

CHAPTER 3

PLANNING CRITERIA

INTRODUCTION

In this chapter, factors that will affect the planning and design of future wastewater facilities are addressed. These factors include regulatory requirements, topography, population, land use, and political considerations. The information presented is general enough to retain validity as design constraints change and at the same time sufficiently detailed to provide a foundation for the design of future facilities.

GROWTH MANAGEMENT

The Growth Management Act (GMA) was enacted by the Washington State Legislature to ensure a continuation of Washington's high quality of life. The basic objective of the GMA is to encourage local county and city governments to develop and implement a 20-year comprehensive plan that incorporates their vision of the future within the framework of the broader needs of the state.

Under the GMA, municipalities must complete their own planning and coordinate these planning efforts with those of the county and surrounding municipalities. The planning effort of a municipality includes the establishment of a future service area. Municipalities are to provide wastewater services to areas within their established planning boundary. The Northshore Utility District includes portions of the Urban Growth Area (UGA) of five cities: Lake Forest Park, Kenmore, Bothell, Woodinville, and Kirkland. In addition, interlocal agreements with the cities of Brier and Redmond allow wastewater from outside the District boundary to flow through District facilities on the way to the King County Department of Natural Resources (KCDNR) system.

STUDY AREA

The Northshore Utility District is located in Western Washington and lies entirely within King County. The location of the District in relation to surrounding areas is presented in Figure 1-1. An aerial photograph of the District is presented in Figure 1-2. The District is bordered by Lake Washington on the southwest, the Snohomish-King County line to the north, and the western foothills of the Sammamish River Valley to the east.

The District corporate boundary encompasses approximately 11,860 acres. The District's corporate boundary legally defines the political boundaries of the District and establishes the residents eligible to vote for District commissioners. The District's corporate boundary is shown in Figure 3-1.

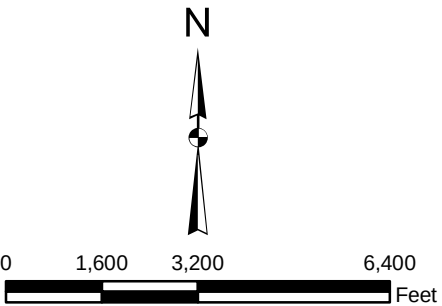
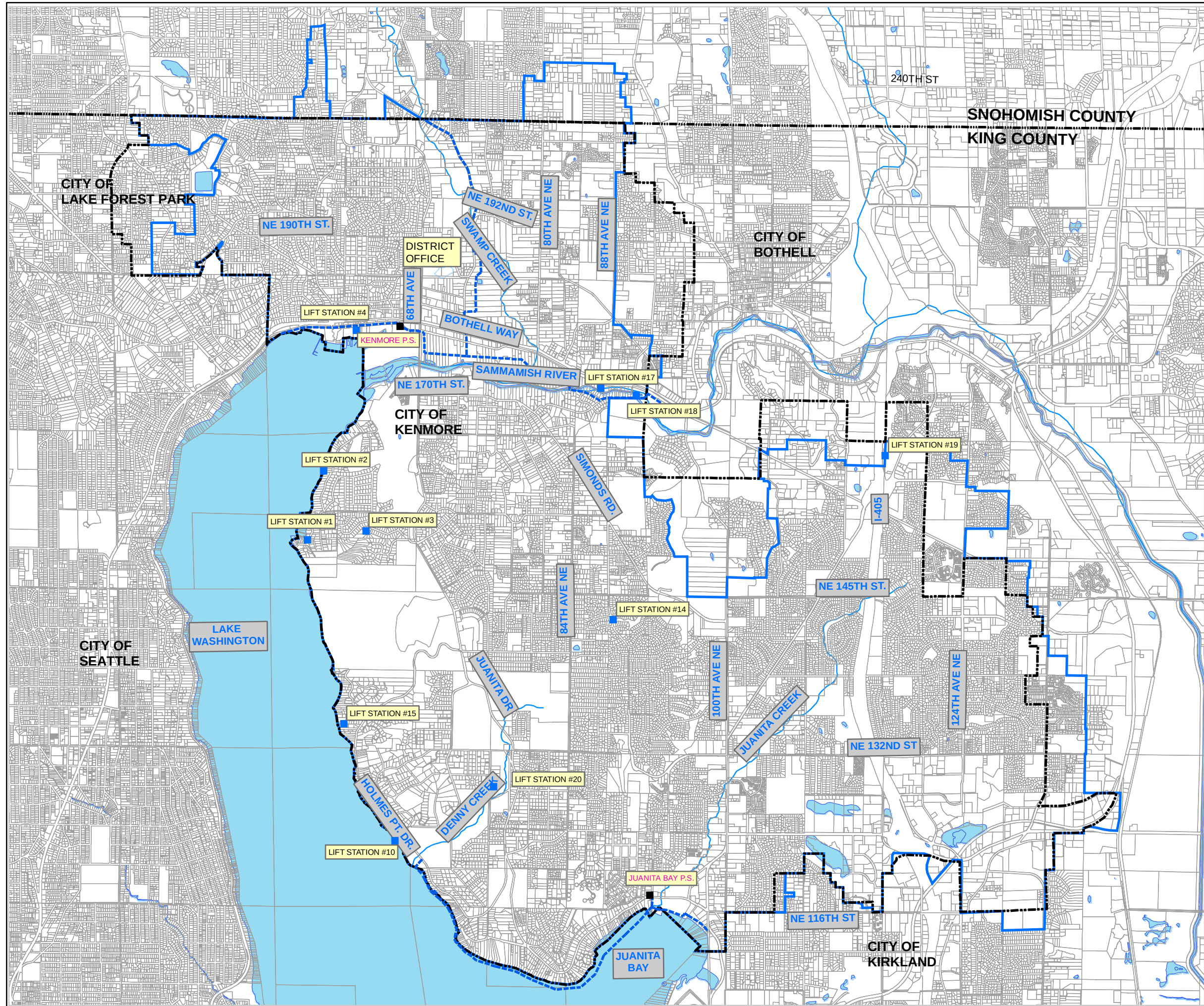
The sewer service area is also shown in Figure 3-1. The sewer service area boundary was determined based on District sewer maps showing existing and future facilities. The sewer service area is not entirely coincidental with the District's corporate boundary since wastewater conveyance systems tend to follow topographical features as opposed to political boundaries. Out of over the 22,000 existing lots within the sewer service area, there are approximately 600 parcels within the sewer service area without access to sewer service.

The sewer service *study* area includes the entire sewer service area and all additional areas that impact the District's sewer service facilities. For example, flows from the areas north of the King County boundary served by the Alderwood Water and Wastewater District are conveyed to KCDNR sewers via the District's sewers. These areas will impact the District's facilities; however, the areas are not within the District's sewer service area. The sewer service study area comprises approximately 11,280 acres (includes rights-of-ways) and is shown in Figure 3-1.

The District provides service to a number of connections outside the District's corporate boundary and other sewer service providers provide service to a number of connections *within* the District's corporate boundary. Interlocal agreements serve as a tool to allow service either outside the boundary by the District or within the boundary by another sewer service provider. The District's interlocal agreements are summarized in Appendix D.

The District provides service to a number of connections located outside of the District boundary. In some cases, the right to provide services to customers outside the District boundary is simply released to the District by the adjacent service provider. These are usually in areas that are topographically connected to District facilities and therefore more efficiently served by the District. The District bills these customers directly, and it is anticipated that the District will continue to provide service to these areas indefinitely. For example, the Totem Estates development, east of 121st Avenue NE and north of NE 160th Street, lies outside the District's corporate boundary. In 1977, an interlocal agreement with Woodinville allowed the District to serve the Totem Estates development and the area is now included in the District's sewer service area. However, in 2000, the District abandoned a lift station that served this development and established an interlocal agreement with Bothell so that the flows are now transported to Bothell's gravity sewer system.

Additionally, the District has agreements with adjacent service providers to transport flows from outside the District into KCDNR facilities. Most notably, areas north of the King County boundary, in Snohomish County, transport flows from Alderwood Water and Wastewater District to KCDNR facilities via the District's sewer service area facilities. In these cases, the District has agreements with the adjacent service provider, and service is often provided on a temporary basis. If the District is to receive compensation under these agreements, it bills the adjacent purveyor, who in turn bills the



- LEGEND:**
- LIFT STATIONS
 - ▭ CORPORATE BOUNDARY
 - ▭ SEWER SERVICE STUDY AREA BOUNDARY
 - KCDNR LIFT STATIONS
 - KCDNR INTERCEPTOR
 - COUNTY LINE
- SOURCE: KING COUNTY GIS



WASTEWATER SYSTEM PLAN

FIGURE 3-1
DISTRICT BOUNDARY AND SEWER SERVICE AREA



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individual customers. The wheeling of flows from the Alderwood Water and Wastewater District to KCDNR flows will continue until the District no longer owns the facilities through which AWWD is transporting flows.

In other cases, adjacent entities provide service to areas within the District. As described above, these arrangements usually serve the best interest of the customer in that, due to topographical considerations, the adjacent service provider can provide service most economically.

PHYSICAL ENVIRONMENT

The physical environment within the District and surrounding areas plays a key role in planning for the future wastewater service of the District's population. The relevant components of the physical environment include topography, groundwater, surface water, site-sensitive areas, and geology and soils.

Topography

The ground slope and natural drainage features within the District play a significant role in the planning and design of the wastewater collection system. The elevation within the District ranges from about 14 feet above sea level along the shores of Lake Washington to approximately 550 feet (NGVD 29) at the Lake Forest Park Reservoir located in the northwest portion of the District. The topography of the District and surrounding areas is shown in Figure 3-2.

Groundwater

The District does not rely on groundwater as a source of supply. A groundwater contamination study has not been performed by the Seattle and King County Health Department for the areas within the District. The average depth to water in the Interlake Drift Plain (see *Geology* section below) is about 37 feet, but this can vary widely depending on location and time of year. The nearest major aquifer is located in the Sammamish Valley near Redmond and ranges in depth from about 13 to 56 feet.

Climate¹

The District receives an average of 38 inches of rain per year, with 73 percent occurring in the 6-month period from October to March. December is historically the wettest month and July the driest. Evaporation is less than 1 inch per month in December and approximately 6 inches per month in July.

¹ National Oceanic and Atmospheric Administration, Published Climatological Data

Winds generally blow from the west, bringing a moderate, maritime climate inland. The average annual temperature is about 53 degrees Fahrenheit (°F). August is the warmest month with an average temperature of about 66 degrees F, and December is the coolest with an average temperature of about 41 degrees F.

Surface Water

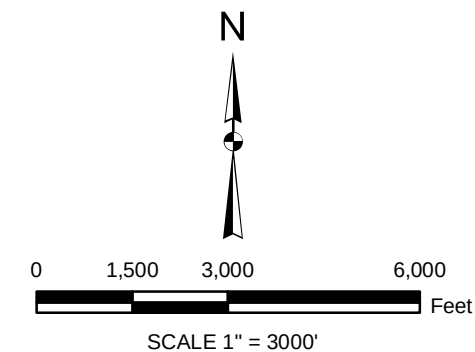
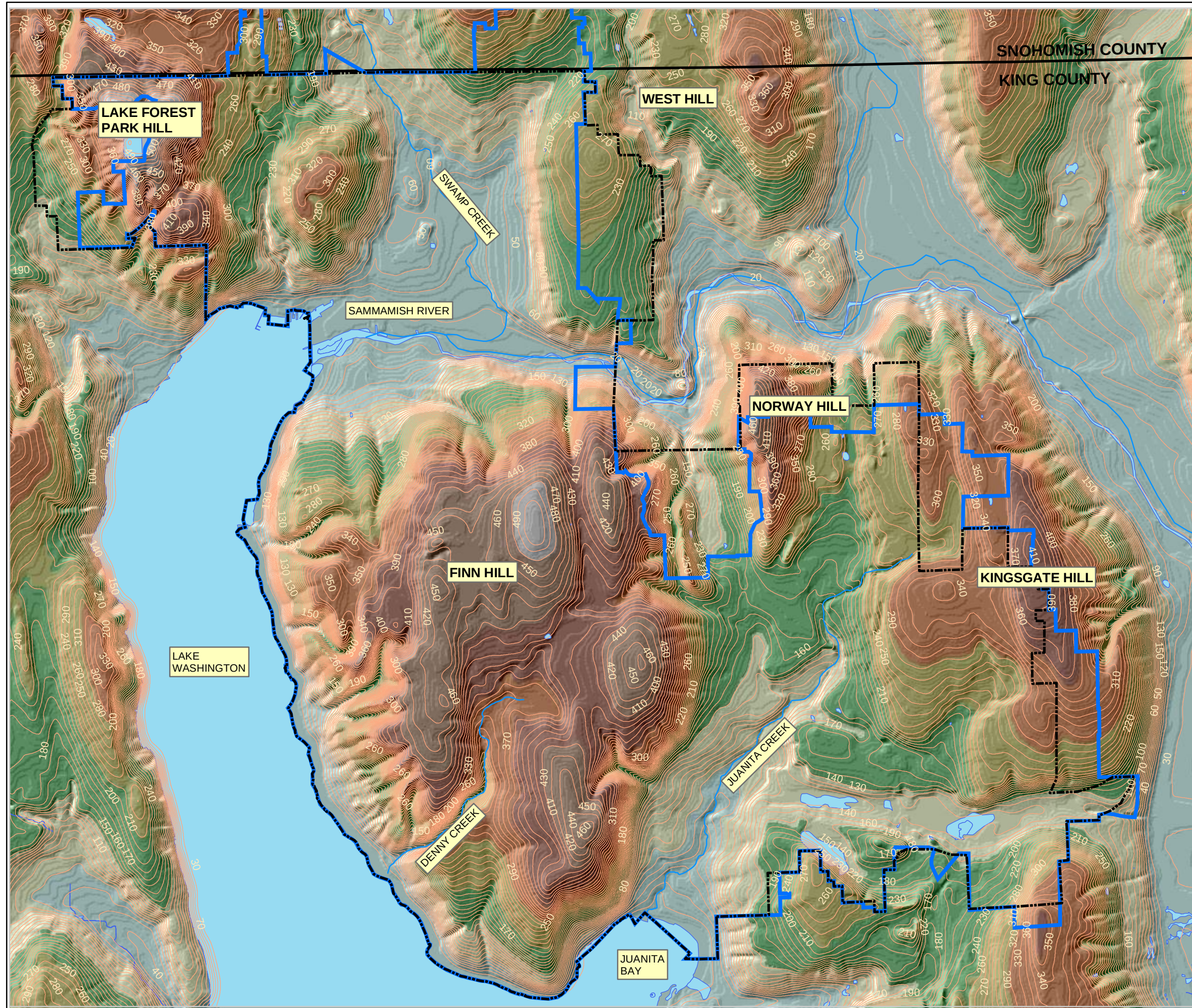
The surface water features within the District boundary include Lake Washington, the Sammamish River, Swamp Creek, and Juanita Creek, which flows south into Lake Washington via Juanita Bay. Swamp Creek, North Creek, and Bear Creek are tributary to the Sammamish River and therefore flow into the Puget Sound via Lake Washington. The surface water features within the District are shown in Figure 3-3. The basin characteristics for the creeks, streams, and rivers discussed below were obtained from stream gauging records published by the U.S. Geological Survey.

Lake Washington is over 200 feet deep in places and has a detention time of approximately 2.5 years. It has a drainage area of over 470 square miles and receives flow from the Cedar River and the Sammamish River. Historically, Lake Washington served as receiving water for surrounding wastewater discharges and as a result experienced severe algae blooms and low oxygen conditions associated with high nutrient loadings. The lake has made a successful recovery since wastewater flows were diverted in the 60s, but concerns are still being raised with regard to stormwater runoff and combined sewer overflows (CSOs). Lake Washington discharges into Puget Sound via Lake Union and the Chittenden Locks.

Bull trout, which are listed under the Endangered Species Act (ESA), are found in Lake Washington. The U.S. Fish and Wildlife Service considers these subpopulations to be “depressed,” with an estimated population of less than 5,000 and fewer than 500 spawners.

The Sammamish River flows north from Lake Sammamish, at Redmond, then turns west and flows through Bothell into the north end of Lake Washington. The Sammamish River drainage basin is approximately 212 square miles in size, and historical records report peaks as high as 1,900 cubic feet per second (cfs).

Swamp Creek drains an area of about 23 square miles and has experienced peak flows of greater than 1,090 cfs. A portion of the North and Bear Creek basins are located within the District, although the creeks themselves are not. North Creek drains a 25-square-mile basin and has experienced peak flows of over 680 cfs. Bear Creek drains a 14-square-mile basin and has experienced peak flows of over 420 cfs. Juanita Creek has a basin area of approximately 6.7 square miles. The Juanita Creek basin is highly urbanized, resulting in peak flows as high as 740 cfs.



LEGEND:

- CORPORATE BOUNDARY
- 10' CONTOURS - USGS
- SEWER SERVICE STUDY AREA BOUNDARY
- COUNTY LINE

ELEVATION

Value

- < 70
- 70 - 150
- 150 - 230
- 230 - 300
- 300 - 365
- 365 - 415
- 415 - 470
- 470 - 530
- 530 - 730

SOURCE: USGS

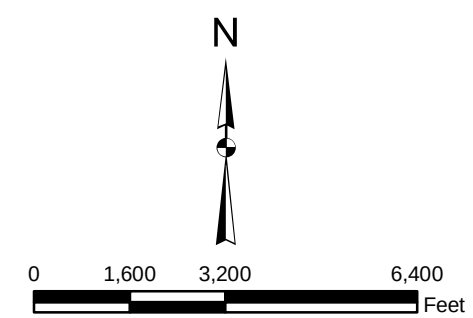
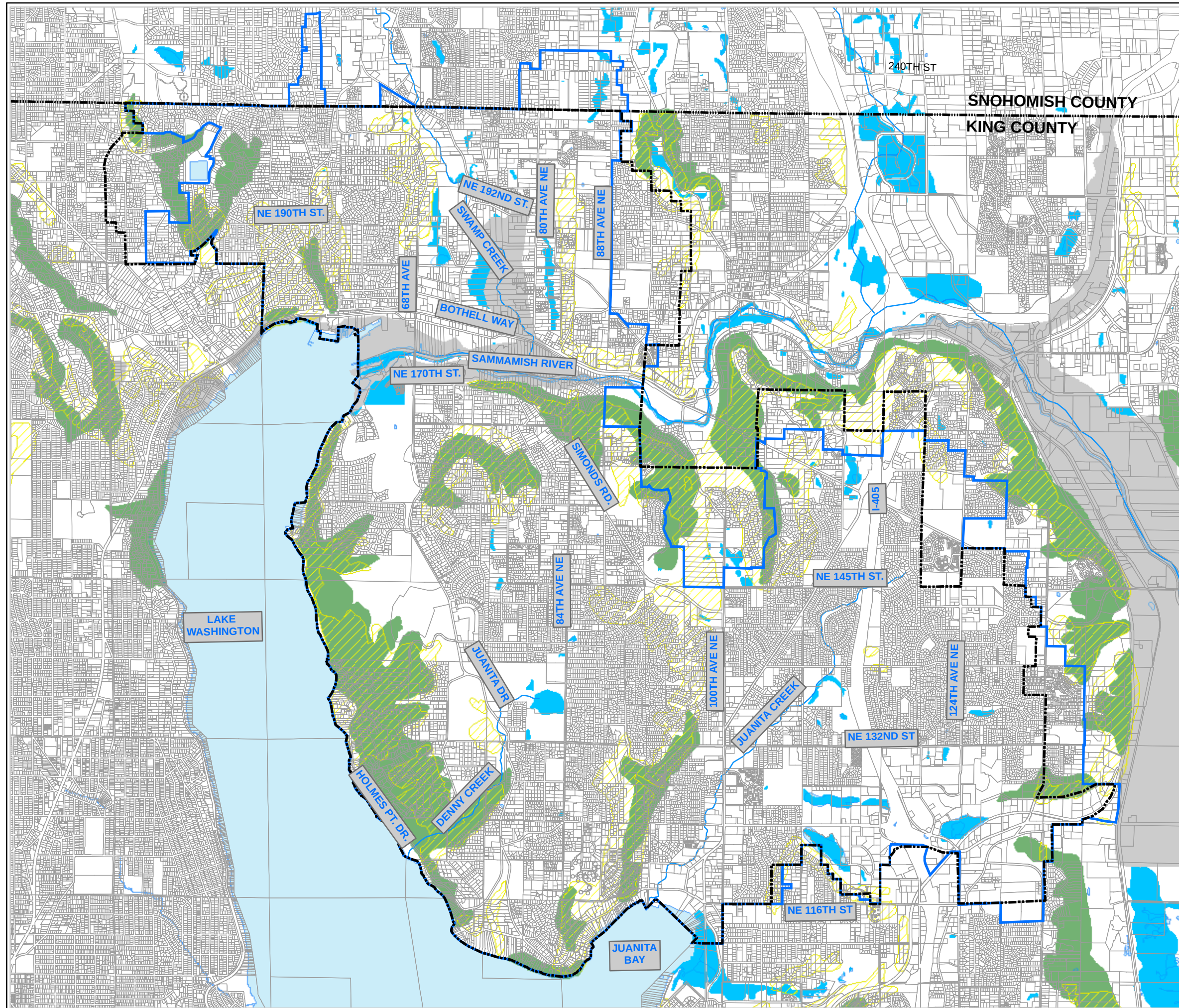


WASTEWATER SYSTEM PLAN

FIGURE 3-2
TOPOGRAPHY MAP



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- LEGEND:**
- SEWER SERVICE STUDY AREA BOUNDARY
 - CORPORATE BOUNDARY
 - SLIDE HAZARD AREAS
 - SOIL EROSION AREAS
 - SEISMIC HAZARD AREAS
 - WETLANDS AREAS
 - COUNTY LINE

SOURCE: KING COUNTY GIS



WASTEWATER SYSTEM PLAN

FIGURE 3-3
SENSITIVE AREAS



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Site-Sensitive Areas

Site-sensitive areas within the District include those classified as erosion hazard areas, wetlands, seismic hazard areas, slide hazard areas, flood hazard areas, and water bodies. The site-sensitive areas within the District are shown in Figure 3-3.

Erosion Hazard Areas

There are approximately 2,017 acres within the Sewer Service Area that are classified by the U.S. Department of Agriculture Soil Conservation Service (SCS) as erosion hazard areas. These areas are especially subject to erosion, if disturbed, and may not be well suited for high-density developments or intensive land uses.

Seismic Hazard Areas

There are approximately 394 acres within the Sewer Service Area that are classified as seismic hazard areas. Seismic hazard areas are those with low density soils that are more likely to experience greater damage due to seismic-induced subsidence, liquefaction, or landslides.

Wetlands

There are approximately 373 acres within the Sewer Service Area that are classified as wetlands. Wetlands are defined by the EPA as areas that are inundated for at least part of the year. Wetlands support valuable and complex ecosystems, and consequently development is severely restricted if not prohibited in most wetlands.

Flood Hazard Areas

There are approximately 240 acres within the Sewer Service Area that are classified as flood hazard areas. Flood hazard areas are areas adjacent to lakes, rivers, and streams that are prone to flooding during peak runoff periods. Flood hazard areas deserve special attention due to the sensitive nature of their ecosystems, as well as the potential for damage to structures located in the floodplain. Figure 3-4 identifies the floodplain areas within and around the District.

Slide Hazard Areas

There are approximately 1,364 acres within the Sewer Service Area that are classified as slide hazard areas. Slide hazards areas are those that are prone to unstable behavior due to steep slopes, lack of vegetation, or unconsolidated soils.

Water Bodies

Lakes and streams are classified as sensitive areas due to the wide variety of plants and animals that they support. It should be noted that a majority of the regulations discussed in Chapter 2 are designed to protect natural water bodies and their associated ecosystems.

Geology

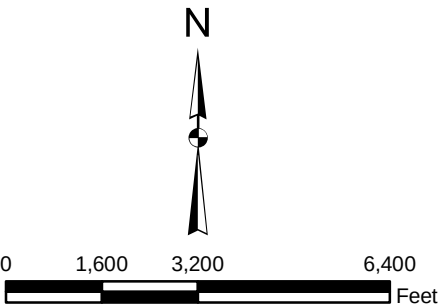
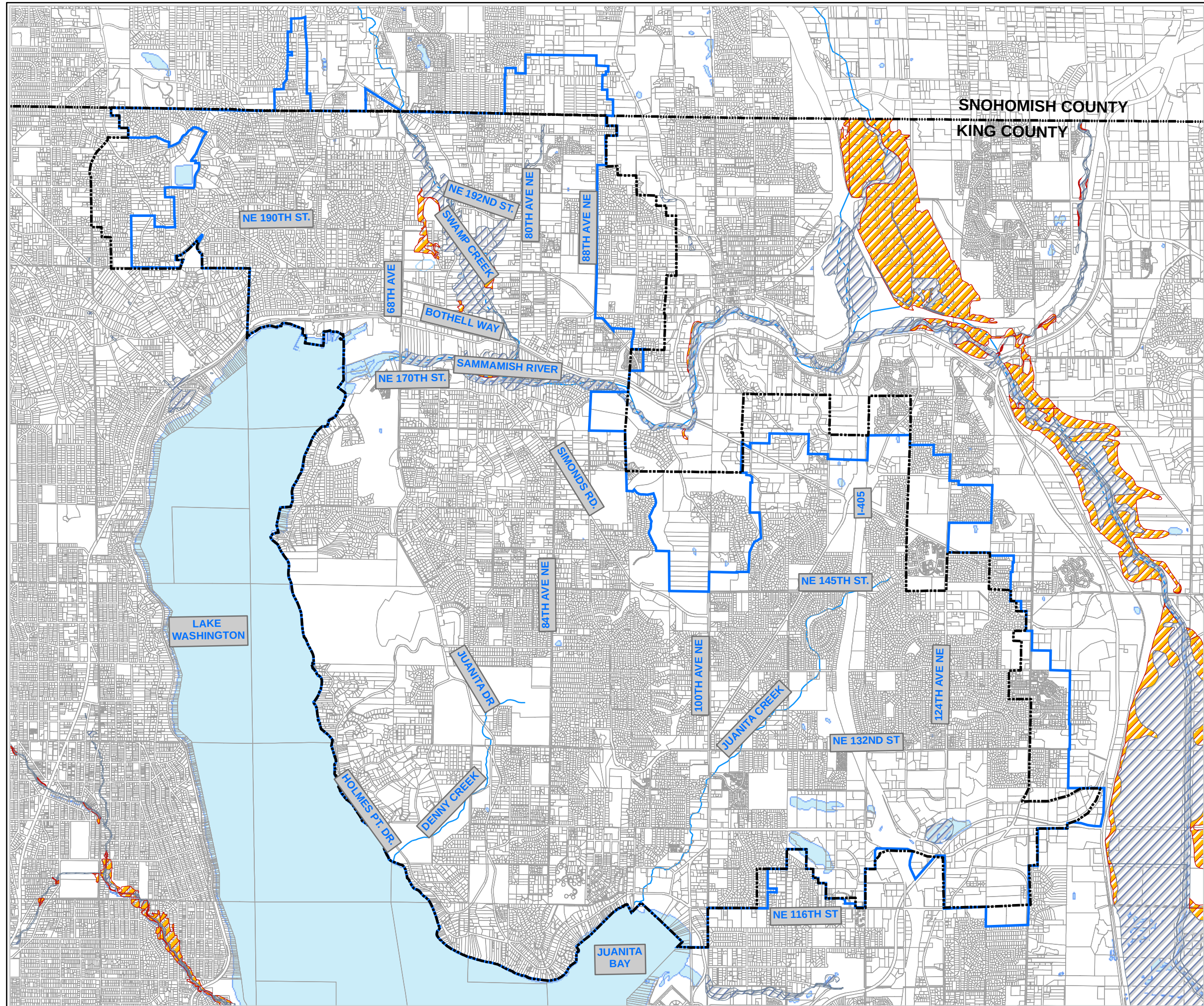
Most of the District lies on what is called the Interlake Drift Plain, located between Lake Washington and Lake Sammamish. The northwestern portion of the District lies on the Seattle Drift Plain. The most recent glaciation of the Puget Sound lowland is termed the Vashon glaciation, which scientists estimate began its northerly recession about 14,000 years ago. Subsequent erosion by icemelt cut steep-sided canyons in the major valley walls and transported the eroded material to lowland areas where alluviation created flat valley floors.

Soils

The majority of the soils within the District boundary are on uplands or terraces. The SCS classifies them as the Alderwood association, which are described as moderately well drained, undulating to hilly soils that have dense, very slowly permeable glacial till at a depth of 20 to 40 inches. The soils in the central areas of the District are classified as the Alderwood-Kitsap-Indianola association, which is described as moderately well-drained, nearly level to steep soils that have very slowly permeable glacial till or glacial lake deposits at a depth of 16 to 40 inches and somewhat excessively well-drained, rolling, deep sandy soils on uplands and terraces. The areas along the Sammamish River and in major stream valleys are classified as the Puget-Earlmont-Snohomish association. These are described as poorly drained and somewhat poorly drained, nearly level soils that have layers of peat within a few feet of the surface. The Everett association is described as somewhat excessively drained, gravelly, gently undulated soil underlain by sand and gravel on terraces.² The locations of the soil classifications within and adjacent to the District are presented in Figure 3-5.

Both the Alderwood and Kitsap series are very slowly permeable silt or clay soils and therefore do not drain well. Conversely, the Indianola series are sandy and highly permeable. In this case the soils are not well suited for on-site systems because the soils drain too fast allowing the effluent to reach surface or groundwater before adequate treatment has occurred.

² Taken from U.S. Department of Agriculture Soil Conservation Service General Soil Maps



- LEGEND:**
- CORPORATE BOUNDARY
 - SEWER SERVICE STUDY AREA BOUNDARY
 - COUNTY LINE
- FEMA FLOOD ZONES:**
- A - AN AREA INUNDATED BY 100 YEAR FLOODING, FOR WHICH NO BASE FLOOD ELEVATIONS (BFE'S) HAVE BEEN ESTABLISHED
 - X500 - AN AREA INUNDATED BY 500 YEAR FLOODING; AN AREA INUNDATED BY 100-YEAR FLOODING WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; OR AN AREA PROTECTED BY LEVEES FROM 100 YEAR FLOODING

SOURCE: FEMA

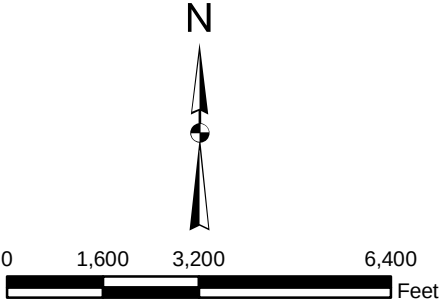
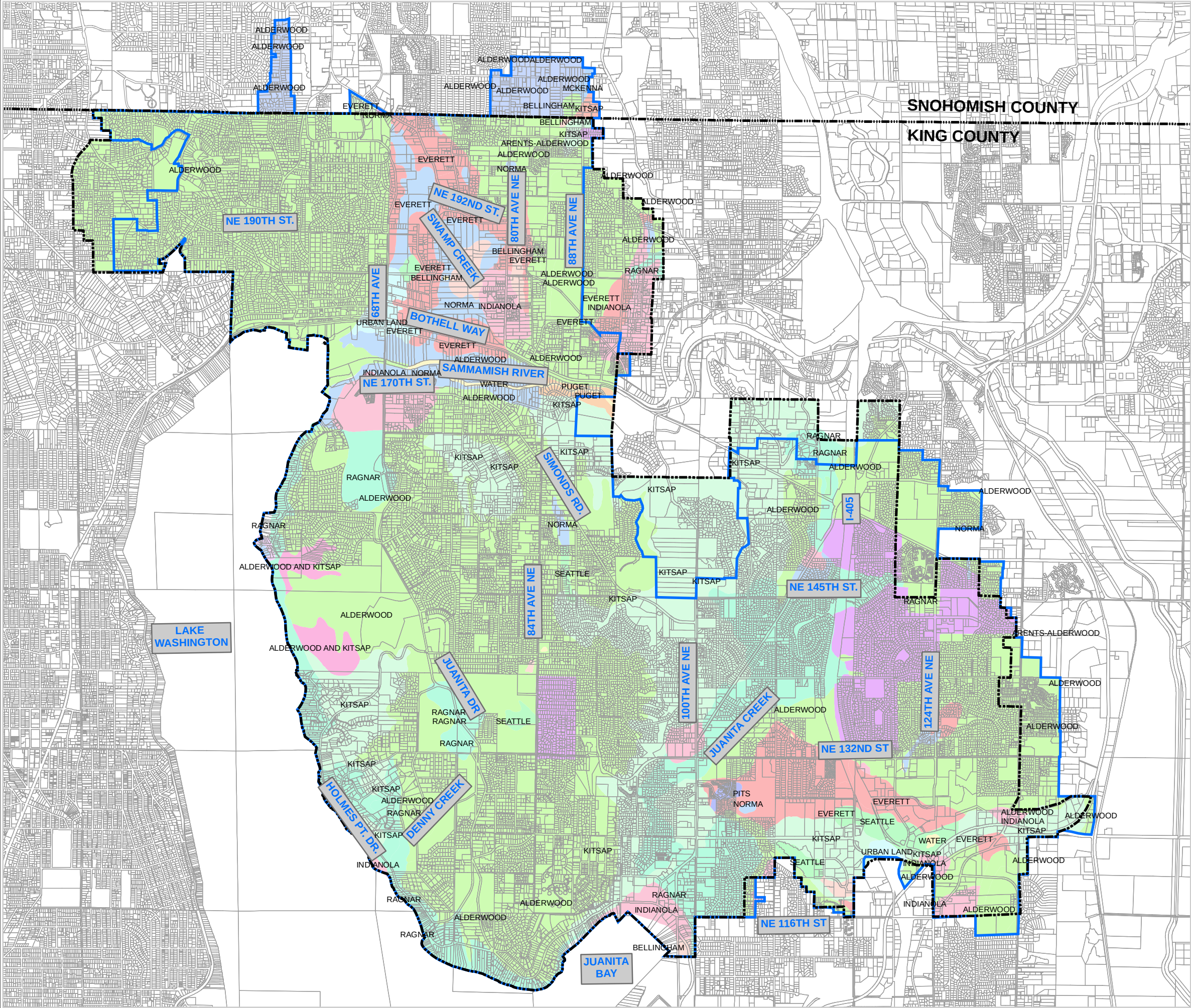


WASTEWATER SYSTEM PLAN

FIGURE 3-4
FLOODPLAIN MAP



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- LEGEND:**
- CORPORATE BOUNDARY
 - SEWER SERVICE STUDY AREA BOUNDARY
 - COUNTY LINE
- SNOHOMISH COUNTY SOILS**
- ALDERWOOD
 - BELLINGHAM
 - EVERETT
 - KITSAP
 - MCKENNA
 - NORMA
- KING COUNTY SOILS**
- ALDERWOOD
 - ALDERWOOD AND KITSAP
 - ARENTS-ALDERWOOD
 - BELLINGHAM
 - EVERETT
 - INDIANOLA
 - KITSAP
 - MIXED ALLUVIAL
 - NORMA
 - PITS
 - PUGET
 - RAGNAR
 - SEATTLE
 - URBAN LAND
 - WATER

SOURCE: US DEPARTMENT OF AGRICULTURE

WASTEWATER SYSTEM PLAN

FIGURE 3-5
SOILS MAP

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Flora and Fauna

Plant species within the District include alder, maple, aspen, fir, cedar, pine, and various shrubs, aquatic plants, and grasses. Animal species present include ducks, woodpecker, great blue heron, bald eagle, salmon, bass, and trout.

Endangered Species

The Puget Sound chinook was listed as “threatened” under the ESA in March 1999. Under the ESA, governments and individuals are prohibited from taking species, or degrading critical habitat of the species. Critical habitat for Puget Sound chinook salmon was designated by NOAA fisheries on September 2, 2005. Lake Washington was designated as critical habitat for chinook salmon, but the Sammamish River and its tributaries were excluded.

According to the National Marine Fisheries Service, critical habitat types necessary to support the chinook life cycle include juvenile rearing areas, juvenile migration corridors, areas for growth and development, adult migration corridors, and spawning areas. Essential features of critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover and shelter, food, riparian vegetation, space, and safe passage conditions. Compliance with the Section 4(d) rule promulgated by National Marine Fisheries Service will reduce the possibility of District activities such as stream crossings or other construction adjacent to streams that may adversely impact any of these critical habitat features.

The U.S. Fish and Wildlife Service listed the Puget Sound bull trout as threatened under the ESA in October 1999. Bull trout habitat requirements are similar to the chinook in many respects. Spawning bull trout are often associated with colder water than the chinook, and may seek out groundwater seepages along the bottom of small tributary streams in the upper elevations of the watershed. Critical habitat for Puget Sound bull trout was designated by USFWS on September 2, 2005. Bear Creek and Lake Washington have been designated as critical habitat for Puget Sound bull trout.

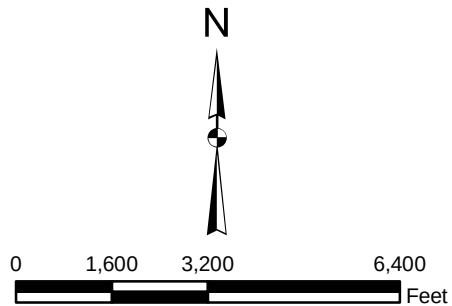
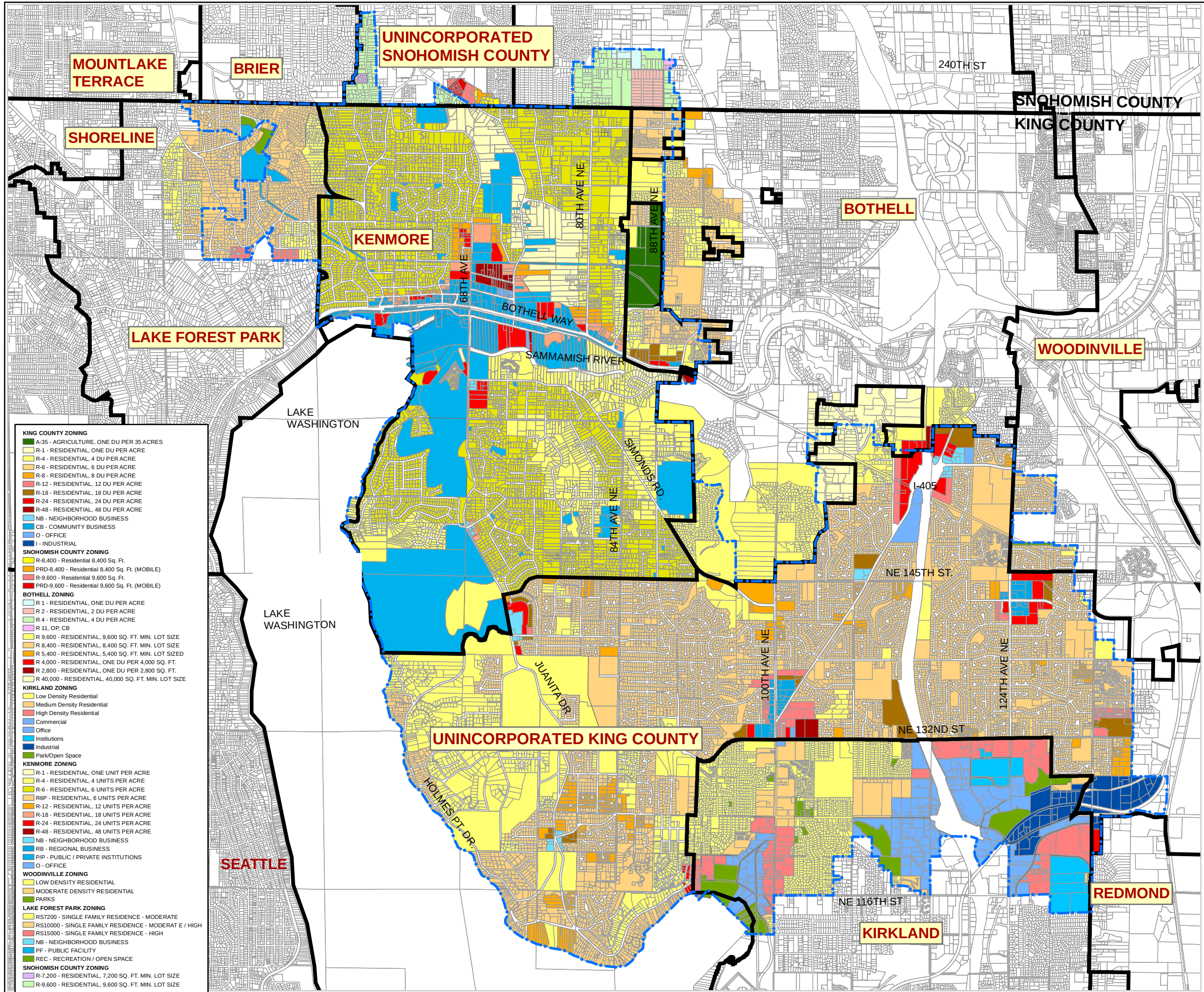
Table 3-1 lists the priority species present in Lake Washington, Sammamish River, Juanita Creek, and Swamp Creek.

TABLE 3-1**Priority Anadromous and Resident Fish Presence**

Type	Lake Washington	Sammamish River	Juanita Creek	Swamp Creek
Fall Chinook	X	X		X
Coho Salmon	X	X	X	X
Sockeye Salmon	X	X	X	X
Winter Steelhead	X	X	X	
Resident Cutthroat	X	X	X	X
Large Mouth Bass	X	X	X	
Rainbow Trout	X	X	X	
Kokanee Salmon				X

LAND USE PLANNING

The future land use for the District is shown in Figure 3-6. Because land use classifications vary among the various municipalities, all categories were combined into four groups, as shown in Table 3-2. For the purposes of this Plan, a representative density was determined for each of the residential classifications, i.e., Low, Medium, and High Density Residential. The total area of each land use designation as defined in Figure 3-6 is given in Table 3-3. These zoning designations are used to develop buildout population estimates later in this chapter.



- LEGEND:**
- SEWER SERVICE STUDY AREA BOUNDARY
 - CITIES
 - COUNTY LINE

SOURCE: KING COUNTY GIS



WASTEWATER SYSTEM PLAN

FIGURE 3-6
ZONING MAP



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TABLE 3-2**Land Use Designation for the Northshore Utility District**

Zoning Classification	Municipality	Zoning Density (DU/acre)	Municipality Zoning Classification
Low Density Residential	Bothell	1-5	R9600, R8400, R40000
	Kenmore	1-6	R-1, R-4, R-6
	Kirkland	1-6	RS7.2, RS8.5, RS12.5, RS35
	Lake Forest Park	3-6	RS7200, RS10000, RS15000
	Redmond	4	R-4
	Woodinville	4-6	R-4, R-6
	Unincorporated Snohomish County	4, 6	R9600, R7200
	Unincorporated King County	1-6	A-35, R-1, R-4, R-6
Medium Density Residential	Bothell	10	R4000, OP, CB
	Kenmore	12	R-12
	Kirkland	9-12	RM3.6, RM5.0
	Unincorporated King County	8-12	R-8, R-12
High Density Residential	Bothell	15	R2,800
	Kenmore	18-48	R-18, R-24, R-48
	Kirkland	18-24	RM1.8, RM2.4
	Unincorporated King County	18-48	R-18, R-24, R-48
Non-Residential	Bothell	0	--
	Kenmore	0	NB, O, P/P, RB
	Kirkland	0	BC, FC I, ILC, JBD, LIT, NRH, P, PLA, PR 1.8, PR3.6, TL
	Unincorporated King County	0	CB, I, NB, O
	Lake Forest Park	0	NB, PF, REC
	Redmond	0	BP

Source: King County Department of Natural Resources.

Table 3-3 provides the total land area and the number of residential units at buildout for each of the zoning classifications. Approximately 90 percent of the District water service area is zoned residential, and 10 percent is zoned non-residential.

TABLE 3-3**Sewer Service Study Area Land Use Designation**

Zoning Classification	Area (acres)	Residential Units
Low Density Residential	6,752	34,250
Moderate Density Residential	373	3,634
High Density Residential	379	8,786
Non-Residential	1,159	0
Total	8,663⁽¹⁾	46,670

Source: King County Department of Natural Resources.

(1) Land area does not include right-of-ways.

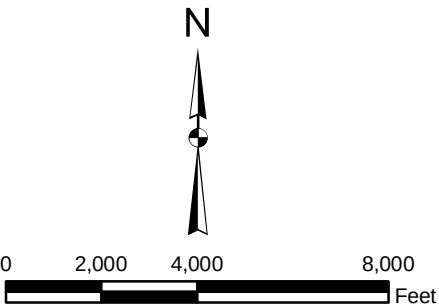
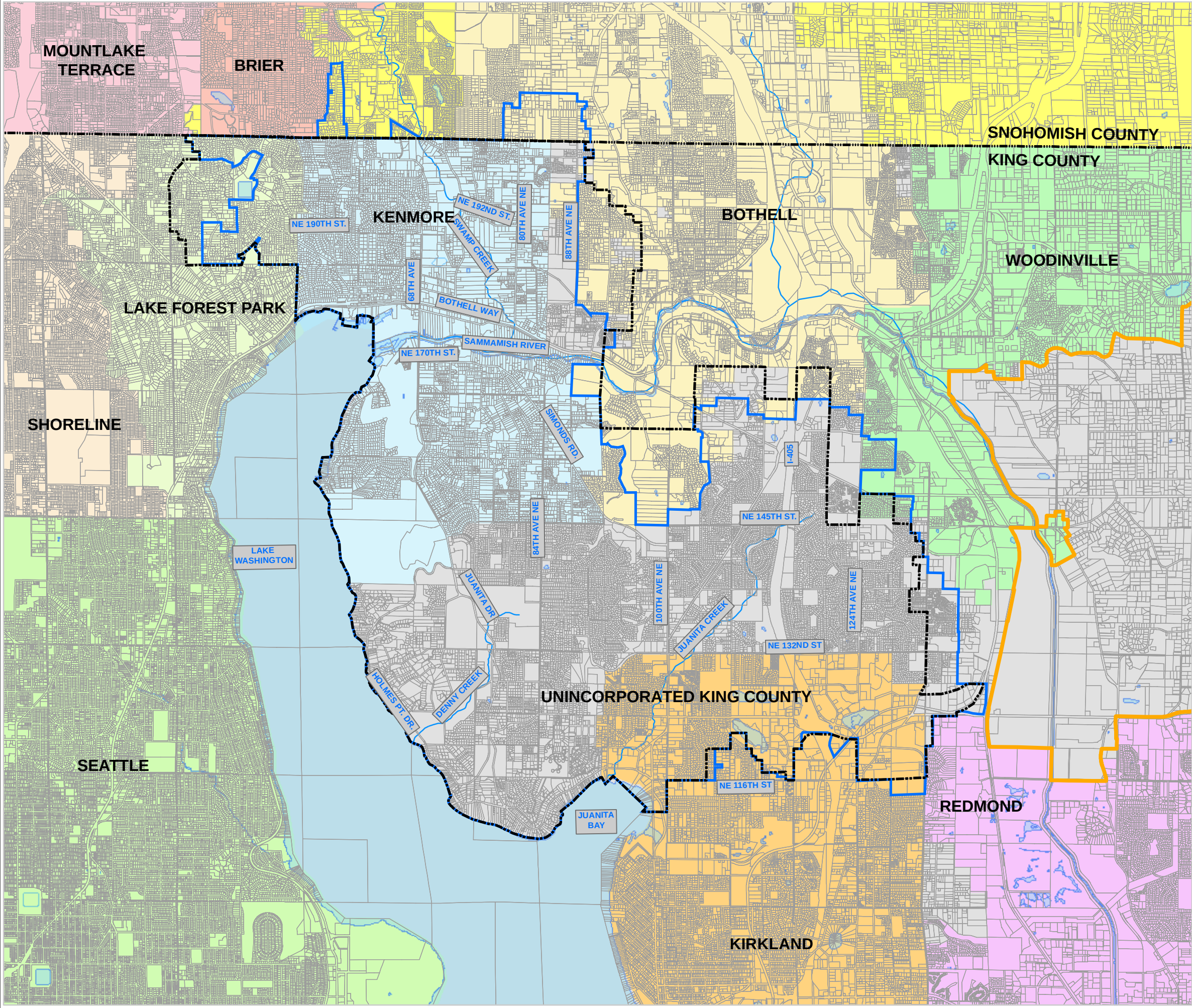
WATER SYSTEM

The District owns and operates a water distribution and storage system. Currently the District purchases all of its water from Seattle Public Utilities through a number of connections to the Tolt Pipelines No. 1 and No. 2 and one connection to the Tolt Eastside Supply Line. The location of the District's water system facilities including master meters, reservoirs, booster pump stations, and main transmission lines are shown in Figure 3-7. The system consists of 22 pressure zones, ranging from a hydraulic grade of 640 feet in the Lake Forest Park area to 292 feet along the shore of Lake Washington.

INTERGOVERNMENTAL COORDINATION

The District does not directly own, operate, or maintain a wastewater treatment facility. Wastewater from the District is currently treated at either of two King County Department of Natural Resources (KCDNR) wastewater treatment plants, either at the West Point Treatment Plant adjacent to Discovery Park, or the South Treatment Plant in Renton. The plants are owned and operated by KCDNR. KCDNR conducts independent engineering and planning studies in an effort to ensure future needs are met and to plan for the construction of future facilities.

In addition to agreements with KCDNR, the District has several agreements with adjacent municipalities to transport flows into the KCDNR system. These agreements are discussed below. In addition, the District has agreements with King County and some of the Cities that allow construction and maintenance within the various municipal boundaries. The current city limits and UGA boundaries of adjacent and intersecting cities are shown in Figure 3-8. A map with the location of the franchise agreements and the interlocal agreements is included in Appendix D.



- LEGEND:**
- COUNTY LINE
 - KING COUNTY UGA BOUNDARY
 - - - - - CORPORATE BOUNDARY
 - SEWER SERVICE STUDY AREA BOUNDARY
- CITY LIMITS:**
- Brier
 - Bothell
 - Kenmore
 - Kirkland
 - Lake Forest Park
 - Mountlake Terrace
 - Redmond
 - Seattle
 - Shoreline
 - Woodinville
 - SNOHOMISH COUNTY UNINCORPORATED
 - KING COUNTY UNINCORPORATED

SOURCE: KING COUNTY GIS



WASTEWATER SYSTEM PLAN

FIGURE 3-8
CITY LIMITS AND CITY UGA BOUNDARIES



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ALDERWOOD WATER AND WASTEWATER DISTRICT

The Alderwood Water and Wastewater District (AWWD) is located in Snohomish County and borders the Northshore Utility District to the north. AWWD boundaries cover approximately 60 square miles, serving a population of more than 200,000.

AWWD delivers a significant portion of its wastewater into the KCDNR system at the Snohomish-King County border near 73rd Avenue NE. The wastewater is transported via the KCDNR 34 mgd Swamp Creek Trunk, constructed in the year 2001, allowing the flows to bypass District facilities entirely.

An agreement allows connections from basins located just north of the District to discharge into the District to the west of the Swamp Creek Trunk. Currently, approximately 90 connections from AWWD discharge into District facilities, with the potential for as many as 160 more as the land becomes developed. Also, approximately 100 connections from the City of Brier discharge into AWWD facilities that currently flow into the District near 55th Avenue NE. An undeveloped area of approximately 145 acres in the City of Bothell north of the King County boundary will also eventually produce flows that will enter the District at 80th Avenue NE.

CITY OF BOTHELL

Bothell was incorporated in 1909. The 2004 city population was approximately 30,930. The current UGA lies in both King and Snohomish Counties and comprises over 9,000 acres with 7,750 acres located within the city limits. The District serves the west and south areas of the City. Development within Bothell is primarily residential in nature.

CITY OF BRIER

The city of Brier lies entirely within Snohomish County and borders the District to the north. The District accepts flow from about 200 acres (approximately 470 connections) within the Brier city limits, which enters the District at 56th Avenue NE near the Snohomish-King County line. The District has an agreement with the City of Brier to continue this arrangement so long as there is sufficient capacity in the District facilities.

Also, there are approximately 45 connections located just east of 24th Avenue West in Snohomish County that discharge into a portion of the Brier system that then discharges into the District under a separate agreement between the District and the City of Brier.

CITY OF KENMORE

The city of Kenmore was incorporated in 1998. The current UGA is coincidental with the city limits, which comprise approximately 3,900 acres. The current population is

approximately 19,200, per the city of Kenmore website www.ci.kenmore.wa.us (March 2006). The city of Kenmore lies entirely within the District boundary.

KING COUNTY

The District collects flows from an area of unincorporated King County totaling approximately 328 acres. The flows are primarily in the southern half of the District and served by the Juanita Pump Station.

KING COUNTY DEPARTMENT OF NATURAL RESOURCES

Wastewater from the District is discharged into King County Department of Natural Resources (KCDNR, formerly METRO) facilities, through which it is transported to either the South or West Point Treatment Plants. The current agreement is valid until the year 2036.

The South Treatment Plant is located in Renton and discharges secondary treated wastewater into Puget Sound. The South Treatment Plant has a capacity of 115 mgd and will be expanded to 135 mgd by the year 2020. The West Point Treatment Plant, located next to Discovery Park in Magnolia, has a capacity of 133 mgd and discharges into Puget Sound. Future expansion options are limited due to an agreement with local residents that permitted construction of secondary treatment facilities with the condition that future expansion beyond the new footprint be prohibited. In response to increased growth and limited expansion options at the existing treatment facilities, KCDNR is designing and constructing a new wastewater treatment facility called the Brightwater Treatment System. Construction is scheduled to begin in 2006, and the facility is expected to begin operations in 2010. The Brightwater Treatment System will not serve the District at this time; however, after 2040 flows served by the Kenmore Pump Station will be rerouted to be treated at the Brightwater Treatment System.

Although most of the treated wastewater is discharged to Puget Sound, some is reclaimed and reused, and this option will continue to be considered as an alternative to disposal in future proposals. Biosolids at both plants are digested to Class B standards and composted for use as fertilizer. Methane produced during this process is used for plant operations or sold.

Because expansion at the West Point Treatment Plant is limited by current agreements with local residents, a third plant is being designed and constructed near the Snohomish-King County border just north of the District. This plant will have a capacity of approximately 36 mgd and is planned to be in service by the year 2010. Expansion of the plant to 54 mgd is proposed by the year 2040.

CITY OF KIRKLAND

The city of Kirkland was incorporated in 1905. The city population in 2005 was estimated at 45,740. The city of Kirkland is composed of approximately 5,200 net acres of developable land-use base (excludes existing rights of way). Approximately 23 percent of the land-use base is composed of nonresidential uses (excludes, residential, park, open spaces, and utilities). Nearly two-thirds of the developable land-use base is residential (includes single family and multifamily land use). In 2003 there were 10,006 single-family residences and 11,315 multifamily residences; however, the number of multifamily residences has increased since 2003, and the number of single-family residences has decreased since 2003.

The District serves some areas within Kirkland from NE 132nd Street south to the District corporate boundary. The District also provides service to areas outside of the corporate boundary where it is the logical sewer service provider.

CITY OF LAKE FOREST PARK

Lake Forest Park was incorporated in 1961. The estimated 2003 population using US Census Bureau data is approximately 12,750. The current UGA comprises approximately 1,840 acres (excludes existing rights-of-way). Development is primarily residential in nature, with 1,490 acres of single- and multiple-family dwellings (approximately 80 percent of the developable land). There are also approximately 31 acres of commercial development, with the remaining land consisting of public facilities, such as parks, roads, recreational facilities, and 136 acres of vacant lands.

The District has an agreement with the City where wastewater from approximately 180 connections located on the western edge of the District are collected and transported into the Lake Forest Park system near 40th Place NE and 185th Street.

SHORELINE WASTEWATER MANAGEMENT DISTRICT

The Shoreline Wastewater Management District (formerly the Ronald Sewer District) lies to the west of the Northshore Utility District. A small area including approximately 10 connections within the District's system drains into the Shoreline system near 40th Court NE. Shoreline owns facilities located within the District boundary that collects wastewater from about 250 connections and exits the District near 40th Avenue.

CITY OF WOODINVILLE

The city of Woodinville was incorporated in 1993. The 2000 census population was estimated at 9,194; however, the city of Woodinville is currently working on the accuracy of the 2000 US Census Bureau count. The City believes the population is likely higher, consistent with the growth trends of neighboring cities. The current UGA comprises

approximately 23,172 acres, 3,587 of which are within the city limits. Approximately two-thirds of the development is residential in nature, with 2,130 acres of single- and multi-family dwellings. Woodinville is primarily a community of single-family dwellings, with about 37 percent multi-family development. The City does not own or operate sewer or water facilities. The District serves approximately 290 connections within the City, although only about 111 are within the District boundary.

WOODINVILLE WATER DISTRICT

The Woodinville Water District (WWD) provides water and some sewer service to the city of Woodinville and to areas of unincorporated King County. WWD provides water and sewer service to areas east of the District. The two Districts have interlocal agreements that allow the most logical sewer provider to provide service.

WWD submitted its *Draft General Sewer Plan* (June 2006) to the District for review and the District found a number of service area discrepancies. The District boundary and the District's sewer service area defined in the WWD Draft General Sewer Plan are inconsistent with the District's corporate boundary and the approved sewer service area boundary established by Superior Court Judgment 607978 (Appendix E). The District submitted comments on WWD's Draft General Sewer Plan on July 28, 2006 (Appendix E).

WWD's *Draft General Sewer Plan* proposes WWD serve areas currently served by the District; the areas are identified as Areas 1 through 5 on Figure 5-1 of WWD's *Draft General Sewer Plan*. However, the District intends to continue to provide service to these areas until an agreement is reached that would allow WWD to purchase the District's assets and assume service. The District has proposed that the two districts sign a master agreement that combines the many existing agreements between the District and WWD and also attempts to resolve service to those areas for which agreements do not exist. The proposed master agreement is included in Appendix E.

RELATED PLANNING DOCUMENTS

The related planning documents listed in the following sections were utilized in the preparation of this Plan.

COMPREHENSIVE PLANS

- *Alderwood Water and Wastewater District Sanitary Sewer Comprehensive Plan, 2000*
- *City of Bothell Comprehensive Plan Update, 2004*
- *City of Brier Comprehensive Plan Update, 2000*
- *City of Kenmore Comprehensive Plan, amended 2003*
- *2004 King County Comprehensive Plan Update, amended 2005*

- *City of Kirkland Comprehensive Plan, December 2004 Revision*
- *City of Lake Forest Park Comprehensive Plan Update, 2005*
- *City of Woodinville Comprehensive Plan Update, 2004*

NORTHSHORE UTILITY DISTRICT WASTEWATER PLANNING DOCUMENTS

- *Northshore Utility District Wastewater System Comprehensive Plan, 2000*
- *Northeast Lake Washington Sewer and Water District Comprehensive Sewer Plan, 1990*
- *Northeast Lake Washington Sewer and Water District Comprehensive Sewer Plan Update, 1993*
- *Northeast Lake Washington Sewer District Comprehensive Facilities Plan, 1977*
- *Water and Sewer Hydraulic Model and Capital Improvement Plan Update (2005)*
- *Wastewater System Hydraulic Model Manual (2006)*
- *Sewer System Buildout Catalog (2006)*

OTHER PLANS AND REPORTS

- *1999 King County Department of Natural Resources Regional Wastewater Services Plan, updated in 2004*
- *Extinction is Not an Option (Statewide Plan to Recover Salmon), 1999*
- *King County 2000/2001 Wet Weather Flow Monitoring, May 2001*

PLANNING PERIOD

Due to the District's growth history and the need to provide wastewater services for future growth, the District's wastewater system is in need of continuous evaluation and improvement. A planning period for the evaluation of a wastewater utility should be long enough to be useful for an extended period of time but not so long as to be impractical. The planning period for this Plan is through 2026, coinciding with a 20-year planning interval. Because the service life of many wastewater system components is greater than 20 years; however, the planning of future facilities will consider a buildout scenario as an estimate of the ultimate required capacity to serve all land under current zoning. In general, it is assumed that mechanical and electrical equipment (e.g., pumps and controls) has a useful life of 20 years, while structures such as manholes and piping have a useful life of 50 years. A detailed schedule of improvements will be proposed for the next 6 years, but should be continuously reviewed, evaluated, and updated as development occurs and regulations change.

KCDNR has developed a Regional Wastewater Services Plan that addresses the required improvements to the wastewater treatment facilities through 2030 and beyond. In 2004, KCDNR issued an update to the Regional Wastewater Services Plan. The effect of KCDNR planning efforts on future District operations are carefully considered throughout this Plan.

POPULATION

To evaluate the adequacy of the existing facilities and to estimate the facilities required for future wastewater service within the study area, the District's existing and projected populations are established based on TAZ population projections (projected in 2004) provided by the Puget Sound Regional Council (PSRC). The TAZs within the study area are shown in Figure 3-9 relative to the District limits.

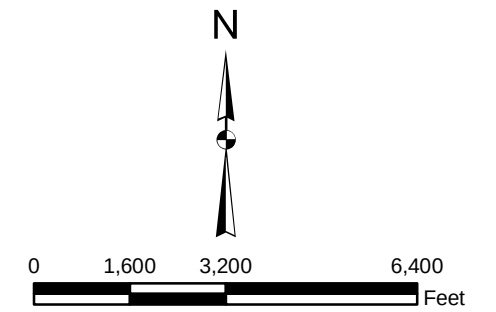
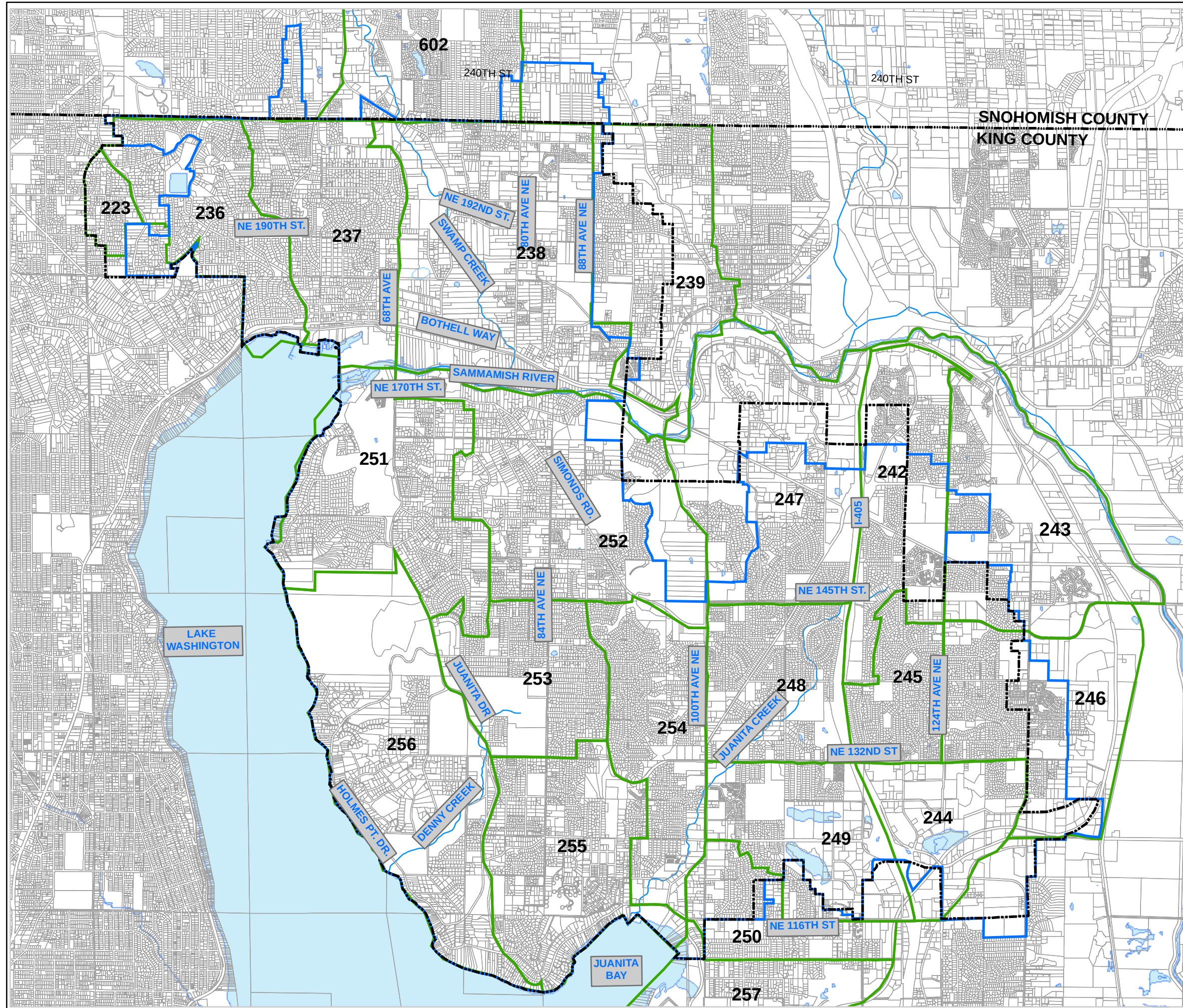
CURRENT AND PROJECTED SEWER SERVICE STUDY AREA POPULATION

Table 3-4 provides the population within the District's sewer service study area for each TAZ within the District's boundaries. In cases where a TAZ does not fall entirely within the District, the population within the District is estimated as a fraction of the total population of the TAZ proportional to the area within the sewer service study area. Because the sewer service study area boundary does not always coincide with the District boundary (See Figure 3-1), the sewer service study area population is not equal to the District population.

TABLE 3-4

Current and Projected District Population Based on TAZ Projections

TAZ	Percent within Sewer Service Study Area	Sewer Service Study Area Population			
		2000	2010	2020	2030
223	14.8%	814	854	881	902
236	87.5%	3,850	4,032	4,164	4,259
237	100.5%	4,750	4,973	5,194	5,362
238	96.7%	5,079	5,316	5,549	5,724
239	4.1%	170	182	205	226
242	64.4%	3,069	3,077	3,271	3,396
243	16.3%	590	591	629	653
244	90.8%	2,348	2,603	2,940	3,221
245	100.0%	3,409	3,749	4,214	4,593



- LEGEND:**
- CORPORATE BOUNDARY
 - SEWER SERVICE STUDY AREA BOUNDARY
 - TRANSPORTATION ANALYSIS ZONE BOUNDARIES (TAZ)
 - COUNTY LINE
 - 252 TAZ NUMBER
- SOURCE: KING COUNTY GIS

WASTEWATER SYSTEM PLAN

FIGURE 3-9
TRANSPORTATION ANALYSIS ZONES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

TABLE 3-4 – (continued)**Current and Projected District Population Based on TAZ Projections**

TAZ	Percent within Sewer Service Study Area	Sewer Service Study Area Population			
		2000	2010	2020	2030
246	56.6%	2,753	2,925	3,080	3,117
247	39.7%	1,514	1,517	1,612	1,673
248	100.0%	5,315	5,385	5,532	5,533
249	80.1%	3,562	3,917	4,401	4,796
250	40.2%	1,469	1,620	1,824	1,992
251	98.7%	4,707	4,936	5,163	5,336
252	79.2%	4,187	4,382	4,574	4,718
253	100.0%	4,588	4,627	4,731	4,708
254	100.0%	6,790	6,854	7,017	6,989
255	100.0%	4,429	4,467	4,567	4,545
256	100.0%	2,555	2,577	2,635	2,622
257	2.3%	90	99	111	121
261	11.8%	529	566	624	681
263	4.7%	239	268	300	322
599	6.5%	258	320	383	419
602	5.5%	210	256	314	373
603	11.8%	450	550	673	800
Total		67,724	70,643	74,588	77,081

Source: Puget Sound Regional Council.

In addition to population estimates and forecasts, each TAZ also provides employment data. Table 3-5 provides the sewer service study area population and employment estimates for years 2000, 2010, 2020, and 2030. Annual growth rates provided in Table 3-5 are used in Chapter 5 to project future wastewater flows within the District sewer service area.

TABLE 3-5**Projected Sewer Service Study Area Population and Employment**

Year	Sewer Service Study Area Population		Sewer Service Study Area Employment	
	Total	Average Annual Growth	Total	Average Annual Growth
2000	67,724	-	20,636	-
2010	70,643	0.42%	23,777	1.43%
2020	74,588	0.54%	28,049	1.67%
2030	77,081	0.33%	31,921	1.30%
Average		0.43%		1.46%

SEWER SERVICE STUDY AREA BUILDOUT POPULATION

The District and the King County GIS Center conducted a study to determine the number of residential units at buildout for the sewer service area. The analysis identified the total land area for each zoning classification and calculated the total number of residential units based upon the allowable dwelling unit density. Total population was calculated based upon an average number of persons per household for each zoning classification.

The 2000 Census estimated the average number of people per household by municipal jurisdiction and classification. The average household size presented in Table 3-6 is the weighted average for all residential units within the water service area.

Table 3-6 identifies the total land area, number of residential units, persons per household, and population by zoning classification. At buildout, the District estimates that the sewer service study area population will be 124,871 people.

TABLE 3-6**Buildout Population for the Sewer Service Study Area by Zoning Classification**

Zoning Classification	Land Area⁽¹⁾ (acres)	Residential Units	Average Household Size (pph)⁽²⁾	Population
Low Density Residential	6,752	34,250	2.87	98,296
Moderate Density Residential	373	3,634	2.55	9,267
High Density Residential	379	8,786	1.97	17,308
Non-Residential	1,159	0	--	0
Total	8,663	46,670	--	124,871

Source: King County Department of Natural Resources.

(1) Excludes existing right-of-ways.

(2) Based on data from the 2000 Census as provided by the Washington State Office of Financial Management.

Table 3-7 summarizes the 20-year and buildout population projections.

TABLE 3-7

Projected Sewer Service Study Area Population and Employment

Year	Population Growth Rate	Population	Employee Growth Rate	Employees
2006	0.42%	69,461	1.43%	22,467
2007	0.42%	69,754	1.43%	22,788
2008	0.42%	70,049	1.43%	23,113
2009	0.42%	70,346	1.43%	23,442
2010	0.42%	70,643	1.43%	23,777
2011	0.54%	71,028	1.67%	24,173
2012	0.54%	71,415	1.67%	24,576
2013	0.54%	71,804	1.67%	24,985
2014	0.54%	72,195	1.67%	25,402
2015	0.54%	72,589	1.67%	25,825
2016	0.54%	72,984	1.67%	26,255
2017	0.54%	73,382	1.67%	26,693
2018	0.54%	73,782	1.67%	27,137
2019	0.54%	74,184	1.67%	27,589
2020	0.54%	74,588	1.67%	28,049
2021	0.33%	74,834	1.30%	28,414
2022	0.33%	75,080	1.30%	28,784
2023	0.33%	75,327	1.30%	29,158
2024	0.33%	75,575	1.30%	29,538
2025	0.33%	75,824	1.30%	29,922
2026	0.33%	76,074	1.30%	30,312
Buildout	NA	124,871	NA	31,921 ⁽¹⁾

(1) TAZ Projection for 2030.