

**CITY OF BURIEN  
SHORELINE MASTER PROGRAM UPDATE**

**SHORELINE ANALYSIS AND CHARACTERIZATION**

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<sup>1</sup> Note that this is a complete list of figures that currently comprise the map folio for the Shoreline Master Program Update. Not all of the figures included at the end of this document are referenced in the text; they were kept together as a group for consistency in figure numbering.

<sup>2</sup> Figures 4A and 10 are in addition to the group of figures that were originally presented in the Shoreline Inventory report dated March 27, 2008.

## 1 INTRODUCTION

This report is intended to provide baseline information on the existing ecosystem and shoreline processes occurring within the City of Burien's (City's) shoreline jurisdiction (Figure 1) to provide a basis for the update of the City's Shoreline Master Program (SMP). This document is supplemental to the Shoreline Inventory, submitted to the Washington State Department of Ecology (Ecology) in March 2008 (revised October 2008) (Grette Associates 2008) as part of the SMP update. This document addresses larger-scale (i.e., watershed) physical and biological processes occurring in the City's shoreline jurisdiction, as well as descriptions of shoreline functions based on a shoreline reach analysis. Finally, this report analyzes opportunities for shoreline protection and restoration, as well as public access and shoreline uses.

In some cases, this report will reiterate information already presented in the Shoreline Inventory (Grette Associates 2008) in order to facilitate review of the larger-scale analysis. In cases where the material is not as pertinent to the analysis presented here, the Inventory will merely be referenced.

### 1.1 STUDY AREA BOUNDARY

The City of Burien is located in south central King County, south of the City of Seattle, north of the City of Normandy Park, and west of the City of SeaTac. Although there are a number of waterbodies, including streams, lakes and marine shorelines, within the City limits only two of these are regulated under the State Shoreline Management Act (SMA). The first is the approximately five-mile stretch of Puget Sound marine shoreline between the north and south City limits. The second is Lake Burien, which is entirely located within the City limits and includes approximately 1.1 miles of shoreline (Figure 1).

Under revisions to the SMA, shoreline jurisdictions have discretion regarding the lateral extent of shoreline zone from the ordinary high water (OHW) mark. The standard shoreline jurisdictional overlay is 200 horizontal feet landward of the OHW mark and the extent of any wetlands with overlap or connection to the 200-foot overlay. In addition, a jurisdiction has the option to include the locally adopted buffers for these wetlands. This analysis will include the wetlands areas and not consider the associated buffers for discussion purposes.

### 1.2 METHODOLOGY

The scope of this document was defined according to the provisions in Washington Administrative Code (WAC) 173-26-201(3)(d). It draws heavily upon the previously presented Inventory of existing information and data from a number of sources, including Geographic Information System (GIS) layers, basin plans, Water Resource Inventory Area (WRIA) documents, relevant consultant reports, and on-line mappers.

### 1.3 REPORT ORGANIZATION

This report is organized to correlate with the required analysis (WAC 173-26-201(3)(d)) and is intended to review large-scale information, and scale down sequentially to smaller reaches (reaches defined below in Section 1.4). This approach is fairly rigorous and ensures consistency between SMPs in adjacent jurisdictions.

#### 1.4 SHORELINE REACHES

As presented in the Inventory (Grette Associates 2008), the City's shorelines were divided into lineal reaches according to land use (e.g., zoning and existing land use) and environmental characteristics (e.g., drainages, substrates and drift cells) (Figures 2-4). The marine shoreline was divided into four reaches, whereas Lake Burien was kept as a single reach based on the consistent use and environment around its perimeter (Table 1; Figure 1).

**Table 1. Shoreline inventory reaches in the City of Burien.**

Location	Reach	Description	Approximate Length (ft)	Approximate Length (mi)
Marine	M1	Primarily residential marine shoreline extending south from City limit to the north edge of Seahurst Park.	6,001	1.14
Marine	M2	Seahurst Park and primarily undeveloped shoreline south to the point at which consistent shoreline residential development begins again. Corresponds to a line projected west from SW 149 <sup>th</sup> Street to intersection with the shoreline.	6,382	1.21
Marine	M3	Consistent residential development extending south to the tip of Three Tree Point.	9,246	1.75
Marine	M4	Consistent residential development from the tip of Three Tree Point to the southern City limit.	7,597	1.44
		<i>Marine Subtotal</i>	29,226	5.54
Lake Burien	LB	Entire perimeter of Lake Burien	6,172	1.67
		<b>Total Jurisdictional Shoreline</b>	<b>35,399</b>	<b>7.21</b>

## 2 ECOSYSTEM-WIDE PROCESSES

### 2.1 GEOGRAPHICAL CHARACTERISTICS

The City of Burien is located along Puget Sound, in the Central Puget Lowland ecoregion. Ecoregions are areas defined by having similar ecosystems, including the type, quality and quantity of environmental resources; ecoregions in Washington and Oregon have been determined through analysis of the geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology of the area (Pater et al. 1998). Ecoregions serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components (Pater et al. 1998). The Central Puget Sound ecoregion is characterized by well-drained, gravelly soils that exhibit limited moisture holding capacity and rather low agricultural productivity. Within the Seattle area, including Burien, its undulating drift plains are heavily urbanized (Pater et al. 1998).

WRIAs are another spatial framework in which an area can be described; Burien is located within WRIA 9 – Green/Duwamish and Central Puget Sound Watersheds. The Habitat Limiting Factors and Reconnaissance Assessment Report for WRIA 9 (Kerwin and Nelson 2000) describes ecosystem-wide processes for the entire WRIA, and specifically for the Nearshore Sub-watershed in which Burien is located. This WRIA report (Kerwin and Nelson 2000) is referenced heavily below and throughout this document.

Additionally, this section relies upon much of the information presented in *The Burien Plan: The Comprehensive Plan for the City of Burien* (City of Burien 2006), as it includes extensive information on current conditions within the City.

#### 2.1.1 Geology

During the Pleistocene epoch (from about 1 million years to approximately 12,000 years ago), glaciers extending south from British Columbia covered the lowlands around Puget Sound. Advances and retreats by these glaciers scoured existing bedrock and left a complex array of glacial outwash, till, alluvium, and lacustrine (lake) deposits (Kerwin and Nelson 2000).

A composite of several different glacial depositional processes composes the glacial drift plain underlying Burien. Processes include lacustrine deposits, predominantly silt and clay; glacial till, a mixture of sand, gravel, clay, silt and boulders deposited directly by the glacier; and advance and recessional drift, largely sand and gravel deposits made by glacial meltwater (City of Burien 2006).

In the upland areas, glacial till dominates the surficial geology. Surface geology in the Miller Creek and Salmon Creek valleys largely consists of recessional outwash deposits formed by glacial meltwater streams. Erosion along the steep Puget Sound bluffs has removed the more recent glacial deposits; therefore, surface exposures of older advance outwash and glacial lake deposits are common in these areas (City of Burien 2006).

### **2.1.2 Soils**

Within Burien, there are distinctive soil differences between the upland areas, major stream valleys, and the Puget Sound bluffs. Soils in upland areas outside of the river valleys are predominantly Alderwood series, derived from glacial till. In general, these soils have very slow permeability, which imposes severe limitations for septic tank drainfields and presents moderate erosion potential in areas with moderately sloping terrain (City of Burien 2006).

Soils within the Miller Creek and Salmon Creek valleys predominantly consist of Everett recessional outwash deposits. These soils are very permeable. As with slow permeable soils, these soils impose severe limitations on the use of septic systems, but for different reasons; very permeable soils may present increased potential for groundwater contamination from septic tank effluent. However, these soils present only a slight erosion potential due to this permeability (City of Burien 2006).

The bluffs and valley walls bordering steep-sloped ravines in the lower reaches of Salmon and Miller Creeks include Alderwood, Kitsap and Indianola series soils. The very slow permeability of these soils imposes severe limitations on the use of septic systems and presents severe erosion hazards. Additionally, coastal beach series soils are found in narrow strips along the base of the bluffs. These soils also present severe limitations for septic systems due to tidal flooding (City of Burien 2006).

### **2.1.3 Topography**

The City of Burien's topography is characterized by gently rolling terrain, typical of the glaciated Puget Sound region. Upland elevations within Burien range from 300 to 400 feet mean sea level (MSL). Along the Puget Sound shoreline, the upland areas drop abruptly from 300 feet MSL to sea level. These Puget Sound bluffs have slopes ranging from steep to very steep, often exceeding 40 percent. Spring-fed creeks and upland streams have produced numerous steep-sloped ravines in this marine shoreline area (City of Burien 2006).

### **2.1.4 Climate**

The climate in Burien is generally mild, with wet winters and dry, cool summers, typical of other marine west coast climates. Annual precipitation in the surrounding areas varies widely, ranging from over 100 inches in the Cascade foothills and decreasing westward to 35 inches along the marine shoreline (Kerwin and Nelson 2000).

### **2.1.5 Vegetation**

The landscape within the City of Burien consists of a variety of natural and disturbed habitats, including wooded areas, wetlands, pastures and urban development. Outside of the areas already protected from development (such as Seahurst Park), few areas of natural vegetation remain. Existing vegetation within the City consists of ornamental plants associated with residential and commercial landscaping. Other vegetation includes the native and/or ornamental trees, plants, shrubs, and grasses within parks and other open spaces. Along the creeks within the City, vegetation common to riparian environments is present (City of Burien 2006).

Tideland/shoreline environments exist along the shoreline of Puget Sound (City of Burien 2006); however, because the majority of the marine shoreline is privately-owned, much of the adjacent upland consists of landscaped yards.

The Central Puget Sound region is home to several sensitive species of plants, including the whitetop aster, the tall bugbane, and the choriso bog-orchid (City of Burien 2006). The potential for these species within the City is considered low.

### **2.1.6 Drainage Patterns**

The City of Burien is located within three major drainage basins: Salmon Creek, draining approximately 1,390 acres; Miller Creek, draining approximately 5,230 acres; and Puget Sound (City of Burien 2006). Additionally, Seola Creek (which runs along the northern City limit) drains to the marine shoreline through a culvert (Wild Fish Conservancy 2003). Drainage is predominantly to the west towards Puget Sound.

From its origination in the City of Seattle, Salmon Creek flows through the White Center area and into Puget Sound adjacent to the northwest corner of the City. Flows from this basin are somewhat attenuated by a series of degraded wetlands and small lakes, including Garret Lake, all of which are outside the City of Burien (City of Burien 2006).

Miller Creek originates in numerous bogs, lakes, and depressions in the plateau that comprise the bulk of the Burien-SeaTac land area. Seven tributaries flow into Miller Creek and it receives drainage from the Burien commercial area, State Highway 509, Sea-Tac Airport and an extensive area in unincorporated King County. The main stem of Miller Creek is only partially in the City of Burien, and the mouth of the creek is not located in the City (it drains into Puget Sound south of the City limits) (City of Burien 2006).

Miller and Salmon Creeks are not unlike other urbanized streams, with their stream channels and stream flows extensively modified through channelization, culverting, fill and other man-made changes. During storms, the peak volume of water conveyed by the creeks is both greater and occurs in less time than it would if the drainage basins had remained in a natural or undeveloped state. This increased stream runoff increases the potential for streambed scouring and the amount of flooding and sedimentation that could occur in downstream areas (City of Burien 2006).

A series of small basins composed of steep hillsides sloping down from the Burien Plateau area to the Puget Sound make up the larger Puget Sound drainage basin. Each small basin collects ground water outcroppings and urban runoff, and forms streams of varying sizes, some quite large (as in Seahurst Park) and others as intermittent spring-fed creeks. Increased development within these basins, and the associated impacts (e.g., effects of impervious surfaces), have caused a number of serious erosion and slide problems (City of Burien 2006).

Lake Burien, which is the only lake located within the City, previously served as the drainage basin for a small area until a system of storm water drainage pipes were installed on the northern side to divert runoff flowing into the lake; however, several drainage points to the lake remain along the shoreline (Figure 7E). Underground culverts drain the lake to the southeast (City of Burien 2006).

## 2.2 HISTORIC WATERSHED CONDITIONS

Prior to European settlement of Puget Sound in the 1850s, the lowlands of Puget Sound included a network of sloughs, islands, beaver ponds, and estuaries. Land use was limited to native peoples fishing, hunting and food gathering. The only evidence of forest clearing by Native Americans was maintaining gardens and camas fields. Shellfish and salmon were their primary food sources (Kerwin and Nelson 2000).

Post-European settlement, land use in Burien consisted primarily of timber-based industry. Further development occurred with the coming of the railroad at the turn of the 20<sup>th</sup> century. Additional settlement occurred with the construction of a north-south road (to become Ambaum Boulevard) connecting Burien to the City of White Center in 1909. Over the years development and urbanization has led to modification of the shorelines. By 1930, the land around Lake Burien and along the northern marine waterfront had been purchased by Jay C. Allen and developed into a large estate called Glennallen; the 400+-acre estate was later broken up and sold off. Development of the marine shoreline north of Salmon Creek occurred primarily throughout the 1950s and 1960s. The southern marine waterfront was not developed extensively due to the steep slopes along the shoreline. By the 1970s, development peaked; that is, almost all the land that is currently developed had been built upon (City of Burien 2004). Burien became an incorporated City in 1993.

Burien is located within the Nearshore Sub-watershed of WRIA 9. Eighty (80) percent of the shoreline is modified within the Nearshore Sub-watershed. Most shoreline modification measures (such as seawalls and bulkheads) were installed to protect residential development from erosion. However, these shoreline modifications have resulted in the alteration of nearshore habitat functions; examples include interruption of habitat-forming processes, destruction of habitat, and degradation of sediment and/or water quality. Within WRIA 9, there are only a minimal number of unaltered shorelines (Kerwin and Nelson 2000).

The Inventory and Assessment of Current and Historic Beach Feeding Sources/Erosion and Accretion Areas for the Marine Shorelines of WRIA 8 & 9 document (Johannessen, MacLennan, and McBride 2005) describes historic shoreforms and processes and compares them to current conditions based on an extensive inventory of existing data and conditions. This document describes historic and existing conditions relative to sediment transport (net short-drift), erosion, and accretion along WRIA 8/9 marine shorelines. City shorelines include three drift cells KI-5-1, KI-7-2, and KI-7-3, from north to south (Figure 4A). KI-5-1 is the longest drift cell in King County (11.2 miles) and extends north from the southern end of Seahurst Park to the northeastern side of the Duwamish Head in Seattle. Net shore-drift in KI-5-1 is from south to north. KI-5-1 includes both Reach M1 and M2 of this inventory. KI-7-2, as well as existing land use patterns, was used to define Reach M3 which extends north from Three Tree Point to approximately Seahurst Park. Net shore-drift in KI-7-2 is generally from the north to the south/southwest. KI-7-3 originates just north of the Des Moines Creek estuary and terminates in the City at Three Tree Point. It is approximately 4.5 miles in length. Net shore-drift in KI-7-3 is from south to north.

It is recognized that "Habitat Limiting Factors and Impacts" in both the freshwater and marine environments include urban and industrial land use practices (Kerwin and Nelson 2000).

Specific to the Burien's shoreline reaches covered by the SMP (which do not include any freshwater tributaries), these urban and industrial land use practices include those described for the Nearshore Sub-watershed by Kerwin and Nelson (2000; below):

- Altering or destroying significant amounts of nearshore habitat;
- Interrupting critical habitat-forming processes;
- Fragmenting or destroying marine riparian corridors; and
- Contributing toxic chemicals and harmful organic compounds to nearshore waters and sediments.

### 2.3 CURRENT LAND USE

The current Comprehensive Plan (City of Burien 2006) states that land use and development in the shoreline areas will be compatible with the SMP, and that adherence to shoreline designations "will ensure that sensitive habitat, ecological systems, and other shoreline resources are protected" (Comprehensive Plan Policy EV 1.2; City of Burien 2006). Existing land use within the entire City of Burien is presented in Table 2, and specific land use information for each shoreline reach is given in Section 3 of this document. Additional general shoreline land use information is presented in Figures 5A-5E and in the Shoreline Inventory (Grette Associates 2008), including sections describing impervious surface; roads and bridges; flood control structures; docks, piers and overwater structures; storm water and sewer outfalls; water and sewer utilities; and culverts.

Table 2. Existing land use in the City of Burien.

Land Use Category	Acres	Percent of Gross Area
Single Family	2301.04	58.36%
High Density MFR	214.27	5.43%
Low Density MFR	37.79	0.96%
Commercial	79.31	2.01%
Retail	156.47	3.97%
Industrial	24.09	0.61%
Institutional	135.84	3.45%
Office	67.70	1.72%
School	119.99	3.04%
Park	456.88	11.59%
Transportation	12.74	0.32%
Vacant	335.86	8.52%
Other	0.78	0.02%
<b>Gross Area</b>	<b>3,942.76</b>	<b>100.00%</b>

Percentages may not total 100 percent due to rounding during GIS analysis.

### 3 SHORELINE FUNCTIONS

The functions provided by shorelines in the marine environment are different than those provided by shorelines in a freshwater environment (in this case, specifically a lake environment). For this reason, the discussion of shoreline functions is presented in two separate sections below – “Marine Reaches” and “Freshwater – Reach LB.”

#### 3.1 MARINE REACHES

Per WAC 173-26-201(3)(d)(i)(C), shoreline ecological functions in marine waters include, but are not limited to:

- Hydrologic – Transporting and stabilizing sediment, attenuating wave and tidal energy, removing excessive nutrients and toxic compounds, recruitment, redistribution and reduction of woody debris and other organic material.
- Vegetation – Maintaining temperature, removing excessive nutrients and toxic compound, attenuating wave energy, sediment removal and stabilization, and providing woody debris and other organic matter.
- Habitat for aquatic and shoreline-dependent birds, invertebrates, mammals, amphibians, and anadromous and resident native fish – Habitat functions may include, but are not limited to, space or conditions for reproduction, resting, hiding and migration, and food production and delivery.

Reach-scale shoreline functions are described below for each of the marine reaches (Reach M1-M4).

##### 3.1.1 Reach M1

Reach M1 is the northernmost marine reach along the Burien shoreline, extending from Seola Beach to the north end of Seahurst Park. The reach is 1.14 miles in length. Historically, most of Reach M1 was exceptional or potential feeder bluff. Now it is almost entirely modified shoreline (Johannessen, MacLennan, McBride, 2005). Figure 4A depicts historic and current shoreforms from Johannessen, MacLennan, and McBride (2005).

Additional summary information for Reach M1 is presented in Table 3.

Table 3. Reach M1 summary.

Total Acreage / Land Use	Stream Discharges	Public Shoreline Access	Hazard Areas	Habitat / Habitat Potential
25.00 acres Single Family: 72% Vacant: 23% Tracts/Other: 4% Low Density MFR: 1% Institutional: 0.01%	Seola Creek, Salmon Creek, unnamed tribs	None	Landslide, Flood	Wetlands, Stream, Fish and Wildlife Areas (salmonids, forage fish, shellfish, eelgrass, Urban Natural Open Space)

<sup>1</sup> Percentages may not total 100 percent due to rounding during GIS analysis.

### *Current Land Use*

This reach is predominantly single family use, with portions of undeveloped property associated with high gradient slopes and vacant parcels comprising approximately 24 percent of the reach (Figure 5A). Future land use within this reach will likely include development of the remaining parcels as single family structures, then redevelopment of smaller residences as property value increases.

### *Hydrologic Function*

The shoreline of Reach M1 is primarily residential, and much of the shoreline is hardened by private bulkheads and boat ramps. These structures affect the hydrological functions of the shoreline, altering the transportation of sediment to and from the shoreline reach. Woody debris and organic material redistribution is restricted to the shoreline area waterward of the bulkheads.

Freshwater input is limited to that from Seola and Salmon Creeks, as well as unnamed tributaries entering Puget Sound from the uplands adjacent to the shoreline. In some cases, small culverts or pipes drain freshwater from the upland through an existing armored structure into Puget Sound (Figure 7A).

Approximately 70 percent of Reach M1 is mapped as 100-year floodplain (Figure 8A). Armoring of the shoreline can contribute to impacts of flooding as an artificial physical boundary can impede the flow during inundation and recession of floodwater.

### *Vegetation Function*

Vegetation along Reach M1 is also influenced by the existing land use in that much of the upland consists of the manicured yards of residential properties. Marine shorelines with highly altered vegetation are not as effective in removing excess nutrients, stabilizing sediment and contributing organic matter as unmodified shorelines. However, any trees along the shoreline, whether native or part of a landscaped yard, contributes to overwater shading of the intertidal zone.

Additionally, the entire reach is mapped as a landslide hazard area, a Critical Area type (Figure 8A). Removal of shoreline vegetation, such as that resulting from development, leads to erosion of the shoreline and may contribute to landslide activity.

### *Other Habitat Function*

Critical Areas within this reach include the right bank and buffer of Seola Creek, Salmon Creek and associated buffers, and several small unnamed tributaries to Puget Sound. The forested ravines associated with these streams are mapped as Urban Natural Open Space, a Priority Habitat in Washington State (Figure 9A). Deep forested ravines and the associated streams provide small mammal, bird and fish habitat.

A high stream gradient limits opportunities for salmonids in Seola Creek and the unnamed tributaries within Reach M1. Salmon Creek has historically had coho salmon (*Oncorhynchus*

*kisutch*) presence. A private structure near the mouth of Salmon Creek confines the channel and may impede fish passage to habitat upstream.

The physical separation of marine waters from the upland resulting from the armoring of shorelines limits the utilization of the transitional intertidal habitat; however, within Reach M1, there are several areas of quality habitat for shoreline-dependent animals along the marine shoreline (Figure 9A). Below the OHW mark, the entire reach is mapped as having geoduck (*Panopea abrupta*) beds. Eelgrass (*Zostera* sp.) patches are present as a sparse fringe along the reach, and provide habitat for fish spawning, juvenile fish and invertebrates. The southernmost end of Reach M1 is mapped having surf smelt (*Hypomesus pretiosus*) spawning habitat. All of these areas are considered Fish and Wildlife Habitat Conservation Areas, a Critical Area type. In addition, estuarine wetlands associated with the marine aquatic bed are considered Category 1 wetlands (Figure 8A).

### 3.1.2 Reach M2

Reach M2 is a marine shoreline reach comprised of Seahurst Park and the undeveloped shoreline south of the park to SW 149th Street or the northern edge of resumed shoreline development. Reach M2 is 1.21 miles long. Historically, Reach M2 included areas of feeder bluff, potential feeder bluff, and exceptional feeder bluff, some of which has now been modified. An accretion shoreform is present along most of its north end. Figure 4A depicts historic and current shoreforms from Johannessen, MacLennan, and McBride (2005). Additional summary information for Reach M2 is presented in Table 4.

Table 4. Reach M2 summary.

Total Acreage / Land Use	Stream Discharges	Public Shoreline Access	Hazard Areas	Habitat / Habitat Potential
28.72 acres Park: 78% Single Family: 14% Vacant: 9%	Unnamed tribs	Seahurst Park, Eagle Landing Park	Landslide, Flood	Wetlands, Stream, Fish and Wildlife Areas (bald eagle, forage fish, shellfish, eelgrass, Urban Natural Open Space)

Percentages may not total 100 percent due to rounding during GIS analysis.

#### Current Land Use

Nearly 80 percent of Reach M2 is park, the majority of which is the shoreline of the 152-acre Seahurst Park (Figure 5B). To the south of Seahurst Park is a smaller public park, the 5-acre Eagle Landing Park. This publicly-owned land is set aside for passive recreation and conservation. Seahurst Park is currently in the process of redevelopment and restoration, but it is anticipated to remain parkland for the foreseeable future. The second highest percentage of land use is single family with 14 percent and the remainder of the reach is vacant. Unlike the other marine reaches, the majority of the single family lots within Reach M2 do not extend far into the intertidal zone.

### *Hydrologic Function*

Historically, much of the shoreline in Reach M2 incorporated bulkheads or some type of armoring; however, restoration efforts in the publicly-owned parks have been focused on reestablishing the shorelines' natural hydrology through removal of this armoring. As described in Section 3.1.1 for Reach M1, armoring limits the amount of both physical and biological interchange that can occur between the upland and the water. However, in areas where a more natural hydrology has been restored (such as areas within Seahurst Park; please see Section 4), the shoreline allows for sediment transport, wave attenuation and redistribution of organic materials (including large woody debris) across all tidal elevations. Additionally, the single family lots between Seahurst Park and Eagle Landing Park have very little armoring.

Water flows from the upland onto the marine shoreline of Reach M2 through culverts that have been installed beneath parking lots and road fill embankments, draining water through or under bulkheading (Figure 7B; Wild Fish Conservancy 2003; Anchor 2002). Most of these modifications to drainage within Seahurst Park were made by the early 1970s by King County (Anchor 2002).

Approximately 30 percent of Reach M2 is mapped within the 100-year floodplain (Figure 8B). As explained in Section 3.1.1, armoring of shorelines can intensify the impacts of flooding, as armoring inhibits the natural inundation and recession of floodwater.

### *Vegetation Function*

Reach M2 has the largest area of native or unaltered shoreline vegetation of any of the shoreline reaches. The vegetation along the shoreline of the parks provides a source for large woody debris and other organic material that will enter the water, as well as overwater shading. Vegetation located upland of armored shorelines does not function to attenuate wave energy; however, the vegetation of the unaltered or restored shorelines within the reach aids in sediment removal and stabilization.

As with much of the marine shorelines in the City, Seahurst Park is entirely flanked on the upland side with a landslide hazard area (Figure 8B). The restoration and conservation of native vegetation that has occurred in or is planned for Reach M2 decreases the amount of erosion that occurs, and could aid in decreasing the occurrence of landslides.

### *Other Habitat Function*

Reach M2 has several important Critical Area types represented within the reach. Two large stream systems dominate the reach, with associated buffers. The riparian ravines surrounding the streams are mapped as Urban Natural Open Space (Figure 9B), providing habitat to wildlife and fish species as well as plant diversity.

The streams within Reach M2 are high gradient, incised streams with salmonid habitat limited to the lowest reaches. The southern stream system has some habitat available at the toe of the slope incline. The northern stream system has been modified to accommodate the fish acclimation facilities at the Marine Occupational Center in the North end of the park. These facilities rear coho salmon as part of the Highline School District marine science curriculum.

Below the OHW mark, the entire reach is mapped as having geoduck beds. Eelgrass patches are present as a sparse fringe along the reach. Most of Reach M2 has surf smelt spawning habitat and a portion of the intertidal in front of the park has been mapped as Pacific sand lance (*Ammodytes hexapterus*) spawning habitat. All of these areas are considered Fish and Wildlife Habitat Conservation Areas, a Critical Area type (Figure 9B). In addition, estuarine wetlands associated with the marine aquatic bed are considered Category 1 wetlands (Figure 8B). A bald eagle (*Haliaeetus leucocephalus*) nest located outside of the shoreline zone near the south end of Reach M2 has a buffer for nest and forage area protection that extends into the shoreline zone and occupies nearly half (southern half) of Reach M2 (Figure 9B).

### 3.1.3 Reach M3

Marine shoreline Reach M3 is the longest shoreline reach within the City of Burien and is delineated by the increased residential development at the south end of Reach M2 and the tip of Three Tree Point at the south end of the reach. Reach M3 is 1.75 miles long. Historically, Reach M3 (KI-7-2) included feeder bluff and potential feeder bluff areas alternating with accretion shoreforms. The bluffs in this reach have been entirely modified, as have some of the accretion shoreforms. Figure 4A depicts historic and current shoreforms from Johannessen, MacLennan, and McBride (2005). Additional summary information for Reach M3 is presented in Table 5.

Table 5. Reach M3 summary.

Total Acreage / Land Use	Stream Discharges	Public Shoreline Access	Hazard Areas	Habitat / Habitat Potential
40.23 acres Single Family: 87% Vacant: 12% Tracts/Other: 1% Low Density MFR: 0.4%	Unnamed tribs	Street ends (several)	Landslide, Seismic, Flood	Wetlands, Stream, Fish and Wildlife Areas (bald eagle, forage fish, shellfish, eelgrass, kelp, Urban Natural Open Space)

Percentages may not total 100 percent due to rounding during GIS analysis.

#### Current Land Use

Land use in Reach M3 is developed single family residential with 87 percent of the shoreline developed in that land use category (Figure 5C). The remaining areas of the reach are vacant. It is anticipated that the land use in Reach M3 would remain single family residential and that properties will redevelop over time.

#### Hydrologic Function

The marine shoreline of Reach M3 is hardened with private bulkheads and numerous private boat ramps that affect littoral drift and longshore migration during most tidal stages. Reach M3 also has several single family docks. Hydrologic functions including sediment transport, wave attenuation and redistribution of organic materials along the shoreline are decreased by the presence of these artificial structures.

Several unnamed tributaries flow into the Reach M3 and storm water drains onto the shoreline through culverts running under or through bulkheads (Figure 7C).

Twenty-six percent of Reach M3 is mapped as 100-year floodplain (Figure 8C). As addressed in previous sections, armoring of the shoreline can hinder the flow of floodwaters to and from the shoreline.

#### *Vegetation Function*

The majority of the shoreline is residential; therefore, most of the vegetation within the Reach M3 shoreline consists of highly altered landscapes. Yards maintained with chemical fertilizers and herbicides, can increase the nutrient and toxic load into the shoreline. Further, a decrease in the amount of native vegetation decreases the function of the shoreline, reducing its capacity to attenuate wave energy, stabilize sediments and provide organic materials. However, any trees located along the shoreline can improve habitat conditions by providing overwater shading.

Removal of large amounts of vegetation and replacement with vegetation not as suited for the environment can increase erosion. Increases in erosion can increase the probability of landslides. The entire upland area of Reach M3 is mapped a landslide hazard area (Figure 8C).

#### *Other Habitat Function*

Critical Areas within Reach M3 include several small unnamed tributaries to Puget Sound and their associated buffers. The forested ravines associated with these streams are mapped as Urban Natural Open Space, a Priority Habitat in Washington State (Figure 9C).

High stream gradients limit opportunities for salmonids in the unnamed tributaries within Reach M3. The intertidal areas utilized by juvenile salmon are separated from uplands functions by the high intensity of vertical bulkheads and the nearshore vegetation maintained in a highly altered (manicured) state.

Despite the separation of upland and marine waters resulting from the armoring of shorelines, there are several Fish and Wildlife Habitat Conservation Areas located with Reach M3 (Figure 9C). Below the OHW mark, almost the entire reach is mapped as having geoduck beds, which extend almost all the way south to the tip of Three Tree Point. Eelgrass patches are present as a sparse fringe along the reach and kelp (order Laminariales) beds are mapped within this reach. The southern half of Reach M3 is mapped as having surf smelt spawning habitat, overlaying a small reach of Pacific sand lance spawning habitat near SW 156<sup>th</sup> Street. The buffer associated with a bald eagles nest in Reach M2 extends into Reach M3 to approximately SW 156<sup>th</sup> Street. In addition, estuarine wetlands associated with the marine aquatic bed are considered Category 1 wetlands (Figure 8C).

#### **3.1.4 Reach M4**

Reach M4 is similar to Reach M3 in that it is characterized by consistent residential development with a south facing aspect. The reach extends from the tip of Three Tree Point to the southern City limits. Reach M4 is 1.44 miles long. Historically, Reach M4 was feeder bluff, which has subsequently been modified, and an accretion shoreform that is still functioning despite shoreline

modifications (Johannessen, MacLennan, McBride, 2005). Figure 4A depicts historic and current shoreforms from Johannessen, MacLennan, and McBride (2005). Additional summary information for Reach M4 is presented in Table 6.

**Table 6. Reach M4 summary.**

Total Acreage / Land Use	Stream Discharges	Public Shoreline Access	Hazard Areas	Habitat / Habitat Potential
22.41 acres Single Family: 91% Low Density MFR: 5% Vacant: 3% Commercial: 1%	Unnamed tribs	Street end (one)	Landslide, Seismic, Flood	Wetlands, Stream, Fish and Wildlife Areas (forage fish, shellfish, eelgrass)

Percentages may not total 100 percent due to rounding during GIS analysis.

#### *Current Land Use*

Land use in Reach M4 is developed single family residential with 91 percent of the shoreline developed in that land use category (Figure 5D). The remaining areas of the reach are split between low density multifamily use (4.99 percent), vacant (2.65 percent) and commercial use (1.23 percent). It is anticipated that the land use in Reach M4 would remain predominantly single family residential and that properties will redevelop over time. Reach M4 is characterized as having narrower parcels than the other marine reaches, which extend into the intertidal south of Three Tree Point.

#### *Hydrologic Function*

As with the majority of the other marine reaches, the shoreline of Reach M4 is hardened with private bulkheads and a few private boat ramps that affect littoral drift and longshore migration during most tidal stages. Reach M4 also has several single family docks. These alterations to the shoreline affect the hydrology of the reach, as described in Sections 3.1.1 – Section 3.1.3.

Drainage into the reach from upland flows through culverts and from several unnamed tributaries (Figure 7D). SW 172<sup>nd</sup> Street parallels the shoreline near most of the reach immediately behind the small residential (garage) structures along the beach; storm water runoff from the road enters Puget Sound with no opportunity for treatment.

Forty-eight percent of Reach M4 is mapped as 100-year floodplain (Figure 8D). As discussed previously, armoring can reduce the ability of the shoreline to accommodate floodwater.

#### *Vegetation Function*

Due to the fact that land use within Reach M4 is similar to that within the other highly modified shorelines discussed above (Reach M1 and Reach M3), the same limitations on shoreline vegetation function exist in Reach M4 as do in the other marine reaches; please see Sections 3.1.1 and 3.1.3 for more details.

Removal or alteration of vegetation can contribute to erosion, thus increasing the chance for landslides. The entire upland area of Reach M4 is mapped a landslide hazard area, excepting the

soils surrounding Three Tree Point and immediately south; those soils are mapped as a seismic hazard zone (Figure 8D).

#### *Other Habitat Function*

Reach M4 includes few small unnamed tributaries to Puget Sound and their associated buffers. These are very high gradient streams with no associated Urban Natural Open Space. Although none are known as being salmon-bearing streams, they have the potential to provide habitat to other fish species.

The intertidal areas utilized by juvenile salmon are separated from uplands functions by the high intensity of vertical bulkheads and the nearshore vegetation maintained in a highly altered (manicured) state. This separation limits the function provided by the shoreline.

Below the OHW mark, the entire reach is mapped having geoduck beds. Eelgrass patches are present as patchy beds along the Reach M4 shoreline. A small segment of the reach is identified as Pacific sand lance spawning habitat. All of these areas are considered Fish and Wildlife Habitat Conservation Areas, a Critical Area type (Figure 9D). In addition, estuarine wetlands associated with the marine aquatic bed are considered Category 1 wetlands (Figure 8D).

### **3.2 FRESHWATER – REACH LB**

Per WAC 173-26-201(3)(d)(i)(C), shoreline ecological functions in lakes include, but are not limited to:

- Hydrologic – Storing water and sediment, attenuating wave energy, removing excessive nutrients and toxic compounds, recruitment of large woody debris and other organic material.
- Shoreline vegetation – Maintaining temperature, removing excessive nutrients and toxic compound, attenuating wave energy, sediment removal and stabilization, and providing woody debris and other organic matter.
- Hyporheic functions – Removing excessive nutrients and toxic compound, water storage, support of vegetation, and sediment storage and maintenance of base flows.
- Habitat for aquatic and shoreline-dependent birds, invertebrates, mammals, amphibians, and anadromous and resident native fish – Habitat functions may include, but are not limited to, space or conditions for reproduction, resting, hiding and migration, and food production and delivery.

Reach LB consists of the entire shoreline of Lake Burien and is the only freshwater shoreline reach in the City. The perimeter of the lake is 1.67 miles long. Additional summary information for Reach LB is presented in Table 7.

**Table 7. Reach LB summary.**

Total Acreage / Land Use	Stream Discharges	Public Shoreline Access	Hazard Areas	Habitat / Habitat Potential
28.80 acres Single Family: 87% School: 8% Vacant: 3% Tracts/Other: 1% Low Density MFR: 1%	Unnamed tribs	None	None	Wetlands, Aquifer Recharge Area

<sup>†</sup> Percentages may not total 100 percent due to rounding during GIS analysis.

*Current Land Use*

Lake Burien is occupied almost entirely by single family development (87 percent) and multifamily (1 percent) (Figure 5E). The lone exception to this is at the northeast corner of the lake where the Ruth Dykeman Children’s Center is located. The density of single family development along the Lake Burien shoreline is somewhat higher than that along the marine shoreline. Reach LB is almost entirely developed to its maximum potential and is likely to remain in single family residential use.

*Hydrologic and Hyporheic Function*

The shoreline of Reach LB is highly altered, as it is surrounded almost entirely by privately-owned residences. Given the relatively small size of the lake, there is not much wave action affecting the shoreline; however, the shoreline would effectively attenuate any waves produced in the lake. The lakeshore bank is low bank with a very gentle upland gradient. Flooding along the shoreline of the lake is not a documented problem, as Lake Burien is not located within the 100-year floodplain (Figure 8E).

While a system of storm water drainage pipes has been installed to divert runoff flowing into the lake, several drainage points into the lake remain (Figure 7E; City of Burien 2006) and the lake still functions as a water storage area. Lake Burien is mapped as an Aquifer Recharge Area, a Critical Area (Figure 8E). Alterations to the surface conditions within an Aquifer Recharge Area associated with development, such as changes in impervious surface area, channeling of runoff and changes in the soils, can affect the rate and quantity of water entering the aquifer. Additionally, contamination of waters within the Aquifer Recharge Area can adversely impact the entire aquifer.

*Vegetation Function*

Due to the nature of land use surrounding Lake Burien (mostly residential), much vegetation within the shoreline of Reach LB consists of manicured lawns. Maintenance of lawns often increases the input of chemicals (fertilizers and herbicides) into the water and limits the input of organic material (including large woody debris) into the lake. However, any trees present along the shoreline contribute to the shading of the shoreline. Due to the topography around Lake Burien, the lack of native vegetation does not greatly increase erosion along the shore; there are no landslide hazard areas associated with the lake (Figure 8E).

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*Other Habitat Function*

Lake Burien in its entirety has been rated a Category 2 wetland (Figure 8E). The buffer associated with a Category 2 wetland is 100 feet. While there are no Priority Habitat and Species documented within Lake Burien or along the shoreline (Figure 9E), wetlands provide habitat for other small mammals, birds and fish (such as feeding, breeding and spawning). There is no fish access into Lake Burien; therefore, anadromous salmonids are not expected within the lake.

## 4 OPPORTUNITIES FOR SHORELINE PROTECTION, RESTORATION, PUBLIC ACCESS AND USE

### 4.1 SHORELINE PROTECTION AND RESTORATION OPPORTUNITIES

Burien has many highly modified shoreline areas almost entirely consisting of privately-owned uplands, as well as tidelands in some cases. Citizen outreach to provide education resources regarding the effects of lawn care practices on water quality within the marine waters and Lake Burien have potential to improve citizen involvement in shoreline protection and restoration.

The WRIA 8/9 shoreforms inventory and assessment (Johannessen, MacLennan, and McBride 2005) identifies a number of specific restoration opportunities including one within City shorelines (see Section 4.1.4). Also recommended in that study are conservation and restoration priorities within and by drift cells within WRIA 8 and 9 to protect and reconnect sediment sources within the region. However, it is important to consider that the analyses are solely based on comparison of current and historic shoreline conditions and do not take into account biological or socioeconomic factors.

Other non-specific restoration opportunities along the marine reaches include bulkhead modification to reduce the effects of hardened vertical structures on sediment transport and nearshore habitat. These modifications include removal, beach reshaping, installing longshore woody debris, and restoring connection of the beach to sediment input systems, including streams and eroding bluffs.

Installing littoral nearshore vegetation, where appropriate, can provide nearshore water quality protection functions to shallow intertidal areas. Stream systems in the City are constrained by ravines, typically hosting invasive vegetation. Restoring native riparian vegetation within these systems benefits export of salmonid prey and improves upland habitat within the shoreline zone.

Shoreline protection and restoration opportunities for each reach are discussed below.

#### 4.1.1 Reach M1

Reach M1 includes the segment (49) identified as the highest priority for restoration within drift cell KI-5-1 (Johannessen, MacLennan, and McBride, 2005). This segment also ranked among the top restoration priorities in WRIA 8/9 based on historic conditions. Drift cell KI-5-1 also generally is ranked as moderately high and high prioritization for restoration and conservation respectively by Johannessen, MacLennan, and McBride (2005). The limited public land ownership in Reach M1 constrains opportunities for larger restoration programs. However, modifications to the baseline condition on a small scale can incrementally provide restoration of nearshore and riparian functions within the reach.

Most of the single family residences along Reach M1 are not setback from the shoreline a significant distance and impede bulkhead redesign. Some locations within the reach may be suitable for bulkhead removal or setback, with a contoured shoreline either in place of or in front of the remaining structure. Shoreline native vegetation can be installed in several locations, particularly in the undeveloped shoreline areas where vegetation can overhang shallow intertidal areas and provide the most export function.

Other restoration opportunities include mouths of Seola and Salmon Creeks where sediment transport to the beach and fish passage to the streams is impeded by structures; any opportunities involving reaches of creeks that share buffers with City of Seattle would be coordinated with the City of Seattle. Modifications in both of these locations can serve to avail more habitat to salmonids and allow continued sediment nourishment to the high intertidal zone.

#### 4.1.2 Reach M2

Reach M2 includes the segment (48) identified as the third highest priority for restoration within drift cell KI-5-1, as well as the segment (207) ranked as the highest priority for conservation (Johannessen, MacLennan, and McBride, 2005). Although the Seahurst Park Master Plan predates the WRIA 8/9 shoreforms study, it does incorporate elements to address conservation and restoration of sediment sources and transport processes within the Park. The Seahurst Park Master Plan (Anchor 2002) described specific restoration opportunities within Seahurst Park (located in Reach M2). The plan proposed to preserve all the existing undeveloped area, increase the natural habitat area and function through extensive restoration and land acquisitions. Per the Master Plan (Anchor 2002), sustaining and restoring the marine shoreline at Seahurst Park is based on four concepts: removing existing shoreline protection structures; modeling restored beach slopes and substrates after natural conditions; replenishing gravel and sand lost to erosion; and restoring and protecting the natural delivery paths of sediment to the beach. As part of the Seahurst Park Master Plan (Anchor 2002), the long seawall reach south of the south park entrance was removed and the beach reshaped to a more natural shoreline state, including native vegetation and large longshore wood placement. Additional phases of the Master Plan include seawall redevelopment and nearshore restoration for the remainder of the park and are in the planning phases.

Additional restoration opportunities exist at Eagle Landing Park. Since the land was acquired in 2002, the City has opened trails and performed reforestation work for the purposes of preserving salmon habitat and providing public water access. Future plans for the property include restoring native plants and on-going native plant maintenance.

The remainder of Reach M2 has limited restoration opportunity relative to other shoreline reaches within the City. South of the park, nearshore vegetation is intact and provides water quality and biological function to the intertidal areas during most tide stages. Some of the single family residences within Reach M2 are protected by bulkheads (approximately two between Seahurst Park and Eagle Landing Park), yet placement of the homes near the bulkhead presents the same constraints to restoration as described in Reach M1.

#### 4.1.3 Reach M3

As Reach M3 and KI-7-2 are in complete overlap, the reach includes all includes segments identified for priority restoration (3) and conservation (1) within the drift cell (Johannessen, MacLennan, and McBride, 2005). Although none of these segments individually are ranked among the top restoration and conservation priorities in WRIA 8/9 based on historic conditions, drift cell KI-7-2 is generally ranked as one of the highest drift cells for restoration and conservation respectively (Johannessen, MacLennan, and McBride 2005). As noted previously, this study is based on comparison between current and historic shoreline conditions and does not

consider biological or socio-economic factors. The limited public land ownership in Reach M3 constrains opportunities for larger restoration programs. However, modifications to the baseline condition on a small scale can incrementally provide restoration of limited nearshore and riparian functions within the reach. Prioritization for restoration and conservation presented by Johannessen, MacLennan, and McBride (2005) can additionally inform where these small scale efforts may reap the most benefit within this reach.

Most of the single family residences along Reach M3 are located immediately behind the bulkheads and can impede bulkhead redesign. There appear to be few locations suitable for bulkhead removal or setback. Some areas may allow for a contoured shoreline, though the elevation of the uplands within the south end of this reach is low, where bulkhead removal could render increased risk to the upland structures. Shoreline native vegetation can be installed in the few areas of undeveloped shoreline areas where vegetation can overhang shallow intertidal areas and provide the most export function.

Other restoration opportunities include the unnamed tributaries where invasive vegetation can be controlled, but the high intensity of maintenance in private property ownership may limit feasibility of these restoration opportunities.

#### 4.1.4 Reach M4

Reach M3 does not include any of the top three priority segments for restoration or conservation within drift cell KI-7-3 (Johannessen, MacLennan, and McBride, 2005). Of the three drift cells within the City, KI-7-3 is the relatively lowest priority for restoration (moderate) or conservation (moderately high) within WRIA 8/9. As noted previously, this study is based on comparison between current and historic shoreline conditions and does not consider biological or socio-economic factors. The land ownership pattern (private single family) in Reach M4 constrains opportunities for larger restoration programs. However, modifications to the baseline condition on a small scale can incrementally provide restoration of nearshore and riparian functions within the reach.

The predominate development pattern of Reach M4 is characterized by structures either immediately on or near the OHW mark, between the road and the intertidal zone. Immediately south of Three Tree Point there is a portion of the reach where the development pattern is unique in that dwellings are sited upland of the right-of-way with the remainder of the residential lot located waterward of the road. In many cases the remaining portions of property waterward of the right-of-way contain residential accessory structures and protective bulkheads. There appear to be few locations suitable for bulkhead removal or setback. Those areas with residential structures set further back are characterized as "high bank" waterfront. Johannessen, MacLennan, and McBride (2005) identify a single specific potential restoration opportunity, removal of a number of creosote pile and possible groin removal (number 35), within the City (although this may be in part or entirely on privately owned land). Some areas may allow for a contoured shoreline either in place of or in front of the remaining structure. These are also locations where the City can encourage shoreline native vegetation to overhang shallow intertidal areas and provide the most export function.

#### **4.1.5 Reach LB**

The intensity of development around the lake and private ownership preclude programmatic habitat restoration. Water quality within Reach LB is affected by storm water input and non-point runoff from maintained property surrounding the shoreline. Typically, these conditions provide opportunity for property owners to maintain water quality through coordinated stewardship and landscape maintenance practices.

#### **4.2 PUBLIC ACCESS OPPORTUNITIES**

Shoreline public access is the ability of the general public to reach and touch the water and the ability to view the water and shoreline from upland locations. Public access facilities include public parks, boat launches, trails, improved street ends and overlooks. On Burien's shorelines, public access is provided primarily by Seahurst Park, Eagle Landing Park, roadways, several beach access gravel drives and trails in the vicinity of Three Tree Point (see Figure 10). Note that in many locations along the shoreline, the beach itself is privately owned, which may be in conflict with informal recreational use (e.g., beach walking, foraging) of contiguous adjacent public lands waterward of the OHW mark. There is no public access to Lake Burien; however, the water can be viewed from several points from nearby roadways.

Potential new public access opportunities to Burien's shoreline areas would entail expanding and improving facilities at existing sites. Any new shoreline public access sites must minimize effects on adjacent properties, minimize adverse impacts to ecologically sensitive areas and not create a public safety risk.

#### **4.3 SHORELINE USE OPPORTUNITIES**

Consistent with the currently adopted City of Burien Comprehensive Plan (City of Burien 2006) and implementing zoning, the shoreline areas are planned for single family residential uses and parks and open space, with the only exception being the Ruth Dykeman Children's Center located on Lake Burien. This parcel is designated as Special Planning Area 2. Aquatic shoreline uses would be supportive of residential uses, e.g., boat facilities, including buoys, docks and ramps. Future redevelopment of shoreline properties would be single family residential.

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**CITY OF BURIEN  
SHORELINE MASTER PROGRAM UPDATE**

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**SHORELINE ANALYSIS AND CHARACTERIZATION  
FIGURES**



<b>Legend</b>		 <b>City of Burien</b> <b>Shoreline Master Program</b>	
	Approx Marine OHWM		Lake Burien
	Approx Marine OHWM +200'		Marine 1
	Approx Lake OHWM		Marine 2
	Approx Lake OHWM +200'		Marine 3
	Parcels		Marine 4
	City Boundary		

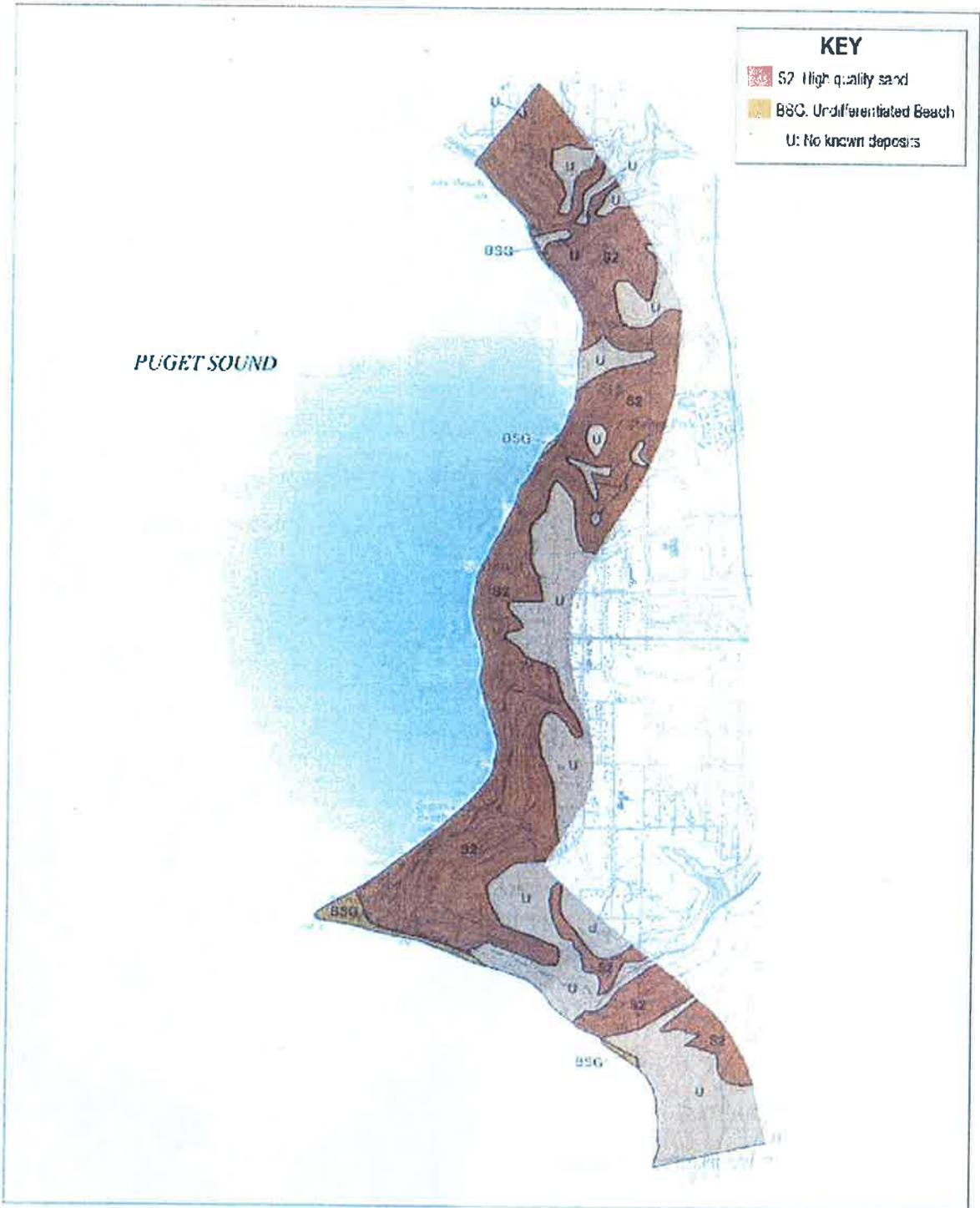
Note: OHWM = ordinary high water mark

Data Sources: City of Burien, King County

Date: 3/24/09

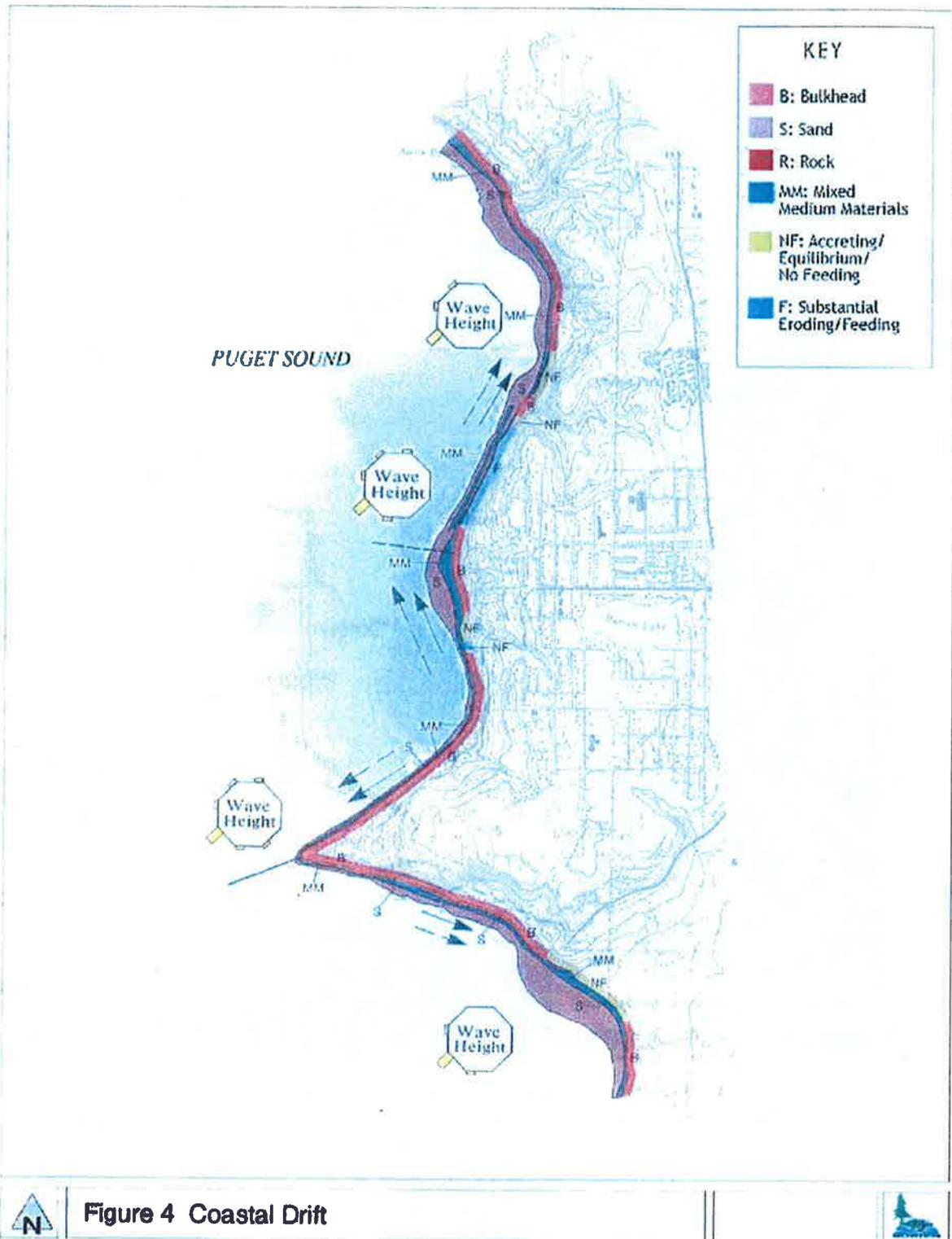
5-102



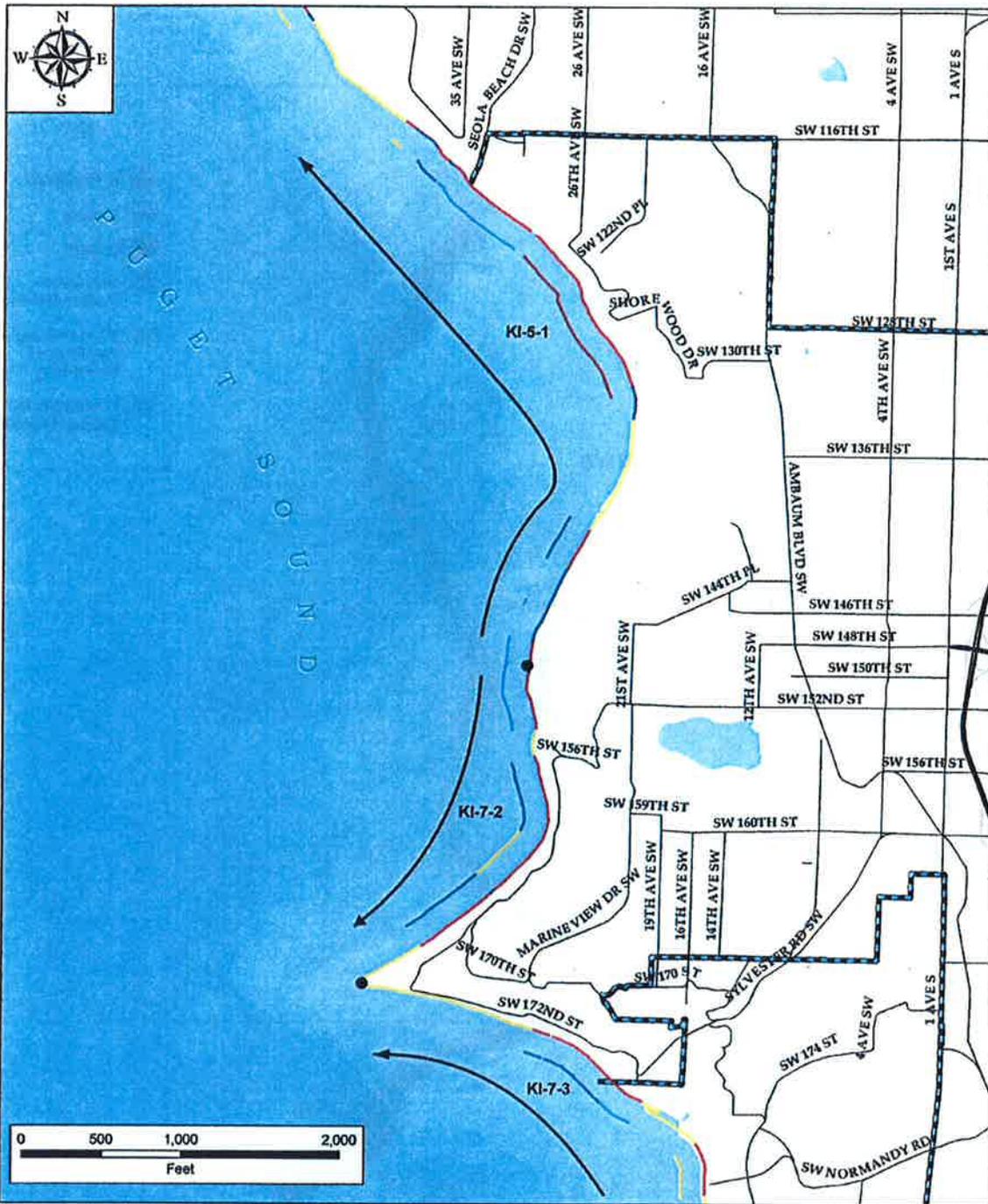


 **Figure 3 Sand and Gravel Areas** 

(adapted from The Burien Plan; City of Burien 2006)



(adapted from The Burien Plan; City of Burien 2006)



**Boundary of Burien**  
 ● Drift Cell Boundaries

**Historic Conditions Shoretypes (offshore)**  
 ~ Feeder Bluff  
 ~ Feeder Bluff Exceptional  
 ~ Potential Feeder Bluff  
 ~ NOT Feeder Bluff

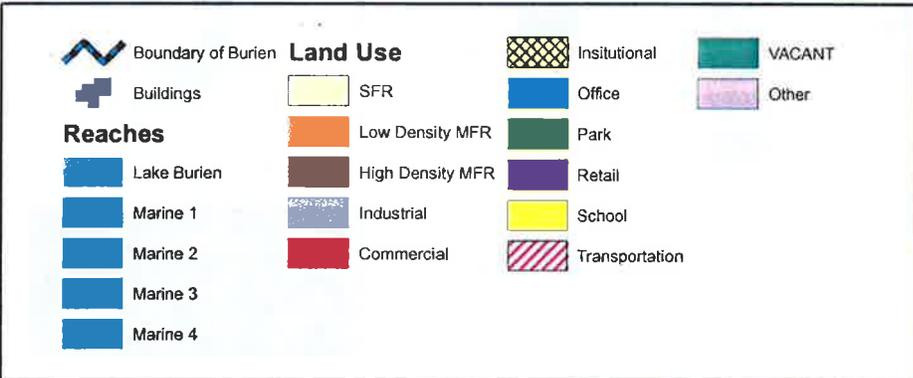
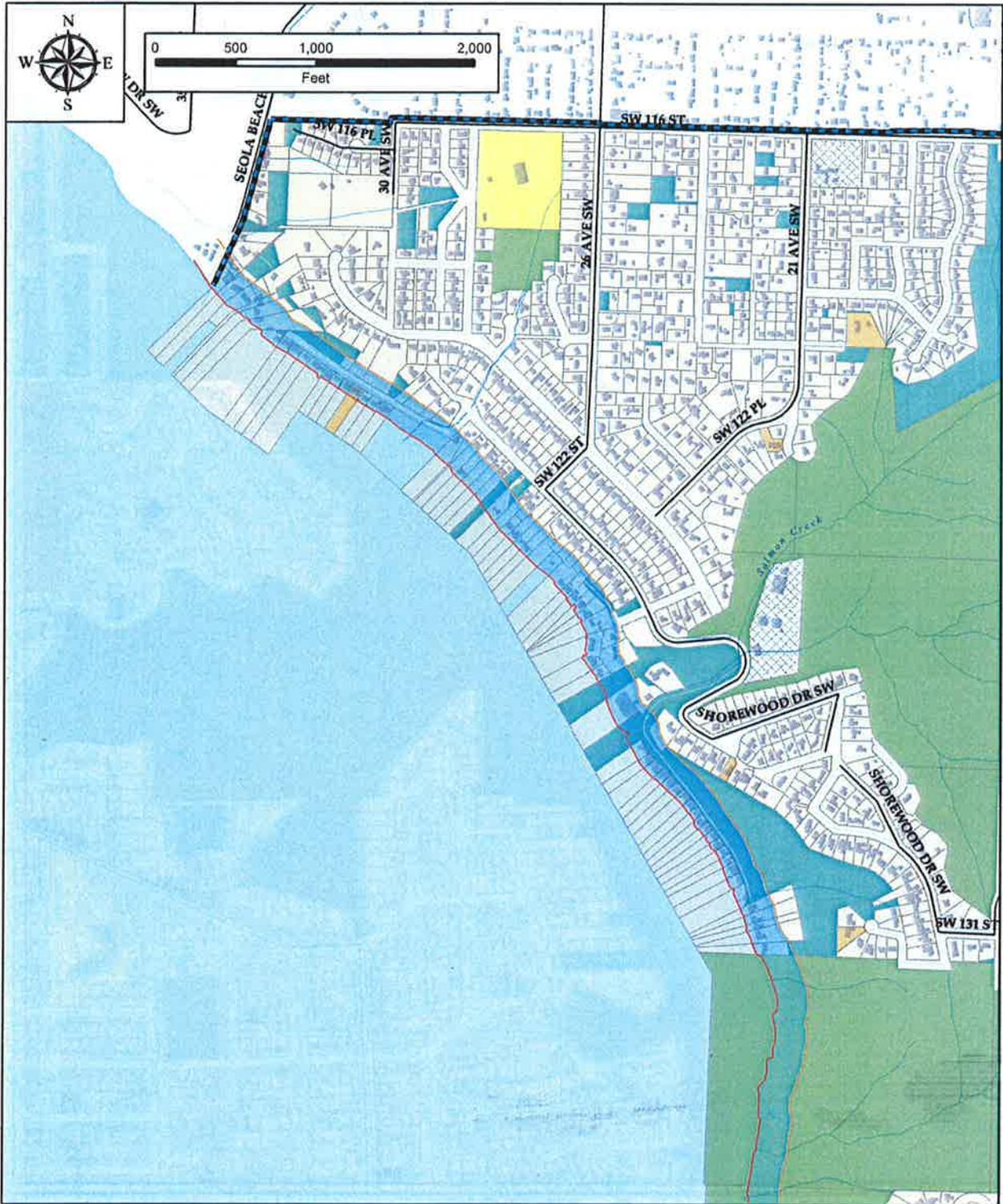
**Current Conditions Shoretypes**  
 ~ Accretion Shoreform  
 ~ Feeder Bluff  
 ~ Feeder Bluff Exceptional  
 ~ Modified

Data Source: Inventory and Assessment of Current and Historic Beach Feeding Sources/Erosion and Accretion Areas for the Marine Shorelines of Water Resource Inventory Areas 8 & 9  
 Published: December 2005



**City of Burien**  
 Shoreline Master Program

**Current & Historic (buffered offshore) Sediment Sources**  
 Figure 4A




**City of Burien**

**Shoreline Master Program**

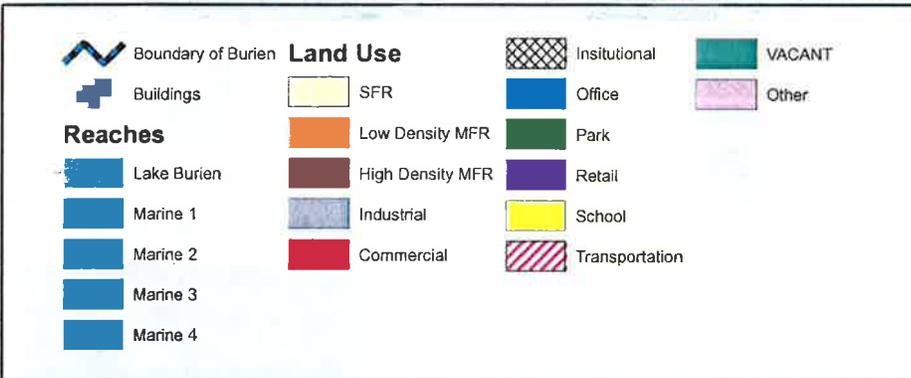
**Land Use**

*Marine 1*

Date: May 24, 2015

Figure 5A

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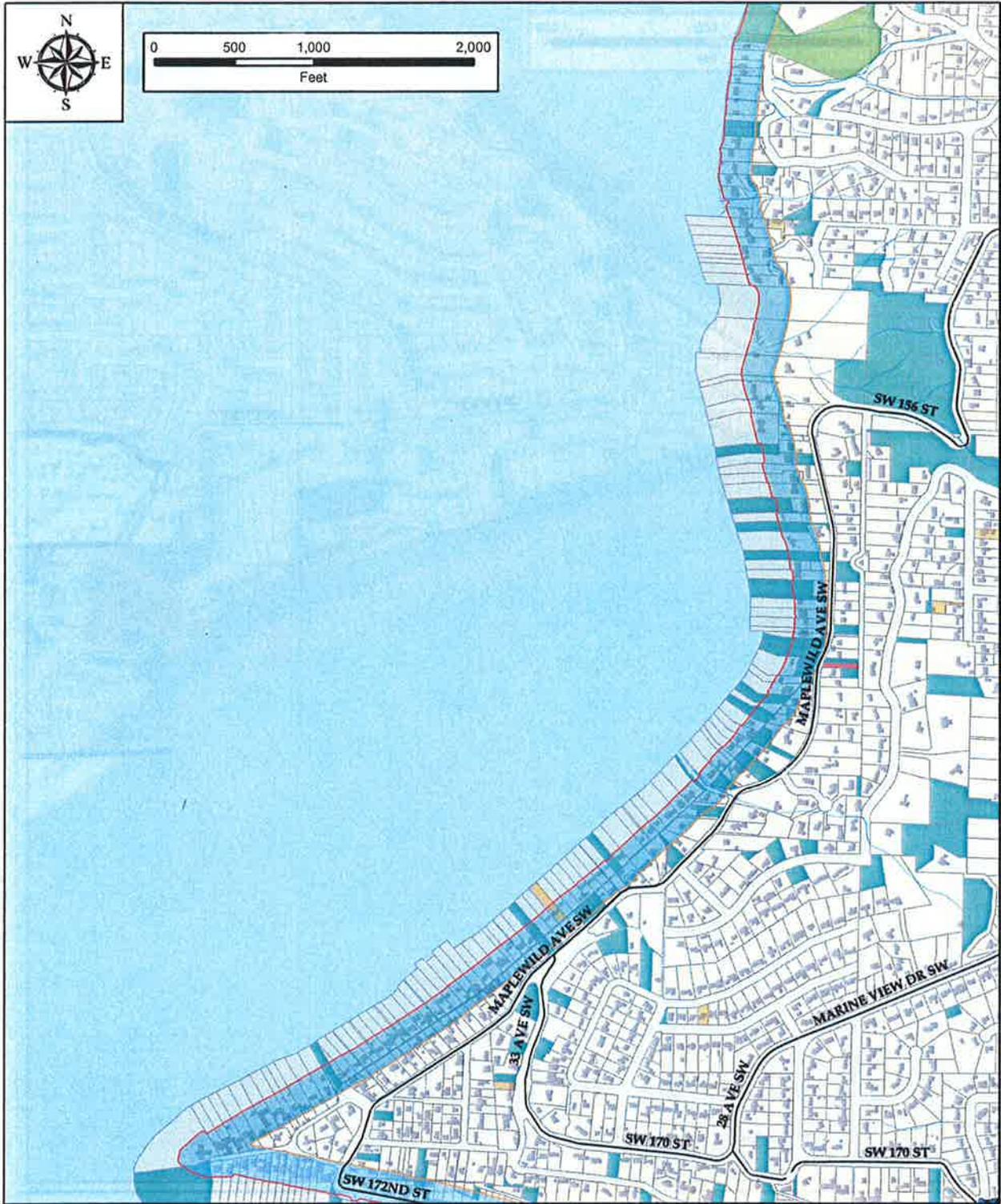
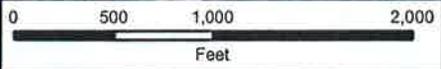

**City of Burien**  
**Shoreline Master Program**

**Land Use**  
*Marine 2*

date: May 04, 2009

Figure 5B

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Boundary of Burien

Buildings

**Reaches**

- Lake Burien
- Marine 1
- Marine 2
- Marine 3
- Marine 4

**Land Use**

- SFR
- Low Density MFR
- High Density MFR
- Industrial
- Commercial

- Institutional
- Office
- Park
- Retail
- School
- Transportation

- VACANT
- Other



City of Burien

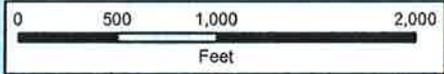
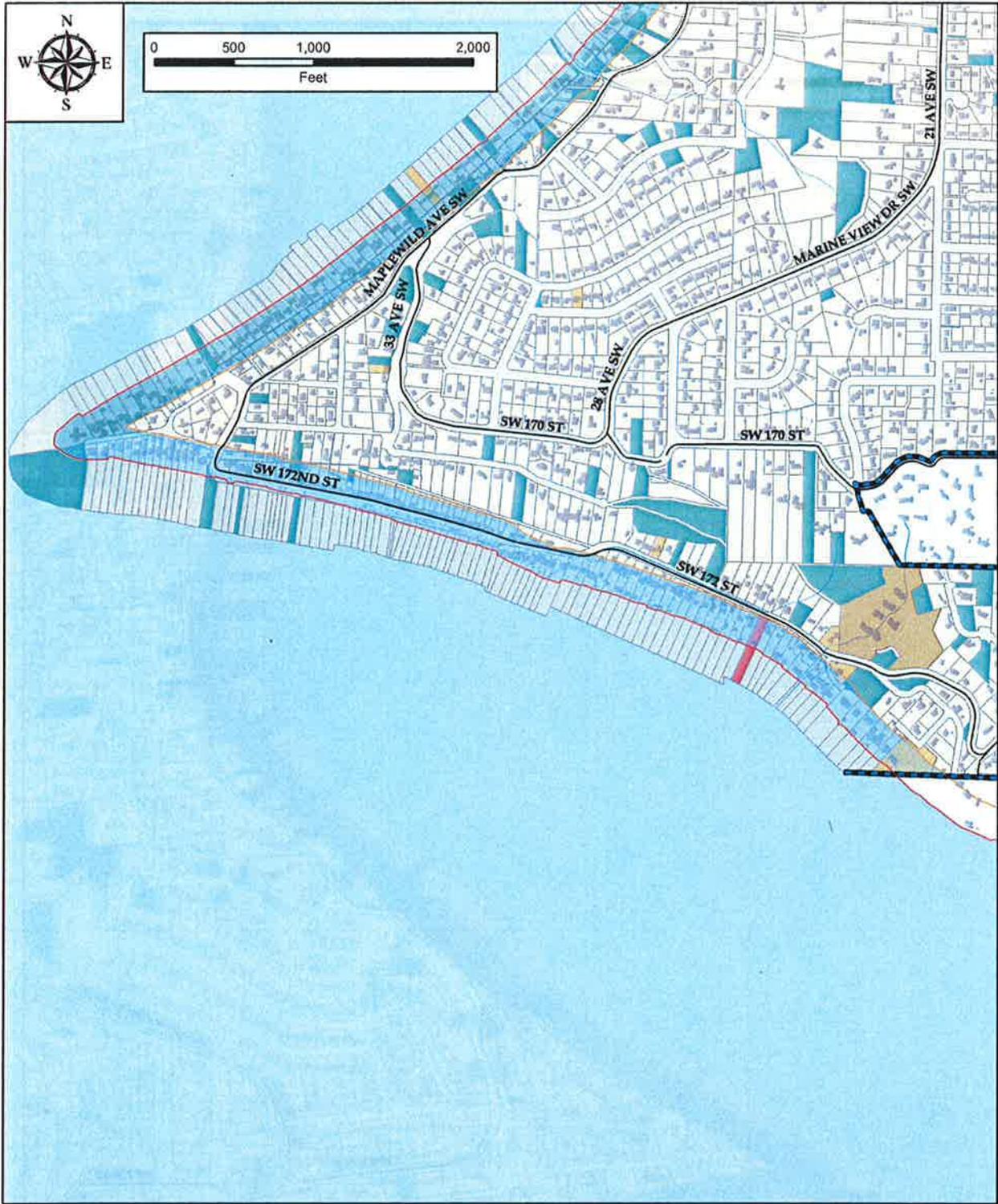
Shoreline Master Program

Land Use  
Marine 3

Date: May 04, 2009

Figure 5C

5-109

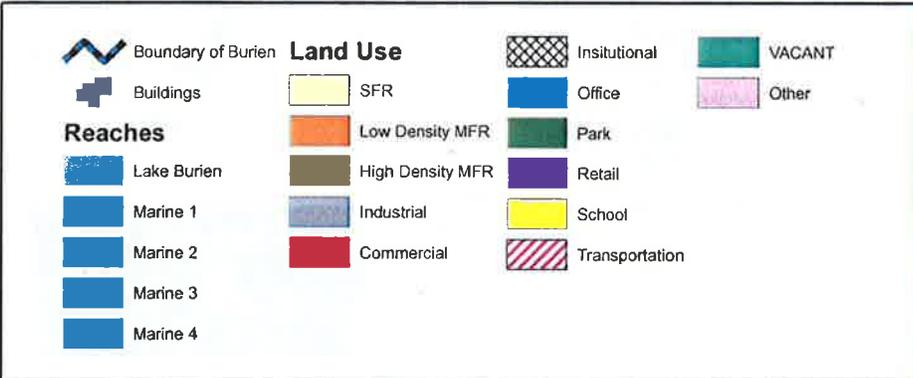
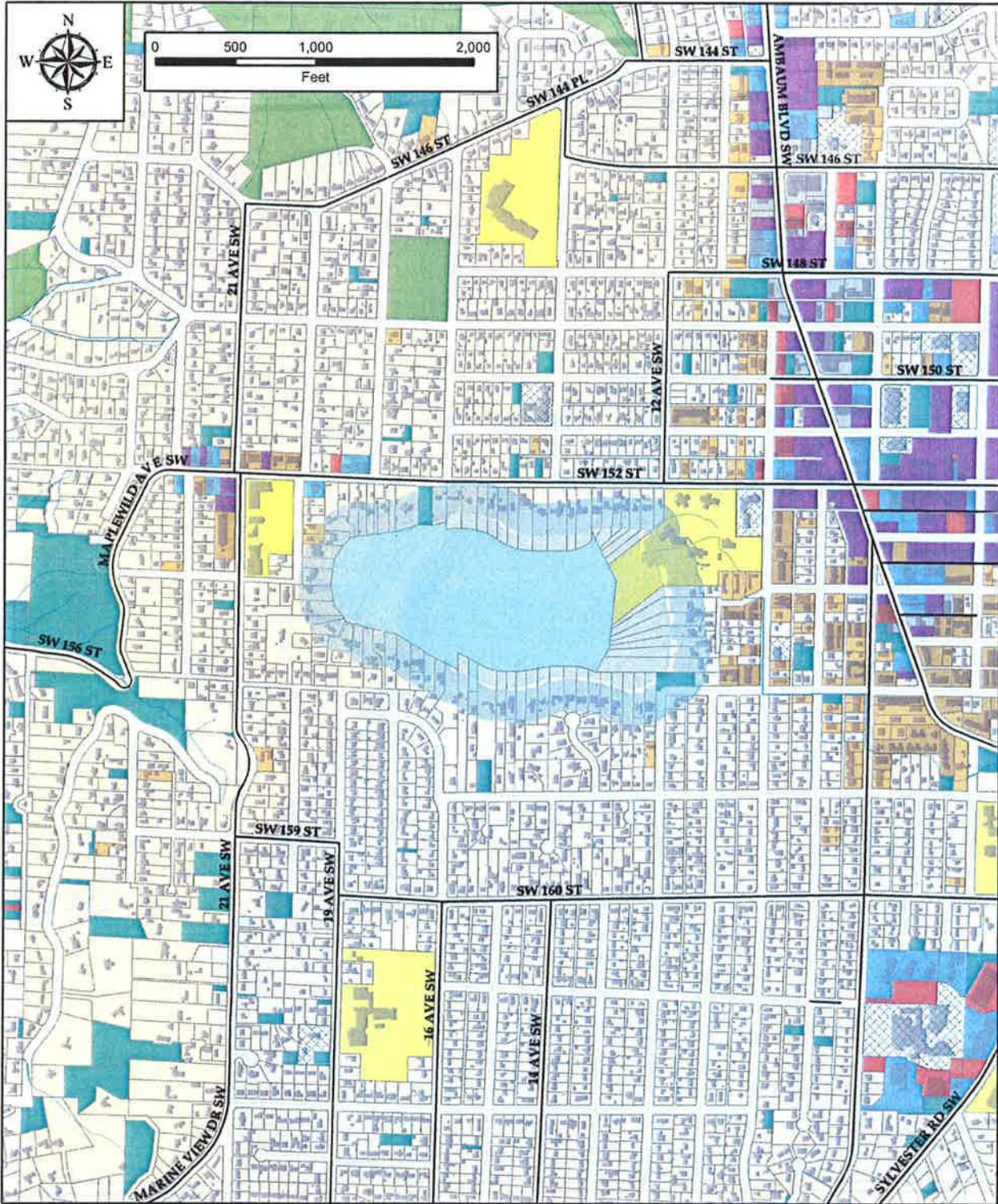



**City of Burien**  
**Shoreline Master Program**

**Land Use**  
*Marine 4*

Drawn: 5/19/2009 Figure 5D

5-110




**City of Burien**

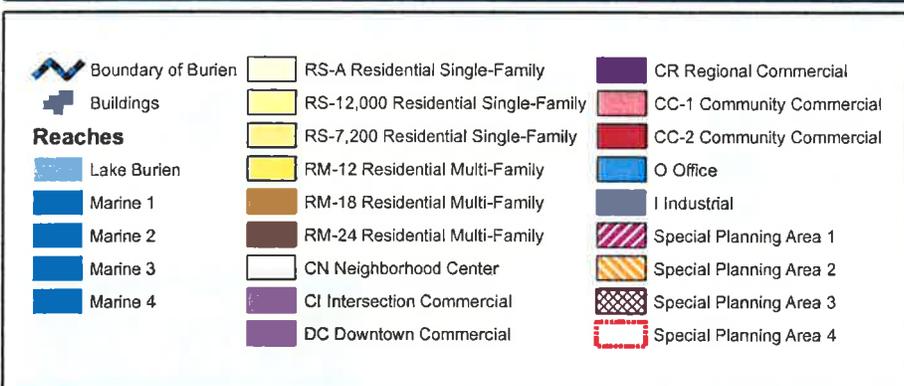
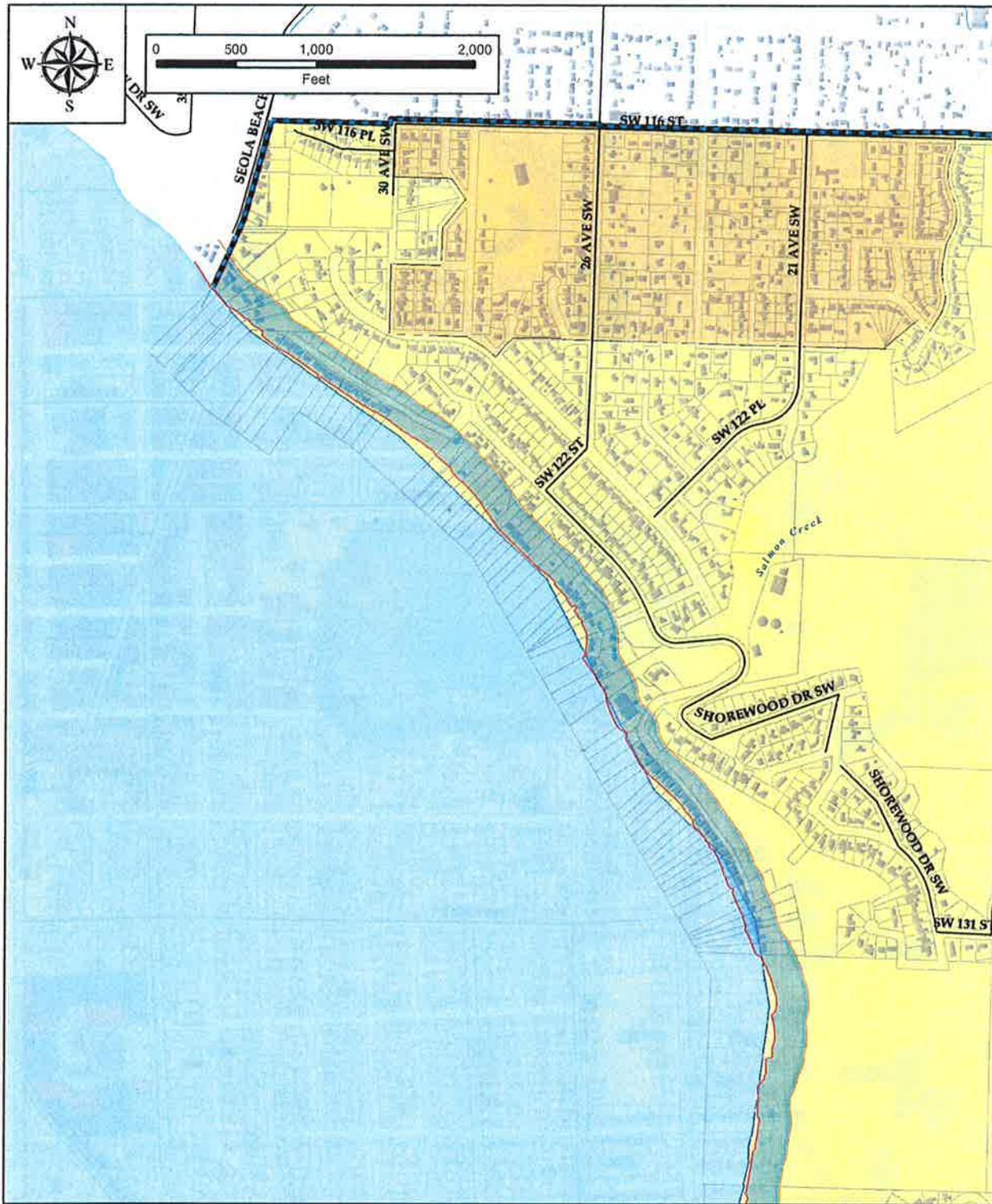
**Shoreline Master Program**

**Land Use**  
*Lake Burien*

Date: Mar 04, 2009

Figure 5E

5-111




**City of Burien**

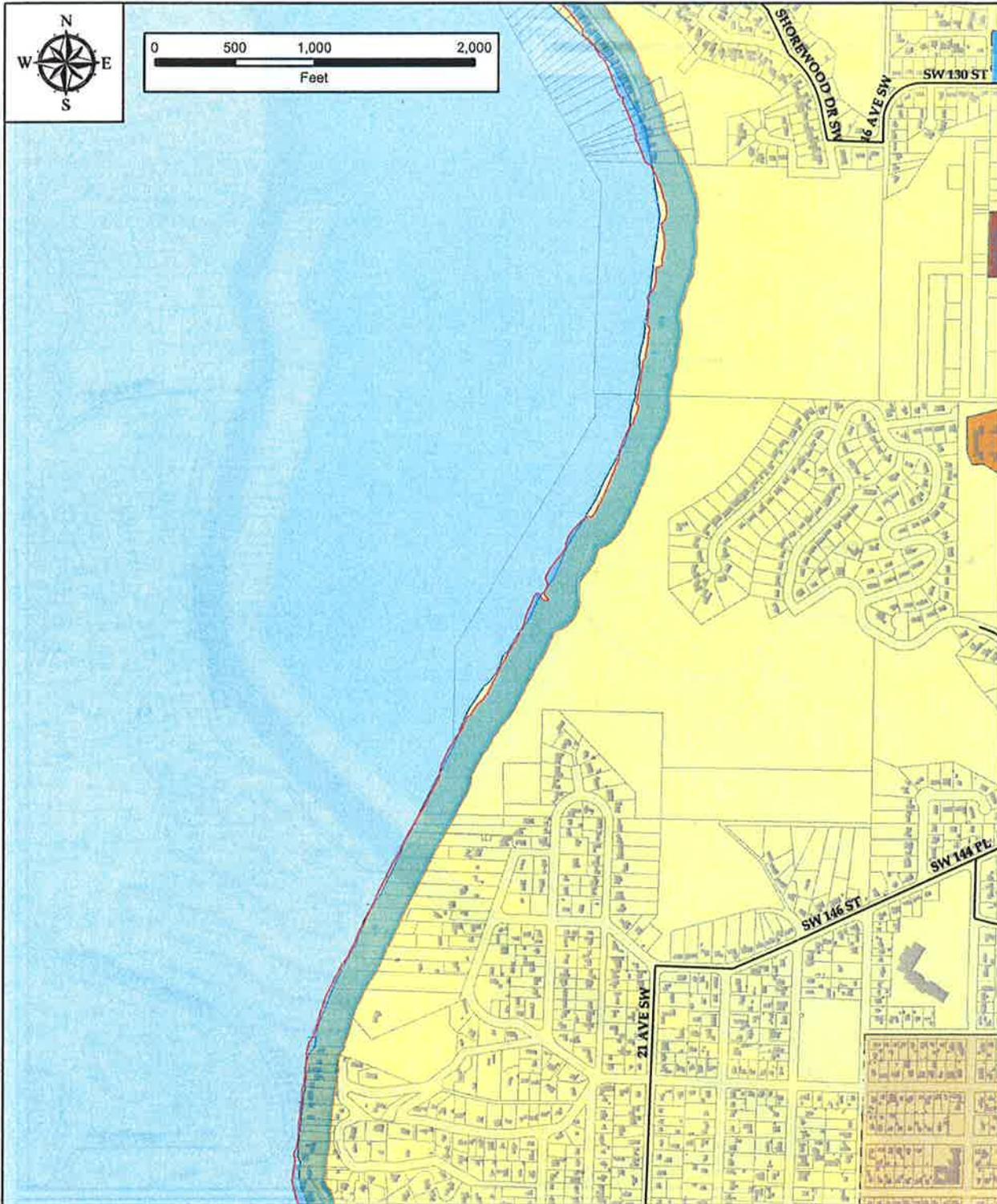
**Shoreline Master Program**

**Zoning**  
*Marine 1*

Date: Mar 01, 2008

Figure 6A

5-11a



Boundary of Burien	RS-A Residential Single-Family	CR Regional Commercial
Buildings	RS-12,000 Residential Single-Family	CC-1 Community Commercial
<b>Reaches</b>	RS-7,200 Residential Single-Family	CC-2 Community Commercial
Lake Burien	RM-12 Residential Multi-Family	O Office
Marine 1	RM-18 Residential Multi-Family	I Industrial
Marine 2	RM-24 Residential Multi-Family	Special Planning Area 1
Marine 3	CN Neighborhood Center	Special Planning Area 2
Marine 4	CI Intersection Commercial	Special Planning Area 3
	DC Downtown Commercial	Special Planning Area 4



**City of Burien**

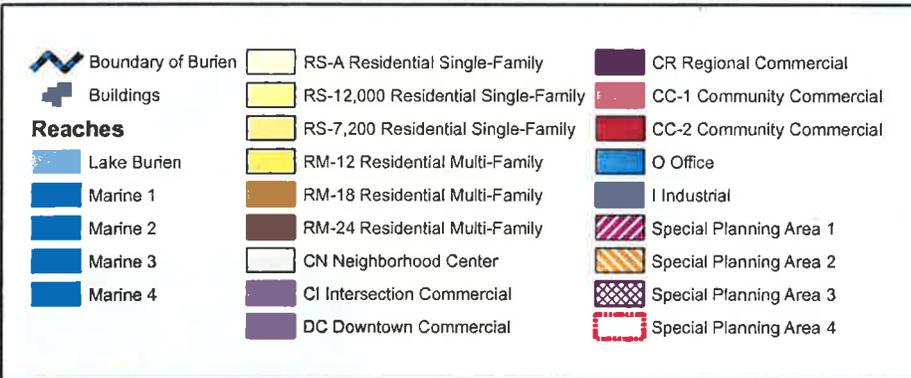
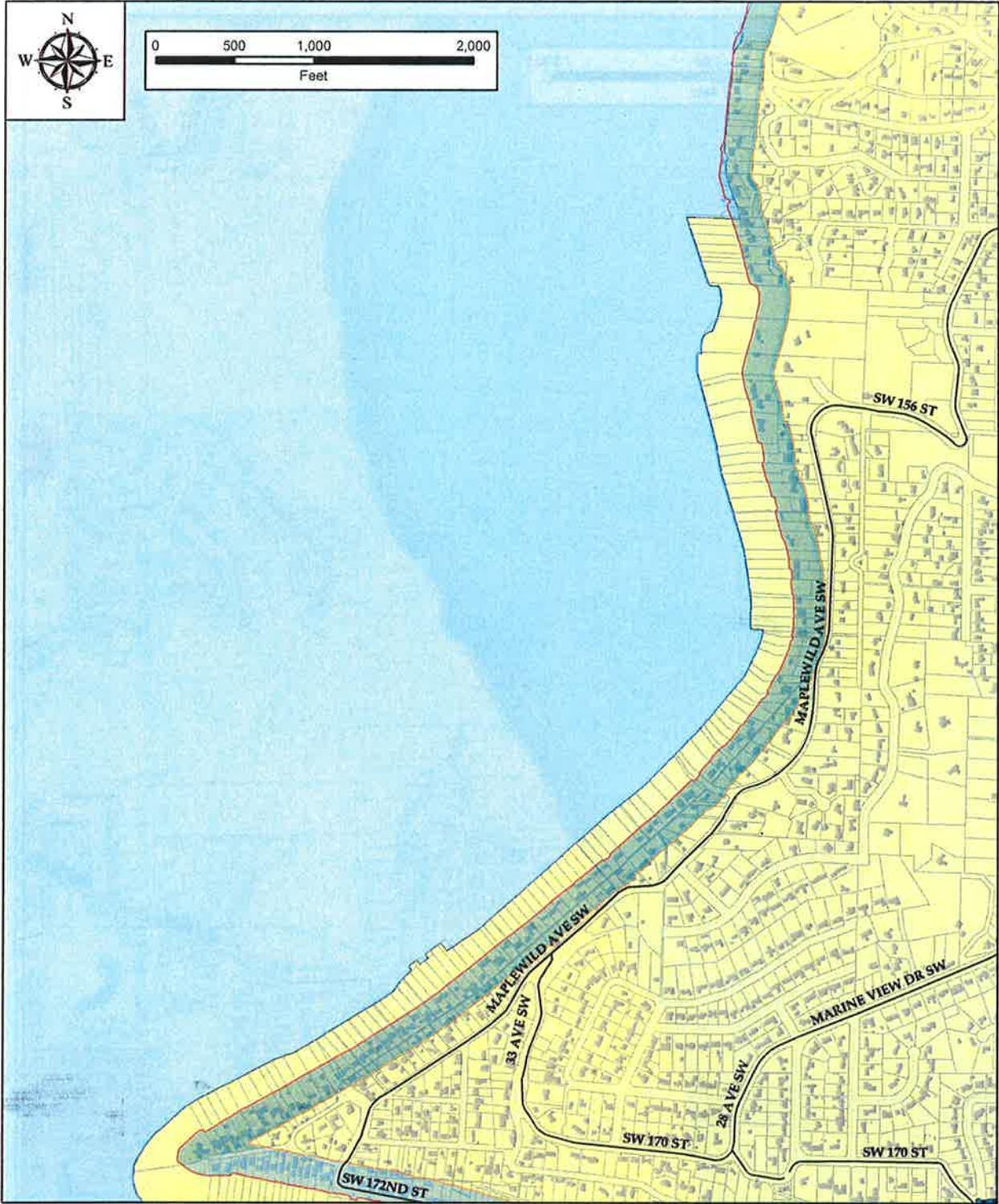
**Shoreline Master Program**

**Zoning**

*Marine 2*

Date: Mar 01, 2008

Figure 6B





**City of Burien**

**Shoreline Master Program**

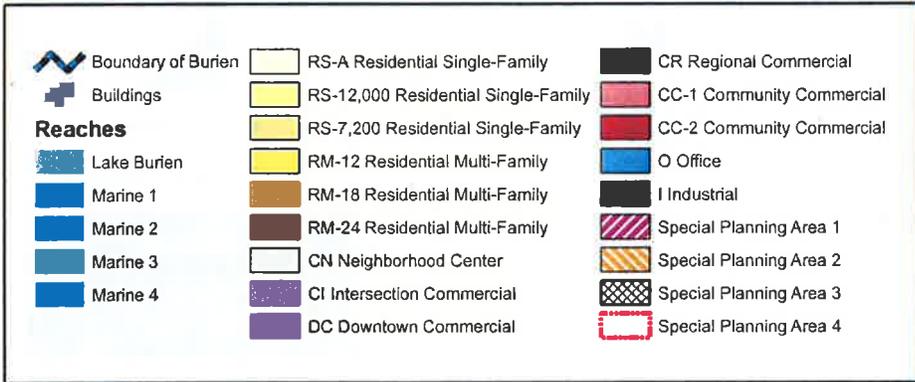
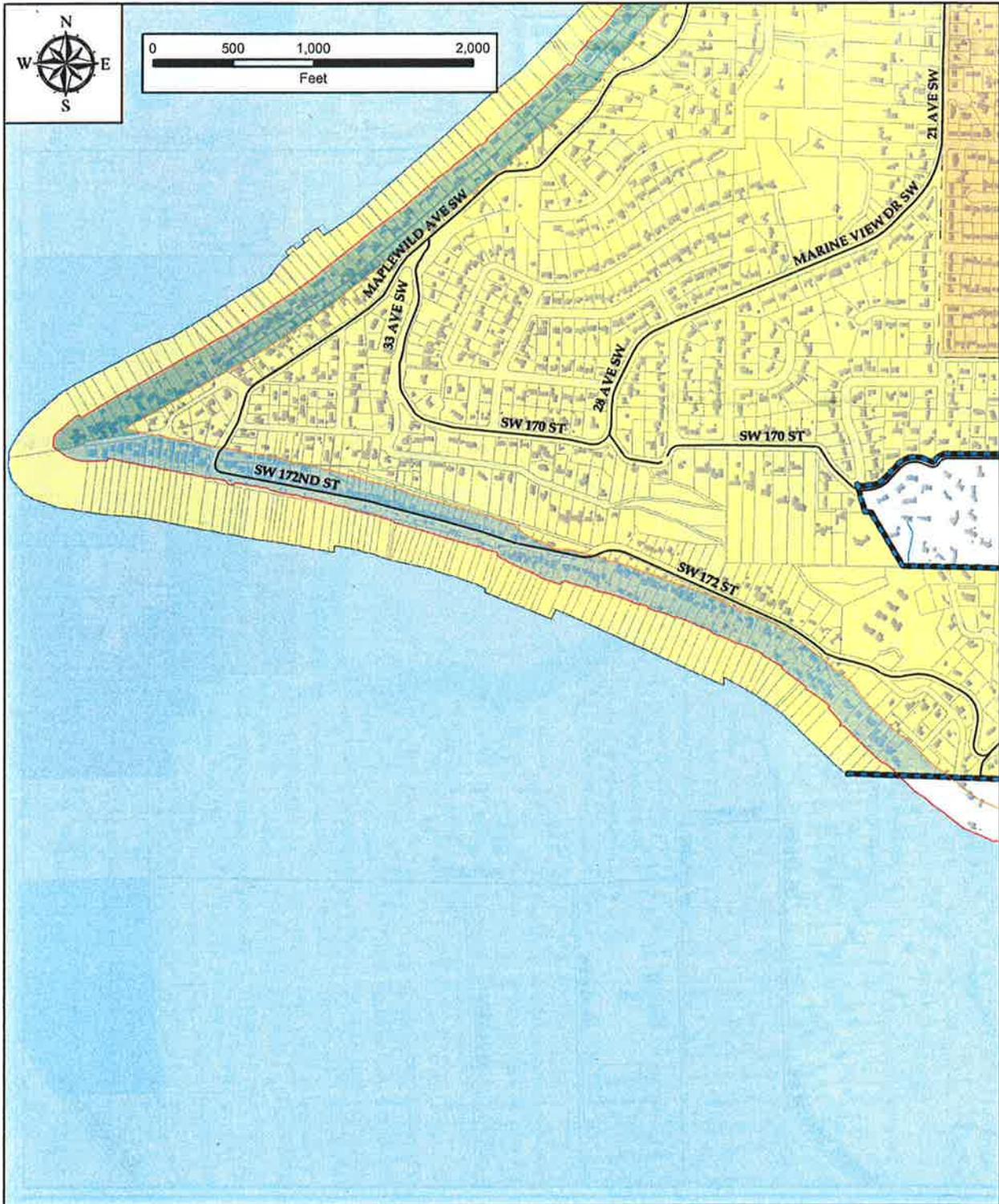
**Zoning**

*Marine 3*

Date: Mar 04, 2008

Figure 6C

5-114



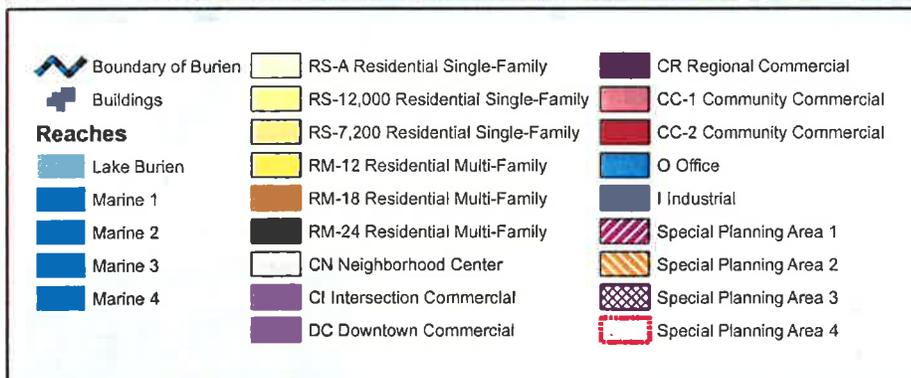
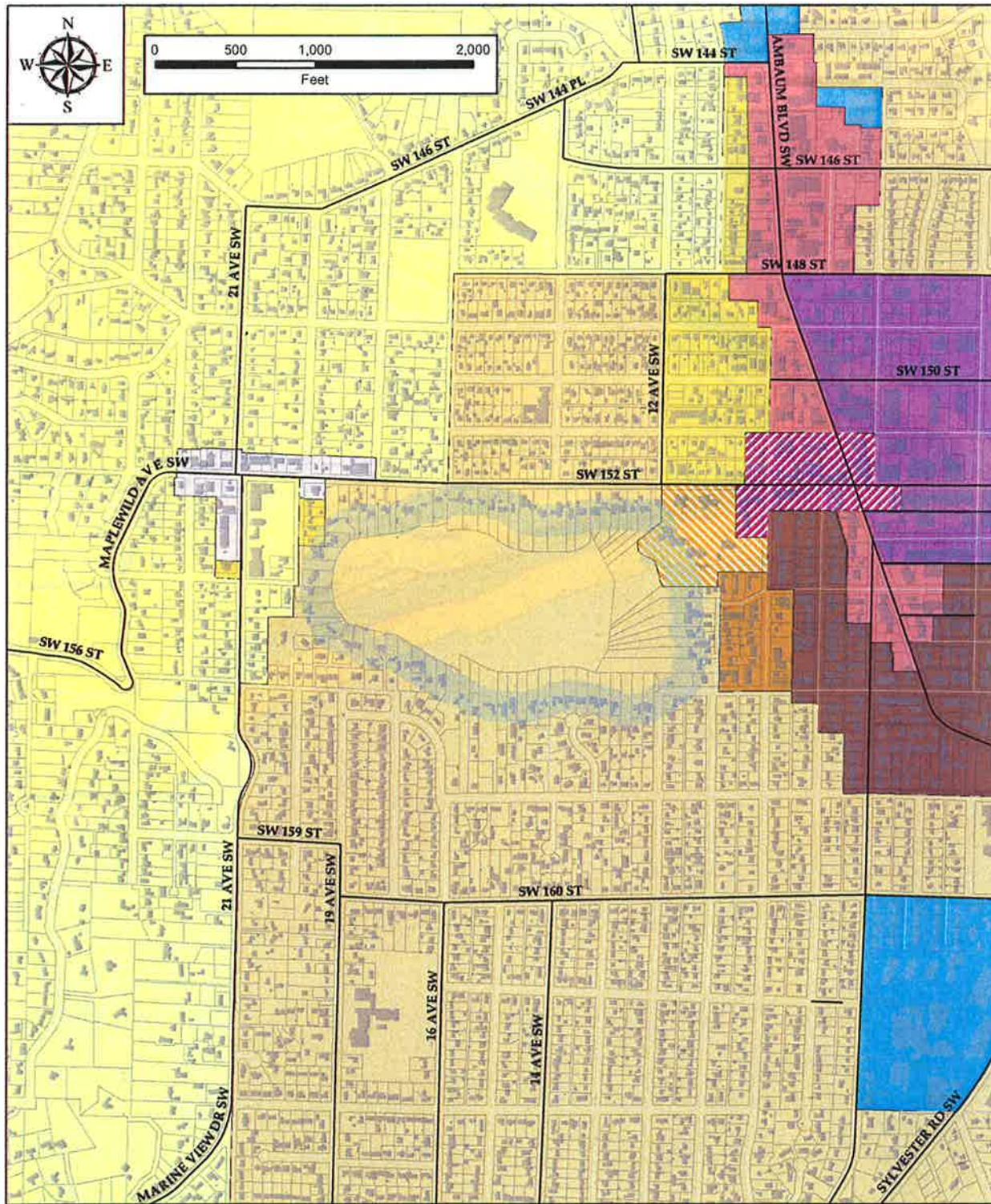

**City of Burien**

**Shoreline Master Program**

**Zoning**  
*Marine 4*

Drawn: May 04, 2008

Figure 6D



**City of Burien**

**Shoreline Master Program**

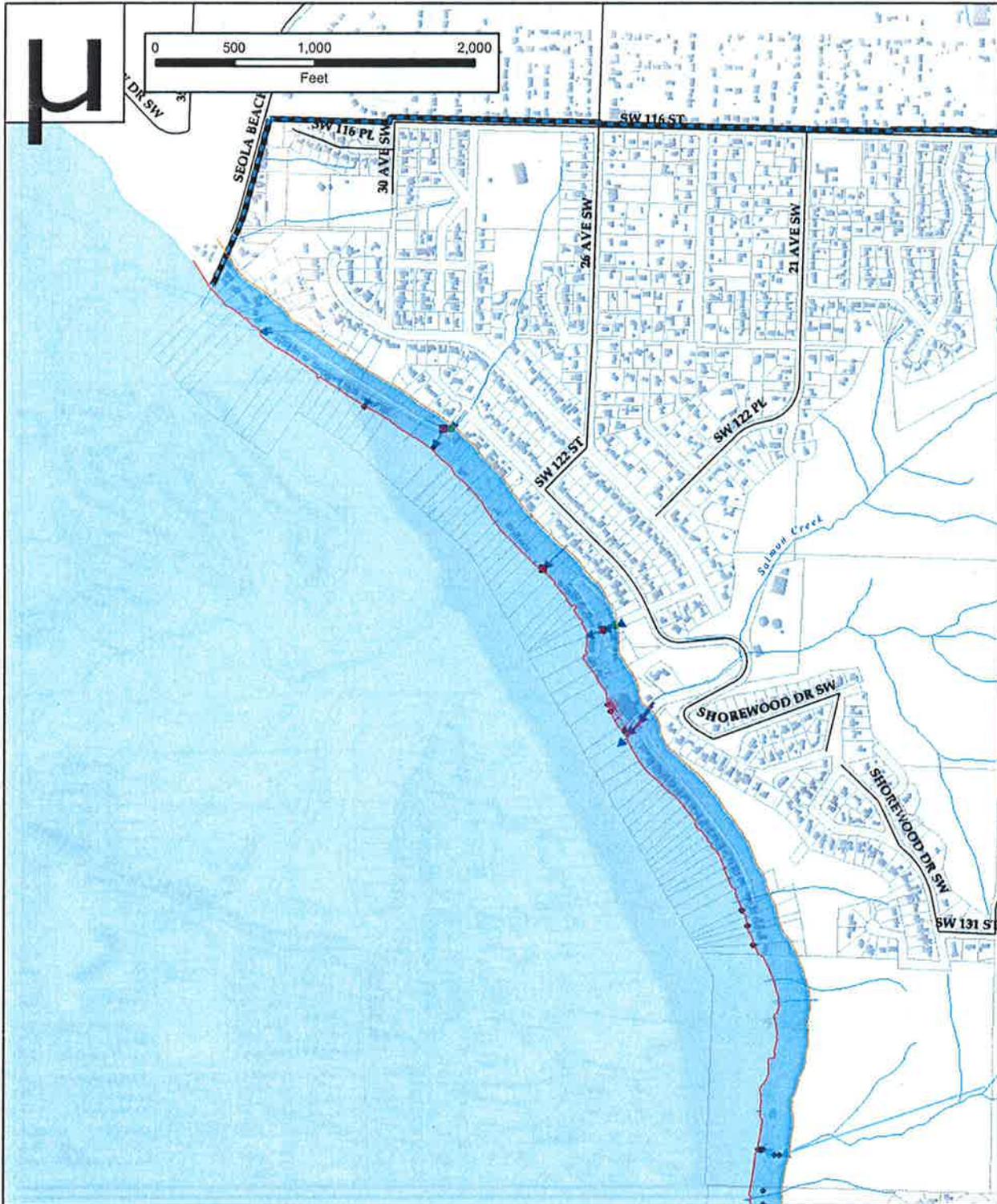
**Zoning**

*Lake Burien*

Update: May 04, 2009

Figure 6E

5-116



Catchbasin Reach		TYPE	
	Boundary of Burien	+	CB Type 1 Infiltration
	Buildings	J	CB Type 1 Inlet
	Reach	!	CB Type 2
	Lake Burien	+	Type 2 FROP
	Marine 1	!	CB Type 2 Infiltration
	Marine 2	(	Type 2 Inlet
	Marine 3	4	Type 3 Infiltration
	Marine 4	N	Type 3 Vault
		.	No Data
		•	Other
		D	Joint
3	Type 2 Flow Splitter	→	Salmon Creek
-	Other	→	Miller Creek
+	Downstream Defender	→	Small Creek
U	Pump Station	→	Open Flow
2	Stormfilter Vault	→	Bioswale
7	CB Type 1	→	Sheet Flow
5	Type 1 FROP	→	Ditches
		→	Storm Pipes



**City of Burien**

**Shoreline Master Program**

**Stormwater System**

*Marine 1*

Date: Mar 04, 2008

Figure 7A

5-117



Boundary of Burien



Buildings

**Reaches**

- Lake Burien
- Marine 1
- Marine 2
- Marine 3
- Marine 4

**Catchbasin Reach**

**TYPE**

- Type 2 Flow Splitter
- Other
- Downstream Defender
- Pump Station
- Stormfilter Vault
- CB Type 1
- Type 1 FROP



CB Type 1 Infiltration



CB Type 1 Inlet



CB Type 2



Type 2 FROP



CB Type 2 Infiltration



Type 2 Inlet



Type 3 Infiltration



Type 3 Vault



No Data



Other



Joint

Salmon Creek

Miller Creek

Small Creek

Open Flow

Bioswale

Sheet Flow

Ditches

Storm Pipes



**City of Burien**

**Shoreline Master Program**

**Stormwater System**

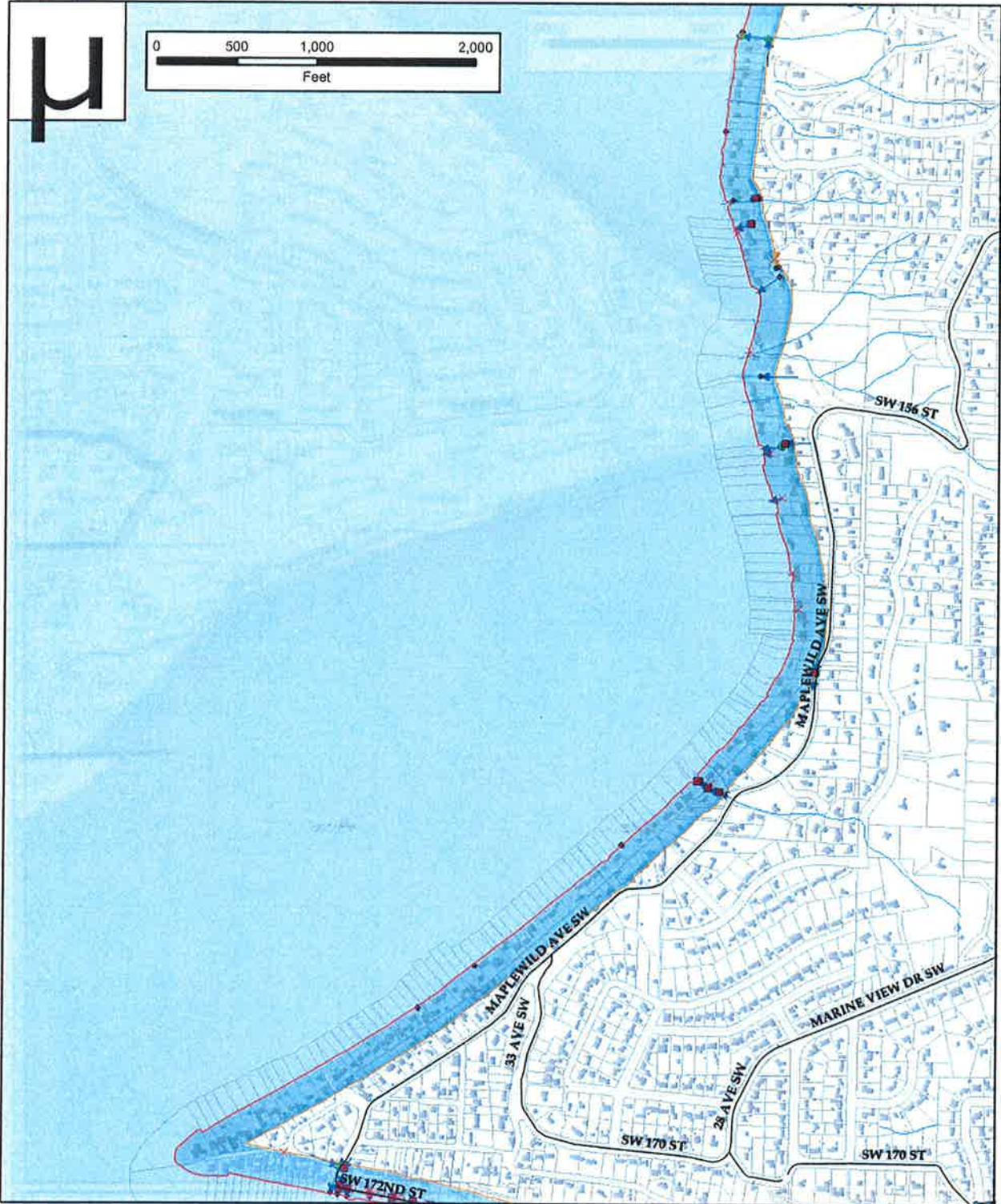
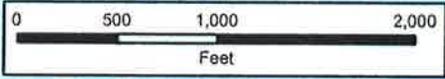
*Marine 2*

Date: Mar 04, 2008

Figure 7B

5-118

μ



Boundary of Burien	<b>Catchbasin Reach</b>	CB Type 1 Infiltration	Salmon Creek
Buildings	<b>TYPE</b>	CB Type 1 Inlet	Miller Creek
<b>Reaches</b>	Type 2 Flow Splitter	CB Type 2	Small Creek
Lake Burien	Other	Type 2 FROP	Open Flow
Marine 1	Downstream Connection	CB Type 2 Infiltration	Bioswale
Marine 2	Pump Station	Type 2 Inlet	Sheet Flow
Marine 3	Stormfilter Vault	Type 3 Infiltration	Ditches
Marine 4	CB Type 1	Type 3 Vault	Storm Pipes
	Type 1 FROP	No Data	
		Other	
		Joint	



**City of Burien**  
**Shoreline Master Program**  
**Stormwater System**  
*Marine 3*

Date: May 02, 2009

5-119

Figure 7C



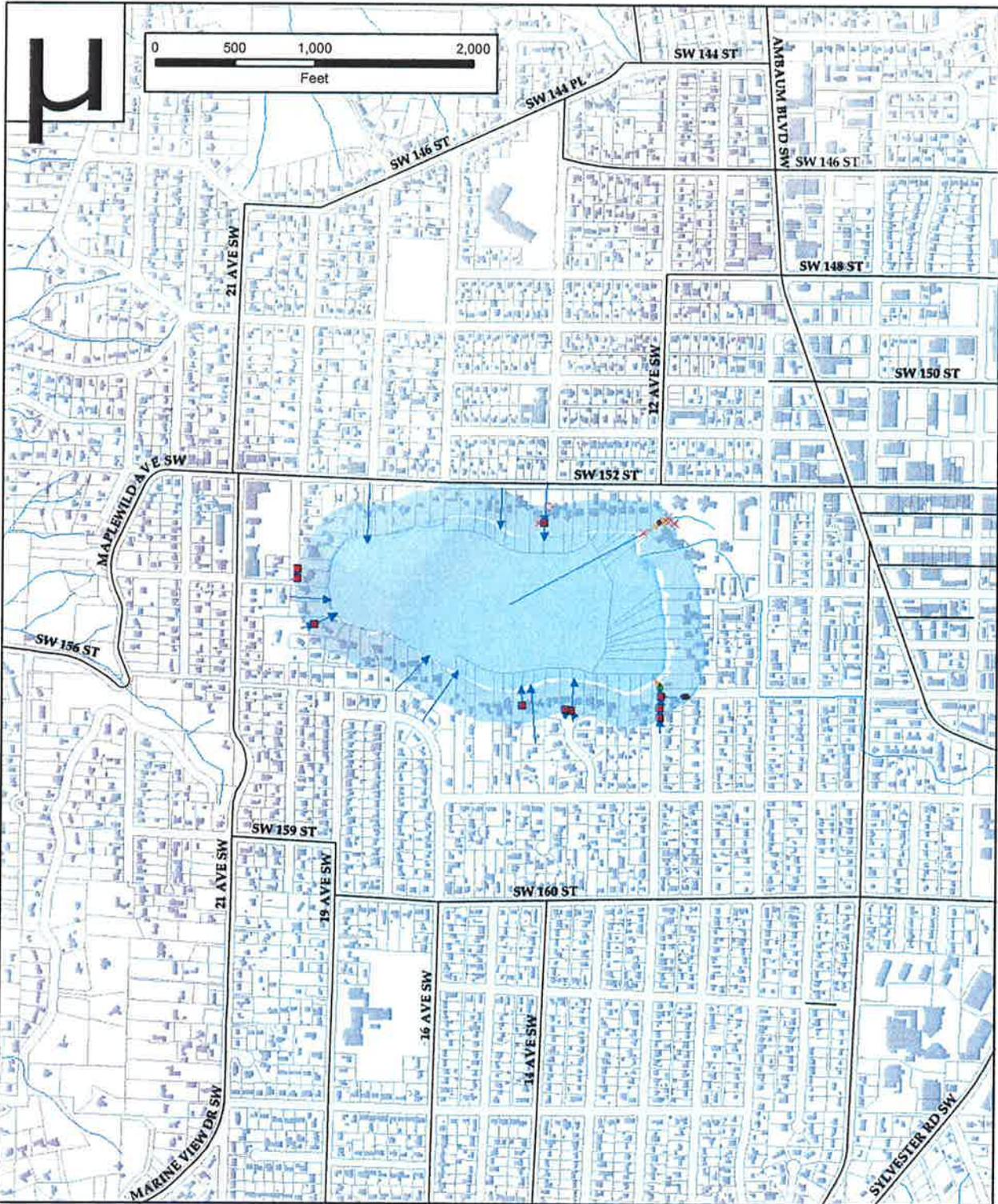
	Boundary of Burien		Catchbasin Reach		CB Type 1 Infiltration		Salmon Creek
	Buildings	<b>TYPE</b>			CB Type 1 Inlet		Miller Creek
<b>Reaches</b>			Type 2 Flow Splitter		CB Type 2		Small Creek
	Lake Burien		Other		Type 2 FROP		Open Flow
	Marine 1		Downstream Defender		CB Type 2 Infiltration		Bioswale
	Marine 2		Pump Station		Type 2 Inlet		Sheet Flow
	Marine 3		Stormfilter Vault		Type 3 Infiltration		Ditches
	Marine 4		CB Type 1		Type 3 Vault		Storm Pipes
			Type 1 FROP		No Data		
					Other		
					Joint		



**City of Burien**  
**Shoreline Master Program**  
**Stormwater System**  
*Marine 4*

Date: Mar 04, 2008 Figure 7D

5-120



	Boundary of Burien		CB Type 1 Infiltration		Salmon Creek
	Buildings		CB Type 1 Inlet		Miller Creek
<b>Reaches</b>	<b>Catchbasin Reach</b>		CB Type 2		Small Creek
	Lake Burien		Type 2 FROP		Open Flow
	Marine 1		CB Type 2 Infiltration		Bioswale
	Marine 2		Type 2 Inlet		Sheet Flow
	Marine 3		Type 3 Infiltration		Ditches
	Marine 4		Type 3 Vault		Storm Pipes
	<b>TYPE</b>		No Data		
			Other		
			Joint		



**City of Burien**

**Shoreline Master Program**

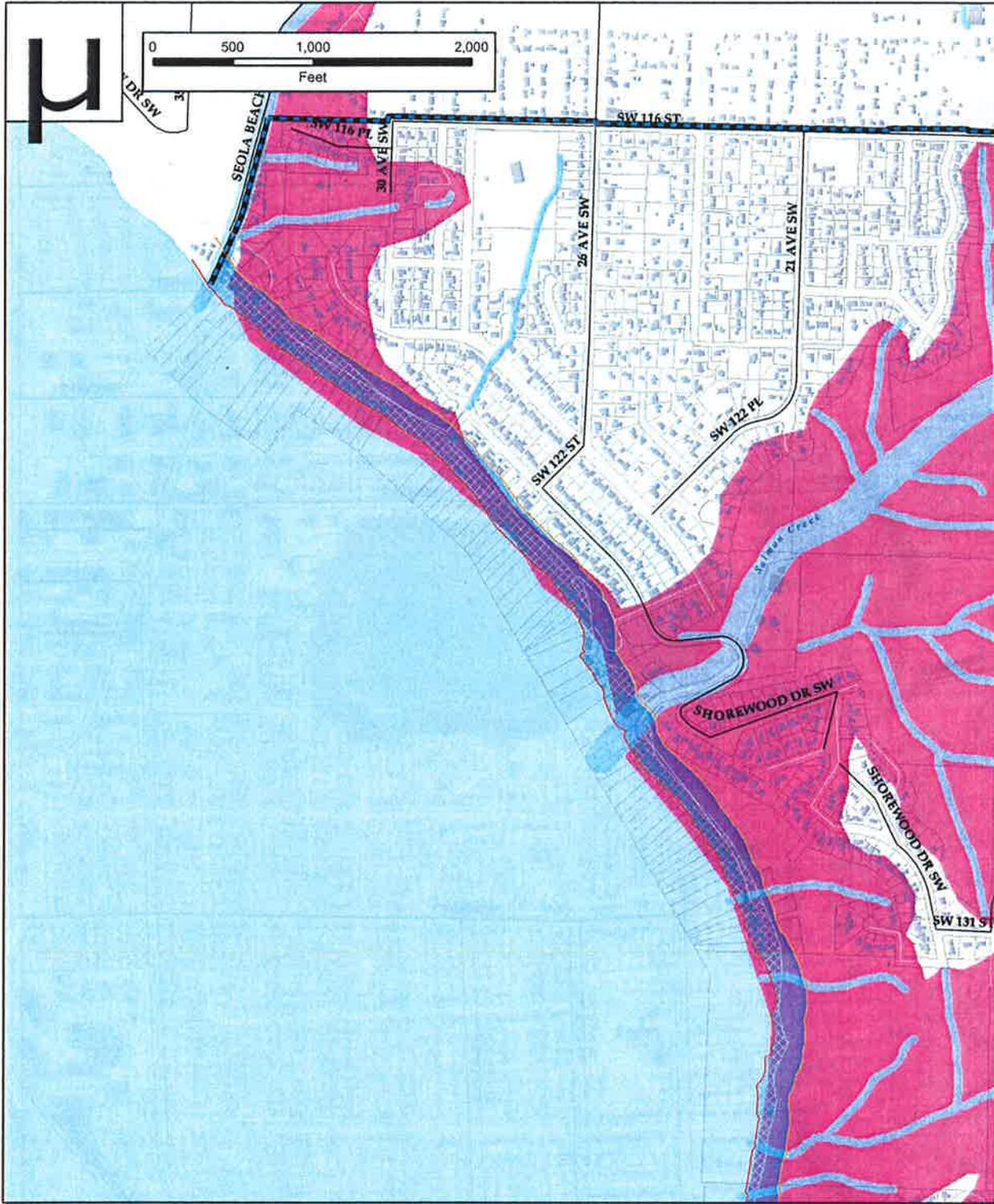
**Stormwater System**

*Lake Burien*

Date: Mar 04, 2008

Figure 7E

5-121



- |                |                    |  |                            |
|----------------|--------------------|--|----------------------------|
|                | Boundary of Burien |  | Seismic                    |
|                | Buildings          |  | Landslide                  |
| <b>Reaches</b> |                    |  | Aquifer Recharge Areas     |
|                | Lake Burien        |  | Wetlands                   |
|                | Marine 1           |  | Stream Buffers             |
|                | Marine 2           |  | 100-Year Flood Area - FEMA |
|                | Marine 3           |  |                            |
|                | Marine 4           |  |                            |



**City of Burien**

**Shoreline Master Program**

**Critical Areas**

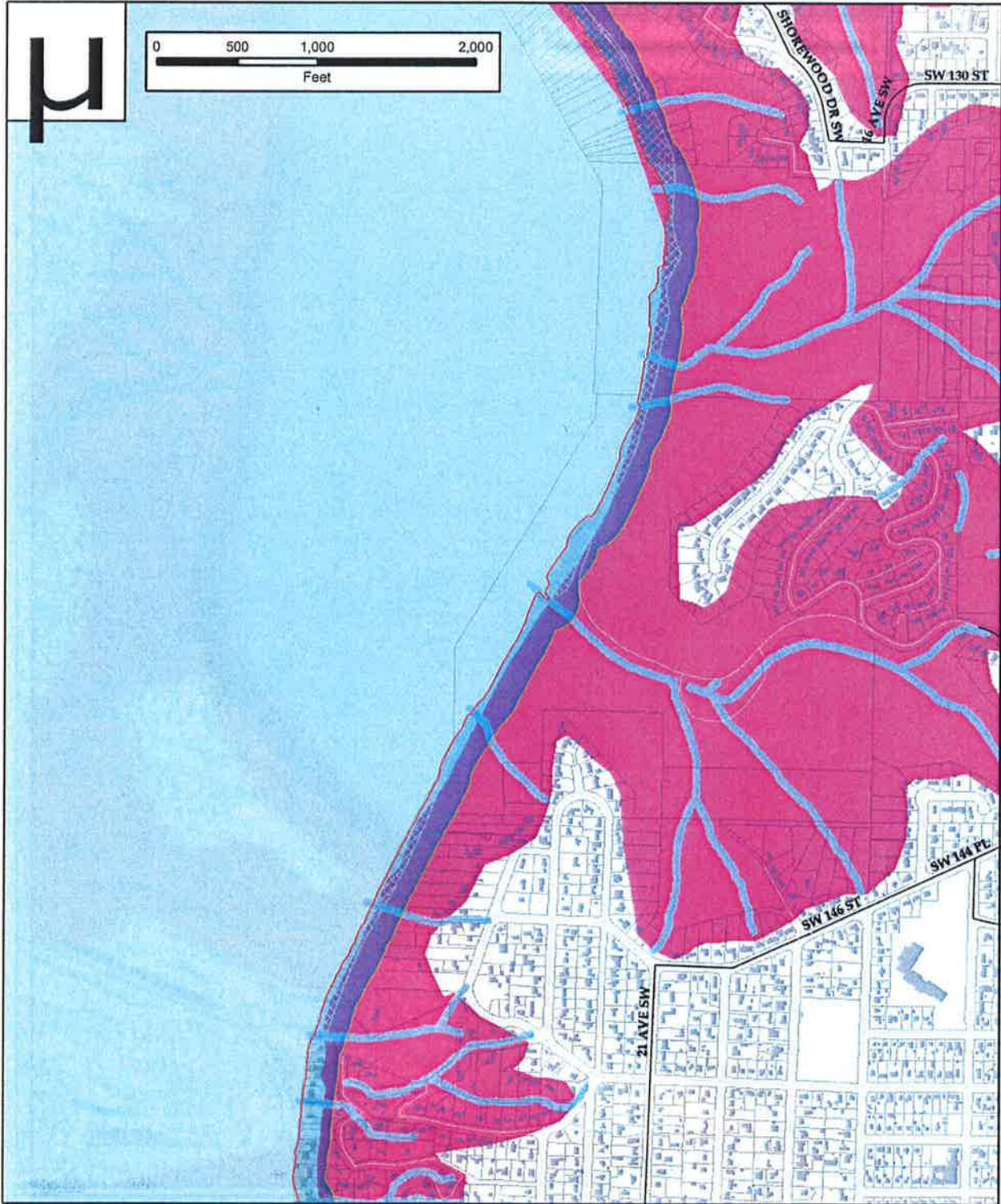
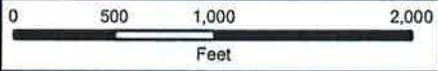
*Marine 1*

Date: May 04, 2010

Figure 9A

5-122

4



- |                    |                            |
|--------------------|----------------------------|
| Boundary of Burien | Seismic                    |
| Buildings          | Landslide                  |
| <b>Reaches</b>     | Aquifer Recharge Areas     |
| Lake Burien        | Wetlands                   |
| Marine 1           | Stream Buffers             |
| Marine 2           | 100-Year Flood Area - FEMA |
| Marine 3           |                            |
| Marine 4           |                            |



**City of Burien**

**Shoreline Master Program**

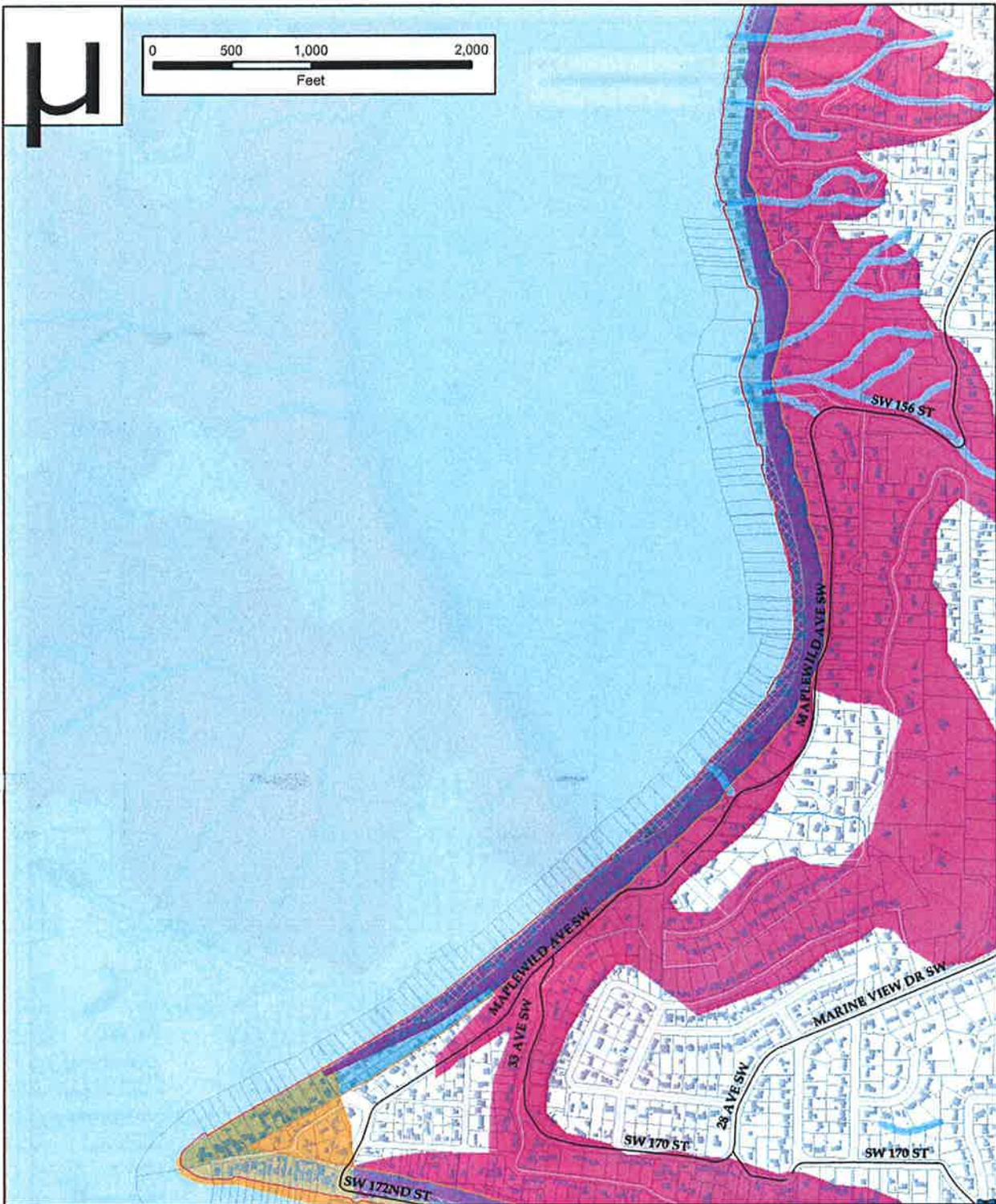
**Critical Areas**

*Marine 2*

Date: May 04, 2009

Figure 8B

5-123



- Boundary of Burien
- Buildings
- Reaches**
- Lake Burien
- Marine 1
- Marine 2
- Marine 3
- Marine 4
- Seismic
- Landslide
- Aquifer Recharge Areas
- Wetlands
- Stream Buffers
- 100-Year Flood Area - FEMA



City of Burien

Shoreline Master Program

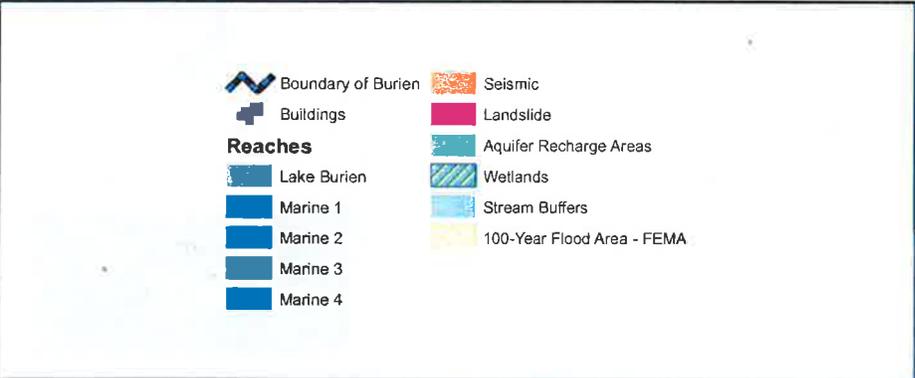
Critical Areas

Marine 3

Date: Mar 04, 2008

Figure 8C

5-124



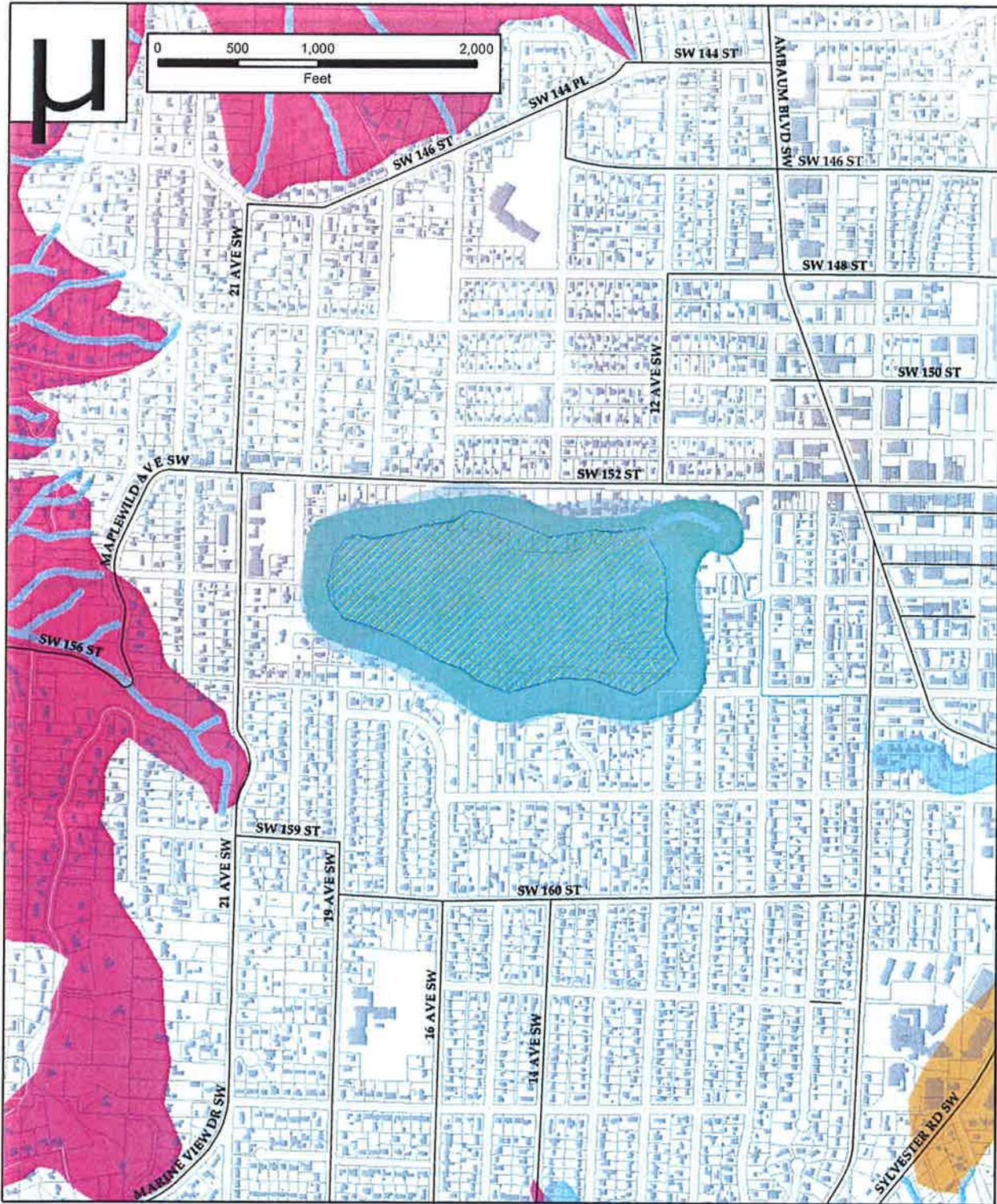

**City of Burien**  
**Shoreline Master Program**

**Critical Areas**  
*Marine 4*

Date: March 2018

Figure 8D

5-125



- Boundary of Burien
- Buildings
- Reaches**
- Lake Burien
- Marine 1
- Marine 2
- Marine 3
- Marine 4
- Seismic
- Landslide
- Aquifer Recharge Areas
- Wetlands
- Stream Buffers
- 100-Year Flood Area - FEMA



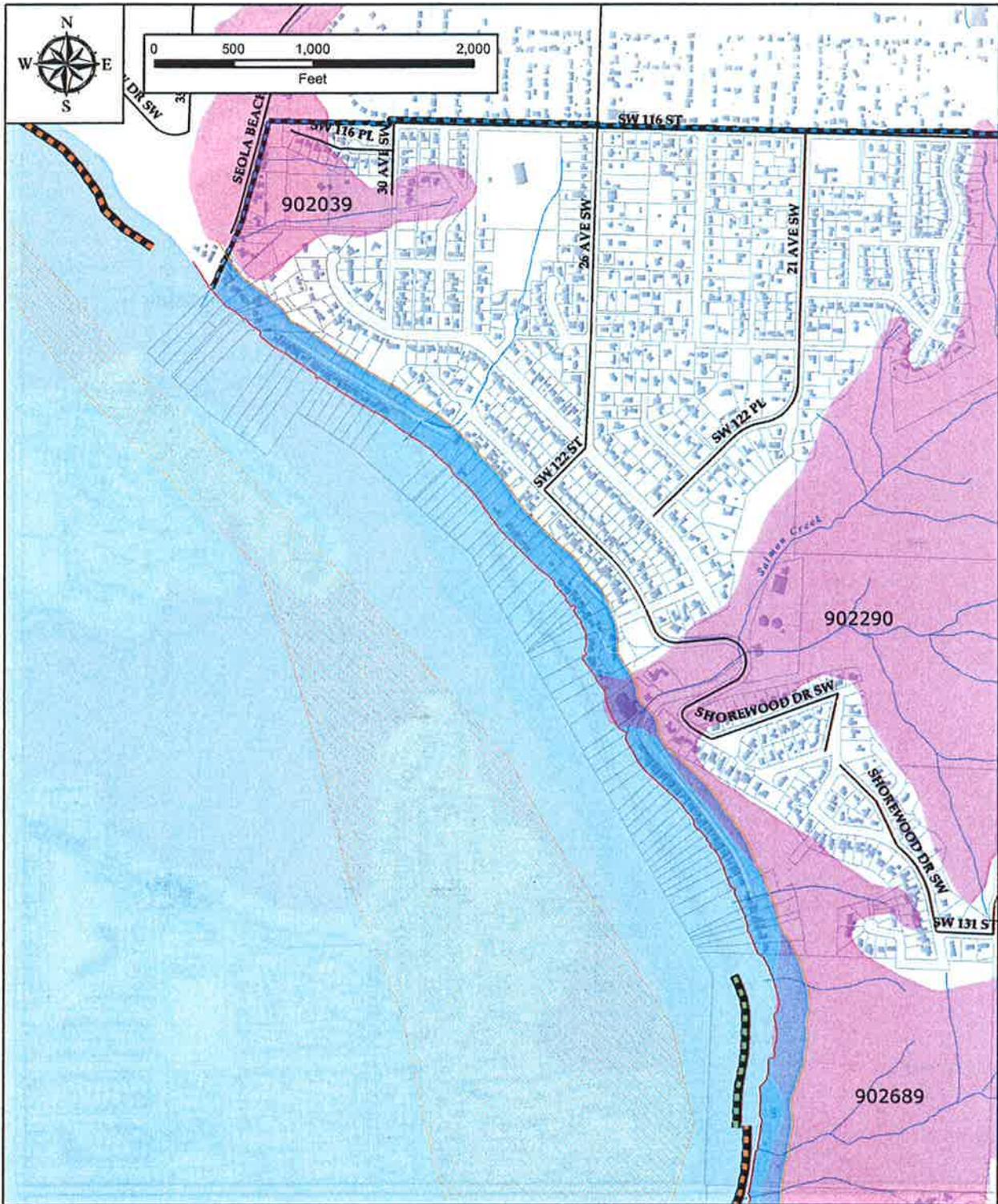
City of Burien

Shoreline Master Program

Critical Areas

Lake Burien

5-126



Boundary of Burien	Priority Habitats & Species - WDFW
Buildings	Heritage Buffer
<b>Reaches</b>	Important Species - WDFW
Lake Burien	Surf Smelt
Marine 1	Pacific Sandlance
Marine 2	Geoduck
Marine 3	
Marine 4	

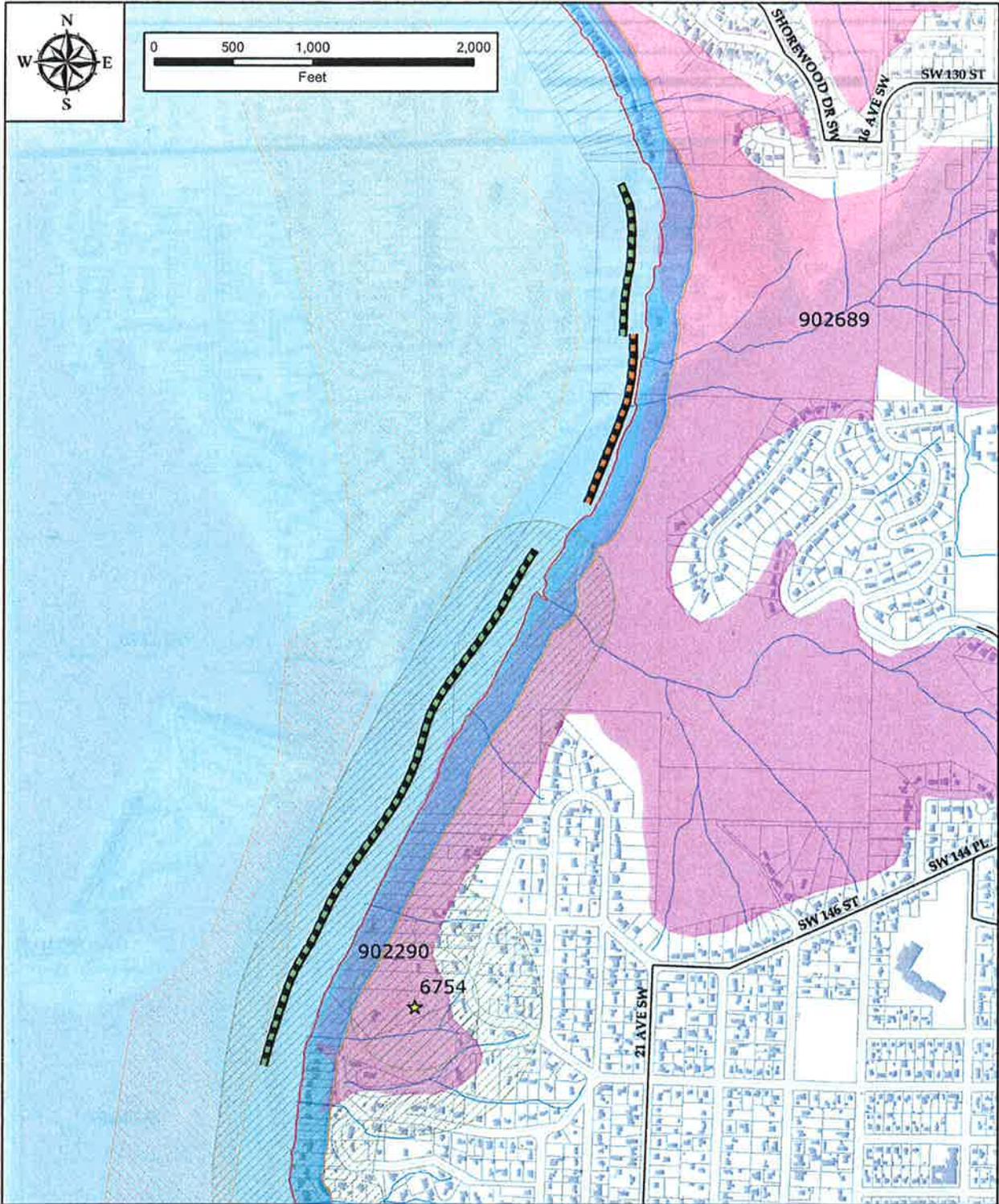
Data represented on these maps are subject to rules and regulations delineated by The Washington Department of Fish and Wildlife under POLICY - 5210. This product contains sensitive information as determined by WDFW and should not be distributed.



**City of Burien**  
**Shoreline Master Program**  
**Fish & Wildlife Habitat Conservation Areas**  
*Marine 1*

Date: Mar 24, 2009 Figure 9A

5-127



	Boundary of Burien		Priority Habitats & Species - WDFW
	Buildings		Heritage Buffer
<b>Reaches</b>			Important Species - WDFW
	Lake Burien		Surf Smelt
	Marine 1		Pacific Sandlance
	Marine 2		Geoduck
	Marine 3		
	Marine 4		

Data represented on these maps are subject to rules and regulations delineated by The Washington Department of Fish and Wildlife under POLICY - 5210. This product contains sensitive information as determined by WDFW and should not be distributed.



**City of Burien**

**Shoreline Master Program**

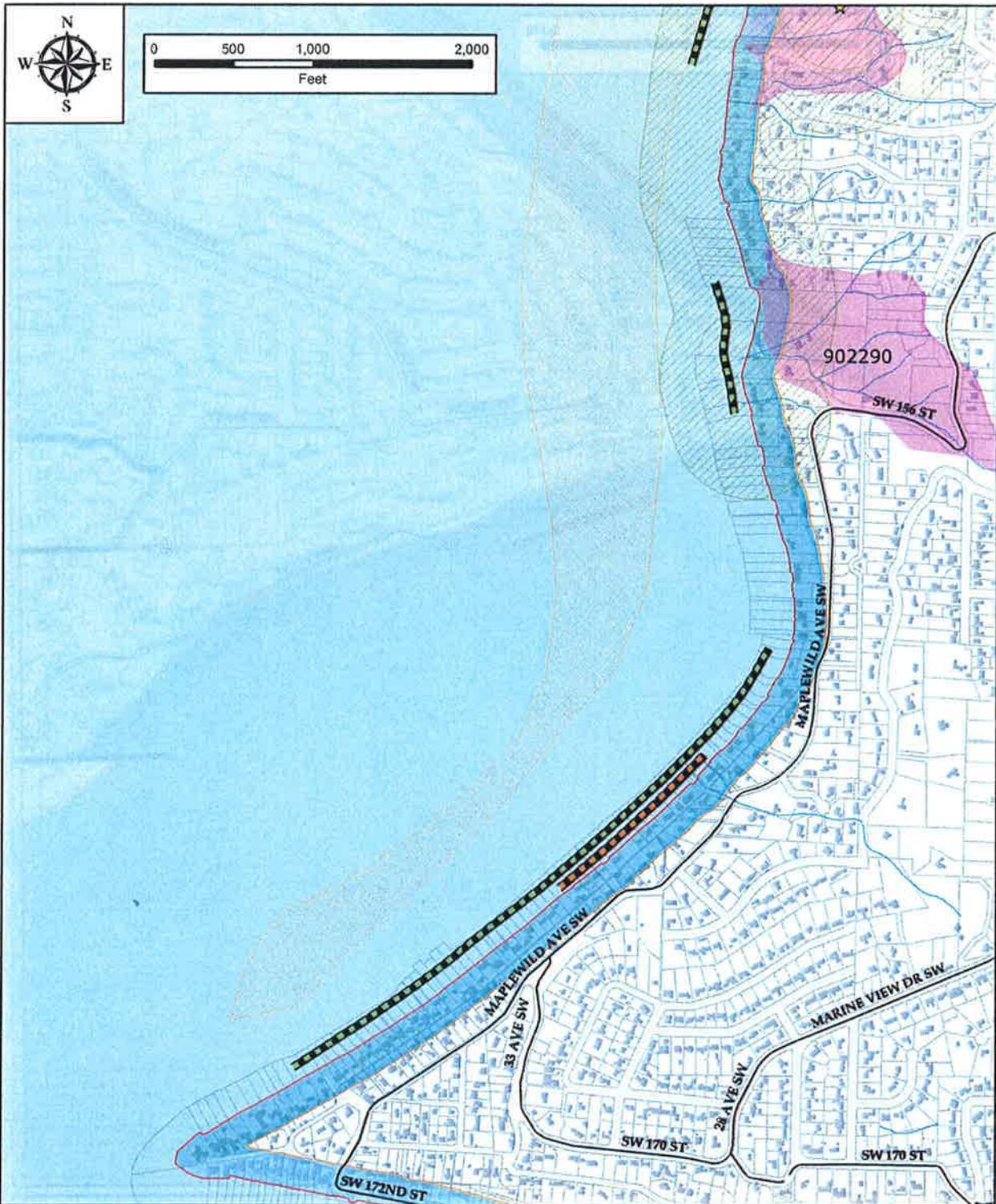
**Fish & Wildlife Habitat Conservation Areas**

*Marine 2*

Date: Mar 01, 2009

Figure 9B

5-128



Boundary of Burien	Priority Habitats & Species - WDFW
Buildings	Heritage Buffer
<b>Reaches</b>	Important Species - WDFW
Lake Burien	Surf Smelt
Marine 1	Pacific Sandlance
Marine 2	Geoduck
Marine 3	
Marine 4	

Data represented on these maps are subject to rules and regulations delineated by The Washington Department of Fish and Wildlife under POLICY - 5210. This product contains sensitive information as determined by WDFW and should not be distributed.



**City of Burien**

**Shoreline Master Program**

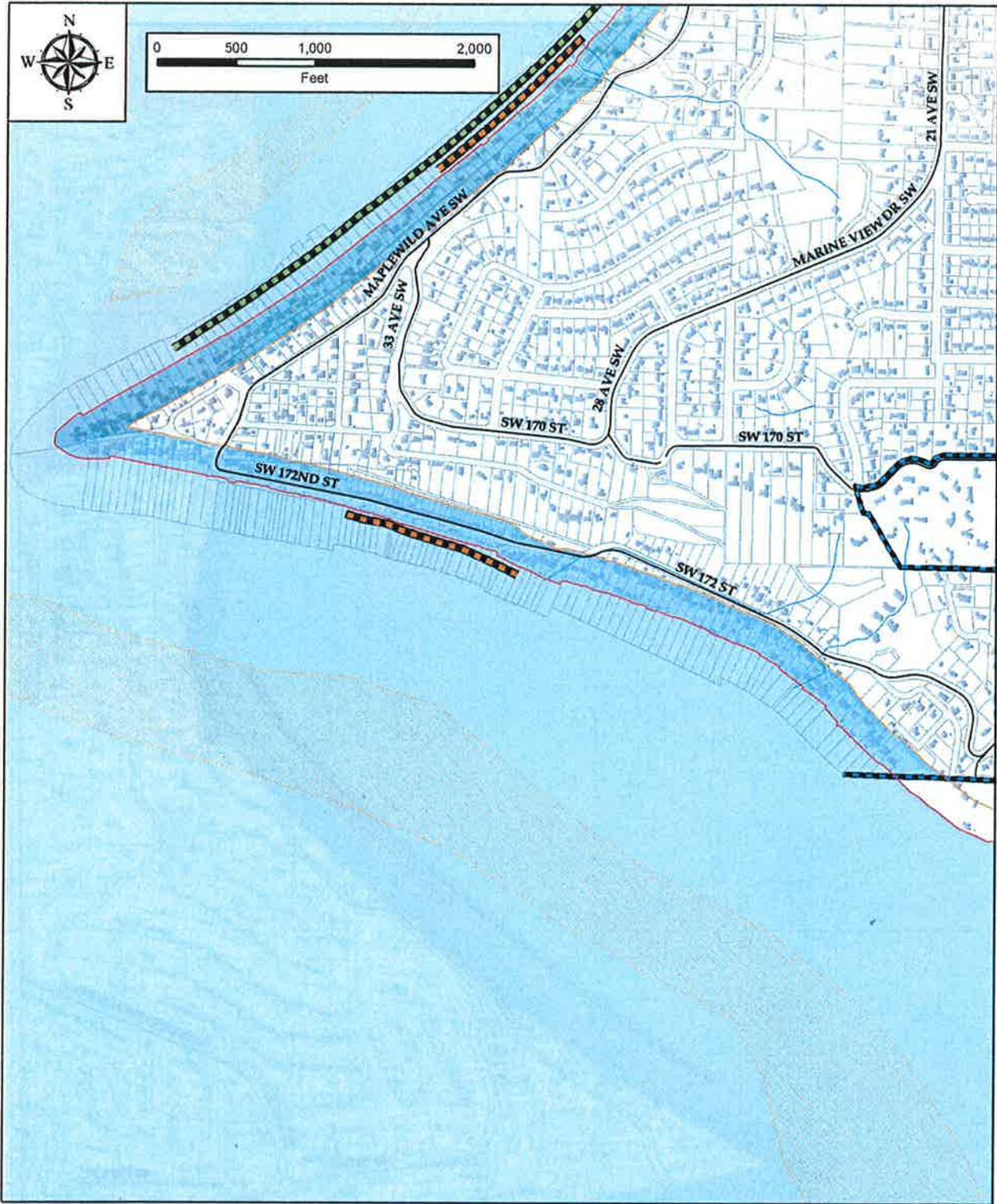
**Fish & Wildlife Habitat Conservation Areas**

*Marine 3*

Disc: May 04, 2005

Figure 9C

5-129



	Boundary of Burien		Priority Habitats & Species - WDFW
	Buildings		Heritage Buffer
<b>Reaches</b>			Important Species - WDFW
	Lake Burien		Surf Smelt
	Marine 1		Pacific Sandlance
	Marine 2		Geoduck
	Marine 3		
	Marine 4		

Data represented on these maps are subject to rules and regulations delineated by The Washington Department of Fish and Wildlife under POLICY - 5210. This product contains sensitive information as determined by WDFW and should not be distributed.



**City of Burien**

**Shoreline Master Program**

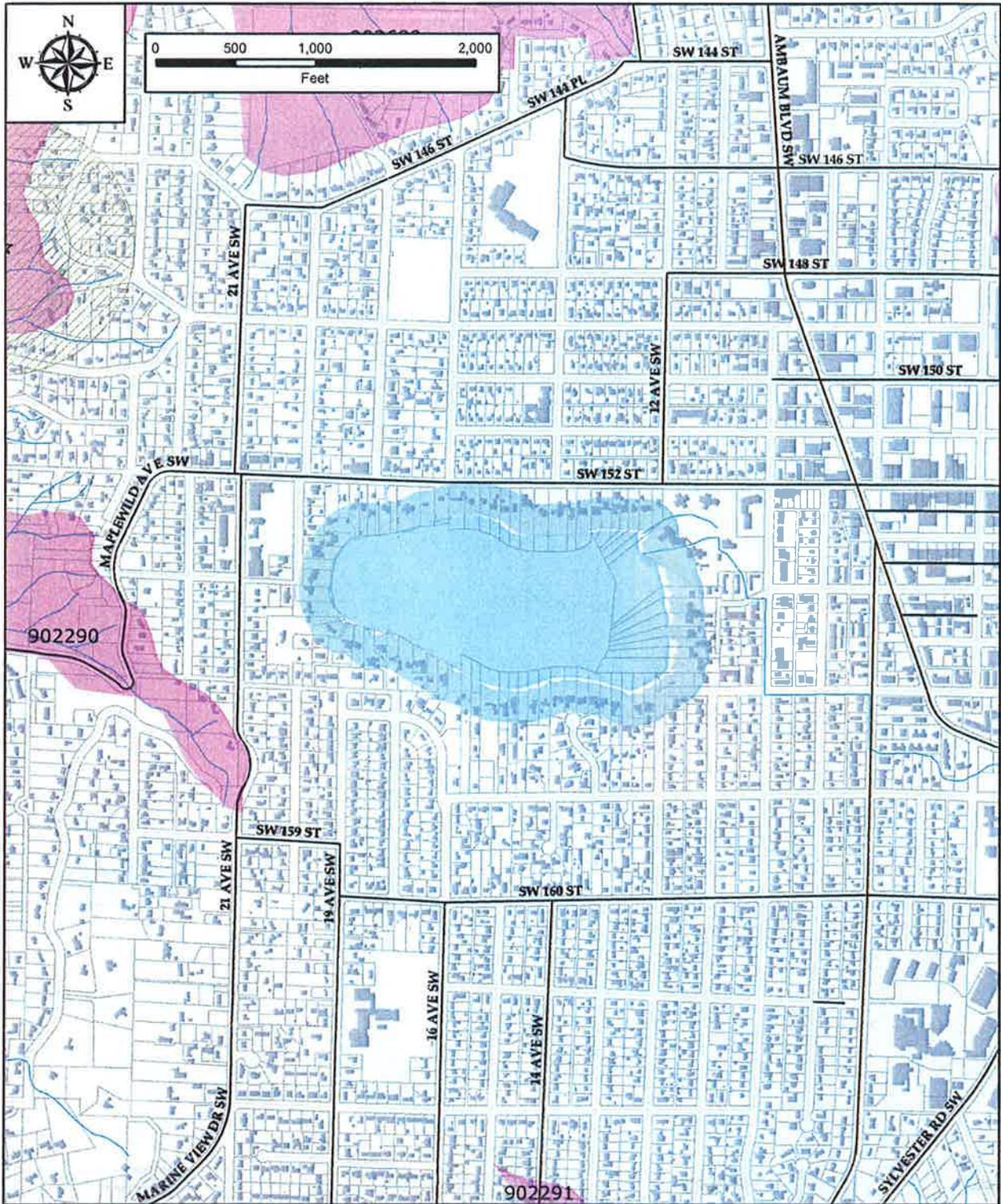
**Fish & Wildlife Habitat Conservation Areas**

*Marine 4*

Date: MAR 24, 2009

Figure 9D

5-130



- Boundary of Burien
- Buildings
- Reaches**
- Lake Burien
- Marine 1
- Marine 2
- Marine 3
- Marine 4
- Priority Habitats & Species - WDFW
- Heritage Buffer
- Important Species - WDFW
- Surf Smelt
- Pacific Sandlance
- Geoduck

Data represented on these maps are subject to rules and regulations delineated by The Washington Department of Fish and Wildlife under POLICY - 5210. This product contains sensitive information as determined by WDFW and should not be distributed.



City of Burien

Shoreline Master Program

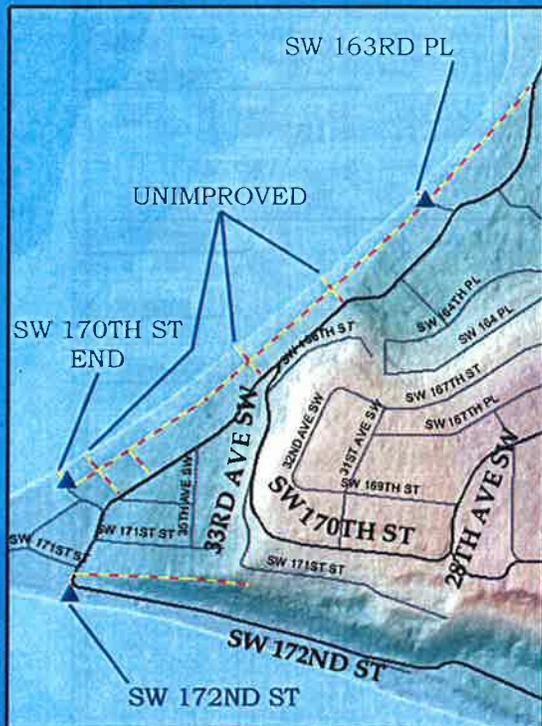
Fish & Wildlife Habitat  
Conservation Areas  
*Lake Burien*

Date: Mar 04, 2018

Figure 9E

5-131

Located in City of Seattle



- Burien Parks
- Park Easements
- Trails/Right of Ways
- Access Points
- City Boundary



Data Sources: City of Burien, King County, INTC  
 PROFILE = THE BURDEN RECORDS AD (revised 7/20/2007), Burien Parks (Public Access.mxd)  
 MAP = THE BURDEN RECORDS AD (revised 7/20/2007) Burien Parks (Public Access.mxd)

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**City of Burien**  
 Shoreline Master Program

**Public Access**

Date: November 6, 2008 **Figure 10**

5-132