



Section **2**

Section 2

Study Area Characterization

2.1 Introduction

This section of the WCSMP describes the study area characteristics including geography, topography, climate, general soil conditions, and land use designations within the City. Land use designations are of interest when planning collection system infrastructure, as the wastewater loading varies by land use category and density. The City's socioeconomic conditions are also documented within this section, including the major sources of commerce within the City and the historical and projected population trends.

2.2 Geography

The City of Gresham is located in the eastern Portland metropolitan area. It is bordered by the City of Portland to the west and bisected by Burnside Road/Highway 26. The City of Damascus and Clackamas County is adjacent to the south and unincorporated Multnomah County to the east. The Columbia River and the cities of Fairview, Wood Village and Troutdale comprise Gresham's northern boundary. The City is entirely within the Portland regional UGB, as managed by Metro. The vicinity map shown on **Figure 2-1** illustrates the City's location within the Portland metropolitan area.

Figure 2-1
Vicinity Map



2.3 Study Area

Gresham’s wastewater system service area is approximately 23 square miles divided into seven drainage basins. The City’s system also receives wastewater flows from the cities of Fairview, Wood Village, and Portland under intergovernmental agreements with each jurisdiction as described in **Section 3**. A small portion of the area served (150 acres) is conveyed to the City of Portland’s and the City of Fairview’s wastewater systems.

The study area for this master plan is the existing City of Gresham wastewater service area and the Pleasant Valley, Kelley Creek Headwaters, and Springwater plan areas on the City’s southern border. The study area contains a total of approximately 27 square miles and is illustrated on **Figure 2-2**.

2.4 Physical Environment

2.4.1 Topography

Ground elevations in the study area range from a low of approximately 10 feet above mean sea level (msl) near the City’s Wastewater Treatment Plant (WWTP) and the Columbia River, to approximately 1,000 feet above msl in the hills south of Johnson Creek near the City’s southern service area boundary.

The study area’s northwestern topography, near the WWTP, is characteristic of an ancient floodplain with relatively flat slopes of two to three percent. Local elevations climb steadily from NE Sandy Boulevard south to the I-84 freeway. Continuing south of I-84 there is a bench and then the topography begins to level with slopes less than one percent. The southerly portion of the study area slopes up to the south with steeply sloping areas in the southeast portion of the City. The study area’s topography is illustrated with contour lines on **Figure 2-2**.

Approximately 140 acres of the City’s industrial and commercially zoned land north of Sandy Boulevard near Blue and Fairview Lakes is within the current Federal Emergency Management Agency (FEMA) 100-year floodplain boundary.

2.4.2 Climate

The study area climate is tempered by Pacific Ocean winds and is characterized by mild, wet winters and warm, dry summers. Precipitation primarily occurs during the winter months, with the wettest period from November through April. Rainfall data tabulated for the Portland-metro area between the years 1981 to 2010 show an average annual precipitation of approximately 36 inches with approximately 73 percent received during the six-month period between October and March. Additional climate information is provided in **Table 2-1**.

Table 2-1
Summary of Climatological Information

| Record | Value |
|---------------------------------------|-----------|
| High Temperature for Period of Record | 107° F |
| Average Annual High Temperature | 63° F |
| Average Annual Low Temperature | 46° F |
| Record Low Temperature | -3° F |
| Average Annual Rainfall | 37 inches |

Note

Data Source: National Centers for Environmental Information (www.ncdc.noaa.gov)

2.4.3 Geology, Soils, and Groundwater

The northerly portion of the study area consists of poorly drained alluvial silt loam and areas of subsurface sandstone. In the middle of the study area, soils range from somewhat poorly drained alluvial silt to well drained loams and silt loams. In the rolling upland area south of Johnson Creek, moderately well drained alluvial loams overlay volcanoclastic sandstone, siltstone, and debris flow deposits.

Although ground water levels fluctuate seasonally, they are generally well below the surface and do not normally impact construction within the study area. However, shallow groundwater conditions exist in certain areas particularly in the northern and middle portions of the City. In

these areas, soils are poorly drained, and the water table is perched. Small creeks and springs are present in the southeast portion of the City.

2.5 Land Use and Zoning

By state law, Metro is responsible for establishing the Portland metropolitan area’s UGB, which includes Gresham. Land uses and densities inside the UGB are selected to support urban services, such as police and fire protection, roads, schools, and water and sewer systems. Understanding land use and demographic characteristics within the study area is particularly important in collection system planning because of their impact on wastewater flow loading.

All parcels within the study area have been assigned a zoning designation by the City of Gresham. Future development is guided by these designations as established in the City’s Comprehensive Plan. The City’s zoning designations provide for various categories of industrial, commercial, and residential land use. Existing land use may vary from a parcel’s Comprehensive Plan zoning designation. Geographic Information System (GIS) land use and zoning information for each property in the study area was provided by the City through Metro’s Regional Land Information System (RLIS) tax lot files. Existing land use is illustrated in **Figure 2-3** and summarized in **Table 2-2**.

Table 2-2
Existing Land Use by Category

| Land Use Category | Area (acres) |
|----------------------|---------------|
| Civic and School | 790 |
| Commercial | 940 |
| Industrial | 1,270 |
| Mixed Use | 10 |
| Office | 100 |
| Parks and Open Space | 1,870 |
| Parking | 80 |
| Residential | 6,250 |
| Transportation | 50 |
| Farm and Forest | 1,260 |
| Undeveloped | 1,950 |
| Other ¹ | 103 |
| Right-of-Way | 2,447 |
| Total | 17,120 |

Notes

1 “Other” represents tax lots without a specified existing land use. Review of these properties found they include power line routes, mobile home parks and vacant properties.

2.5.1 Existing Residential Land Use

Existing residential development within the study area is primarily single-family with concentrated areas of multi-family development downtown and near transit corridors. Some undeveloped or partially developed tracts of land are intermixed with existing development throughout the City. South of Johnson Creek and in the Pleasant Valley, Kelley Creek Headwaters, and Springwater plan areas, there are larger parcels of undeveloped residential land.

2.5.2 Existing Commercial Land Use

Current commercial development within Gresham includes large-scale retail, such as grocery stores, centered at intersections of major arterials across the City. Smaller retail and commercial services development is concentrated along these arterials. Major east/west arterials from north to south include Halsey, Glisan, Stark, and Division Streets, Powell Boulevard/Highway 26, and Burnside Road. Major north/south arterials are 181st/182nd Street, 223rd/Eastman Parkway, and 257th/Kane Drive. North of Halsey Street to the Columbia River along the I-84 freeway and Sandy Boulevard, commercial development is focused on product distribution and warehousing.

2.5.3 Existing Industrial Land Use

Most industrially zoned land in the City is located between Halsey Street and the Columbia River to the north. Existing industrial development is primarily computer chip and other small parts manufacturing. There are significant tracks of developable industrial and commercial land north of Halsey Street. The City anticipates that the most likely future development here will be in distribution and warehousing, land uses with relatively low wastewater generation potential.

2.5.4 Open Space

The City has an Inventory of Significant Natural Resources and Open Spaces, which designates areas as open space. Lands with this designation are intended for conservation as undeveloped or landscaped to enhance the quality of life in the community. Tax lots within the inventory are assumed to be undeveloped in the future.

Metro owns several large parcels of land in the Johnson Creek Basin and Kelley Creek Headwaters Plan Areas. It is likely that these properties will be incorporated into Metro's natural areas and parks program. However, for the purposes of this plan, it is assumed that these parcels will develop in the future in accordance with their zoning designation.

2.5.5 Zoning

Zoning designates planned future uses for lands throughout the City and often differs significantly from the existing land uses. Zoning designations used as the basis for projecting future wastewater flows to the collection system are summarized in **Table 2-3** and illustrated in **Figure 2-4**. School lands and lands in the open space overlay are assumed to remain in those uses in the future and

are summarized as such in **Table 2-3**. However, some properties, such as those owned by Metro within the plan areas, are currently designated with open space land use, but are not included in the open space overlay.

Table 2-3
Zoning Designations Summary

| Category | Existing City Limits | Kelley Cr Plan Area | Pleasant Valley Plan Area | Springwater Plan Area | Total |
|--------------------------------------|----------------------|---------------------|---------------------------|-----------------------|---------------|
| Developable lands | | | | | |
| Commercial | 280 | 0 | 10 | 30 | 320 |
| Industrial | 1660 | 0 | 20 | 650 | 2330 |
| Multi-Family Residential | 1250 | 0 | 0 | 40 | 1290 |
| Mixed Use Commercial and Residential | 970 | 0 | 590 | 0 | 1560 |
| Farm and Forest | 140 | 0 | 40 | 0 | 180 |
| Single Family Residential | 6040 | 200 | 0 | 290 | 6530 |
| Schools | 560 | 0 | 40 | 20 | 620 |
| Total Developable | 10,900 | 200 | 700 | 1,030 | 12,830 |
| Undevelopable Lands | | | | | |
| Roadway | 2240 | 0 | 30 | 150 | 2420 |
| Wetland | 40 | 0 | 10 | 0 | 50 |
| Floodplain | 850 | 0 | 20 | 80 | 950 |
| Environmentally Sensitive | 0 | 0 | 210 | 290 | 500 |
| Parks and Open Space | 370 | 0 | 0 | 0 | 370 |
| Total Undevelopable | 3,500 | 0 | 270 | 520 | 4,290 |
| Total All Lands | 14,400 | 200 | 970 | 1,550 | 17,120 |

2.6 Future Service Areas

Pleasant Valley, Springwater, and Kelley Creek Headwaters Plan areas were brought into the UGB by Metro Council in 2002. The Pleasant Valley, Springwater, and Kelley Creek Headwaters Plan Areas are composed primarily of undeveloped, rural land with current wastewater disposal provided by on-site septic systems. As urban development progresses and these areas are annexed into the City of Gresham, the City will need to provide infrastructure for collecting and conveying wastewater flows. These plan areas are shown in **Figure 2-2**.

The Pleasant Valley Implementation Plan (December 2003), Springwater Community Plan (May 2005), and Kelley Creek Headwaters Urbanization Plan (July 2009) were used as the basis for planned land use in the new service areas. These plans outline how development will occur when the properties in these areas are annexed into the City. Target development densities for the various land uses in the planning areas were determined based on adopted or proposed code. For residential dwellings, population density was assumed to be similar to that seen within the existing City. The maximum population for the plan areas is 24,150 residents and 21,990 employees, based on the maximum densities for each of the zoning classifications.

Planning level recommendations for collection system improvements and cost estimates for serving the plan areas is provided in **Section 8**.

2.6.1 Pleasant Valley Plan Area

The Pleasant Valley Plan Area is a 1,532-acre area south of Gresham and east of Portland. Pleasant Valley is planned to be a largely residential area, with some retail and employment centers. The 2002 Pleasant Valley Concept Plan estimates buildout populations of 12,010 residents and 4,990 employees at buildout in the Pleasant Valley Plan Area.

This area generally drains to the northwest, away from the City's existing system. Previous master plans and studies have identified the main conveyance conduit for Pleasant Valley flow as the proposed Kelley Creek Interceptor. This proposed interceptor would connect to an existing interceptor which was constructed in Jenne Road in 2009 in anticipation of development in Pleasant Valley. All wastewater flows from the Pleasant Valley Plan Area within the City's Urban Services Boundary are expected to ultimately be conveyed to the Linneman Pump Station by this interceptor.

2.6.2 Kelley Creek Headwaters Plan Area

The Kelley Creek Headwaters Plan area is adjacent to and east of the Pleasant Valley Plan Area. Planned zoning for the developable land in this area is for single family residential. The buildout population in the Kelley Creek Headwaters Plan Areas is projected to be 2,690 residents, calculated based on the maximum number of dwelling units for the zoning designation and density of 2.7 persons per dwelling unit.

Flows from future development in the Kelley Creek Headwaters Plan Area are expected to be conveyed by gravity to future City of Gresham trunks in Pleasant Valley. The downstream infrastructure will be sized adequately to convey the flows assuming development according to the planned zoning.

2.6.3 Springwater Plan Area

Springwater Plan Area is a 1,727-acre area located to the southeast of Gresham at the foot of Hogan Butte, extending from the Gresham city limits south to the Multnomah County line, and east to approximately 282nd Street. Most of this area was part of a 2002 expansion of the UGB.

The Springwater Plan Area is zoned to be a new industrial center for East Multnomah County, with some residential, commercial, and office development. According to the 2005 Springwater Community Public Facilities Plan, the Springwater Plan Area will be home to 6,750 to 9,450 residents and 17,000 employees at buildout. However, the area topography is characterized by rolling hills, which is more conducive to residential than industrial development. All parcels annexed to date have had a zoning change to residential. The trend of zoning changes is a good indication that this area is likely to develop with a much higher proportion of residential land use

than anticipated in the planning study. This study considers two alternative future development scenarios for wastewater conveyance serving the Springwater Plan Area: 1) zoning as designated in the Plan Area, and 2) 75 percent built out as residential and 25 percent industrial.

The Springwater Plan Area generally drains towards the City's existing service area. It abuts the Johnson Creek, Kelly Creek, and East Basins to the north, and Clackamas County to the south. Due to capacity limitations in the Kelly Creek and East basins, and the proximity of Johnson Creek Basin collection system, it is assumed wastewater from the Springwater Plan Area will be conveyed directly to the Johnson Creek Basin.

2.7 Natural Resource Areas

Natural resources are natural materials occurring in nature and include air, water, plants, animals, and soil. The Columbia, Sandy, and Willamette Rivers and their tributary streams are significant natural resources that are protected by federal, state, and local regulations. The City has designated Overlay Districts in its development code that limit development to protect natural resource areas including floodplains, habitat areas, open space, and scenic views. The assumptions pertaining to development within natural resource areas is described below, based on the existing development code.

2.7.1 Wetlands

The significant wetland areas in Gresham city limits are the Fairview Creek Ponds, Fairview Creek Headwaters, and several areas adjacent to Johnson Creek. Development of these natural resources is restricted under the federal, state, and local regulations, with impacts to the wetlands generally requiring mitigation. However, some infrastructure installed prior to these restrictions remains in place.

2.7.2 Floodplain

A floodplain is an area of land adjacent to a river or stream that experiences flooding during high river or stream flow. A floodplain is a natural place for a surface water to dissipate its energy during periods of heavy rainfall. These areas are both natural resources and hazards. The City has specified a Floodplain Overlay District in its development code, including standards for development within the district (Gresham Development Code Article 5 section .0100). Within the Gresham city limits, the FEMA 100-year floodplain is delineated in low elevation areas along the banks of the Johnson and Fairview Creeks and their tributaries. Although some of these areas are zoned for development, it is assumed that no new development will occur in these areas in the future.

2.8 Natural Hazard Areas

The City is at risk for several types of natural disasters. In order to reduce risks of development within potential hazard areas, the City has designated the Hillside Physical Constraint District and

Floodplain Overlay District. The City has also invested in a planning for improvements in seismic resiliency.

2.8.1 Seismic Hazards

Gresham is in a region that has been identified as at risk during a Cascadia Subduction Zone event and shallower fault scenarios. A wastewater collection system is potentially vulnerable to damage and failure during seismic events. The City is currently evaluating the seismic risks to the wastewater collection and treatment systems in its *Wastewater Seismic Resilience Plan*. The hazards considered in this plan included peak ground velocity (shaking), permanent ground deformation, liquefaction, lateral spreading, and landslides.

The *Wastewater Seismic Resilience Plan* identifies several improvements to the collection system and outfalls, including pump station and force main anchoring and supports, structural reinforcement of gravity trunks, improvements of stream crossings, and outfall redundancy. These projects will be incorporated into the prioritized capital improvement plan. Seismic risk is further incorporated into this plan by overlaying the seismic hazard layers with structural and capacity deficiencies to inform project prioritization.

2.8.2 Steep Slopes

The Hillside Physical Constraint District outlines development standards for lands with greater than 15 percent slope or within an area designated “Higher Landslide Risk Area”, “Transition Area”, or “Further Review Area. The development code allows a maximum of one dwelling per tax lot on slopes over 35 percent. For sites with slopes 15 to 35 percent, the maximum number of permitted units is the maximum allowed by the underlying district.

2.9 Municipal Water System

The City operates and maintains a municipal water system that provides potable drinking water to residents within the City limits. The municipal water system’s primary water source is the Bull Run Watershed, managed by the City of Portland. Secondary water sources include the Columbia South Shore Well Field also managed by City of Portland, and the Cascade Well Field managed by the Rockwood Public Utility District.

The majority of the City’s dry weather wastewater flow comes from customers’ use of the municipal water system. Thus, wastewater flows and municipal water demand follow a similar diurnal cycle throughout the day. The municipal water system experiences higher demand in the summer, primarily due to irrigation.

Customers in the South Shore area are served on demand through PWB distribution mains and master meters from PWB's Parkrose Tanks. One master meter connection to the RWPUD supplies water to the City's wastewater treatment plant in the South Shore area.

2.10 Municipal Stormwater System

The City operates a Municipal Separate Storm Sewer System (MS4) under a Phase I NPDES MS4 permit grouped with the City of Fairview. As required by the MS4 permit, the City uses a Stormwater Management Plan (SWMP) to improve stormwater quality and reduce pollutant discharges from the City's stormwater system. This document is in the process of being updated. City code prohibits stormwater connections to the wastewater collection sewer system.

2.11 Socio-Economic Environment

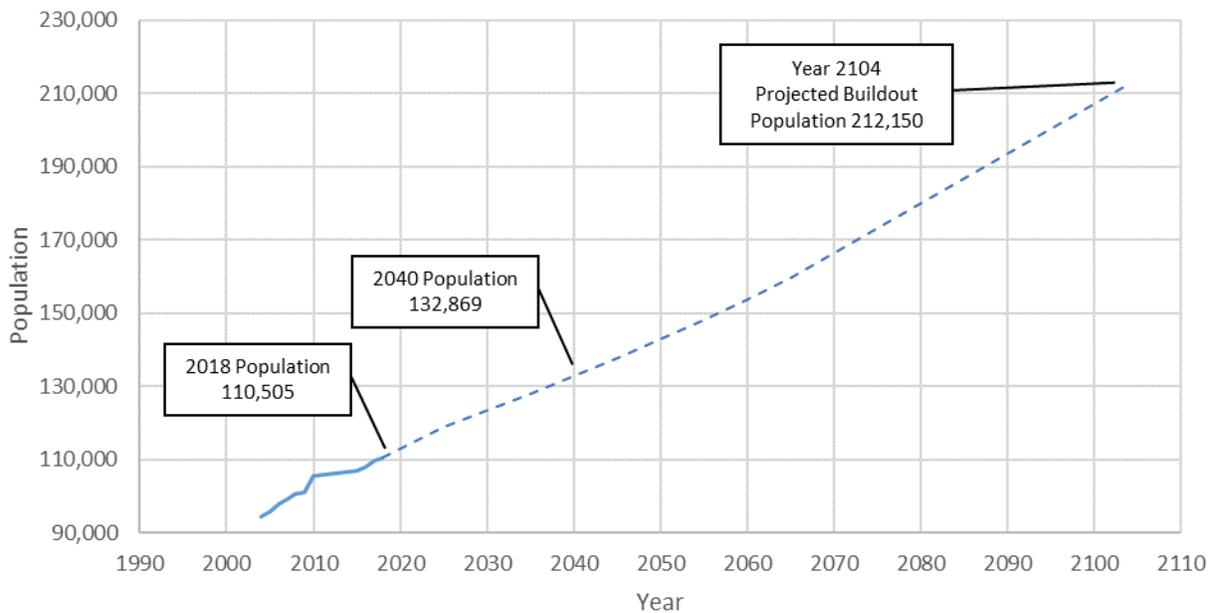
2.11.1 Economic Conditions and Trends

According to United States Census Bureau data, approved building permits for both single- and multi-family dwellings in Oregon have increased 90 percent between 2012 (when Gresham completed its previous Wastewater System Master Plan Update) and 2017. The 2018 unemployment rate in the Portland metropolitan area is near historic lows at 3.8 percent, which is a significant decline since hitting 8.7 percent in 2012. The previous Master Plan Update followed a nationwide decline in the housing market and increase in unemployment. Although the last decade has seen extremes in economic growth rates, future employment and population growth projections in the wastewater service area is expected to occur gradually, with growth rates decreasing over the planning period as the available land is developed. Employment is projected to grow at an average of 1.24 percent per year in the Portland metropolitan area over the 20-year plan period.

2.11.2 Current Population

Gresham is the fourth most populous city in Oregon, with an estimated population of 110,505 in 2018. Although wastewater from the Cities of Fairview and Wood Village is also treated at Gresham's WWTP, most of this flow goes directly to the WWTP without entering the collection system. Therefore, the populations of Wood Village and Fairview are not considered in this CSMP. Current and historical population estimates for the State of Oregon are developed by Portland State University's (PSU) Population Research Center (PRC). Gresham historical population is shown in **Figure 2-5**.

**Figure 2-5
Historic and Projected Population**



2.11.3 Population Forecasts

Future population growth within existing city limits is forecasted using annual growth rates 1.14 percent through July 1, 2020 and gradually decreasing to 0.70 percent by 2040. These rates are projected for Multnomah County areas within the UBG by the PRC, published in 2017.

Projections assume the growth rate is most rapid from 2019 and steadily decreases over time, as the most readily developable land is still available and gradually develops. The growth rate is slower as the maximum density is approached, and the vacant land inventory consists of more difficult to develop properties.

The build-out population within city limits is calculated based on the maximum number of dwelling units anticipated for each zoning designation and density of 2.7 persons per dwelling unit, as established in the City's Comprehensive Plan. Population and future wastewater flows are allocated to each basin based on the percentage of total developable land available in each basin.

The buildout year is established by finding the year in which the population, based on growth rates from PSU PRC, reaches the buildout population. The 2011 WWTP Master Plan estimates a maximum population of 188,000. This population projection includes the cities of Fairview and Wood Village but does not include the population projections for Pleasant Valley, Springwater, or Kelley Creek Headwaters. The addition of the buildout populations from the plan areas to the projections of the population within current city limits brings the total buildout population to approximately 212,150. Based on estimated growth rates after 2040 at 0.65 percent per year

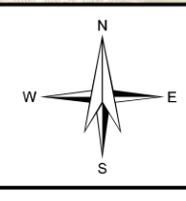
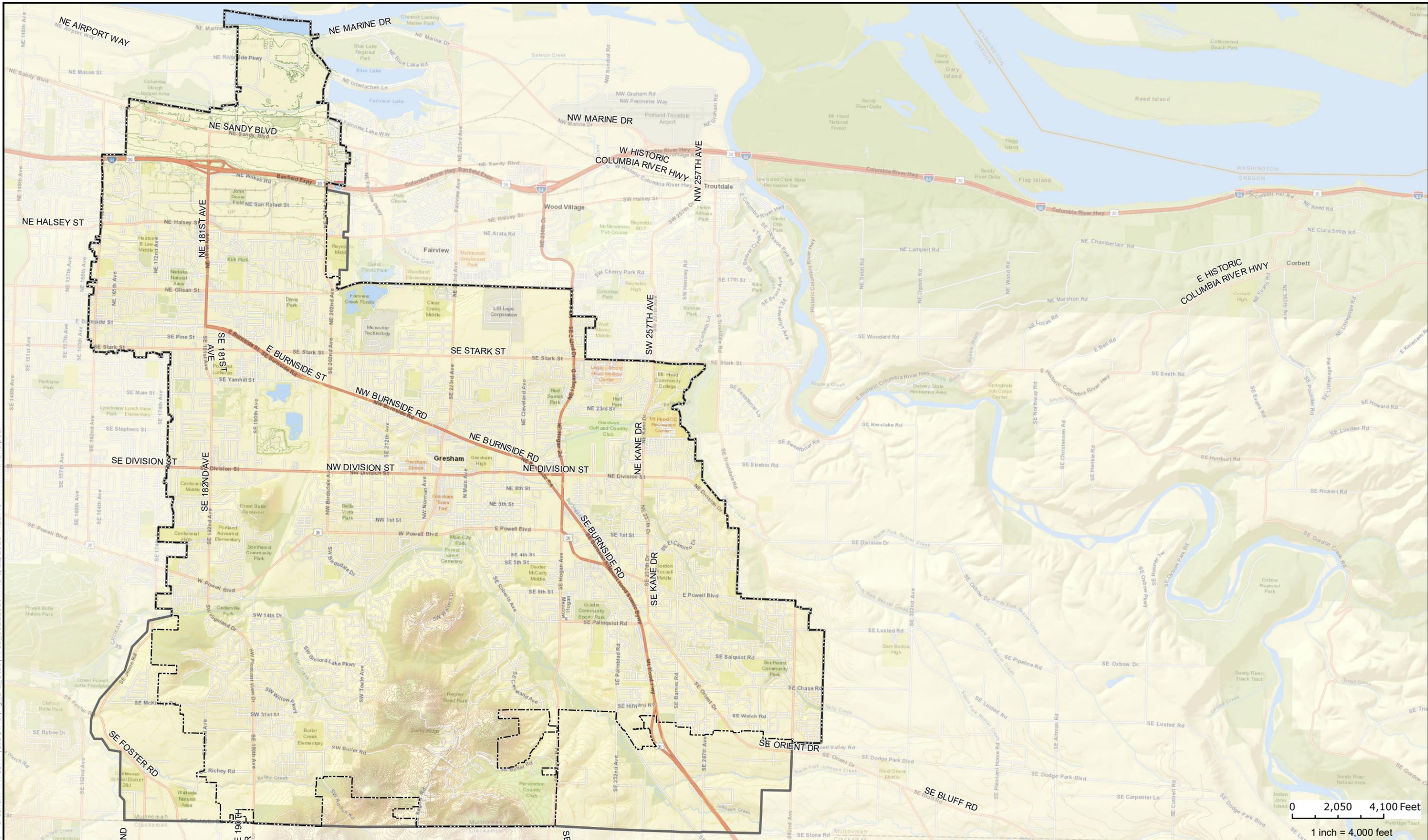
decreasing to 0.47 percent per year in 2065, the buildout population will be reached in the year 2104, as shown on **Figure 2-5**.

2.12 Summary

This section describes the physical characteristics of the City of Gresham’s wastewater service area and existing land use within the City, in addition to descriptions for future land use for the plan areas. This section also includes future population estimates for the City and outlines the methods used to arrive at these estimates.

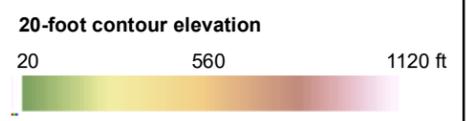
The City is divided into general land use categories including residential, industrial, and commercial. The flow generated from these areas is defined by these land use categories. Currently unserved areas in the southern portion of the City are included in the study area. The population forecasts are based on PSU PRC data, historical growth rates and data generated by Metro for future growth. The population projections presented in this section are resolved relative to the previous WWTP master planning results, actual developed and developable lots and correlate to a projected build out year of approximately 2100. The data summarized in this section will be used in the wastewater flow development process described in **Section 5**.

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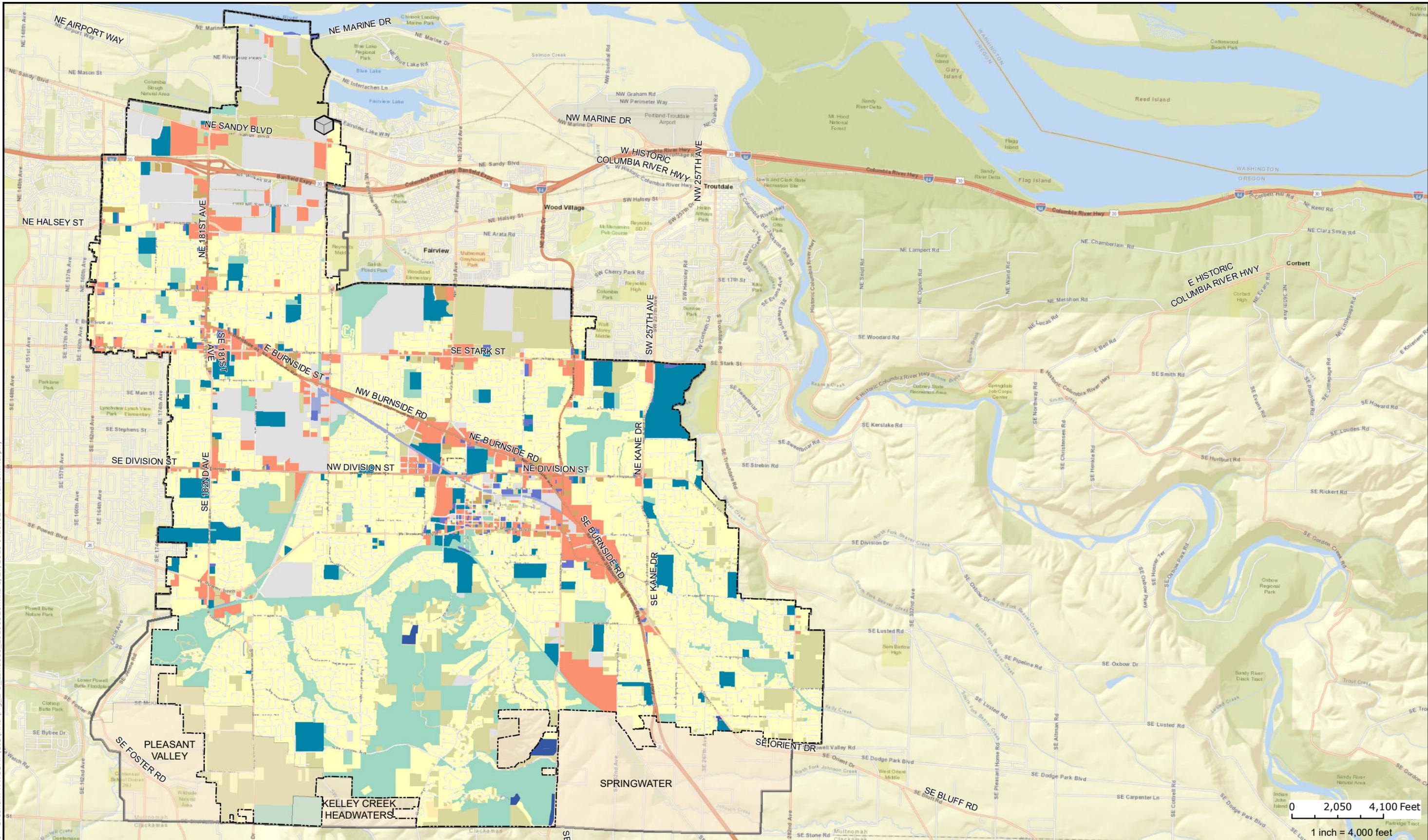
**City of Gresham, Oregon
Wastewater System Facility Plan**

- Study Area
- City Limits

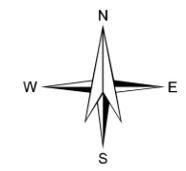


**Figure 2-2
Study Area**

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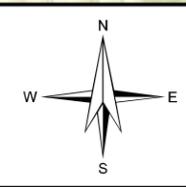
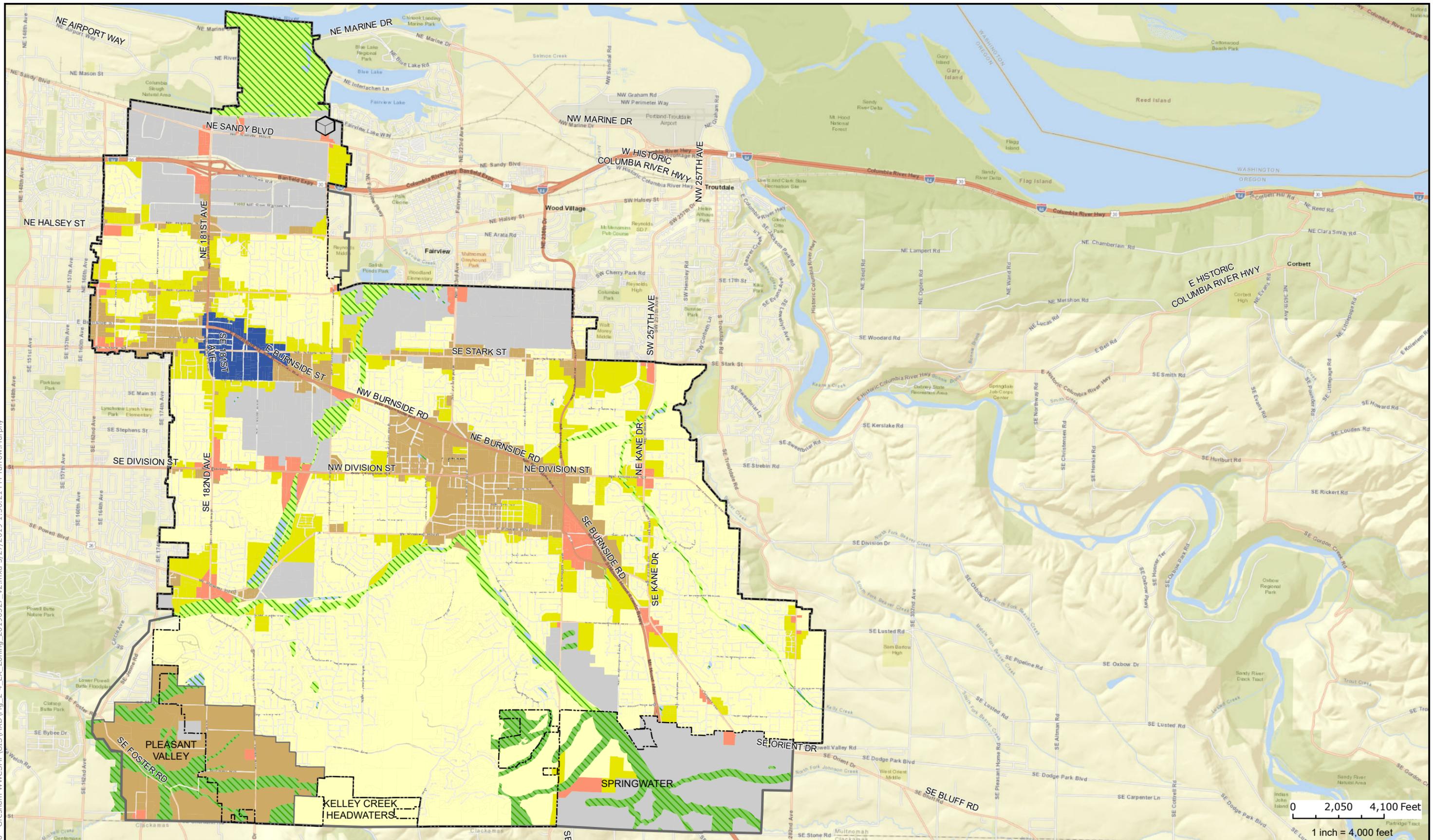
0 2,050 4,100 Feet
1 inch = 4,000 feet



City of Gresham, Oregon Wastewater System Facility Plan

| | | |
|-------------|------------------|----------------|
| Study Area | OPEN SPACE | MIXED-USE |
| City Limits | FARM AND FOREST | COMMERCIAL |
| OTHER | RESIDENTIAL | INDUSTRIAL |
| UNDEVELOPED | CIVIC AND SCHOOL | PARKING |
| | OFFICE | TRANSPORTATION |
| | | PLAN AREA |

**Figure 2-3
Existing Land Use**



City of Gresham, Oregon Wastewater System Facility Plan

| | | |
|-------------|----------------------------|---------------|
| Study Area | FARM & FOREST Mixed Use | MULTI FAMILY |
| City Limits | RESIDENTIAL & COMMERCIAL | UNDEVELOPABLE |
| COMMERCIAL | SINGLE FAMILY | FLOODPLAIN |
| INDUSTRIAL | | WETLAND |
| | | ROADWAY |

**Figure 2-4
Existing Zoning**