.S.D.A Websoil Survey for septic tank absorption, indicating that the soil has one or more features that make the soil unfavorable for septic use. The soils may not adequately filter the effluent, particularly when the system is new, which can result in groundwater contamination. It also indicates that poor septic performance and high maintenance is to be expected, and the above summary appears to support this assertion.

Table 17. Reach 3 - Process and Function Summary

<table>
<thead>
<tr>
<th>Shoreline Processes &amp; Functions</th>
<th>Alterations</th>
<th>Function Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrologic</td>
<td>Armoring</td>
<td>Hydrologic</td>
</tr>
<tr>
<td>Sediment transport</td>
<td>Docks, piers and other overwater structures</td>
<td>LOW/MODERATE</td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td>Impervious surfaces associated with homes, garages, and other residential uses</td>
<td>Vegetative LOW/MODERATE</td>
</tr>
<tr>
<td>Nutrient/toxic compounds removal</td>
<td>Septic systems</td>
<td>Habitat MODERATE</td>
</tr>
<tr>
<td>Vegetative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maintaining temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large woody debris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical space and conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food production and delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resting and foraging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Shoreline processes and functions within Reach 3 have been impacted by the following activities:

- Shoreline armoring, including wooden and concrete bulkheads that cover much of the area;
- Reliance on septic systems in an area with soils of limited absorption/filtration capabilities;
• Septic system failures;
• Large overwater structures and private beach access staircases; and
• High percentage of impervious surfaces because of the large number of residences and associated outbuildings.

Effects on the nearshore environment include:
• Increased wave energy from armoring coarsens beach substrate. Forage fish, such as sand lance and surf smelt, require certain beach substrate composition to spawn, and herring rely on the presence of eelgrass, which is also affected by substrate composition.
• Excessive nutrients found in the soil from septic systems or other nonpoint source pollution can cause an overgrowth of algae, which can block light and cause an imbalance in nutrient and gas exchange.
• Overwater structures, particularly large structures, interfere with sediment transport and creosote may leak toxins into the water;
• High flow rates and volumes resulting from increased runoff from impervious surfaces can alter the formation and function of nearshore features.

Opportunity areas may include:
• Protecting marine riparian vegetation by adopting clearing and grading regulations designed to avoid/minimize vegetation loss, and require replanting with multiple native species.
• Encouraging alternate or “soft” armoring methods.
• Avoiding or minimizing construction of additional overwater structures by encouraging mooring buoys and shared docks and moorage.
• Encouraging or requiring ‘grated’ decking or other similar measures to allow light penetration.
• Removing old creosote and treated overwater structures.

Reach 4 – Pacific Northwest National Laboratories/Battelle Marine Research Facilities
Table 18. Reach 4 - Shoreline Summary

<table>
<thead>
<tr>
<th>Land Use and Zoning</th>
<th>Habitat</th>
<th>Hazards</th>
<th>Public Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine Research</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>facilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRII – Residential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(County) 100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Development Park</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(City) 100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Shellfish
- Kelp/eelgrass
- Drift cell (L to R)
- Eagle Zones 1 and 2
- Shorebirds
- Waterfowl
- Wildlife Corridor
- Forage fish
- High gravel bluffs
- Barrier beach
- Intermediate slope stability
- Unstable slopes
- Landslide areas
- Critical Aquifer Recharge Area
- Marine shores, no known upland access

This area encompasses about 45.5 acres and consists of five parcels, all of which are owned by Battelle, which operates the Pacific Northwest National Laboratory for the US Department of Energy. The facility conducts research in the marine environment in a variety of areas, such as coastal ecosystem research, marine biotechnology, coastal biogeochemistry, and sensory information systems. The facility has structures located upland and on the shoreline. The facility was built in 1982 and consists of several large buildings, ranging from approximately 520 square feet to over 22,000 square feet. It also has over 60,000 square feet of asphalt and 9,000 square feet of concrete. The shoreline location is essential to PNNL/Battelle’s research on the marine environment.

Figure 10 - PNNL/Battelle Marine Shoreline Facility

The area now home to the shoreline lab was modified in the late 1960s or early 1970s with about three to four feet of fill because the site was previously a peat bog and historically contained a lagoon and tidal marsh. However, the entire base of the South Spit had already been completely modified by about 1926 to accommodate a cannery. The area has one large dock and the entire shoreline edge of the facility has a concrete bulkhead approximately 600 feet in length.

With the exception of the PNNL/Battelle facilities, the rest of the reach is largely undeveloped, though this area is also a site identified for future development. PNNL/Battelle is currently expanding at about 10% per year. PNNL/Battelle must dramatically increase the number of their
employees by 2012 in response to a Dept. of Energy contract. They plan to expand the
shoreline labs, but intend to expand vertically rather than enlarging their building footprint.

Further upland is another area that may be the site of future laboratory expansion, as indicated
in the photo below. PNNL/Battelle has plans to attract similar research companies to the site,
though none have been specifically identified. It is unclear whether there would be any potential
use conflicts between the Research and Development Park zoning designation and allowed
uses and the Shoreline Management Act.

Figure 11 - PNNL/Battelle Potential Development

Because of the nature of the research and clientele, this location is an attractive area for
expansion. The area between the bluff and the tree line is approximately 90 vertical feet lower
than the area above the tree line. As such, it provides natural screening for the research and
development projects that would be developed on this site. Before expansion, however,
PNNL/Battelle will annex into the City and work with the City to extend water and sewer facilities
to the area.

While it may appear the expansion may cause a conflict with the neighboring residential uses,
PNNL/Battelle own a parcel adjacent to the northernmost residential parcel, and there are no
plans to develop that parcel. PNNL/Battelle intend to keep that parcel undeveloped to act as a
natural buffer.

As noted in previous sections, this area is also subject to erosion and sloughing. The high levels
of water saturation have caused several large trees to die, and these trees have subsequently
been removed to eliminate the hazard to area buildings and parking areas. Increased
impervious surfaces from future development, absent adequate storm drainage control, will only
increase the water saturation and erosion. Water saturation and erosion make the likelihood of
additional bulkheads or other forms of armoring very high.
Shoreline processes and functions within Reach 4 have been impacted by the following activities:

- Shoreline armoring, which includes approximately 600 feet of wood bulkhead in front of the shoreline facility;
- Shoreline modification and fill, which reduced the length of the South Spit by approximately 33%;
- One large overwater dock; and
- Impervious surfaces from the large number of structures and associated outbuildings and parking area located at the shoreline facility.

Effects on the nearshore environment include:

- Increased wave energy from armoring coarsens beach substrate. Forage fish, such as sand lance and surf smelt, require certain beach substrate composition to spawn, and herring rely on the presence of eelgrass, which is also affected by substrate composition.
- Overwater structures, particularly large structures, may interfere with sediment transport.
- High flow rates and volumes resulting from increased runoff from impervious surfaces can alter the formation and function of nearshore features.

Opportunity areas may include:

- Encouraging vertical expansion in the shoreline area and in upland areas away from nearshore habitats.
- Address stormwater runoff to prevent additional water saturation.
- Avoiding/minimizing additional overwater structures and armoring.
- Preserving existing nearshore and wildlife habitats.
- Opening public access to Travis Spit, which is also owned by PNNL/Battelle. This portion of land, however, falls under Clallam County’s jurisdiction and is not an area identified for annexation into the City of Sequim.
Reach 5 – Washington Harbor

Table 20. Reach 5 - Shoreline Summary

<table>
<thead>
<tr>
<th>Land Use and Zoning</th>
<th>Habitat</th>
<th>Hazards</th>
<th>Public Access</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td>Undefined drift cell</td>
<td>Critical Aquifer Recharge Area</td>
<td>View</td>
</tr>
<tr>
<td>Marine Research facilities</td>
<td>Bald Eagle Zones 1 and 2</td>
<td>Intermediate slope stability</td>
<td></td>
</tr>
<tr>
<td>Zone</td>
<td>Eelgrass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRII – Residential (County)</td>
<td>Falcon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td>Shorebirds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research and Development Park (City)</td>
<td>Barrier estuary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td>Salt Marsh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This area is also owned by PNNL/Battelle and encompasses the inner shoreline area from the tip of South Spit and running approximately one-half mile along the public portion of Washington Harbor Rd. The parking lot for the shoreline facility is accessed via Washington Harbor Rd., and there is a small public lot located just before the entrance to the research facility. The public parking lot is surrounded by approximately 100 feet of riprap.

The photo demonstrates that a large portion of the Reach is heavily vegetated on the south side of Washington Harbor Rd. These are large trees and are home to bald eagle nesting sites. Though PNNL/Battelle is looking to expand their facilities, the facility manager indicated that there are no current plans to develop within the approximately seven acres of forested area.

Regionally, Washington Harbor and Bell Creek, which drains into Washington Harbor, are affected by a number of impacts. Bell Creek, for example, is listed on the Dept. of Ecology’s water quality 303(d) list for impaired waters. It is listed for high levels of bioassessment, dissolved oxygen, and fecal coliform. Moreover, Bell Creek’s hydrology has been significantly
altered by irrigation operations, urban storm drainage and runoff, and filled wetlands associated with the creek. Perhaps the most impairment comes from the road that was constructed for the City’s wastewater treatment plant outfall. This road bisects the Harbor and cuts off tidal exchange to the rest of the Harbor. Along with tidal exchange, erosion and fluvial sediment deposition, which are critical habitat forming processes, have been impaired. There has been some discussion with the City of Sequim, the Jamestown Tribe, and the property owner along Gibson Spit to remove the access road for the City’s outfall and replace the road with a bridge to facilitate greater tidal exchange and improve habitat functions.

Table 21. Reach 5 - Process and Function Summary

<table>
<thead>
<tr>
<th>Shoreline Processes &amp; Functions</th>
<th>Alterations</th>
<th>Function Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrologic</td>
<td>Armoring</td>
<td>Hydrologic MODERATE</td>
</tr>
<tr>
<td>Sediment transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrient/toxic compounds removal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetative</td>
<td>Impervious surfaces associated with marine research uses and Washington Harbor Rd.</td>
<td>Vegetative MODERATE</td>
</tr>
<tr>
<td>Maintaining temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large woody debris</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attenuating wave energy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat</td>
<td></td>
<td>Habitat MODERATE</td>
</tr>
<tr>
<td>Physical space and conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food production and delivery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resting and foraging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migration</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Shoreline processes and functions within Reach 5 have been impacted by the following activities:

- Shoreline armoring, which includes the 100’ of riprap surrounding a small public parking lot;
- Shoreline modification and fill, which reduced the length of the South Spit by approximately 33%;
- Impervious surfaces from Washington Harbor Rd., which runs parallel to the Harbor’s edge; and
- Regional armoring and upland irrigation operations and land uses.

Effects on the nearshore environment include:

- Increased wave energy from armoring coarsens beach substrate.
- High flow rates and volumes resulting from increased runoff from impervious surfaces can alter the formation and function of nearshore features.
- Stormwater runoff and irrigation operations transport upland pollutants and contaminants to the nearshore.
- Large numbers of shorebirds and waterfowl in the Harbor may also contribute to the high levels of fecal coliform in the water.

Opportunity areas may include:

- Encouraging regional efforts to improve environmental processes and functions.
- Remove riprap from in front of public parking area; explore “soft” armoring techniques.
CONCLUSIONS

Data Gaps
In terms of land use, data gaps include the lack of septic records for some parcels located on the shoreline. With many of these systems constructed in the 1930s, it is important to know the overall condition of the septic systems to address potential environmental hazards. The number of individual wells is also a data gap, as most of the available well logs date from the 1970s. During this time, well logs are generally incomplete or missing, and no well logs seem to pre-date the 1970s, so there is no way to properly establish the full effect permit-exempt wells have on the aquifer. In addition, the City currently does not have the capability to determine the percentage of impervious surfaces, and attempts to determine these percentages would be estimations at best because of the lack of available records.

In terms of environmental gaps, information regarding sand lance and surf smelt is generally lacking, as little is known about either species. These species are located near areas of anticipated future growth, so it may be worthwhile to monitor the long-terms effects of upland development. In addition, sediment input, fine sediment, mass wasting, and sediment supply are data gaps for Johnson Creek.

Summary
The shoreline area has remained stable over the past two decades or more, with W. Sequim Bay Rd. and the John Wayne Marina constructed decades earlier and limited residential development. Extensive armoring throughout the shoreline area has affected sediment transport and may have long-term, adverse effects on the beaches and substrate. The armoring along W. Sequim Bay Road and John Wayne Marina is the most significant source of sediment transport interference and beach coarsening due to increased wave energy. Both of these uses, however, are well established and it is unlikely that enough armoring will ever be removed to allow sediment transport to return to its natural state. Nonetheless, the habitat within the area appears relatively stable and only moderately impaired, on the whole, despite the presence of the Marina. The Marina, however, also provides the only existing public access within the shoreline area, as most of the tidelands are held in private ownership. Recreational opportunities abound here, with the picnic areas, boating facilities, and beach access offering a wide variety of ways in which the public may enjoy the shoreline. Restoration opportunities would most likely be limited to the Marina, such as creosote piling removal or fish passage enhancement.

Future development within the shoreline jurisdiction and at the watershed scale, however, may provide some challenges in achieving no net loss and resolving use conflicts in the coming years. The commercial zoning designation will need to address the priority uses as outlined in the Shoreline Management Act (SMA), RCW 90.58.020, and WAC 173-26-181. In addition, uses within the Research and Development Park zoning district should make clear that uses within SMA jurisdiction are the preferred uses under the SMA. On the other hand, future development may provide the means to address a number of environmental impacts along the shoreline, such as limiting or reducing the number of on-site septic systems within the area. It may also provide opportunities to address stormwater runoff issues, as well as provide opportunities to encourage shared boating facilities. Restoration opportunities and additional public access sites may be available as a means of off-setting identified environmental impacts. Because of the City's limited shoreline area, the benefits from any restoration, however, will be
limited without regional coordination with Clallam County, the Jamestown S’Klallam Tribe, and other organizations.

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