Chapter Four

Affected Environment

Final Environmental Impact Statement

Vancouver Rail Project

The feasibility of a project and its implementation often depends on whether it will have impacts on the communities that it is intended to serve, or if construction of its components will impact the surrounding natural environment.

The purpose of this chapter is to provide a discussion of the general environmental and community features within the **Vancouver Rail Project** study area. Information contained in this Draft Environmental Impact Statement (DEIS) was extracted from environmental discipline reports that were prepared specifically for this project.[1]

Data sources used for this analysis are briefly discussed with each resource. In addition, a detailed listing of sources can be found in the References section of this document.

What are the general features of the Vancouver Rail Project's general study area?

The **Vancouver Rail Project**'s general study area includes rural and developed areas within and northwest of the Vancouver city limits. The study area adjoins residential lands, including single-family residences and mobile home parks. On the east side of the study area, residential development is separated from railroad activity by undeveloped steep slopes that support a mixture of tree and shrub habitats. The western side of the study area is a mixture of residential uses, light industrial, and community services.

Vancouver Lake and Burnt Bridge Creek dominate the northern end of the study area and function as recreational open spaces. In this vicinity, existing railroad tracks are on a built embankment between Vancouver Lake and upland slopes to the east.

The railroad right-of-way crosses three tributaries to Vancouver Lake: two unnamed tributaries near the northern terminus of the study area and Burnt Bridge Creek. **Exhibit 4-1** highlights some of these community and environmental features. The industrialized shoreline of the Columbia River is located near the southern end of the general study area.

How does an environmental impact statement review community and environmental features?

A number of environmental and community resources are reviewed as part of an environmental process. Typically, information regarding the existing conditions of the resources within the study area is collected from a number of sources.

[1] *Technical and detailed discipline reports for each of the discussed resource areas are available for review from the WSDOT Rail Office.*

General Existing Features:
Vancouver Rail Project Study Area
Exhibit 4-1

Following collection of existing conditions information (also know as affected environment), an impacts analysis is performed. An impacts analysis typically overlays each proposed alternative (including a no action alternative) upon the existing conditions findings. Based on this "overlay", potential impacts to the physical and sociological elements of the study area can be identified. For certain resources, more technical analyses are performed. The extent of these impacts is typically quantified, if appropriate. Mitigation measures – that is, ways in which impacts can be avoided or made less harmful – are also identified as part of this analysis.

What environmental and community resources were analyzed?

ENVIRONMENTAL AND COMMUNITY RESOURCE
EARTH (SOILS AND GEOLOGY)
AIR
WATER -- Water Quality/Surface Water -- Groundwater -- Floodplains
PLANTS AND ANIMALS -- Wildlife and Vegetation -- Wetlands -- Fisheries
ENERGY
ENVIRONMENTAL HEALTH -- Noise and Vibration -- Hazardous Materials
LAND USE -- Land Use (including Shorelines and Farmlands) -- Parks and Recreation (Public Lands) -- Historic, Cultural and Archeological -- Social and Economic -- Environmental Justice -- Visual Quality

Environmental and Community Resources Reviewed in this Environmental Impact Statement
Exhibit 4-2

Based on the Washington State Department of Transportation's *Environmental Procedures Manual M31-11*, a number of resources are reviewed as part of an environmental process. **Exhibit 4-2** lists the resources that are reviewed in this document.

This section presents a discussion of the affected environment for each environmental and community resource listed in **Exhibit 4-2**.

Earth (Soils and Geology)

Knowing the types of soils and geologic formations in a study area is very important. These elements dictate how a project should be constructed as well as its susceptibility to landslides and seismic activity.

In addition, steep slopes could be disrupted during construction activities. It is critical that these key areas be identified as part of project planning.

How was information collected?

Geotechnical studies included a search and review of published geotechnical and soils maps, reports, and existing records from previous projects in the area. In March 2000, a field review of the study area was conducted. The purpose of this field review was to evaluate surface conditions. This served as a basis for preliminary consideration of likely impacts and possible mitigation measures.

What are the general geotechnical conditions in the study area?

The rail corridor generally follows the Columbia River basin from the Oregon border to the Cowlitz County

line. Soils are predominately silt loam. The rail corridor crosses slopes exceeding forty percent within the city of Vancouver just south of Vancouver Lake. Landslides are a potential in Clark County.

The study area, except for the extreme northern end, is located along the foot of west-facing terraces fronting the lowlands on the western side of Vancouver. The northern end of the study area extends onto soft compressible alluvial sediments associated with Vancouver Lake. On the southern portion of the study area, the terraces slope upward at relatively gentle gradients, but along the central and northern sections, the terrace coincides with the toe of steep bluffs. In the west section of the study area, along the Northern Pacific (NP) siding, the study area abuts city roadways located on low-lying ground.

Geological mapping indicates that the study area is underlain by Pleistocene Outburst Deposits of Glacial Lake Missoula, and recent alluvial deposits of the Columbia River.[2]

The glacial outburst deposits[3] in the study area consist of flood gravel, and flood sand and silt. The flood gravel consists of boulder to cobble to gravel with a sandy matrix and minor silt interbeds, generally cross-bedded with forest beds dipping down valley. The flood sand and silt deposits consist of silt, sand and clay which grade into the flood gravel deposits, and contain slack water deposits and cross bedded fine surge deposits, and some interbedded gravels. Recent alluvial deposits consist of sand, silt and gravel deposited in streambeds.

During field review, observation suggested that the soils exposed in the existing rail cuts along the tracks consist mainly of dense fine-grained materials. However, flood gravel deposits were not observed as indicated by the published mapping.[4]

According to the Soil Survey of Clark County,[5] the following surficial soil types occur within the study area:

- Hillsboro silt loam: This soil type develops on Columbia River alluvium, forming slopes inclined from zero to three percent. This soil profile is deep, well drained, and moderately permeable. Surface runoff is generally very slow and erosion hazard is slight. Most of the flat-lying portions of the study area are underlain by this soil type. The Unified Soil Classification[6] is typically ML (silt), the Plasticity Index[7] ranges from six to ten percent, and

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[2] *W.M. Phillips, Geologic Map of the Vancouver Quadrangle, Washington and Oregon (Washington Division of Geology and Earth Resources, 1987) and Walsh, Geologic Map of the Southwest Quadrangle, Washington and Oregon (Washington Division of Geology and Earth Resources, 1987).*

[3] *Walsh, 1987*

[4] *Phillips, 1987 and Walsh, 1987.*

[5] *United States Department of Agriculture, Soil Survey of Clark County, Washington (U.S. Department of Agriculture Soil Conservation Service, 1972).*

[6] *The Unified Soil Classification system is a standard classification system for soils used in engineering.*

[7] *The Plasticity Index is an engineering measure of a particular soil's capacity to retain its*

the fines content (percentage passing the #200 mesh sieve) is between eighty and ninety percent.

- Hillsboro loam: This soil type develops on the Columbia River alluvium, forming slopes inclined from twenty to thirty percent. The soil has a medium to rapid surface runoff potential and if left bare over winter, it has a moderate to severe erosion hazard. This soil type occurs along the hill slopes in the central portion of the study area. The Unified Soil Classification is typically ML (silt) near the surface to SM (silty sand) with depth. The Plasticity Index ranges from eight to twelve percent, and the fines content varies from 55 to 65 percent in the upper approximately three feet, decreasing to between fifteen to 25 percent below about three feet.
- Wind River sandy loam: This soil type develops on Columbia River alluvium, forming slopes inclined from eight to 65 percent, and is sometimes excessively drained. Surface runoff is medium to very rapid, depending upon slope inclination. The erosion hazard is moderate to very severe if left bare during winter. This soil type covers a wide area along the eastern side of the study area, but is only impacted by cut slopes on the northern end of the corridor. This soil type is sandier than Hillsboro loam. The Unified Classification is SM (silty sand), and the fines content is between fifteen and 35 percent.

It should be noted that the Soil Survey describes the surficial soils, and is largely based on shallow test pits of around four to five feet deep. Therefore, no definitive conclusions with regard to the soils at depth can be drawn. Fill material of unknown origin underlies much of the low-lying flat areas.

Are there any geological hazards in the area?

A range of geotechnical conditions exist in the study area. **Exhibit 4-3** identifies six general sections in the study area that have similar geotechnical conditions. The following discussion presents some general elements for each of these sections.[8]

Section 1: The seismic hazard rating for this section is rated as D – Least Relative Hazard. No other geologic hazards were identified over this section.

The main geotechnical consideration for this section is the extent of sub-grade preparation required below the ballast bed, because of disturbance from previous works in this area, and provision of good drainage. Drainage is often difficult in such areas because of the very flat yard grades.

Section 2: Field review indicated active slope erosion occurring in this vicinity. Locally, the erosion appears to be the result of downslope directed surface water and/or sloughing due to build up of water along the slope toe.

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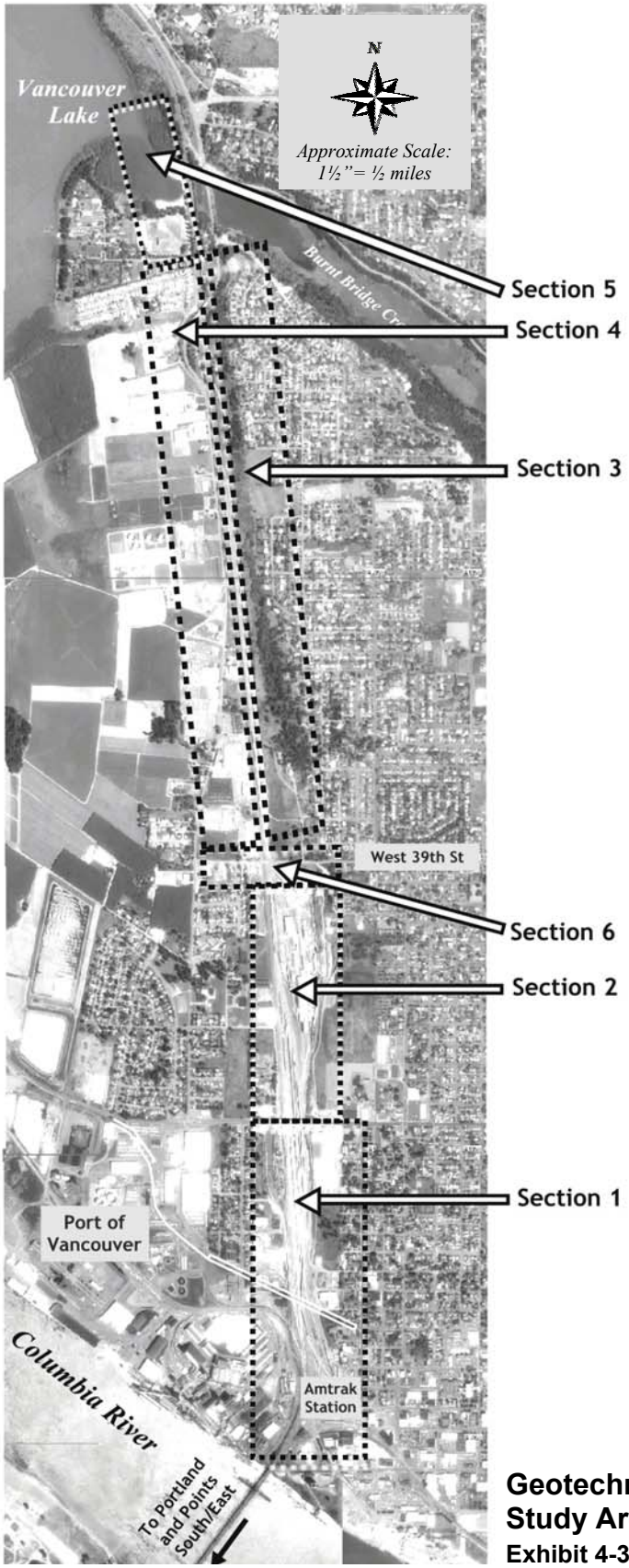
shape under varying stresses or forces. Soils that contain finer particles, such as clay or silt, tend to hold their shape better and have a higher plasticity index. Sandy soils generally have a low plasticity index.

[8] *Information for this geotechnical review was obtained from: M.A. Mabey, I. P. Madin, and S. P. Palmer, Relative Earthquake Hazard Map for the Vancouver, Washington, Urban Region (Washington Division of Geology and Earth Resources, 1994).*



Geotechnical Sections of Study Area
Exhibit 4-3

No indications of deep-seated slope instability and only minor evidence of previous slope failures were noted along this section. Major slope hazard is not anticipated based on the apparently satisfactory performance of the existing low cut slopes along the track.

The seismic hazard rating for this section is mapped as Zone B with lesser portions of Zone A – Greatest Relative Hazard. No other geologic hazards were identified over this section.

Section 3: The existing slopes above this segment of the alignment are sloped at a two to one ratio (horizontal to vertical) or flatter. Immediately above track level, a terrace is present.

Soil conditions according to the Clark County Soil survey vary from Hillsboro loam on the south portion of the segment to Wind River sandy loam towards the northern part of this segment.

Storm water runoff comes from the slopes in the vicinity of West 39th Street. Much of the storm water probably infiltrates into the ground. This seepage will contribute to slope instability.

According to the Clark County soil survey data, greater erosion should be anticipated on the Wind River sandy loam than on Hillsboro loam. The seismic hazard rating for this section is mapped as Zone A – Greatest Relative Hazard.

Section 4: Geological hazards over this section relate mainly to seismic hazard, and are mapped as Zone A – Greatest Relative Hazard.

Further hazards relate to the potential for settlement of sections of track where thick fill placement is required, resulting in consolidation of the underlying compressible alluvial soils. No other geologic hazards were identified over this section.

Section 5: Visual assessment of the area indicated that organic soils and soft sediments should be expected in this area. In addition, the seismic hazard rating for this section is mapped as Zone A – Greatest Relative Hazard. Therefore, the potential for lateral spreading or a flow slide in a major earthquake must be evaluated.

Section 6: Conditions vary from Columbia River alluvium in the lowlands on the west of the alignment, to terrace material on the more high-lying ground to the east. In addition, a thin fill layer covers the entire area.

The major geological hazards over this area relate to the compressibility of the underlying soils to support bridge foundations, and the stability of the foundation soils under a design level earthquake. In this regard, the seismic hazard rating for this section is mapped as Zone A – Greatest Relative Hazard. Therefore, the potential for liquefaction of the foundation soils is a significant hazard.

Air

Polluted air can cause or worsen lung-related diseases, such as emphysema, chronic bronchitis and asthma; and can cause breathing difficulty and even death. Easily inhaled small particles, called particulate matter, are perhaps the most significant health concern related to poor air quality.

Polluted air can contribute to water pollution. It can also damage building materials, cloth and metals and lead to decreased visibility and damaged trees, agricultural crops and other living organisms.

Air quality in Washington is considered moderate to good. In 1995, thirteen areas in the state were identified as being in "non-attainment" (not meeting federal health-based standards) for one or more of four air pollutants: ground-level ozone, small particulate matter, carbon monoxide and sulfur dioxide. Ten of those areas have recently been reclassified as maintenance areas. A maintenance area is one that has been re-designated by the U.S. Environmental Protection Agency (EPA) from non-attainment to attainment as a result of both a ten-year record of monitored attainment (no exceedences of standards) and an EPA approved maintenance plan.

The primary cause of poor air quality in Washington is motor vehicle exhaust. Exhaust from motor vehicles contains many toxic pollutants, including carbon monoxide. Motor vehicles are also a source of particulate matter and ground-level ozone.

In addition, high levels of particulate matter are caused by tiny particles of soot, dust and unburned fuel from woodstoves, fireplaces, backyard burning, agricultural burning and industry.

What are current air quality regulations?

Air quality impacts from rail projects, including operational changes, are governed by the U.S. Environmental Protection Agency's General Conformity Rules 40 CFR 51 and 93. The rules require that a conformity determination must be made for projects that emit more than the de minimis level for each criteria pollutant. The de minimis levels are contained in **Exhibit 4-4**.

De Minimis Emission Levels for Criteria Pollutants
Exhibit 4-4

CRITERIA POLLUTANT	DE MINIMIS LEVEL
Ozone (NOx), SO2 or NO2: --All maintenance areas	100 Tons/year
Ozone (VOC's): --Maintenance areas outside an ozone transport region	100 Tons/year
Carbon Monoxide: --All maintenance areas	100 Tons/year
PM-10: --Moderate Non-attainment Areas	100 Tons/year

Three agencies have jurisdiction over the air quality in the study area: the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and the Southwest Air Pollution Control Authority (SWAPCA).

These agencies establish regulations that govern both the concentrations of pollutants in the outdoor air and contaminant emissions from air pollution sources. Although their regulations are similar in stringency, EPA and Ecology each have established their own standards, SWAPCA has adopted these standards. Unless the state or local jurisdiction has adopted more stringent standards, the EPA standards apply.

In order to measure existing air quality, Ecology and SWAPCA maintain a network of air quality monitoring stations throughout the Vancouver area. In general, these stations are located where there may be air quality problems, and so are usually in or near urban areas, or close to specific large air pollution sources. Other stations are located in remote areas to provide an indication of regional air pollution levels.

Based on monitoring information collected over a period of years, the state (Ecology) and federal (EPA) agencies designate regions as being "attainment" or "non-attainment" areas for particular air pollutants. Attainment status is therefore a measure of whether air quality in an area complies with the federal health-based National Ambient Air Quality Standards (NAAQS).

Typical existing sources of air pollution in the study area include locomotives, automobile and bus traffic, home and commercial space heating (including residential wood burning), and a variety of industrial/commercial sources. These sources emit many of the pollutants that fall under the NAAQS. In the case of rail transportation projects, the air pollutants of major concern are the following criteria pollutants:

- Ozone (hydrocarbons and oxides of nitrogen are precursors);
- Carbon monoxide; and
- Fine particulate matter (PM_{10}).

Exhibit 4-5 provides a general discussion of these pollutants.

Under federal and state clean air rules there are special requirements in non-attainment and maintenance areas to ensure that proposed transportation projects do not cause or contribute to existing air quality problems. These “conformity rules” require analyses to demonstrate compliance with existing air quality control plans and programs.

Description of Pollutants

Exhibit 4-5

POLLUTANT	DESCRIPTION
OZONE	Ozone is a highly reactive form of oxygen created by sunlight-activated chemical transformations of nitrogen oxides and volatile organic compounds (hydrocarbons) in the atmosphere. Unlike carbon monoxide concentrations which tend to occur very close to the emission source(s), ozone problems tend to be regional in nature because the atmospheric chemical reactions which produce ozone occur over a period of time. During the delay between emission and ozone formation, ozone precursors can be transported far from their sources. Transportation sources are one of a number of sources that produce ozone precursors.
CARBON MONOXIDE (CO)	Carbon monoxide is the product of incomplete combustion. It is generated by transportation sources and other fuel-burning activities like residential space heating, especially heating with solid fuels like coal or wood. Unlike ozone, carbon monoxide is a pollutant whose impact is usually localized. The highest ambient concentrations of carbon monoxide usually occur near congested roadways and intersections during periods of cold temperatures (autumn and winter months), light winds, and stable atmospheric conditions.
FINE PARTICULATE MATTER (PM_{10})	During prolonged periods of stagnant meteorological conditions it is possible that PM_{10} emissions from vehicles, residential solid-fuel space heating, and other sources could elevate PM_{10} concentration beyond the established health standards. Federal, state, and local regulations set limits for particles less than or equal to about 10 micrometers in diameter. This fraction of particulate matter is called PM10, and is important in terms of human health impacts because particles this size can be inhaled deeply into the human lung. PM10 in the study area is generated by industrial activities and operations, fuel combustion sources like residential wood burning, and motor vehicle engines and tires, and other sources. Fugitive (i.e., uncontrolled) dust releases are generally the largest source of PM10 emissions during construction activities. Emissions depend on soil type, soil moisture content, and total area of soil disturbance. Dust emissions could be generated by wind blowing over exposed soil surfaces during construction. The movement of construction equipment and support vehicles around the proposed project site could also generate dust.

How is air quality monitored and managed in the study area?

The **Vancouver Rail Project** is located within the Vancouver ozone and carbon monoxide maintenance areas. The maintenance areas include the entire Vancouver Metropolitan Urban Area. The maintenance area is mapped in **Exhibit 4-6**. Due to the location and the type of project, the **Vancouver Rail Project** must meet general conformity requirements.

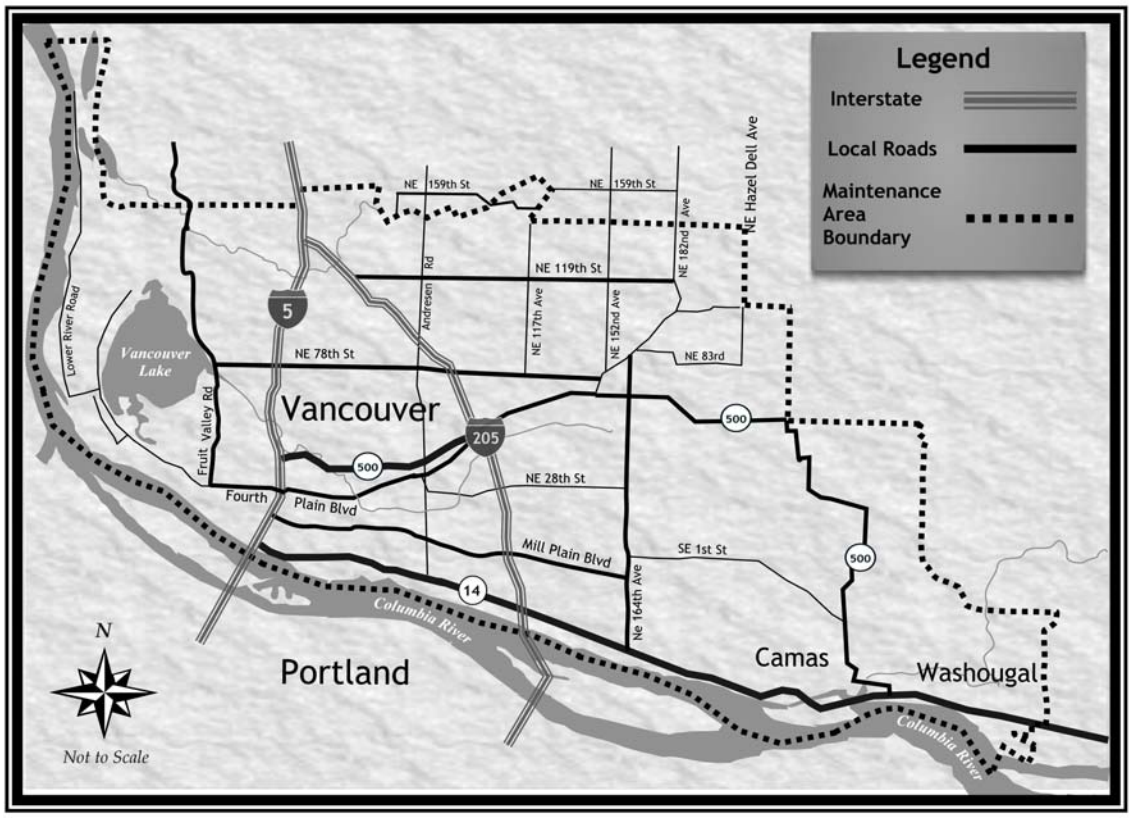
General conformity rules apply to the portion of the project located in or affecting the maintenance areas. Project effects to the air quality outside the maintenance areas are not expected to create exceedances of the NAAQS and are not required to be analyzed.

Federal transportation conformity rules also apply to railroad crossings where changes are made to the roadway. The proposed changes to West 39th Street constitute a need to proceed with conformity analysis.

Railroad crossings, where no changes are made to the roadway, are specifically exempted under both the state and federal transportation conformity rules. These rules recognize that safety impacts may be greater than potential air quality impacts. Consequently air quality conformity analysis of motor vehicles due to changes in railroad crossings, without changes to the roadway, is not required under the transportation conformity rules.

Vancouver Air Quality Maintenance Area

Exhibit 4-6



The federal Clean Air Act requires the state to take actions to reduce air pollution in non-attainment areas to the extent that federal health-based standards are not exceeded, and to provide control measures to assure attainment for at least ten years. The framework that provides for meeting these goals is the State Implementation Plan (SIP).

A maintenance area is one that has been re-designated by the EPA from non-attainment to attainment as a result of both a ten-year record of monitored attainment (no exceedences of standard) and an EPA approved maintenance plan. Because the **Vancouver Rail Project** is located within ozone and CO maintenance areas, the project must conform to air quality implementation plans. As required by the Federal Clean Air Act, Ecology, and SWAPCA have submitted both the ozone and the CO SIP's to EPA for review, and the plans have been approved.

Under section 176(c) of the Clean Air Act, as amended in 1990 and adopted by chapter 70.94 RCW of the Washington Clean Air Act of 1991, the Southwest Regional Transportation Council (RTC), as the responsible metropolitan planning organization, and the Washington State Department of Transportation (WSDOT) can not adopt, approve, or accept any transportation improvement plans, programs, or projects unless they conform to the Washington SIPs.

Conformity with an implementation plan is defined as complying with a plan's purpose of maintaining ambient air quality standards. The federal and state rules and regulations governing conformity are described in the EPA 40 CFR parts 51 and 93 and in Chapter 174-420 of the Washington Administrative Code (WAC).

Water

This environmental resource often entails the review and analysis of an area's surface water, water quality, groundwater, and floodplains. This section presents discussions on each of these elements.

Surface Water/Water Quality

Our image of Washington State is of a land of sparkling lakes, rivers and coastal waterways. The need to keep these waters clean is critical not only to the natural beauty of our communities but also to the survival of animal species and fisheries that depend upon these waterways for water and food. By inventorying potentially impacted surface water features, we can ensure that during construction and operations the quality of these waterways will not be compromised.

To catalog the occurrence of potentially impacted surface water bodies, biologists walked through the study area and documented waterways that crossed or were adjacent to the project area. They also assessed potential receiving water bodies downstream/downslope from the proposed construction areas.

How was information collected?

Field investigation included: reconnaissance surveys of waterways; visual inspection to identify streams and topographic features relevant to hydrological function; and identification of potential project impacts or mitigation opportunities.

Field investigations were conducted in July, August and November 1997, June and July 1999, and January 2000.

The shores of Vancouver Lake

What is the general setting of the study area?

The **Vancouver Rail Project** is located in the Salmon-Washougal basin and Vancouver Lake subbasin. The project is located in Water Resource Inventory Area[9] (WRIA) 28. Waters in this area are tributary to the Columbia River, which flows within one mile of the southern portion of the study area.

Over most of the study area, the topography is relatively flat. However, portions of the study area lie approximately mid-slope along a relatively steep ridge to the east of the Vancouver rail yard. That portion of the study area drains to a roadside ditch, through a culvert to West 39th Street, and eventually to the low area near the rail yard. The rail yard is essentially flat. No culverts or other stormwater conveyances were noted during the field survey, however, it is likely that there are culverts that carry stormwater to Vancouver Lake or the Columbia River. To the north of the rail yard, much of the drainage is to Burnt Bridge Creek and Vancouver Lake, which discharge to the Columbia River.

Four culverts were observed within the project vicinity. One ten-foot arch culvert connects Burnt Bridge Creek and Vancouver Lake under the existing tracks. The Burnt Bridge Creek culvert appears to function properly and was designed to allow the passage of the 100-year flood. The second and third culverts are minor drainage culverts located north of the Burnt Bridge crossing, at the north end of the study area. These culverts also appear to be functioning properly. The fourth culvert is a minor drainage culvert located at West 39th Street; the culvert, or its collection system, may be functioning improperly.

The Burnt Bridge Creek watershed has been highly urbanized, with about forty percent of the watershed covered with impervious surfaces. Upstream of the project location, Burnt Bridge Creek drains a pond formed by construction of Northwest Lakeshore Avenue and the BNSF railbed. The culvert under Northwest Lakeshore Avenue drains into a narrow pond/wetland between the road and the railbed. The eight-foot box culvert under the railbed is approximately one hundred feet long and drains directly into Vancouver Lake. Flow through the culvert is at lake elevation. There is no plunge pool; from the appearance of the shoreline, the top of the culvert

[9] *A WRIA is a term used by state and local planning and resource agencies to refer to one of the state's 62 major drainage basins.*

coincides with the seasonally high lake elevation. Vancouver Lake is connected by a system of sloughs to the main stem of the Columbia River. The railbed is approximately ten feet above the top of the Burnt Bridge Creek culvert. The Burnt Bridge Creek watershed drains an area of approximately 23 square miles.[10]

Has water quality in the study area been tested?

Surface water quality data is available for Burnt Bridge Creek. Burnt Bridge Creek is a Clean Water Act (CWA) 303(d) listed water.[11] Tests show that the creek currently does not meet 1994 state surface water quality standards for pH, dissolved oxygen, temperature or fecal coliform. Other than Burnt Bridge Creek, there are no surfaces water resources in the study area.

Burnt Bridge Creek is located at the north end of the study area, where it empties into Vancouver Lake. The lake is classified as "Lake Class" under Washington's Water quality standards, and Burnt Bridge Creek is classified as a Class A water.

Vancouver Lake is approximately one half mile from the northern end of the study area. Vancouver Lake is not on the 303(d) list as a threatened and/or impaired waterbody. Vancouver Lake Wildlife Area is located across the lake, approximately one mile west of the Vancouver Rail Project. **Exhibit 4-7** shows the Burnt Bridge Creek and Vancouver Lake area.

Groundwater

In addition to surface waters, groundwater and aquifers are also critical elements of our environment. Groundwater is an important natural resource. For many residents of western Washington, groundwater is their sole source of water for drinking and washing, for farming and manufacturing, indeed, for all their daily water needs.

An aquifer is an underground formation of permeable rock or loose material that stores useful quantities of water and can be tapped by a well. Aquifers provide drinking water for our communities.

Groundwater quality, like surface water, can be eroded by contaminants introduced by various domestic, industrial, and agricultural practices.

Even where we might not use it directly as a drinking water supply we must still protect groundwater, since it will carry contaminants and pollutants from the land into the lakes and rivers from which other people get a large percentage of their freshwater supply.

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[10] *United States Geological Survey, Surface-water supply of the United States, 1966-1970: Part 14 (Washington, DC: United States Geological Survey, 1972).*

[11] *A 303(d) listed water is a water body that has been tested by the state and been shown through this testing to exceed the minimum standards for at least one of several water quality standards. 303(d) listed waters are regularly monitored by the state until they reach compliance with water quality standards. Section 305(b) of the federal CWA requires each state to prepare a water quality assessment report every two years. The EPA compiles the information from the state reports and prepares a summary for Congress on the status of the nation's waters.*

Surface Water Features in the Study Area
Exhibit 4-7

What are the groundwater conditions in the study area?

Much of the study area extends above unconsolidated sedimentary aquifers in the region. These sedimentary rock deposits yield groundwater from the Lewis aquifer region. A sole source aquifer is not present under the study area. The aquifers lie in the Troutdale Formation, and in more recent alluvial deposits. Yields of water vary depending on the permeability of the material. Regionally, groundwater flows from east to west and moves from central Clark County to the Columbia River.

Groundwater has been tested in Clark County by the Washington Department of Ecology and the U.S. Environmental Protection Agency as part of a groundwater-quality monitoring network. The groundwater in the study area is primarily soft to moderately hard calcium-magnesium bicarbonate-type water.

In 1994, the Washington Department of Health adopted a statewide Wellhead Protection Program. The regulation requires Group A public water systems to delineate, inventory, and develop management plans to protect their water supply source, including a contingency plan and spill response program. Although there are a number of irrigation, industrial and private domestic wells within 1000 meters of the rail tracks, only one public well is in the vicinity of the rail yard. This well is located on the terrace bluff east and up-gradient of the rail line. The well is

operated by the City of Vancouver, which has a Wellhead Protection Program. The study area is not within the wellhead protection calculated fixed radius area.

How is water drained in the study area?

Drainage pathways are not present along the rail line because the railway companies have maintained the existing railroad bed facilities with a subgrade and ballast structure.

The Burlington Northern and Santa Fe Railway Company's (BNSF) policy dictates that rail yards typically are no more than thirty percent impervious.

Standard railroad bed design indicates that ballast depths vary from eighteen to twenty four inches. A larger ballast material could occupy the lower half of the ballast. Preferred ballast materials are clean graded crushed stone, with hard, dense angular particle structure. This type of structure provides sharp corners and cubicle fragments with a minimum of elongated flat pieces. These qualities provide pore spaces allowing for proper drainage of the ballast section. This crushed rock ballast allows water to infiltrate through the rock and into groundwater.

BNSF states that any drainage ditches placed beside the tracks channel upslope direct water away from the rail structure. The railside ditches convey this water to culverts located along the right-of-way under the tracks and to the downslope side.

Floodplains

Floodplains are lowland areas adjacent to lakes, wetlands and rivers that are covered by water during a flood. The ability of the floodplain to carry and store floodwaters needs to be preserved and respected to protect human life and property from flood damage. Also, undeveloped floodplains provide many other natural and economic resource benefits.

Floodplains, because of their connection to river systems, often contain wetlands and other areas vital to a diverse and healthy ecosystem. Floodplain vegetation provides important resting, feeding and nesting areas for many waterfowl species. Undisturbed floodplains have high natural biological diversity and productivity. River corridors are frequently used as flyways for migrating birds.

Floodplain vegetation and soils may serve as water filters, intercepting surface water runoff before it reaches the lake, stream or river. This process aids in the removal of excess nutrients, pollutants and sediments from the water and helps reduce the need for costly cleanups and sediment removal.

How are floodplains regulated?

Flood insurance studies are maintained by the Federal Emergency Management Agency (FEMA) to determine the "existence and severity of flood hazards" and to help administer both the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. In general, FEMA flood insurance rate maps (FIRMs) define the regulatory boundaries of 100-year floodplains along the rivers or streams where FIRM studies have been conducted. Site-specific studies or local

ordinances define regulatory floodplains where FEMA flood insurance rate map studies have not been conducted.

Federal laws regulating floodplain and flood impacts are contained within the National Flood Insurance Program (NFIP), a program managed by FEMA. Through the NFIP, FEMA has established minimum federal standards for floodplain regulation that are administered locally by cities and counties, with state oversight. At their discretion, however, state and local agencies can adopt local floodplain standards that are much more restrictive or comprehensive than the federal requirements. Local requirements take precedence over minimum federal criteria for the purpose of regulating development in the floodplain.

How was data collected?

Field investigation was confined to the railroad tracks and immediately adjacent lands. FEMA flood insurance rate maps were used to identify 100-year floodplains. Field investigations were conducted in November 1997, June 1999, January 2000, and March 2000. Surveys consisted of walking the study area and documenting the 100-year floodplain within and adjacent to the rail line.

Where are the floodplains located?

Floodplains or flood fringe areas are located in the northern portion of the study area. The dominant surface water features in the study area are Vancouver Lake and its tributary stream, Burnt Bridge Creek. Waters in this area are tributary to the Columbia River, which flows within 1 mile of the southern portion of the study area.

The two highest floods observed at Vancouver were from the Columbia River in June 1894 and May 1948, with peak flows of nearly 1,222,000 and 1,010,000 cubic feet per second (cfs), respectively. Stormwater discharges for Burnt Bridge Creek range from 115 cfs (10-year storm event) to 330 cfs (500-year storm event) (**Exhibit 4-8**).

Summary of Stormwater Discharges for Burnt Bridge Creek (cfs)
Exhibit 4-8

DRAINAGE AREA (SQUARE MILES)	10-YEAR STORM EVENT	50-YEAR STORM EVENT	100-YEAR STORM EVENT	500-YEAR STORM EVENT
23	115	220	255	330

Based on Federal Emergency Management Agency (FEMA) maps of the area (**Exhibit 4-9**), the 100-year floodplain lies adjacent to the study area from Burnt Bridge Creek to the northern terminus of the study area. An eight-foot box culvert connects Burnt Bridge Creek and Vancouver Lake. The culvert is functioning

Location of 100-Year Floodplain
Exhibit 4-9

properly and was designed to convey the 100-year flood flows. The railbed above the culvert is at an elevation of 42 feet and the 100-year floodplain is at an elevation of approximately 32 feet, which coincides with the top of the culvert.

Plants and Animals

This environmental resource entails the review and analysis of an area's wildlife and vegetation, fisheries, and wetlands. These are the wild areas outside of our developed yards and businesses that support species and processes important for maintaining the natural environment. Many of these wild areas adjacent to urban settings are maintained through indifference or neglect. Areas such as wetlands were once thought of as swampy, bug-filled "wastelands" that were useful only when they were filled in and developed for industry, housing, or businesses. Today, however, society is beginning to realize that wetlands are unique, natural areas, important to the ecosystem we all share, and should be conserved and protected.

The preservation of our wildlife, fisheries and vegetation has long been a priority of Washingtonians.

To preserve our wildlife, habitats, and wetlands a number of federal and state programs and regulations have been put into place. The Endangered Species Act is a federal law initially passed by Congress in 1973 in an attempt to counteract the alarming rate of species extinction. The Act provides a means of conserving plants and animal species that are currently in danger of extinction (endangered species) and those that are likely to become endangered within the foreseeable future (threatened species). It also protects the habitat needed for their survival.

The U.S. Fish and Wildlife Service and the National Marine Fisheries Service are responsible for ensuring that government and citizen actions do not further harm species that are listed as endangered or threatened, as well as for developing and implementing a plan for recovering the species to a stable population.

Washington State Department of Fish and Wildlife (WSDFW) oversees the protection and preservation of state threatened, endangered, sensitive and candidate species.

State Endangered Species are defined in WAC 232-12-297, Section 2.4, to include "any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state."

State Threatened Species are defined in WAC 232-12-297, Section 2.5, to include "any wildlife species native to the state of Washington that is likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats."

State Sensitive Species are defined in WAC 232-12-297, Section 2.6, to include "any wildlife species native to the state of Washington that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats."

State Candidate Species is defined in WDFW Policy M-6001 to include fish and wildlife species that the Department will review for possible listing as State Endangered, Threatened, or Sensitive. A species will be considered for designation as a State Candidate if sufficient evidence suggests that its status may meet the listing criteria defined for State Endangered, Threatened, or Sensitive.

The Washington Natural Heritage Program (WNHP), a part of the state Department of Natural Resources, maintains lists of state threatened and endangered plant species.

The WNHP collects data about existing native ecosystems and species to provide an objective, scientific basis from which to determine protection needs. The program also develops and recommends strategies for protection of the native ecosystems and species most threatened in Washington.

Wildlife and Vegetation

Numerous data sources were used for this analysis. The References section of this document lists these sources. Field investigation was typically confined to the rail line and immediately adjacent lands. Field investigations were conducted in November 1997, June 1999, January 2000 and October 2002.

Vegetation surveys were performed by field investigation and aerial photo interpretation. The field investigation involved walking the study area to identify plant communities, their species composition, and their approximate distribution. Aerial photographs[12] were used to delineate the boundaries of plant communities.

What types of vegetation are in the study area?

Upland vegetation communities in the study area are described in **Exhibit 4-10** and mapped in **Appendix B**. All upland plant communities are within the Western Hemlock Zone as defined by Franklin and Dyrness.[13]

Upland vegetation on the west side of the tracks outside the right-of-way (primarily in the northern quarter of the study area) is mature deciduous forest dominated by bigleaf maple (*Acer macrophyllum*), black cottonwood (*Populus balsamifera*), Spanish or American chestnut (*Castanea sativa* and *C. dentata*, respectively) or their hybrid, Garry oak (*Quercus garryana*), white poplar (*Populus alba*), and red alder (*Alnus rubra*). Dominant native understory shrubs include snowberry (*Symphoricarpos albus*), Indian-plum (*Oemleria cerasiformis*), thimbleberry (*Rubus parviflorus*), and hazelnut (*Corylus cornuta*).

Native vegetation also occurs on the east side of the Vancouver rail yard north of West 39th Street. This hill slope is dominated by native and non-native trees and shrubs. The most common species include Douglas fir, red alder, and black cottonwood trees.

Disturbed areas associated with the existing rail activity and other industrial lands have been colonized by Himalayan blackberry (*Rubus discolor*), domestic cherry (*Prunus domestica*), crab grass (*Digitaria* spp.), quackgrass (*Agropyron repens*), and many other weeds. Ongoing disturbance throughout the study area and adjacent industrial properties have extensively disturbed upland soils in these areas.

Are there any threatened and endangered plant species in the study area?

Information on threatened and endangered plant species (TES) and priority habitats potentially occurring in the study area was obtained from the Washington

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[12] Washington Department of Natural Resources orthophoto quads, 1990 series, scale 1:12,000, black-and-white, for the SW and NW quarters of T2N R1E

[13] J.F. Franklin and C.T. Dyrness, Natural Vegetation of Oregon and Washington, (Corvallis, Oregon: Oregon State University Press, 1988)

Upland Vegetation Communities in the Study Area

Exhibit 4-10

VEGETATION COMMUNITY	COMMUNITY DESCRIPTION
UNVEGETATED	No plants except occasional weeds growing in surfaces covered by pavement, buildings, or gravel. Occurs primarily in the heavily used portions of the Vancouver Yard, in the southern half of the project area; or between closely-spaced existing tracks.
RUDERAL	Disturbed, primarily weedy/invasive herb and shrub vegetation dominated by Himalayan blackberry (*Rubus discolor*), crab grass (*Digitaria* spp.), quackgrass (*Agropyron repens*), domestic cherry (*Prunus domestica*), and many other weeds. Approximately 65% of this type is covered by shrubs, and the rest is herb dominated. Occurs throughout the project area and is the dominant vegetation within the ROW north of the Fourth Plain Boulevard bridge.
YOUNG MIXED HARDWOOD	Often sparse forest of red alder (*Alnus rubra*) with secondary black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), bigleaf maple (*Acer macrophyllum*), Douglas-fir (*Pseudotsuga menziesii*), and western red cedar (*Thuja plicata*). Dominant trees are less than 12 inches diameter breast height (dbh) (usually much less). Dominant understory shrubs include Himalayan blackberry, Indian-plum (*Oemleria cerasiformis*), salmonberry (*Rubus spectabilis*), and hazelnut (*Corylus cornuta*). Occurs in many locations north of the West 39th Street crossing.
SUBMATURE COTTONWOOD	Forest of black cottonwood with secondary bigleaf maple, Garry oak (*Quercus garryana*), white poplar (*Populus alba*), and red alder. Dominant trees are 12 to 24 inches dbh. Dominant native understory shrubs include snowberry (*Symphoricarpos albus*), Indian-plum (*Oemleria cerasiformis*), thimbleberry (*Rubus parviflorus*), and hazelnut (*Corylus cornuta*). Primarily occurs north and south of the Burnt Bridge Creek crossing.
MIXED MATURE	Forest dominated by bigleaf maple, red alder, Douglas-fir, and black cottonwood with an average tree size greater than 12 inches dbh. Dominant understory shrubs include salmonberry, Indian-plum, sword fern (*Polystichum munitum*), Himalayan blackberry, and hazelnut. Occurs on a bluff east of the project area in the general vicinity of West 50th Street.

Department of Natural Resources Natural Heritage Program (WNHP), the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species Program, and the U.S. Fish and Wildlife Service (USFWS). This information was used in conjunction with the wildlife and habitat survey data to assess the potential presence of protected species/habitats in the study area.

A biological assessment was prepared for this project. This assessment addresses potential project impacts to several species that are listed as Threatened or Endangered under the Endangered Species Act. Species addressed include: steelhead, Chinook salmon, chum salmon, bull trout and the Bald Eagle. Steelhead have historically used habitats within the Burnt Bridge Creek drainage. The other fish species are primarily associated with the Columbia River. A potential Bald Eagle nest site occurs within 1 mile of the project area and wintering eagles may use habitats throughout the Vancouver Lake area for perching and foraging. The project site is not known to contain important food resources or perching habitat for Bald Eagles.

Information from WNHP indicates there are no records for TES plant species in the immediate vicinity of the study area. Habitats in the study area are not expected to support TES plants based on the general level of disturbance and lack of habitat. The Washington Natural Heritage Program has no records of such species in the study area.

What types of wildlife and habitats are located in the study area?

Most of the study area (74 percent) is industrial with little or no wildlife use. The remaining habitat (26 percent) is ruderal, young mixed hardwood, submature cottonwood, and mixed mature forest (**Exhibit 4-10**).

Are there any Special-Status Wildlife Species in the study area?

Exhibit 4-11 summarizes information on special-status species that potentially occur in the vicinity of the study area, and **Appendix C** presents a detailed description of these species. Federally listed endangered species are identified as those species in immediate peril of becoming extinct from a large portion of their range. As **Exhibit 4-11** indicates, no federally listed endangered species is likely to rely on the habitat within the study area.

Are there any Threatened Species in the study area?

Federally listed threatened species are species likely to become endangered within the foreseeable future if current threats continue. Two federally listed threatened species are known to be present in the general area of the project: bald eagle and Aleutian Canada goose.

Wetlands

Numerous data sources were reviewed for information on vegetation patterns, topography, drainage, soils, and potential or known wetlands in the study area, including:

- National Wetland Inventory (NWI) maps;
- U. S. Geologic Survey (USGS) 7.5-minute topographic maps; and
- Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service) soil survey maps.

In addition, field investigations were conducted in November 1997, June and October 1999, and March 2000.

Special-Status Species that Potentially Occur in the Study Area
Exhibit 4-11

SPECIES	STATUS*	HABITAT ASSOCIATION	POTENTIAL TO USE IMPACTED AREAS
Bald Eagle	FT	Large streams, rivers, lakes, and mature coniferous forest	Yes; wintering, foraging, and nesting adjacent to Vancouver Lake
Aleutian Canada Goose	FT, ST	Croplands, meadows, upland, and marsh environments	Yes; possibly stops at Vancouver Lake during migration
Oregon Spotted Frog	FC, SE	Marshy edges of ponds, lakes, and wetlands	No; no known locations and limited distribution of species
Western Toad	FC	Ponds, streams, lakes, and slow- moving rivers	No; no known location and limited distribution of species
Pacific Western (Townsend's) Big-Eared Bat	FSPOC	Roosts in caves, mines, tunnels, or abandoned buildings	No; lack of roosting habitat
Myotis (Fringed, Long-Legged, Long-Eared) (Bats)	FSPOC	Roosts in caves, mines, tunnels, or abandoned buildings	No; lack of roosting habitat
Olive Sided Flycatcher	FSPOC	Forest and woodlands, tall trees with dead branches	No; lack of nesting trees
Sandhill Crane	SE	Meadows, grain field, large marshes, and shallow ponds.	Yes; marginal foraging and breeding habitat; may winter at Vancouver Lake
Western Pond Turtle	SE	Marshes, sloughs, ponds, and lakes	Yes; within historic range and wetland complex at Burnt Bridge Creek is potentially suitable for breeding
Lewis' Woodpecker	SC	Cottonwood riparian areas with snags and brushy undergrowth	Yes; potential wintering habitat
Pileated Woodpecker	SC	Mature coniferous forest	Yes; although limited, suitable forage and nesting habitat is present
Gray Tailed Vole	SC	Farmland, pasture, railroad, and highway ROW	Yes; although limited suitable habitat exists along the edge of the railroad
Vaux's Swift	SC	Old growth component and high snag density	No; lack of nesting habitat
White-Breasted Nuthatch	SC	Oak or oak-conifer woodlands, or other open canopy hardwood forests	Yes; northern extent of Oregon population ranges to the West of Vancouver Lake; may be present during breeding season
Purple Martin	SC	Nests in cavities, both natural and artificial. Requires open areas with abundant flying insect supply	Yes; potential nesting and foraging habitat within project area
Northern or Brush Prairie Pocket Gopher	SC	Open vegetation types ranging from lowland prairies to mountain meadows; key elements are adequate supply of herbs and dry soil suitable for burrowing	Yes; occurs in City of Vancouver. May be present in fields and grassy areas adjacent to project area
Red-Tailed Hawk	SI	Open fields, forest edge	Yes; suitable perching, nesting, and foraging habitat
Band-Tailed Pigeon	SI	Coniferous forest	No; lack of suitable habitat
Cavity-Nesting Ducks	SI	Tree cavities adjacent to lakes, ponds, slow-moving waters	Yes; may nest in second growth stands adjacent to project area and winter in Vancouver Lake
Great Blue Heron	SI	Fresh and saltwater wetlands	Yes; expected to forage along edge of Vancouver Lake adjacent to project area
Osprey	SI	Nests constructed in large snags or live trees with flat tops; preys on fish captured near water surface	Yes; foraging in Vancouver Lake and waterways adjacent to project area
Waterfowl, Regular Concentrations	SI	Open water, wetlands, ponds, or lakes	Yes; winter at Vancouver Lake and Burnt Bridge Creek
Songbirds and Small Mammals	SI	Variable habitat types	Yes; breeding and foraging observed throughout the project area

*Status: FT = federal threatened; FC = federal candidate; FSPOC = federal species of concern; SC = state candidate; ST = state threatened; SE = state endangered\; SI = species of interest

Field investigations were typically confined to the rail line and immediately adjacent lands. Field investigations included:

- wetland delineation and classification,
- wetland functional assessment, and
- assessment of potential project impacts.

How were wetlands delineated and classified?

Wetlands within the study area were delineated[14] using the Routine Determination Method outlined in the Washington State Wetland Identification and Delineation Manual[15] and the U.S. Army Corps of Engineers Wetland Delineation Manual.[16] In general, wetland delineation consisted of three main tasks:

1. Assessing vegetation, soil, and hydrologic characteristics to identify areas that meet the wetland identification criteria;
2. Evaluating constructed drainage features to determine if they would be regulated as wetlands; and
3. Marking wetland boundaries with delineation flags. Wetlands were then classified according to the U.S. Fish and Wildlife Service (USFWS) classification system and rated using the Washington Department of Ecology four-tier wetland rating system.[17] Wetlands were also rated according to local wetland ordinances.

The study area is located within two local jurisdictions: Clark County and the City of Vancouver. Both the County and the City have wetland regulations and a five-tiered wetland rating system. The County wetland inventory map shows wetlands associated with Burnt Bridge Creek at the north end of the improvement area. **Appendix D** provides a more detailed overview of the delineation process.

What type of wetlands are in the study area?

The National Wetlands Inventory (NWI) shows a complex of palustrine and lacustrine unconsolidated bed habitats and palustrine forested (PFO), shrub (PSS), and emergent (PEM) wetlands in the vicinity of the study area, primarily at the north end. These wetlands are associated with Vancouver Lake and three tributaries: Burnt Bridge Creek and two unnamed creeks.

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[14] *Delineation means that the jurisdictional boundary of an identified wetland is marked in the field by a qualified specialist.*

[15] *Washington State Department of Ecology, Washington state wetland identification and delineation manual. Ecology Publication #96-94. Olympia, Washington, 1997.*

[16] *Environmental Laboratory. 1987. Corps of Engineers wetland delineation manual. (Technical Report Y-87-1.) Environmental Laboratory, Department of the Army, Waterways Experiment Station. Vicksburg, MS.*

[17] *Washington State Department of Ecology, Washington state wetlands rating system. (Publication 93-74.) Olympia, WA, 1993.*

Data for Wetlands Delineated in the Study Area

Exhibit 4-12

		CLASSIFICATION			
WETLAND	WATERSHED	USFWS[1]	LOCAL[2]	BUFFER REQUIREMENT (FT)[2]	STATE[3]
E1	Vancouver Lake	PFO, PSS, PEM	4	50	III
E2	Vancouver Lake	PFO, PEM	I	300	I
E3	Burnt Bridge Creek/ Vancouver Lake	PEM, PFO	I	300	I
W1	Vancouver Lake	PFO, PEM	I	300	I

[1]Cowardin et al. (1979), PFO = palustrine forested, PEM = palustrine emergent, PSS = palustrine scrub-shrub.

[2] City of Vancouver wetland protection ordinances.

[3]Washington State Department of Ecology (1993).

Four wetlands were identified in the study area (**Exhibit 4-12 and Appendix B sheets 1 and 2**). The wetlands consist of forest, shrub, and emergent plant communities. Wetland E1 is associated with the northernmost tributary to Vancouver Lake. A small urban stream called Cold Canyon Creek drains through Wetlands E2 and W1. Wetland W1 is also associated with the active floodplain of Vancouver Lake. Wetland E3 is associated with Burnt Bridge Creek. Wetlands E1, E2 and E3 are all situated between the railroad grade and Northwest Lakeshore Avenue and all have been modified topographically and hydrologically by grading activities and by the additions of culverts. The east edge of Wetland W1 has been modified by construction of the original railroad grade.

Descriptions of these wetlands are provided in the following paragraphs.

Wetland E1

Wetland E1 lies east of the tracks at the north end of the study area. It is confined to the area between Northwest Lakeshore Avenue and the railroad grade, and includes a small, unnamed stream. The wetland includes forested, shrub, and emergent habitats. Portions of Wetland E1 extend north and east of the study area.

Wetland E1 is apparently supported primarily by perennial groundwater seepage and surface runoff that derives from the hillslope east of Northwest Lakeshore Avenue. The water collected in the wetland drains to the north to a culvert north of the study area. Wetland E1 has forested, shrub, and emergent habitat types. The dominant tree is black cottonwood. Understory species include reed canarygrass (*Phalaris arundinacea*) and lady fern (*Athyrium filix-femina*). Emergent vegetation is dominated by American speedwell (*Veronica americana*), climbing nightshade (*Solanum dulcamara*), and cattail (*Typha latifolia*). Shrub habitats are dominated by Scouler willow (*Salix scouleriana*) and Pacific ninebark (*Physocarpus*

capitatus). These species are classified as wetland plants by Reed,[18] and therefore, the hydrophytic vegetation criterion is met.

Soil in Wetland E1 is silty sand that does not match the description for the mapped soil unit, Hillsboro silt loam. The soil has hydric characteristics, including a low matrix chroma in the upper twelve inches, and therefore meets the hydric soils criterion.

Wetland Classification

Wetland E1 is a permanently or semi-permanently flooded/saturated palustrine forest (PFO), palustrine scrub-shrub (PSS), and palustrine emergent (PEM) wetland approximately two acres in size. The wetland is disturbed in that it has been cut and filled and has been subject to dumping. It is a Category III wetland under the Washington State Department of Ecology's four-tier rating system, and a Category 4 wetland under the City of Vancouver critical areas regulations because it is not known to be used by threatened or endangered species and is less than five acres in size. The City requires a 50-foot buffer around Category 4 wetlands.

Wetland E2

Wetland E2 is located north of the spur at Rye Junction that begins the Burnt Bridge Creek rail line at the north end of the study area. The wetland occupies a deep, closed depression bounded on the west by the rail fill and on the east by Northwest Lakeshore Avenue. Wetland E2 extends east of the study area and includes Cold Canyon Creek, a small tributary to Vancouver Lake. The wetland includes forested and emergent habitat areas. Evidence of past beaver activity was observed on small-diameter cut stumps in this wetland.

Hydrology for this wetland derives from Cold Canyon Creek which flows into the wetland via a culvert under Northwest Lakeshore Avenue. Water flows from the wetland into a small drainage opening that passes under the railroad grade and emerges in Wetland W1 in what is locally called a "boil." No culvert structure was observed from either side of the railroad grade.

Because the outlet in this basin is restricted, the wetland is subject to significant seasonal fluctuations of water depths. Based on the stranded flotsam and sediment deposits on the current year's leaf crop, the wetland is subject to water level changes between six and eight feet. The frequency, timing, and duration of such fluctuations are unknown. Water was not ponded in the wetland at the time of any of the field investigations. However, the presence of saturated soils and signs of ponding during the growing season provide sufficient evidence that the wetland hydrology criterion is met.

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[18] *P.B. Reed, Jr., National list of plant species that occur in wetlands: Washington. (Biological Report NERC-88/18.47.), (Washington, DC: National Wetlands Inventory, 1988) and P.B. Reed, Jr., Northwest supplement (Region 9) species with a change in indicator status or added to the Northwest 1988 list, wetland plants of the state of Washington 1988. (WELUT – 88 (26.9).), (Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service, 1993).*

Wetland E2 supports small areas of forest and emergent plant communities. The forest community is dominated by Oregon ash (*Fraxinus latifolia*) and black cottonwood with an understory of American highbush cranberry (*Viburnum opulus* ssp. *trilobum*), Scouler willow, and Nootka rose (*Rosa nutkana*). The emergent community is dominated by water-parsley (*Oenanthe sarmentosa*), dock (*Rumex obtusifolius*), and climbing nightshade. These species are classified as wetland plants by Reed;[19] therefore, the hydrophytic vegetation criterion is met.

Soils in Wetland E2 are indicative of prolonged saturation and/or inundation. The soils do not match the description for the mapped unit, Hillsboro silt loam. The soil profile consists of silty sand with low matrix chroma in the upper eighteen inches. Therefore, the hydric soils criterion is met.

Wetland Classification

Wetland E2 is a seasonally flooded/saturated PFO and PEM wetland approximately 0.2 acre in size. It is a Category I wetland according to Ecology's rating system and a Category I wetland under City of Vancouver regulations because it has the potential to provide rearing habitat for steelhead trout spawned in nearby waters. No verified use by steelhead is known, but a conservative approach assumes that they could access the wetland and stream. Category I wetlands are protected with a 300-foot buffer.

Wetland E3

This wetland is associated with Burnt Bridge Creek near the north end of the study area, on the east side of the rail line. The wetland is associated with the floodplains of Burnt Bridge Creek and Vancouver Lake. The wetland is bounded on the east by the road fill of Northwest Lakeshore Avenue and on the west side by rail fill. The north and south limits of the wetland are defined by natural rises in topography. Wetland E3 extends east beyond the study area.

Hydrology for this wetland derives from periodic flooding of Burnt Bridge Creek and from seasonal changes in the lake level of Vancouver Lake. The creek enters the wetland via a large-diameter culvert under Northwest Lakeshore Avenue, and exits the wetland via a six- to eight-foot diameter concrete box culvert under the railroad grade. Based on observation of flotsam and drift lines, the wetland is subjected to a maximum inundation of six to seven feet above the water levels present at the time of this investigation. The frequency, timing, and duration of such inundation events are unknown. However, soils were saturated and water was ponded in vegetated areas of the wetland at the time of investigation. A large open water area exists at the eastern culvert. The wetland hydrology criterion is met based on the presence of ponded water and saturated soils in this wetland.

Wetland E3 supports an emergent plant community dominated by rice-cutgrass (*Leersia oryzoides*) and lesser amounts of reed canarygrass. A narrow strip of forest community is dominated by Oregon ash with an understory of reed canarygrass. Other abundant species include an unidentified iris species (*Iris* sp.)

[19] *Ibid.*

and beggars-tick (*Bidens frondosa*). These species are classified as wetland plants by Reed,[20] therefore, the hydrophytic criterion is met.

Soils in this area have not been mapped. Soil characteristics in Wetland E3 are indicative of prolonged saturation and/or inundation. The soil profile consists of silt with low matrix chroma colors and strong sulfidic odors. These characteristics meet the criteria for hydric soils.

Wetland Classification

Wetland E3 is a one to 1.5 acre, seasonally flooded to permanently saturated, PEM and PFO wetland associated with Burnt Bridge Creek and the active floodplain of Vancouver Lake. It is a Category I Wetland according to Ecology's rating system and a Category I Wetland according to the City of Vancouver regulations because it is associated with Burnt Bridge Creek which contains anadromous fish, and has documented historic use by steelhead, which are listed as Threatened. The City requires a 300-foot buffer to be maintained around Category I wetlands.

Wetland W1

This large forested and emergent wetland is located at the north end of the study area, on the west side of the rail line. It is bounded on the east by the rail grade and extends west, beyond the study area, toward Vancouver Lake. The southernmost boundary of Wetland W1 is 500 feet north of Burnt Bridge Creek. Cold Canyon Creek emerges from the base of the rail grade and meanders through Wetland W1 and drains into Vancouver Lake. Wetland W1 is associated with the active floodplain of the lake.

The majority of wetland W1 is located outside the survey corridor. However, portions of the northern and southernmost sections of the wetland buffer extend into the project site.

Water enters the wetland from groundwater seeps at the edge of the railroad ballast. Additional water is supplied by changing water levels in Vancouver Lake. Vancouver Lake is tidally influenced. At the time of the field investigation, water was flowing in the stream channel within the wetland and was ponded in a few shallow depressions. Soils were generally saturated to the surface. The presence of ponded water and saturated soils in this wetland indicate the wetland hydrology criterion is met.

Wetland W1 is a primarily forested habitat dominated by black cottonwood, Pacific willow (*Salix lasiandra*), and Oregon ash. Understory shrubs are rare. The herbaceous understory is dominated by reed canarygrass, water-parsley, and stinging nettle (*Urtica dioica*). Reed[21] classifies these species as wetland plants; therefore, the vegetation in Wetland W1 is hydrophytic. Within the study area, the southern portion of wetland W1 is a palustrine forested habitat dominated by black cottonwood. Vegetation under the tree canopy is sparse; however, the fringes of the wetland are dominated by reed canarygrass, water-parsley, and stinging nettle

[20] *Ibid.*
[21] *Reed, 1988 and 1993.*

(*Urtica dioica*). Outside the study area, the wetland is a mosaic of forested and emergent habitats dominated by Oregon ash, cottonwood, and reed canarygrass.

Soils characteristics in Wetland W1 do not match the description for the mapped unit but are indicative of prolonged saturation and/or inundation. In the southern portion of the wetland the soil profile consists of silty clay loams and loamy sand with low matrix chroma colors with mottles. These characteristics meet the technical requirements for hydric soils.

The soil profile for the northern portion of Wetland W1 consists of sands and sandy silts with low matrix chroma colors with mottles.

Wetland Classification

Wetland W1 is an approximately thirty-acre, seasonally flooded PFO and PEM wetland associated with the floodplain of Vancouver Lake and an unnamed tributary. It is a Category I wetland according to Ecology's rating system, and a Category 1 wetland under the City of Vancouver critical areas regulations because it is a forested habitat greater than one acre outside an urban area. The City requires a 300-foot buffer for Category 1 wetlands.

Were wetland functions identified?

Each wetland was evaluated for its ability to perform each of the following eight functions: flood/stormwater control, base flow/groundwater support, erosion/ shoreline protection, water quality improvement, biological support, general habitat functions, specific habitat functions, and cultural/socioeconomic values.

Wetland E1

The two most important functions provided by Wetland E1 are flood and stormwater control and water quality improvement. The location of the wetland in a depression with a constrained outlet provides high water storage capacity with a slow release. This minimizes downstream stormflows, protecting the stream channel and adjacent wetland habitats. The dense vegetation provides excellent water filtration functions by slowing flows and allowing pollutants to settle out or be biochemically removed by vegetation during the growing season. The dense vegetation also provides erosion control along the stream channel. The groundwater seepage provides base flow support for the stream and downstream wetland habitats.

Wetland E1 provides biological support functions because it has a complex vegetation structure, open water pools, significant primary productivity, export of food sources, and its vegetation consists primarily of native plant species. Because this wetland is relatively small, has low habitat diversity, and is surrounded by developed areas, it has limited ability to provide general habitat functions as described by Cooke.[22] It provides some specific habitat for invertebrates small birds. The wetland provides limited opportunities for recreation and nature observation.

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[22] *S.S. Cooke, Wetland and buffer functions semi-quantitative assessment methodology. Draft user's manual. (Seattle, WA: Cooke Scientific Services, 1997).*

Wetland E2

Wetland E2 provides the same flood/stormwater control, water quality improvement, base flow/groundwater support, and erosion/shoreline protection functions as Wetland E1 because it is also situated in a depression with a confined outlet. The primary difference is that this wetland is about one-tenth the size of Wetland E1 so the total values of the functions provided are less. Its biological support and general habitat functions are also the same as Wetland E1 except that the small stream channel is present within the wetland. Its cultural/socioeconomic values are very limited because it is so small and closely surrounded by the railroad grade, the adjacent road, and invasive Himalayan blackberry in much of its upland buffer.

Wetland E3

Wetland E3 has limited capacity to provide flood/stormwater control functions because it is situated in an unconfined drainage. The dense vegetation provides water quality improvement and erosion/shoreline protection functions. Its location within the active floodplain of Vancouver Lake increases the opportunity for the wetland to perform these functions. This wetland may provide some base flow/groundwater support to Burnt Bridge Creek due to its size and its potential for helping maintain cool water temperatures during the warmer portion of the growing season.

Wetland E3 provides biological support because it maintains permanent surface water and provides moderate to high primary productivity, organic accumulation, and export to a salmon-bearing stream. Its general habitat functions are limited because of its relatively small size, lack of habitat diversity, and disturbed surroundings. This wetland provides very important habitat for fish, including at least one federally listed species. The forested edge provides good bird habitat and the perennial surface water provides habitat for a variety of invertebrates. This wetland provides some cultural/ socioeconomic values because of its size, habitat types, and proximity to public access areas along the lake.

Wetland W1

Wetland W1 is, at approximately thirty acres in size, by far the largest of the four wetlands in the study area and provides the most functions due to its size, less disturbed nature, and association with the floodplain of Vancouver Lake. Its large size provides a significant amount of flood/stormwater control, erosion/shoreline protection, and water quality improvement functions. The dense emergent layer throughout most of this relatively flat wetland provides significant water quality filtration and pollutant uptake functions. It provides baseflow support to the lake due to its associated drainages and groundwater seeps and its forested communities.

Wetland W1 provides excellent biological support because its plant communities are productive, provides organic material export, has moderately complex vegetation structure and plant diversity, and is connected to both upland habitats and the lake. Its size provides refuge functions for wildlife and its structural

complexity provides habitats for a variety of wildlife, including passerine birds, waterfowl, predatory birds, invertebrates, small mammals, and some amphibians.

Fisheries

Numerous data sources were used to identify and collect information regarding fish habitat in the study area. These methods are consistent with current federal and state agency requirements.

What sources of information were used?

Field investigations, typically confined to the railroad tracks and immediately adjacent lands, were conducted in November 1997, June 1999 and January 2000.

Surveys consisted of walking the study area and documenting species and habitats within and adjacent to the rail line. Habitat types and potential hydrological barriers were noted.

Other sources of information were used for this review, including:

- U.S. Geological Survey (USGS) 7.5-minute topographic maps;
- Species identified by NMFS and USFWS correspondence regarding potential presence of Federally listed species in the study area;
- Priority Habitats and Species (PHS) maps distributed by the Washington Department of Fish and Wildlife (WDFW);
- Occurrence of threatened, endangered, and sensitive (TES) fish species as described by the WDFW Stock Inventories for Salmon and Steelhead, bull trout and cutthroat trout;
- Occurrence of sensitive fish and sensitive habitats inventoried by the Washington Natural Heritage Program (WNHP);
- Published literature; and
- Discussions with regional fisheries biologists.

Information on threatened and endangered species (TES) and priority habitats potentially occurring in the study area was obtained from the WNHP, the WDFW Priority Habitats and Species Program, WDFW staff, the National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS). This information was used in conjunction with the fish and habitat survey data to assess the potential presence of protected species/habitats in the study area.

Are fish present in the study area?

An electroshock survey conducted by WDFW in the winter of 1997 found that Burnt Bridge Creek is used by a variety of salmonids, including juvenile coho salmon (*Oncorhynchus kitsutch*), cutthroat trout (*O. clarki clarki*), and rainbow trout (*O. mykiss*), as well as by a variety of nonsalmonids, including suckers (*Catastomus* sp.), sculpins (*Cottus* sp.), three-spine stickleback (*Gasterosteus aculeatus*), bullhead catfish (*Ictalurus* sp.), western brook lamprey (*Lamperia richardsoni*), peamouth (*Myocheilus caurinus*), dace (*Rhinichthys* sp.), and redside shiner (*Richardsonius balteatus*). Historical data indicate that the stream formerly

supported chinook and chum salmon and steelhead.[23] Mohoric[24] reported limited use of the Burnt Bridge Creek watershed by steelhead and cutthroat trout. The stream contains no passage barriers and all habitat is potentially accessible to fish; the effects of urbanization appear to limit the stream's utility for fish rearing.

Waters in the study area support one evolutionary significant unit (ESU)[25] of salmonids that have been listed as threatened—the Lower Columbia River steelhead ESU. The Southwestern Washington/Columbia River cutthroat ESU has been proposed for listing as threatened. The Lower Columbia River/Southwestern Washington coho salmon ESU is a candidate for listing. Use of Burnt Bridge Creek by these species is limited by the impacts of urbanization[26].

In addition to the salmonid ESUs which are known to use Burnt Bridge Creek, other Lower Columbia River salmonids could hold in Vancouver Lake. These include the Lower Columbia River chinook salmon ESU (threatened) and Columbia River chum salmon ESU (threatened). Bull trout (Columbia River Distinct Population Segment [DPS], threatened) have not been documented in Burnt Bridge Creek or Vancouver Lake but may occur below the study area in the Columbia River. Although some of these species are known to use rearing and spawning habitats above the railbed crossing in the Burnt Bridge Creek drainage, salmonid use at the Burnt Bridge Creek crossing is limited to primarily migration. The crossing is located at the creek's confluence with Vancouver Lake. Areas in the lake may provide holding habitat for upstream migrating adults and transitional habitat for downstream migrating juveniles, but use of this area would be highly transitory, occurring almost entirely during the upstream and downstream migratory periods. There is negligible rearing and no spawning habitat at or immediately downstream of the Burnt Bridge Creek culvert under the railbed. **Appendix E** provides a detailed discussion of these species.

Energy

Energy and its conservation are important factors to consider when implementing a transportation program.

How much energy is used for passenger rail service?

Amtrak *Cascades* service on this portion of the Pacific Northwest Rail Corridor consists of three daily Talgo train round trips and one round trip by Amtrak's *Coast Starlight*. The idle fuel consumption rate for the engines that pull the train is sixty gallons per hour. The track distance within the study area is approximately four miles. Using the 1.77 gallons/mile rate, fuel consumption for the eight daily passenger train trips through the study area is 56.6 gallons of diesel fuel. Freight

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[23] *Weinheimer, 1999 and Jones & Stokes Associates, Inc. 1999. Thurston Way interchange. Biological assessment. July 26. (JSA G001-005.) Bellevue, WA. Prepared for Washington State Department of Transportation. Vancouver, WA.*

[24] *Mohoric, K. Habitat biologist. Washington Department of Fish and Wildlife (WDFW). July 12, 1999 – telephone conversation.*

[25] *An Evolutionary significant unit is a term used under the Endangered Species Act to denote a particular population of animals that is to be protected under provisions of the act.*

[26] *Ibid*

trains consume approximately 2,932 gallons of diesel fuel. Delays to passenger trains caused by freight rail operations result in approximately 1.36 hours of passenger train delays, which consumes approximately 81.6 gallons of diesel fuel.

What other energy is used in the study area?

Electrical energy is used on the right-of-way to operate switches, crossing guards and communication devices. This energy is supplied throughout the corridor by The Burlington Northern and Santa Fe Railway Company which owns the right-of way. In addition, each train operates electrical equipment such as radios, through on-board power generation.

Yard operations in the Vancouver rail yard consume diesel fuel. In addition, rail and yard operations result in the closure of the West 39th Street at-grade crossing for approximately eight hours per day. Vehicles stopped at the crossing consume fuel while delayed.

Environmental Health

Environmental health analysis entails review of noise and vibration conditions in the study area as well as the location and disposal of hazardous materials.

Noise and Vibration

This section provides a general discussion of existing noise and vibration levels in the study area. More detailed information and methodology can be found in the *Noise and Vibration Discipline Report*.[27]

Noise

An increase in noise can affect the peacefulness of your home, the sacredness of your religious institution, or the serenity of a park or historic site. It is, therefore, important to measure changes in noise.

Passenger train noise varies because of operating factors and conditions. Operating factors include the type of train, the number and length of trains, and operating speeds. Conditions include the number of curves on the tracks, track maintenance, and the terrain in which the track is set. In addition, grade crossings require certain whistles and warning bells. The significance of the noise depends not only on conditions, but also on the particular land uses and activities that occur along the corridor and their sensitivity to noise.

How was noise measured?

The project team monitored existing noise levels in the study area and predicted future noise levels were calculated using the Federal Transit Administration (FTA) manual, Transit *Noise and Vibration Impact Assessment* (April 1995).[28]

[27] *Available from the WSDOT Rail Office.*

[28] *The FTA manual is the standard manual used to calculate noise impacts related to rail.*

Noise is measured in decibels (dB), a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight". The A-weighted scale corresponds to the sensitivity range for human hearing. Noise levels are measured in dBA, the A-weighted sound level in decibels. When noise levels change three dBA, the change is considered to be barely perceptible to human hearing. However, a five dBA change in noise level is clearly noticeable. A ten dBA change in noise levels is perceived as a doubling or halving of noise loudness, while a 20 dBA change is considered a dramatic change in loudness.

The Ldn is used to analyze transit noise levels and identify noise impacts. The Ldn is defined as the descriptor for cumulative 24-hour exposure to noise. The Ldn is calculated using daytime and nighttime equivalent steady-state sound level measurements (Leq's). The Leq is the descriptor, which, in a stated period of time, contains the same acoustic energy as the time-varying sound level during the same period. Leq can be considered the average sound level. In the computation of an Ldn, nighttime Leq's are given an extra ten dB to account for the average person who considers noise at nighttime to be a nuisance. Therefore, an increase in the nighttime noise events will have a larger impact on the Ldn than will an equivalent increase in the number of daytime noise events.

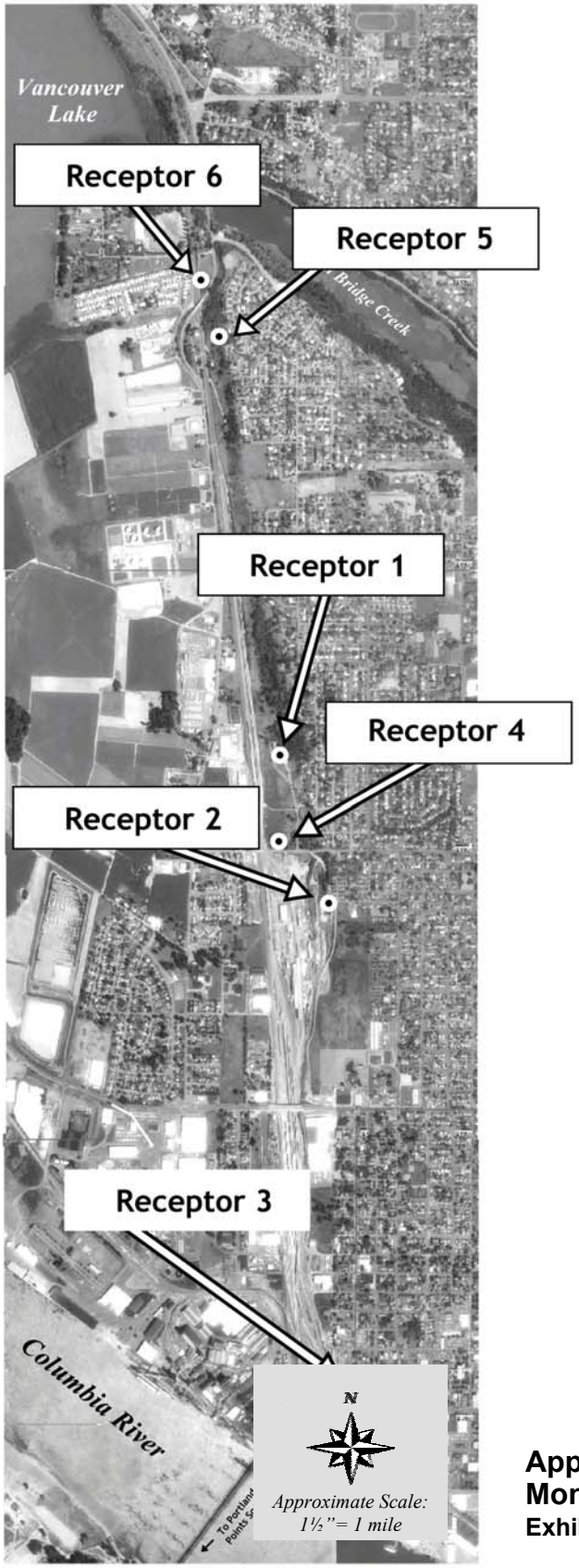
What are the current noise levels in the study area?

The Washington State Department of Transportation collected 24-hour noise monitoring data at six locations in the study area. These locations were chosen by the project team as being representative of the ambient noise environment that exists in the immediate vicinity of the rail yard. Twenty-four consecutive one-hour Leq measurements were taken at these locations, and an Ldn was calculated at each site. **Exhibit 4-13** presents the monitoring locations and findings. **Exhibit 4-14** shows the approximate location where these sites are located.

Noise Monitoring in the Study Area

Exhibit 4-13

RECEPTOR ID	LOCATION	LDN
1	Two isolated residences east of the track at Northwest 44th Street.	67 dBA
2	Along the top of the bluff near the new Columbia Crest housing development.	63 dBA
3	Residences adjacent to the commercial land that is east of the track between West 11th Street and West Fourth Plain Boulevard	78 dBA
4	North side of 39th Street, on the hill above the rail yard, west of Rose Street	72 dBA
5	1730 NW Trillium Lane	73 dBA
6	West side of rail tracks, across from 1901 NW 69th Circle (formerly 6801 Whitney Lane)	70 dBA



Approximate Location of Noise Monitoring Sites
Exhibit 4-14

This 24-hour monitoring data includes all freight train activity in the Vancouver yard area. Locomotive horns used at the grade crossing are included in this data, as are stationary trains preparing for crew changes. The monitoring data also includes noise from sources that are not related to the Vancouver yard activities. This includes jet engines (from airplanes), vehicular traffic from nearby roadways, and any noise from people and animals (like dogs barking) near the monitoring location.

Vibration

The vibration assessment was also based on the Federal Transit Administration (FTA) manual, and included an evaluation of low frequency noise emissions. Low frequency noise emissions can be perceived as vibration. The analysis also included evaluation of ground-borne vibration.

What is ground-borne vibration?

Ground-borne vibration can be a concern of neighbors close to a freight system. In contrast to air-borne noise, ground-borne vibration is not a common environmental problem. It is unusual for vibration from sources such as trucks and busses to be perceptible, even in locations that are close to major roadways. However, some common sources of ground vibration are trains, buses on rough roads, and construction activities like pile driving, blasting, and heavy earth-moving equipment.

Train wheels rolling on the rails create vibration energy, which is transmitted through the track support system into the ground. The vibrating transit structure excites the adjacent ground creating vibration waves that propagate through the soil and rock layers to the foundations of nearby buildings. The vibration energy continues to propagate from the foundation throughout the structure of the building. People may perceive this energy as vibrations, or if the walls of the structure radiate the energy, a rumbling sound.

Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by ten vibration decibels (VdB) or less. The vibration levels from any source can be ten decibels higher than normal if there is unusually rough road or track, wheel flats, geologic conditions that promote efficient propagation of vibration, or vehicles with very stiff suspension systems. The effects of ground-borne vibration include a perceivable movement of the building floors, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. Building damage is not a factor for normal transportation projects with the occasional exception of blasting and pile driving during construction. These are extreme cases.

Diesel powered trains differ in their overall length, number and size of locomotives, and number of heavily loaded cars. Typically, locomotives and rail cars with wheel flats are the sources of the highest vibration levels. Because locomotive suspensions are similar, the maximum vibration levels of passenger and freight locomotives are similar. It is not uncommon for freight trains to be the source of intrusive ground-borne vibration at distances of approximately fifty feet from the tracks. However, there are relatively few new freight lines in this country; most

Common Vibration Sources and Human and Structural Response

Exhibit 4-15

HUMAN/STRUCTURAL RESPONSE	VELOCITY LEVEL (VDB)	TYPICAL SOURCE (AT 50 FEET)
Threshold of minor cosmetic damage to fragile buildings	100	Blasting from construction projects
Difficulty with tasks such as reading a computer screen	90	Bulldozers and other heavy equipment at construction sites
Residential annoyance from infrequent events (i.e. Commuter trains)	80	Upper range for typical rapid transit trains
Residential annoyance from frequent events (i.e. Rapid transit trains)	70	Bus or truck driving over bumpy road, typical rapid transit trains
Limit for vibration sensitive equipment*. Approximate threshold for human perception of vibration.	65	Typical bus or truck.
Below the threshold of human perception	50	Typical background vibration levels.

**Electron microscopes and high-resolution lithography equipment are typical of equipment that is highly sensitive to vibration.*

railroad tracks used for freight lines were in existence for many years before the affected residential areas were developed.

Exhibit 4-15 is adapted from the FTA manual, and illustrates common vibration sources and the human and structural response to ground-borne vibration.

What is the current criteria for evaluating ground-borne vibration?

Exhibit 4-16 shows the FTA impact criteria for ground-borne vibration and noise. The table presents criteria for three land use categories. Category 1 represents land uses where low ambient vibration is essential, like high-tech research facilities using electron microscopes or manufacturing facilities with very low tolerances to background vibrations. Category 2 represents residences (high density and low density) where sleeping occurs. Category 3 represents institutional land uses where on-site activities are largely limited to the daytime hours. The study area for this project includes a mix of Categories 2 and 3. Because Category 2 has a lower threshold for vibration, it was the focus of this analysis.

The screening distances for a transit[29] project are 600, 200, and 120 feet for high sensitivity land uses (research, etc), residential, and institutional land uses, respectively. As stated, a factor of 1.5 was applied to the distances to add a factor of safety and conservatism. Therefore, the project area was evaluated to determine if sensitive land uses exist within distances of 900, 300, and 180 feet from the project corridor. The windshield survey identified no Category 1 land uses in the project area. However, residential areas were found to exist within 225 feet of the rail line. Therefore, a general vibration assessment was performed.

Did the assessment determine vibration levels in the study area?

The purpose of the general assessment method was to provide a relatively simple method of developing estimates of the overall levels of ground-borne vibration and noise that can be compared to the acceptability criteria given in the FTA manual. The basic approach for the general assessment was to define a curve that predicts the overall ground-surface vibration as a function of distance from the source, then apply adjustments to these curves to account for factors such as vehicle speed, building type and receiver location within the building. Then the general assessment compares the vibration level (at a distance where a vibration-sensitive land use exists) from the curve with impact criteria for defined land uses. If the curve predicts vibration levels in excess of the impact criteria, then vibration impacts may occur.

Ground-Borne Vibration and Noise Impact Criteria

Exhibit 4-16

LAND USE CATEGORY	DESCRIPTION	GROUND-BORNE VIBRATION IMPACT LEVELS (VDB RE 1 MICRO INCH/SEC)	GROUND-BORNE NOISE IMPACT LEVELS (DB RE 20 MICRO PASCAL)
Category 1	Where low ambient vibration is essential.	65 VdB (Note 1)	(Note 2)
Category 2	Residences, and where people usually sleep.	80 VdB	43 dBA
Category 3	Institutional land uses with mostly daytime activity.	83 VdB	48 dBA

Note 1: This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as an optical microscope. Vibration-sensitive equipment is not sensitive to ground-borne noise.

Note 2: Vibration-sensitive equipment is not sensitive to ground-borne noise.

[29] *Although intercity passenger rail is not considered "transit", transit criteria were used for the purpose of this analysis.*

The next step in the general vibration assessment was to compare these distances to the vibration impact criteria in **Exhibit 4-16**. Category 2 land uses have a ground-borne vibration impact criteria of 80 VdB. Based on **Exhibit 4-15**, the threshold distance to 80VdB is fifty feet. Therefore, this impact threshold distance was used, and the study area was reviewed to evaluate if any vibration-sensitive land uses existed within fifty feet of the rail line.

A windshield survey of the study area and a review of project mapping were conducted to determine if any residential buildings were located within fifty feet of the west side of the study area (where new tracks are proposed). No residences or institutions with primarily daytime use were found to be within fifty feet of where new tracks are proposed. Therefore, vibration monitoring was not conducted to determine existing conditions in the study area.

Hazardous Materials

Finding and cleaning up hazardous materials along the rail line is for the benefit and safety of railroad workers, rail passengers and local residents. It is not anticipated that there will be exposure to potentially hazardous sites and materials during construction or operations. However, there is a possibility of finding a historical spill or dump site in the study area. Since the railroad is primarily used for freight hauling, any commodity being hauled along the route during the past one hundred years could have spilled at any location. Recent legislation requires records and clean ups of such incidences. Any spill events prior to the 1970s were generally not recorded.

How was information collected?

Research methodology consisted of a public records review, a review of air photographs of the vicinity, a review of available Sanborn Insurance Maps, and contacts with government agencies and business owners. Sanborn Fire Insurance maps for the period 1892 to 1951 were used to identify the location of facilities, and determine the size and extent of various businesses near the right-of-way. This information was compared with database research to determine which properties may have hazardous sites that may affect the project.

Research into more recent land use was accomplished by analysis of aerial photographs for various years between 1966 and 1996. A windshield survey was also conducted in the study area.

Environmental records of the Washington State Department of Ecology (WDOE) were researched to identify property with records of environmental enforcement, past or present underground storage tanks, and generation, transportation, and storage of hazardous materials.

Were any hazardous materials sites found?

Ten site areas were found with records indicating the possibility of contamination within one thousand meters (approximately 3,281 feet) of the railroad. As a reported facility, the WDOE has copies of site studies available for public inspection. A review of the WDOE files was performed on each of the sites in November 1997.

Additional contact with agency personnel occurred in June 1999, to update information previously collected.

Exhibit 4-17 presents information about sites in the general study area. The exhibit includes one site appearing on the National Priorities List (NPL) and two that are former NPL sites. All of the National Priorities List sites are further than one thousand meters from the rail line and are presented for informational purposes only.

Exhibit 4-18 identifies the general locations of these sites (figure site numbers on **Exhibit 4-17** correspond to site numbers on **Exhibit 4-18**). As noted in **Exhibit 4-17**, most of these sites are in the clean up stages and/or are located down gradient from the railroad.

Could there be other sites in the study area?

Land uses that are likely to generate hazardous materials (**Exhibit 4-19**) are identified in reports by the Transportation Research Board and WSDOT *Environmental Procedures* guidelines.

Existing land use for the study area is a railroad and rail yard. This right-of-way was established over one hundred years ago. At that time the United States Congress established a 400-foot wide right-of-way for railroads. Over time, some of the periphery property has been sold. Currently, typical right-of-way varies from fifty to one hundred feet, except at yard locations, or in rural areas. In the study area, the right-of-way was delineated at approximately one hundred to 150 feet wide, except within Vancouver rail yard, where it extends from 400 to 600 feet wide. The proposed project would be located on or adjacent to the Burlington Northern Santa Fe right-of-way and some property acquisition is expected to be required.

Land use in the vicinity of the Vancouver rail yard improvement has been industrial for many years. The study area is predominately within or adjacent to the existing zoned railroad right-of-way, which has been present for over one hundred years. The study area contains the rail yard and its existing maintenance facilities. The yard contains multiple tracks used for sorting, assembling, and disassembling trains. The land to the west of the rail yard is predominately zoned for Heavy and Light Industrial uses. These industrial uses include some types of the facilities included in **Exhibit 4-19**, in addition to trucking companies and convenience stores.

East of the yard the land slopes upward to a bluff, where a residential section of Vancouver begins. North of the yard, the study area includes a siding extension along the railroad, adjacent to the mainline track. A single-lane, paved frontage road, used for private access, runs parallel to the track. In this area, land use of the surrounding properties has evolved from farmland to rural residential, with some open space present. These areas have been zoned primarily as “Urban Low Residential” zones.

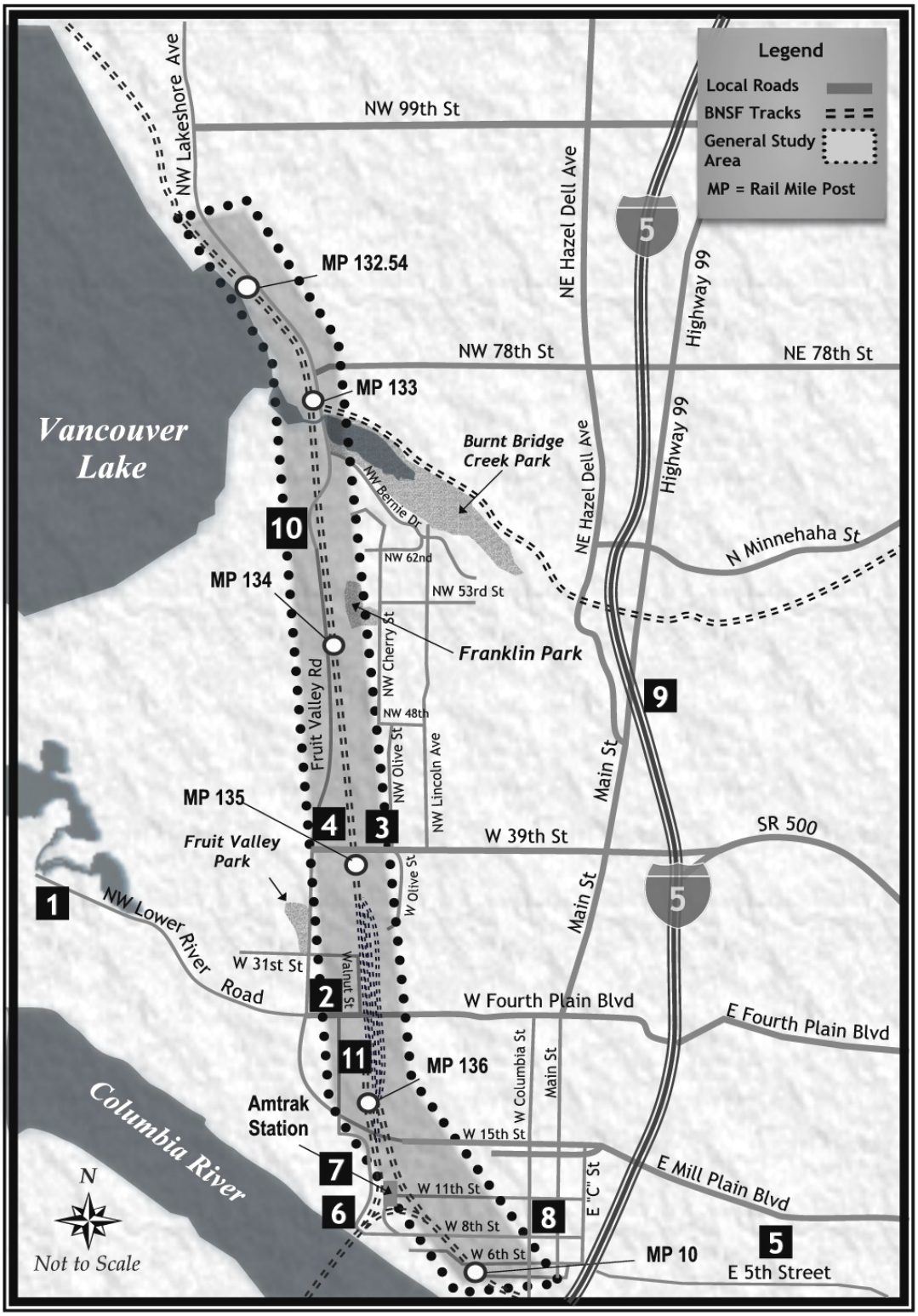
A review of agency records indicated three locations within the Vancouver rail yard that may be associated with hazardous materials releases. None of the other sites investigated appeared to have contamination that in some way may affect the study area. The areas of potential concern are described below.

Hazardous Materials Sites

Exhibit 4-17

FIGURE SITE #	SITE NAME/ADDRESS	STATUS
1	Alcoa Vancouver 5509 Northwest Lower River Road Vancouver, WA 98660 (3.5 miles west of rail yard)	Former National Priorities List (NPL) Site, remedial action completed 1992.
2	Automotive Services, Inc. 2001 West Fourth Plain Boulevard Vancouver, WA 98660 (.1 miles west of right-of-way)	Leaking underground storage tanks (LUST), soil & groundwater contamination. Cleanup started 1991, bioremediation complete 1993. A subsurface investigation was completed in 1996.
3	BN Maintenance Yard, Vancouver 1515 West 39th Street Vancouver, WA 98660	Three sites are located within the BNSF rail yard.
4	Chevron Bulk Plant #61001854 (Former) 1801 West 39th Street Vancouver, WA 98660 (adjacent to right-of-way)	Soil & groundwater contamination, tanks removed 1991, vapor extraction and/ or thermal adsorbtion conducted. Chevron sold property, warehouse now built on site.
5	Frontier Hard Chrome Inc. 113 East Y Street Vancouver, WA 98661 (3 miles east of right-of-way)	Currently on final NPL, chrome removal completed 1994.
6	FT Vancouver Plywood West 8th Street Foot of Vancouver, WA 98660 (.25 miles west of right-of-way)	Soil & surficial water contamination. In final clean up stages, according to Port (owner) aurthorities.
7	Great Western Malting Co. Foot of West 11th Street P.O. Box 1529 Vancouver, WA 98668 (.75 miles southwest of right-of-way)	Soil & groundwater contamination, interim cleanup dated 1991 and 1993. Groundwater contamination plume to SW away from site, towards the Columbia River.
8	Metro Buick Olds 904 West Washington Street Vancouver, WA 98660 (1.25 miles east of right-of-way)	Minor heating and waste oil soil contamination, interim cleanup started 1990. Site is in commercial district on bluff above yard, no possibility minor contamination could migrate to improvement site.
9	USDOE BPA Ross Complex 5411 NE Highway 99 Vancouver, WA 98663 (2.5 miles east of right-of-way)	Former pentachlorophenal contamination. Deleted from final NPL in 1996.
10	Winsel Farms 6112 West Fruit Valley Road Vancouver, WA 98660 (.5 miles west of right-of-way)	Former metal, soil & groundwater contamination, clean up conducted, contamination not detected in closest well.
11	2001 NE Roosevelt Property 2001 Northeast Roosevelt Street Vancouver, WA 98660 (.25 mi west **of** right-of-way)	Soil & groundwater contamination, near UP tracks, west of BNSF lines, clean up conducted.

General Location of Selected Hazardous Materials Sites
Exhibit 4-18



Land Uses Associated with Use, Storage, or Generation Of Hazardous Materials

Exhibit 4-19

- Fueling, repair, and maintenance of motor vehicles (automobiles, aircraft, trucks, construction equipment, RVs).
- Electroplating and other metal manufacturing and fabricating operations.
- Metal finishing, refinishing, and etching (auto body, printed circuit board manufacturing, jewelry fabrication).
- Operation or repair of printing and reproduction equipment.
- Dry cleaning and laundry services.
- Photographic processing and printing.
- Analytical laboratory operations.
- Building and excavation of structures and roads.
- Provision of home, industrial, or commercial pest control.
- Chemical manufacture, formulation, or processing.
- Warehouse operations.
- Manufacture, formulation, or processing of pesticides or agricultural products or chemicals.
- Home, garden, pool, or agricultural supply manufacturing.
- Textile manufacturing (including fabric dying and finishing).
- Manufacture, refinishing, or stripping of furniture or wood products.
- Cosmetic manufacturing or processing.
- Chemical treatment of lawns, gardens, yards, or provision of other landscape and tree services.
- Pressure treating or preserving wood products.
- Building and repairing boats.
- Production and repair of shoes.
- Paint formulation and mixing.
- Metal galvanizing.
- Drum, barrel, and tank reconditioning.
- Battery manufacturing, rebuilding, or recycling.
- Solvent recycling.
- Scrap metal and junk yard operations.
- Chemical and petroleum product storage facilities (both above and underground tanks and flammable storage rooms).
- Landfills.
- Receipt of bulk deliveries of raw or processed materials.
- Leasing or renting of vehicles, maintaining fleet operations, renting equipment.
- Product distribution, consolidation, and shipping operations.
- Waste or spent product incineration.
- Nursery and greenhouse operations.
- Schools, auditoriums, and other facilities with large heating requirements.
- Recycling facilities.

What sites could potentially be contaminated?

Multiple federal and state records were searched to determine the potential for on-site contamination, or contamination from adjacent sites. The significance of neighboring site contamination is the possibility that contamination, if found, may have originated from off-site sources and migrated towards the site.

Based upon the above information searches, the Vancouver rail yard has several potential locations for on-site contamination. The first location is the result of a spill caused by a rail car running into an engine in 1996. The rail car damaged a tank located on the engine. Approximately forty cubic yards of soil were contaminated with hydrocarbons. This soil was left in place because threat to humans and the environment were considered minimal, and there would have been great difficulty cleaning up the site. The site is located on the north lead in the A yard where four sets of tracks meet. This location does not impact the study area.

In addition to this reported spill, the northwest portions of the Vancouver rail yard have been under investigation by the Washington Department of Ecology and the U.S. Environmental Protection Agency. The portion of the yard being investigated is the site of the former Seattle-Portland-Spokane (SPS) railway, a predecessor to BNSF. The SPS facility has been used for railway operations since 1902.

The area includes many former facilities located during the aerial photograph review, as in the northeast section of the current yard. These former facilities include the original roundhouse and a diesel locomotive washing facility. The former roundhouse was dismantled prior to 1979.

The object of the investigation was to determine if groundwater contamination had occurred in the vicinity. The report recognized that the yard is in a highly industrialized area. The report concludes that groundwater resources near the site may be affected by a variety of contaminant sources, and that it is likely that the SPS Railway site contributed to this contamination. The report does not identify plumes or pin point sources. Contamination was by polycyclic aromatic hydrocarbons (PAHs) and hydrocarbons.

The roundhouse location was unused for nearly 20 years. The roundhouse turntable has recently been refurbished and is currently in use. BNSF is in the process of drafting information regarding a current clean up of hazardous materials, to be filed with the Washington Department of Ecology. BNSF has released some unpublished information regarding a current clean up between the new turntable and the former diesel maintenance area. In general, soil containing pesticide and herbicide contamination was successfully removed in the vicinity of the tank car cleaning area. Some petroleum-related contamination was unable to be removed due to depth or proximity to existing structures. Otherwise, contamination beneath the new trackage and related facilities was generally removed. The released information included monitoring wells information indicating ground water was unaffected near the clean up.

Land Use

Land use is often referred to as the built environment. This resource examines our communities, our cultural past, and our use of land. A number of resources are

reviewed as part of the land use analysis, they are: land use (including shorelines and farmlands); parks and recreation (public lands); historic, cultural and archeological resources; social and economic factors; relocation; environmental justice; and visual quality.

Land Use (including shorelines and farmlands)

Land use refers to the types (uses) of buildings and land (for example, commercial, residential, agricultural) in an area. It is important to look at land use for two reasons. First, is the proposed project compatible with surrounding land uses?

Second, will existing land uses change as a result of the proposed project? Sometimes it is desired to have the existing land use change, and sometimes it is not desirable.

Another aspect of land use is the development and enforcement of comprehensive plans. In 1990, the Washington State Legislature adopted the state's first comprehensive Growth Management Act (GMA) that is designed to help a community direct its urban growth, reduce its sprawl, and protect its resources. As part of GMA, many communities are required to develop land use plans that will dictate the character and direction of growth within their cities.

How was land use information collected?

Published materials were used to review zoning designations and land use policies. In addition many agencies were contacted to discuss current policies and future land use legislation.

The following documents were reviewed for zoning designations and land use policies.

- Clark County Comprehensive Plan
- City of Vancouver Comprehensive Plan
- City of Vancouver Zoning Ordinance M-3162.
- In addition, local agencies and departments were contacted in July and August 1997, June and July 1999, and June 2000.

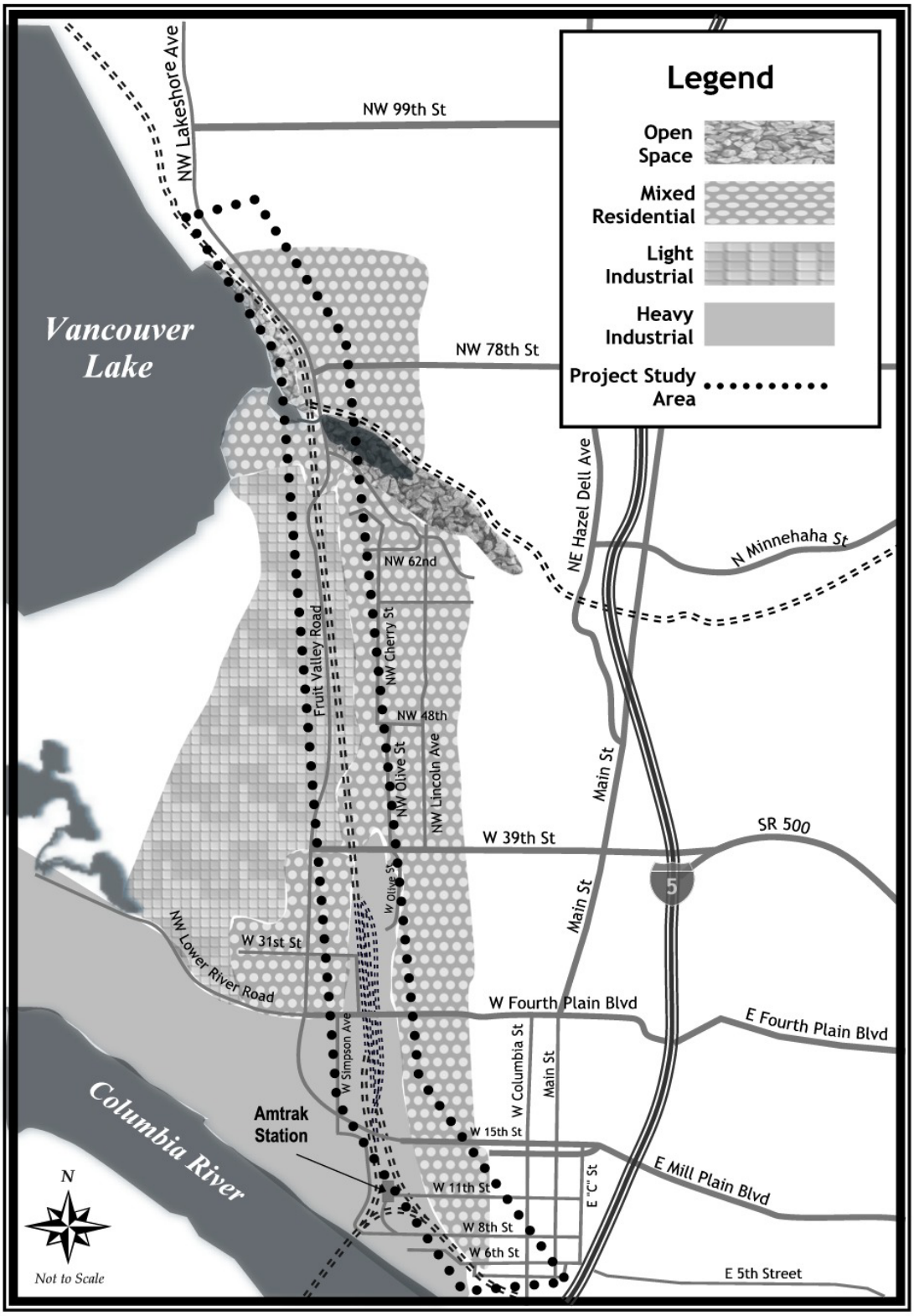
What are the general characteristics of the study area?

The study area is primarily located within the existing railroad right-of-way. Railroad maintenance and improvement is permitted within the zoned railroad right-of-way, which has been present for over one hundred years.

As indicated in **Exhibit 4-20,** most land use adjacent to the rail right-of-way is predominantly zoned for Heavy and Light Manufacturing uses, which define rail access as part of the zoning districts. However, recently, new housing has been developed adjacent to the rail yard. The development is known as Columbia Crest, and is located midway between West 39th Street and West Fourth Plain Boulevard, east of the right-of-way.

Prior to crossing the Burnt Bridge Creek/Vancouver Lake confluence area, the rail right-of-way is bordered by an Urban Low Residential (R-1) zoning district to the

General Zoning and Land Use in the Study Area
Exhibit 4-20



west and east, in addition to Franklin Park, a Park zoning district to the east. The area north of Rye Junction surrounding the rail corridor is also an Urban Low Residential district. This zoning allows for utilities as a conditional use. Fruit Valley Road runs in a north/south direction adjacent to the west side of the rail line and crosses at approximately Northwest 65th Street.

The Burnt Bridge Creek Greenway area is a Park (P) zoning district. Vancouver Lake is located northwest of the City of Vancouver between the rail corridor and the Columbia River. The City of Vancouver Shoreline Management Master Program designates the shoreline of Burnt Bridge Creek as Urban Conservancy, Urban High Intensity and in some adjacent areas, Urban Medium Intensity. Transportation corridors, including rail, are permitted within these shoreline designations.

There are no prime agricultural lands located within the study area.

What are the current plans and policies for the study area?

The Clark County Twenty-Year Comprehensive Growth Management Plan, serves to preserve a high quality of life in communities, institutions, and government within the county. The transportation element within the plan anticipates a transition from private to transit vehicles, including high-capacity transit and light rail. The Plan supports new or improved passenger rail transportation along the Pacific Northwest Rail Corridor as an alternate form of transportation to the single occupant vehicle.

The City of Vancouver's Comprehensive Plan, titled, "Visions of Vancouver Urban Area; Growth Management Plan," includes the city's Mobility Management Plan. The purpose of the Mobility Management Plan is to ensure efficient travel for business, industry, and residents. The Plan supports passenger rail as a form of alternate transportation and its expansion to the City of Vancouver.

The City of Vancouver Shoreline Management Master Program, adopted January 24, 1997, serves to coordinate shoreline uses and conservation with development planning. The Shoreline Management Plan permits the construction of new (railroad) bridges in the shoreline area when necessary for major transportation corridors.

The rail line crosses Burnt Bridge Creek east of its confluence with the southeastern edge of Vancouver Lake. The City of Vancouver Shoreline Management Master Program designates the shoreline of Burnt Bridge Creek at this crossing as Urban Conservancy, Urban High Intensity and in some adjacent areas, Urban Medium Intensity. Transportation corridors, including rail, are permitted within the shoreline designations.

Parks and Recreation (Public Lands)

Park and recreation facilities within the study area were identified by reviewing municipal zoning districts, comprehensive plans, and aerial photographs. City and County Planning Departments were also interviewed.

Similarly, a thorough inventory of local services and community institutions was conducted. The location of parks, recreational, pedestrian and bicycle facilities within the study area were identified.

What parks and recreational facilities are located in the study area?

There are over fifty five parks and playgrounds in and around the City of Vancouver. Several neighborhood parks and access routes connect to larger recreation areas located near the study area. A system of trails for bicyclists and pedestrians connect these parks and recreation areas. Recreational facility use data by activity or by facility are currently not collected by the City or the County.

Neighborhood Parks

The City of Vancouver maintains a system of neighborhood parks. City parks located in the project area include Burnt Bridge Creek Park, Heathergate Ridge, Franklin Park, Fruit Valley Park, Hidden Park, Carter Park, John Ball Park, and Esther Short. Another parcel (Vancouver Lake parcel), located just west of the rail tracks at the mouth of Burnt Bridge Creek and Vancouver Lake, is also a designated park facility. **Exhibit 4-21** presents the locations of these parks.

Two of these parks (Heathergate Ridge and the Vancouver Lake parcel are located within the project study area. In addition, two other parks (Burnt Bridge Creek Park and Franklin Park) have property near or adjacent to the railroad right-of-way. Franklin Park is located adjacent to the east of the BNSF right-of-way parallel with 56th Street. The railroad corridor is not visible from the public use portion of the park, located approximately 375 feet east of the right-of-way. The rail right-of-way traverses Burnt Bridge Creek. East of the right-of-way a portion of the Burnt Bridge Creek floodplain has been designated as the Stewart Glen Burnt Bridge Creek Greenway.

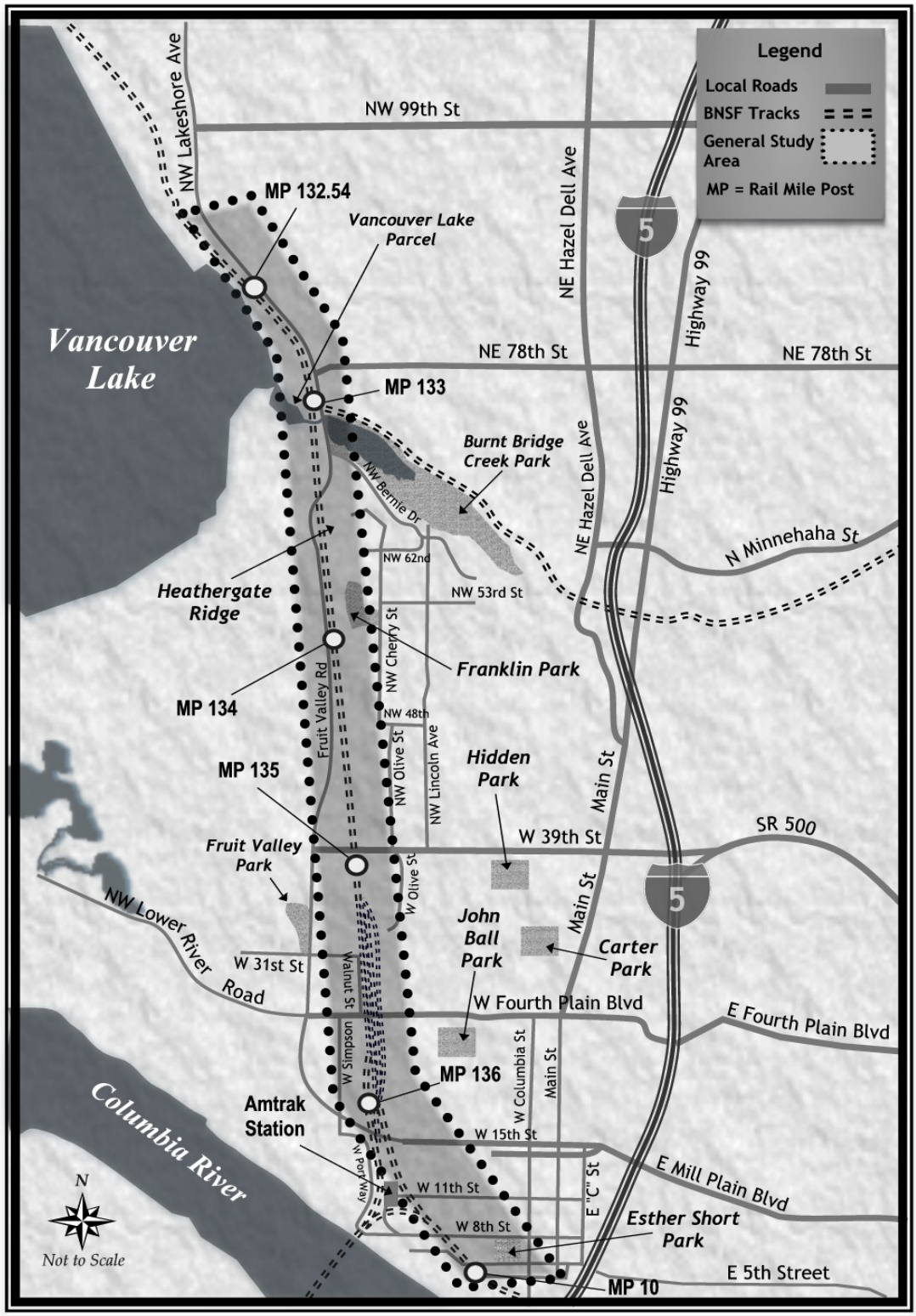
The City of Vancouver is currently planning a citywide trail system in this vicinity. The proposed trail will extend along Fruit Valley Road and eventually cross over the railroad tracks on or near the existing overpass. The trail will continue along Burnt Bridge Creek. Burnt Bridge Creek flows to Vancouver Lake east of the right-of-way and just south of the north end of the proposed rail improvements.

Other Recreation Areas

Vancouver Lake and the parkland surrounding the Lake are to the west of the project area. In addition to the waterfront access provided at Vancouver Lake Park on the west side of the Lake, there is a non-motorized boat launch on West La Frambois Road along the south shore that allows visitors access for fishing, windsurfing and other water sports. Vancouver Lake is also the site of college and club rowing competitions. The 234-acre park is a wetland and provides wildlife viewing and migratory waterfowl. SR 501, an extension of West Fourth Plain Boulevard and Northwest Lower River Road, provides access to the park.

West of Vancouver Lake there is a state wildlife refuge, the Vancouver Lake Wildlife Area, which is maintained by the Washington State Department of Fish and Wildlife. Primary users of this area are birdwatchers and hunters. Other activities include fishing and harvesting of wild mushrooms and fruits. Further to the west, along the shore of the Columbia River, Frenchman's Bar Riverfront Park provides a waterfront and beach site for picnicking, fishing, volleyball, a three-

General Location of Parks and Recreation Facilities in the Study Area
Exhibit 4-21



quarter of a mile walking trail, an outdoor amphitheater, and other recreational activities.

To the southeast of the study area, there are many trails and historic areas along the Columbia River. These trails connect Vancouver Landing, downtown, and the Fort Vancouver National Historic Site.

Fort Vancouver is located south of East Mill Plain Boulevard and east of I-5. It was established in 1948 as a National Historic Site, commemorates the Pacific Northwest center for fur trade and other commerce, agriculture, and industry of the first half of the 19th century. The 366-acre site contains barracks, Officers Row, Pearson Field, the Water Resources Education Center, and portions of the Columbia River Waterfront. The National Park Service, Department of the Army, Office of Archaeology and Historic Preservation of the State of Washington, and the City of Vancouver, Washington are partners in a cooperative management agreement for the site.

Bike and Pedestrian Facilities

Bike and pedestrian facilities are located to the west of downtown near Lake Vancouver and to the south and east of downtown. There are also several trails to the northeast of the rail corridor. Most bicycle and pedestrian trail routes travel north to south.

To the west of Vancouver Landing, bicycles and pedestrians can access several trails, including the Lower River Road Greenbelt, the Columbia River Trail (which runs parallel to Northwest Lower River Road), Frenchman's Bar and Vancouver Lake. There are designated bicycle lanes along both West La Frambois Road from West Fruit Valley Road connecting to Vancouver Lake Park, and Lower River Road/SR-501, connecting to the wildlife area. East of Vancouver Landing, Fort Vancouver, downtown and Waterfront Park are accessible via trails along the Waterfront.

The City is planning several longer-term investments in pedestrian and bicycle improvements in and around the corridor that will increase access to recreation areas. These improvements are independent of the rail project. The West Mill Plain Boulevard Extension provides bike corridor access to the west side of the rail corridor and Vancouver Lake. Other routes may provide tributary access to trails that access Vancouver Lake and the wildlife area. Northwest Fruit Valley Road is a trail corridor and connects to West Fourth Plain Boulevard and West Mill Plain Boulevard on the south and north to Northwest Lakeshore Avenue. The City of Vancouver is planning improvements to the Fruit Valley Road corridor that include the addition of bike lanes.

Based on a study performed in the summer 2000, data indicates that very few pedestrians and bicyclists use West 39th Street to access recreational facilities and trails.[30]

[30] *The Resource Group, Pedestrian and Bicycle Usage on West 39th Street, Vancouver Rail Project, August 2000.*

Historic, Cultural and Archeological

Cultural resources include state and nationally designated historic buildings, districts, and archeological sites. Western Washington is rich in cultural resources ranging from Native American burial sites and villages to the historic districts and buildings.

Section 106 of the National Historic Preservation Act of 1966, as amended, requires that federal agencies identify and assess the effects of federally assisted undertakings on historic properties, consult with others to find acceptable ways to avoid or mitigate adverse effects, and afford the Advisory Council on Historic Preservation an opportunity to comment.

Project team archeologist surveying the study area

The study area was surveyed south of West 39th Street as part of the 1999 analysis and no archaeological sites were identified;[31] however, the alignment north of West 39th Street was unavailable for inspection until this year. This area was identified as having high archaeological potential to contain sites in the Clark County predictive model.[32] It was rated moderate based upon the proximity to Vancouver Lake and Burnt Bridge Creek.[33]

The original ground surface within the BNSF railroad right-of-way has been disturbed by previous construction and maintenance impacts. In addition to the construction–related impacts resulting from building and reconstructing the Vancouver rail yard during the past century (e.g., clearing, grading, ditching), on–going right-of-way maintenance has resulted in additional compaction, excavation, and mixing of sediments. In many places, the coarse–crushed rock used for ballast has been side–cast, effectively concealing the ground surface. In other areas, paved

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[31] *Glenn D. Hartmann, A Cultural Resources Survey of the Washington State Department of Transportation's Pacific Northwest Rail Corridor, Western Washington. Archaeological and Historical Services Short Report DOT99–42. Eastern Washington University, Cheney, 1999.*

[32] *David V. Ellis, David and Douglas Wilson,* Protecting Clark County's Archaeological Heritage: A Database and Predictive Model. *Archaeological Investigations Northwest, Inc., Portland.*

[33] *Hartmann, 1999.*

or graveled access roads have been constructed along the grade within the right-of-way. In addition to these disturbances, communications cables (and in some places, gas pipelines) have been buried along the rail line from Vancouver to the Canadian border. Other disturbances that could have impacted archaeological sites that might be located within the rail right-of-way include agriculture, access roads, industrialization, and urbanization.

The western portion of the study area, north of West 39th Street, slopes gently to the west. Sediments are early Holocene alluvium. There had been a few residences in this area as evidenced by ornamental plants, concrete pads, and cinderblock retaining walls; however it appeared that the houses had been removed several years ago. The soil surface was quite disturbed as a consequence of demolition, and buried pipes were evident at a depth of almost a meter. While performing the field survey, visibility was excellent along the rail line as the surface had been graded with a bulldozer just prior to the present survey, providing a cleared, approximately fifteen to twenty foot–wide swath parallel to the existing rail line. This provided ample opportunity to inspect the area for archaeological deposits.

In April 2001, the rail right-of-way north of West 39th Street was examined by pedestrian survey with two archaeologists walking "lazy–S" transects parallel to the alignment. Three shovel test units were excavated within the project right-of-way just east of the existing tracks. Excavations reached a maximum depth of seventy five centimeters and sediments were screened through a one-quarter inch hardware cloth. Soil stratigraphy in these units was consistent: a dark brown silt loam with a few small pebbles. There were no suggestions of buried surfaces and no archaeological materials were found. Throughout the area north of West 39th Street there was no evidence of prehistoric use of this area: fire–cracked rock, debitage, burnt bone, and evidence for buried surfaces (in road cuts and shovel probes) were all absent. The absence of archaeology is probably best explained by the lack of a fresh water source in the immediate vicinity of the project corridor and the fact that there are other, more desirable locations for habitation nearby.

No archaeological resources were identified during survey of the study area north of West 39th Street. Survey results suggest there is little reason to suspect buried cultural resources are present within the proposed project alignment.

Five previously recorded cultural resource sites and one NRHP district were identified within the study area (**Exhibit 4-22**). The Vancouver Lakes National Register Historic District is comprised of several dozen prehistoric and historic archaeological sites. The BNSF line forms the arbitrary, eastern boundary of the district, which lies to the immediate west and north of the study area. Only one site within the Vancouver Lakes District, 45CL309h, is in proximity to the study area.

The archaeological inventory form indicates the archaeological materials are several hundred feet west of the existing right-of-way, just to the north of Burnt Bridge Creek. There, The Burlington Northern and Santa Fe Railway Company (BNSF) rail line is located on elevated grade that has been cut–and–filled and it is unlikely that the site extends eastward under the right-of-way. A recent archaeological investigation for improvements to Northwest Fruit Valley Road included limited

Summary of Historical and Recorded Archeological Sites in the Study Area

Exhibit 4-22

NAME/NUMBER	TYPE OF SITE	NRHP ELIGIBLE?	PROJECT LOCATION
Vancouver Lakes NRHP District	prehistoric and historic archaeological sites	*listed*	West of the existing BNSF railroad from the Columbia River northward to the Lewis River
45CL309h	archaeological	*within District*	Just north of Burnt Bridge Creek, west of BNSF railroad
45CL197h	historic structure	*demolished*	West of line, south of West 39th Street; outside study area right-of-way
45CL223h	historic rail depot	*likely*	West of study area at the west end of West 11th Street
Packard House	historic house	*likely*	7004 Northwest Fruit Valley Road, just east of the right-of-way
1901 NW 69th Circle (formerly 6801 NW Whitney Road)	historic house	*yes*	East of rail tracks, just north of where Fruit Valley Road crosses over the railroad tracks

test excavations at the eastern edge of the Vancouver Lakes District, i.e., in proximity to the BNSF tracks. No archaeological materials were identified.[34]

Site 45CL197h was an historic prune dryer located in Vancouver, just west of the Burlington Northern Santa Fe Railway right-of-way, south of West 39th Street. Since the time it was recorded**,** the structure has been razed.

The Vancouver Railroad Depot, designated as site 45CL223h, is at the end of West 11th Street. This site is commonly known as the Amtrak Passenger Station.

The Packard House, 7004 Northwest Fruit Valley Road, was inventoried after the 1999 analysis. It is a single–family, wood frame, Queen Anne style residence (**Exhibit 4-23 and Exhibit 4-24**), located to the immediate east of the existing BNSF railroad alignment. The house is above the existing BNSF railroad grade and sits approximately 100 feet back from the existing roadcut. This structure was not evaluated for NRHP eligibility at the time its was inventoried; however a recent cultural resources study for improvements to Northwest Fruit Valley Road is recommending it as a NRHP eligible property.[35]

Also inventoried was a single–family bungalow at 1901 NW 69th Circle (formerly 6801 Northwest Whitney Road).

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[34] *Jo Reese, Telecommunication regarding Archaeological Investigations Northwest cultural resources investigations for the N.W. Fruit Valley Road project, 2001.*

[35] *Ibid.*

The building at 1901 NW 69th Circle in Vancouver, Washington appears to have been constructed circa 1895 and has been determined to be eligible for listing in the National Register. The project team completed a Historic Property Inventory Form for this property, which can be found in the Addendum Cultural Resource Report developed for this project.

The building is a one-story, single-detached vernacular house located in a rural setting. The house is located on the east side of the BNSF railroad approximately seventy feet from the tracks. A gravel road paralleling the east side of the railroad provides access to the house from NW Fruit Valley Road. The residence is located on a 1.5-acre lot and is surrounded by large evergreen trees and Himalayan blackberries. The house is visible from Whitney Road to the east of the railroad tracks.

The overall shape of the plan is rectangular, offset by a wrap-around verandah on the south and west elevations and a small porch on the east elevation. Access to the house is available through the primary entrance on the west elevation, and additional entrances are located on the east elevation and off the wrap-around verandah on the south elevation. The three garages with hinged, wooden doors below the verandah horizontally divide the west elevation.

Evaluation of Historic Property at 1901 NW 69th Circle Vancouver, Washington

There are four National Register Criteria for Evaluation, including association with significant events (Criterion A); association with significant people (Criterion B); possession of significant design or construction (Criterion C); and association with information important in prehistory or history (Criterion D). Further, a building typically cannot be considered eligible for the National Register if it is less than fifty years old.

Based upon the research conducted and evaluation of the building at 1901 NW 69th Circle in accordance with the National Register Criteria, it is recommended that this building is eligible for the National Register of Historic Places under Criterion C, in the area of architecture, as a locally distinctive, one story vernacular house dating to the late 19th century, early 20th century in Vancouver, Washington. It is one of the only remaining well-preserved, modest vernacular houses in Vancouver with the particular configuration of garages below the verandah. It is a locally distinctive example of an early twentieth century vernacular house. While the integrity of the setting of the building has been compromised with the overpass to the south and Fruit Valley Road to the east of the house, the building retains its integrity in location, design, materials, and workmanship.

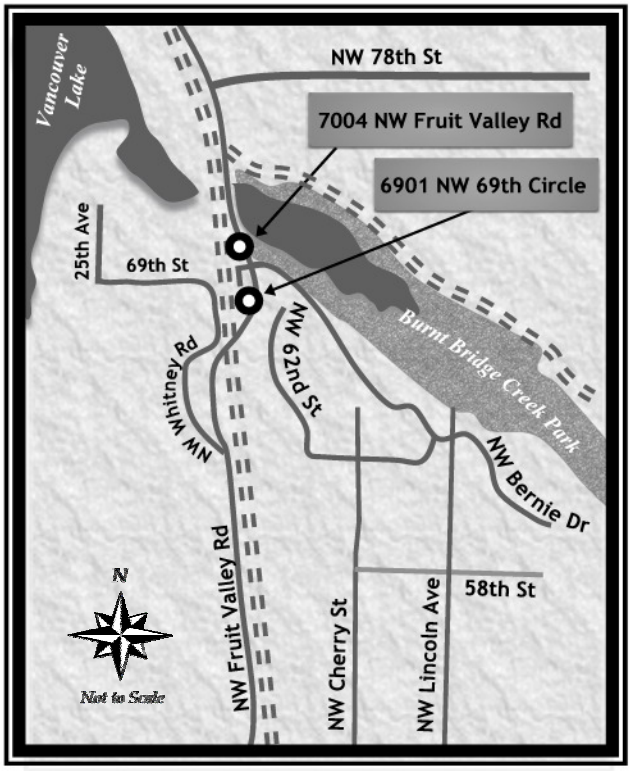
Historic Structures in the Study Area
Exhibit 4-23

7004 NW Fruit Valley Road

6901 NW 69th Circle

Location of Historic Structures in Study Area

Exhibit 4-24



Social and Economic Factors

In environmental planning, the technical area called social and economic resources includes review of access and safety to social and educational facilities (religious institutions, schools, community centers), emergency vehicle access, community cohesiveness, disruption to the community through displacements and relocation, and general impacts to disadvantaged groups (minorities and low-income individuals and families).

When building a new project or implementing a new program, these elements play a vital role in the placement of the new facility or program. It would be illogical to plan and implement a bus system if it did not go from a residential neighborhood to a commercial area. It is important to make sure the facilities can truly serve the community.

In the case of intercity passenger rail, many of the communities cannot be served directly (because they don't have a station in their community and they are not on the rail line), but it is still critical to look at the social and economic resources throughout the corridor to make sure that the rail system will not impact the social structure of the existing communities.

Another important aspect of the social and economic conditions of a community is to understand the communities' views of safety. Many residents feel that more trains and faster trains will make their communities less safe. Residents feel uncomfortable driving or walking over railroad tracks. Also, since the tracks separate neighborhoods from shorelines, many people illegally walk over the tracks to get to the beach to fish, walk, or picnic.

What are the general population characteristics in the study area?

The **Vancouver Rail Project** study area is located in the City of Vancouver and a portion of unincorporated Clark County, in southwestern Washington State.

Limited 2000 Census data are available for Washington State and Clark County; these data include population figures and racial composition. The 2000 population of Clark County is 345,238 (Clark County website) and the City's population was 143,560.

Population Growth

Exhibit 4-25

POPULATION GROWTH IN CLARK COUNTY AND THE CITY OF VANCOUVER				
POPULATION	1990	2000	CHANGE	% CHANGE
Clark County (including Vancouver)	238,053	345,238	107,185	45.0
Vancouver	46,764	143,560	97,180	209.5

The City of Vancouver and Clark County underwent rapid population growth in the 1990s, with the County population increasing by 45 percent between 1990 and 2000. Annexation actions in the 1990s more than doubled the land area of the City of Vancouver; nevertheless, Vancouver's population grew by 209.4 percent from 1990 to 2000. Most of the growth in the City of Vancouver occurred in the rapidly developing portions of the city to the east of the project area.

Clark County had a 1999 workforce of 178,300 and an unemployment rate of 3.9 percent.[36] The County's largest employment sector in 1998 was the service sector, with 23 percent of county employment, followed by manufacturing and retail trade, each with 18 percent of county employment.

Exhibit 4-25 summarizes the population growth in the City and County over the 1990s.

What neighborhoods are located in the study area?

The City has a neighborhood program within the Community Development and Housing Department that provides a partnership between the City government and the neighborhoods. The City has 56 officially recognized neighborhood associations.[37]

The Vancouver Rail project area is located on the west side of the City near its western boundary. There are residential neighborhoods located to the east and west of the yard, but the City's central business district and most of its residential areas are located to the east and south of the improvement area. There are six neighborhoods in or near the project area: Northwest, Fruit Valley, Carter Park, Lincoln, Hough, and Esther Short. (**Exhibit 4-26**)

The existing rail corridor follows the natural topography of the area, with the Fruit Valley Neighborhood immediately to the west of the rail yard and the Northwest, Lincoln, Hough, Carter Park, Esther Short, and Northwest neighborhoods to the northeast and southeast of the yard. Each of these neighborhoods, except for the Fruit Valley neighborhood, has completed a neighborhood plan. A brief description of each is included below, organized from north to south along the rail corridor.

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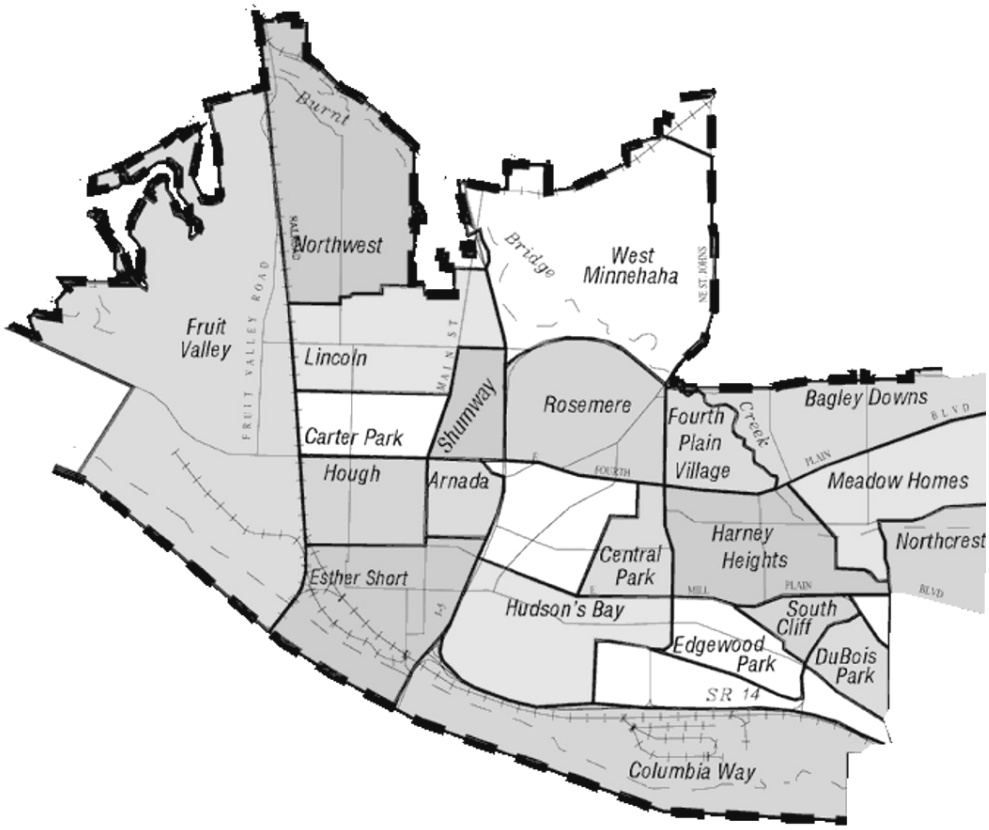
[36] *Clark County Population and Economic Handbook, 2000*

[37] *City of Vancouver, 2000*

City of Vancouver Neighborhoods
Exhibit 4-26



The Northwest, Lincoln and Fruit Valley neighborhoods are the most likely to potentially experience project-related impacts. These neighborhoods to the west of the rail yard have a limited number of connection points to the rest of the City. Roadways to reach areas west of the rail line in Fruit Valley exist at two grade-separated crossings at West Fourth Plain Boulevard (SR 501) and at West 78th Street. In addition, an at-grade crossing exists currently at West 39th Street.

Northwest. The Northwest neighborhood is in the northwest corner of the City with low-density residential development and a generally stable, balanced population of young families, middle-aged people, and retirees. Two elementary schools and three residential care homes are part of the neighborhood. The neighborhood's priorities include identifying and preserving historic and cultural resources; increasing and maintaining open space; preserving stability and safety; improving traffic control, circulation and communication among neighbors.

Lincoln. The Lincoln neighborhood is located to the east of the proposed project. The neighborhood is composed primarily of single-family homes and some apartment buildings. The area near the rail yard is zoned light and medium industrial. Several small commercial and office buildings exist in the neighborhood. The neighborhood's objectives and action steps, as adopted in the neighborhood plan, include: increasing retention of neighborhood businesses;

protecting trees and encouraging new planting; improving open space and recreational opportunities at Hidden Park; monitoring uses of West 39th Street and SR 500; promoting a balance of land uses; maintaining neighborhood character; and improving the community's appearance and safety.

Hough. The Hough neighborhood is located northwest of downtown Vancouver and is east of the proposed project. Hough is one of the City's oldest neighborhoods, made up primarily of single-family housing with some apartment complexes in the southern portion of the neighborhood.

Carter Park. The Carter Park neighborhood is located north of downtown and to the east of the proposed project. Carter Park contains primarily single-family housing with industrial zoning on the west edge of the neighborhood near the railroad tracks.

Esther Short. The Esther Short Neighborhood is the City's commercial, cultural, financial and municipal center and is south and east of the proposed project. The area includes some single-family and multi-family housing. Ninety percent of the neighborhood is zoned for city center uses.

Fruit Valley. The Fruit Valley neighborhood is west of the improvement area and includes a variety of land uses including residential, industrial, and unimproved open spaces. The neighborhood is the only one in the project area without an adopted neighborhood plan.

What are the housing characteristics in these neighborhoods?

The County had an estimated 134,063 housing units in 1999 and issued 2,524 single family building permits and 609 multi-family building permits that year. Seventy-three percent of county residents own their own homes.

As noted in the neighborhoods discussion above, there is a mix of housing types in the study area, including single-family, multi-family, and mobile homes.

How do residents and community members access facilities?

Vehicular, public transit, bicycle and pedestrian access between the project area neighborhoods on the west side of the rail corridor are provided primarily by roadway crossings (from south to north) of the rail corridor at:

- West Mill Plain Boulevard (grade-separated);
- West Fourth Plain Boulevard (grade-separated);
- West 39th Street (at-grade); and
- Northwest Fruit Valley Road (grade-separated).

Existing at-grade roadway crossings of the rail corridor provide access to the Port of Vancouver, residential areas to the west of the yard and recreational facilities at Vancouver Lake and along the Columbia River. Northwest 8th Street and Northwest Jefferson Street provide access to the Port of Vancouver and other properties along the Columbia River Waterfront.

As the tracks continue north, crossing Northwest 11th Street at grade level they proceed under the Mill Plain Extension to the existing West Mill Plain Boulevard. The road crossing at Northwest 11th Street provides local access. At the north end

of the project area, the tracks again cross Northwest Lakeshore Avenue, which provides access to Fruit Valley, Northwest and Hazel Dell residential areas.

The grade-separated crossing at West Fourth Plain Boulevard provides the major point of access to businesses, residential areas, and recreational sites located west of the yard. Fourth Plain Boulevard is a major thoroughfare providing east-west access across the City of Vancouver. North of this grade-separated crossing, the proposed track would cross West 39th Street at grade level. Located approximately ten blocks north of West Fourth Plain Boulevard, West 39th Street provides an alternative east-west connection across the rail yard.

C-Tran provides transit services to Vancouver and Clark County, and several C-Tran routes serve the study area. The portion to the west of the rail corridor is served by C-Trans's "Fruit Valley" route, which runs north and south on Fruit Valley Road through the study area and terminates at the 7th Street Transit Center in downtown Vancouver. C-Tran has one commuter facility near the study area at the Bonneville Power Administration Park & Ride at Northeast Ross Street and Northeast 15th Avenue. This facility has express routes to downtown Portland, Lloyd Center, Marquam Hill and Swan Island.

What if homes or businesses in these neighborhoods need to be relocated?

It is sometimes necessary to relocate families and businesses because the new transportation facility may either impact the home or business to the point where that property is no longer usable, or the new transportation facility may need more right-of-way to accommodate its design.

To mitigate residential and/or business relocations that may occur as a result of any of the project alternatives, WSDOT will conduct the acquisition and relocation program in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Relocation resources are available without discrimination, to all eligible residential and business relocatees. If, at the time of acquisition of real property and/or real property rights, it is determined that there is insufficient comparable relocation housing in the vicinity for displaced residents, funds would be available to provide housing of last resort. [38]

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[38] *In the event that replacement housing is not available within the displaced resident's financial means through the application of any of the foregoing benefits, any number of other alternative solutions may be used. These alternatives, known as housing of "last resort", include but are not limited to:*

--Purchasing housing for the displaced resident and renting or selling the dwelling at a price within the person's financial means.

--Renovating existing available housing.

--Building new, comparable, dwelling units.

--Providing financing for low income and/or a bad credit 180-day homeowner-occupant.

--Entering into partnerships with public or private agencies which provide housing for low-income persons.

Public Services

The City of Vancouver and Clark County are the largest providers of public services to residents and businesses in the project area. Most public services (e.g., government offices, recreation facilities) are located in the downtown core and to the east of Interstate 5.

The following discussion provides a brief overview of public services provided in the project area, as well as the community facilities located in and near the study area. Parks and recreation and pedestrian and bicycle facilities are discussed following this section. **Exhibit 4-27** shows the general locations of these public services.

What emergency services protect and serve the study area?

The City of Vancouver Fire Department provides fire protection services to Vancouver residents and businesses. Neighborhoods around the rail yard are primarily served by two fire stations. Station 82 is located at 900 West Evergreen Boulevard, and Station 86 at Northwest 37th Street and Main Street. Both are located east of the rail yard. The grade-separated crossing at West Fourth Plain Boulevard provides the preferred access point to the areas west of the tracks, but at present, West 39th Street offers another response access point for units responding from Station 86 when the crossing is not blocked by rail traffic.

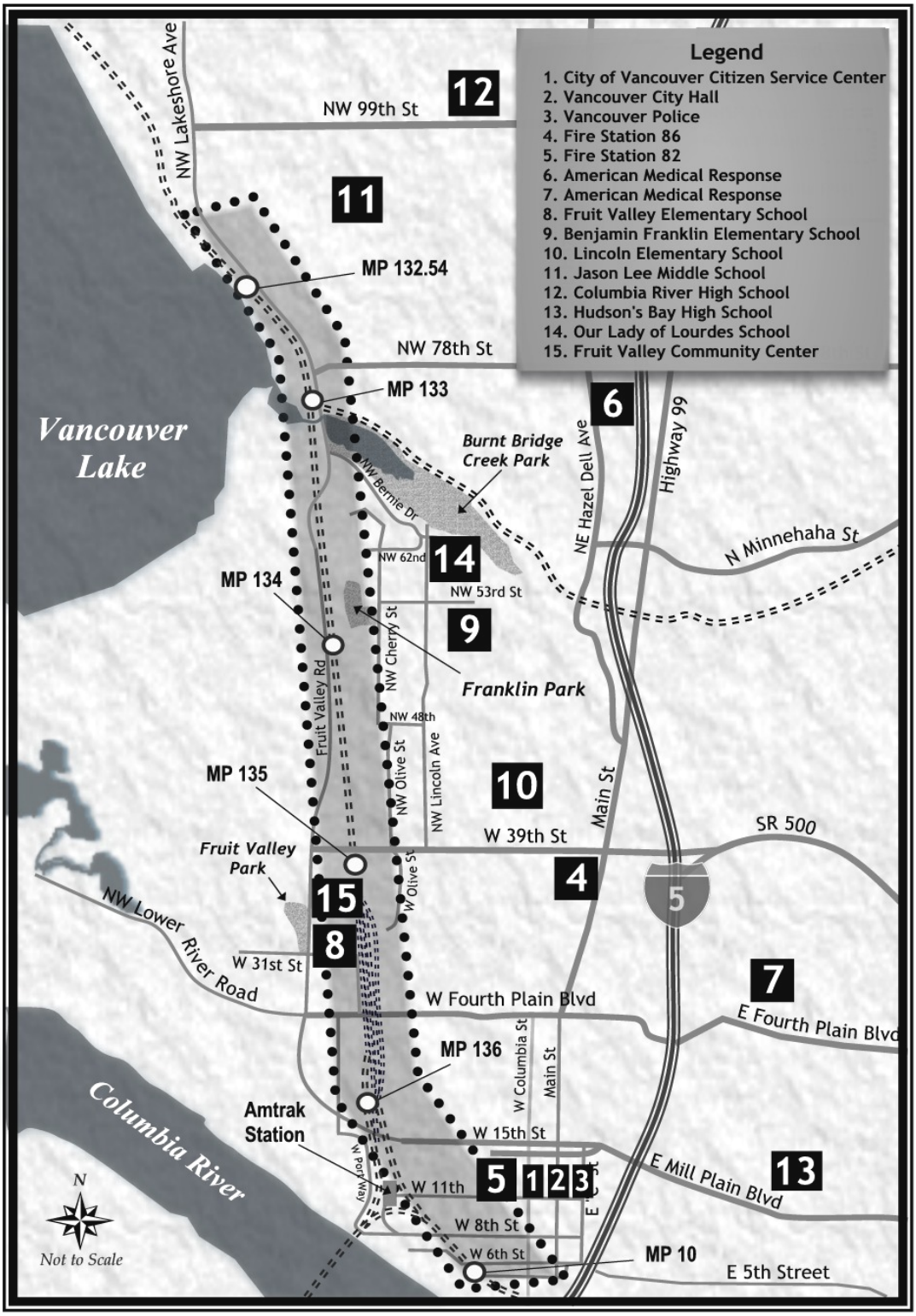
The West Mill Plain Extension provides emergency vehicles an optional response route to the Fruit Valley neighborhood, Vancouver Lake Lowlands and Port of Vancouver. Depending on the location of the call, Station 86 also uses West 78th Street for response. The Fire Department reports that because of frequent closures of West 39th Street due to rail traffic, it is not considered a reliable response corridor.

In addition to emergency response services offered by the Fire Department, American Medical Response Company provides ambulance services to the residents of Vancouver. The company's facilities at 2404 East Z Street and 409 Northeast 76th Street serve areas near the BNSF rail yard. They generally operate under the assumption that the West 39th Street railroad crossing is blocked by train traffic.[39] The City of Vancouver Police Department provides law enforcement services to City residents and businesses. The City's single police station is located within the central business district, at 300 East 13th Street.

Response to the project area is primarily from the West Precinct, although police response is different from fire and ambulance services in that units are generally on patrol and may be dispatched from anywhere in the response area.

[39] *David Evans & Associates, Revised Draft – West 39th Street Rail Crossing Transportation Analysis, April 2000.*

Public Services within the Study Area
Exhibit 4-27



What schools are located in the study area?

The Vancouver School District operates 21 elementary schools, five middle schools, and five high schools for its 21,500 students. District facilities are located throughout the City. The newly constructed Fruit Valley Elementary School is located west of the BNSF rail yard, just south of West 39th Street. Benjamin Franklin and Lincoln Elementary Schools are located to the east of the rail yard. Fruit Valley students continue at Jason Lee Middle School, north of the improvement area, and attend high school at either Columbia River or Hudson's Bay High School. Other schools in the vicinity include Hazel Dell, Lake Shore, and Hough Elementary Schools and Discovery Middle School.

Fruit Valley Elementary School is currently the smallest elementary school in the Vancouver School District, with approximately 200 students in kindergarten through fifth grade.

Approximately 85 percent of students qualify for free or reduced price lunches. The School District characterizes the student population as "quite transient," with approximately 36 percent of students entering and/or leaving each year."[40]

The District regularly buses students over the railroad tracks at Fourth Plain Boulevard to access the area. Students are transported to and from the Fruit Valley School and the District's other facilities. The district reports regular use of the at-grade crossing at West 39th Street.

Our Lady of Lourdes is a private school located near the study area at 4701 Northwest Franklin Street; enrollment is 310 students in preschool through eighth grade.

In late 2001, the Vancouver School District broke ground on a new Fruit Valley Elementary School and community center. The old school on the east side of West Fruit Valley Road will be closed. The new school will be located northwest of the existing school – at West La Fromboise Road and West Fruit Valley Road.

What religious and social institutions are located in the study area?

There are religious institutions throughout the City of Vancouver. Churches are generally concentrated outside the study area, north and south along Main Street and on smaller side streets. Several churches and religious institutions are located in proximity to the study area. Based on a site visit to the study area, no churches or religious institutions are immediately adjacent to the rail corridor.

The Fruit Valley Community Center is located to the west of the study area, across West Fruit Valley Road next to Fruit Valley Park. The Community Center houses meeting rooms for local church groups, unions, and other meetings. The facility is often used for family and community gatherings. Community meeting space is available to the east of the project area, in other City community centers and east of I-5 at Clark Community College and Officer's Row (George C. Marshall House).

[40] *Vancouver School District, 2000*

What other public services and utilities are located in or serve the study area?

Southwest Washington Medical Center operates two full service hospital and medical center campuses and several satellite locations in Vancouver. The Memorial Health Center and Urgent Care Clinic (a Southwest Washington Medical Center facility) at 35th Street and Main Street, to the east of the study area, provides urgent care, hospice, psychiatric, and same day services.

Public health services are provided by the Southwest Washington Health District and area non-profit organizations. These services are described in greater detail in following sections.

Public facilities are concentrated to the east of the project area and include the Civic Center, Clark County Historical Museum, Fort Vancouver Historic Site and the Vancouver Community Library. Shelters, refugee and low-income health services, are located to the east of I-5, as well, and are operated by Southwest Washington Health District and non-profit service providers. There is a Southwest Washington WorkSource office, which provides employment and training service to job seekers, on West 39th Street, east of study area.

Clark Public Utilities provides electric and water utility services to areas north of the study area. The southern portion of the study area is controlled by the City of Vancouver, which provides base operations support for water, wastewater, and drainage services, along with street and grounds maintenance. The Water Maintenance Work Team operates and maintains the water distribution system for Vancouver and the Wastewater Work Team operates and maintains the wastewater collection system of 650 miles of wastewater pipes and 29 pumping stations. Water Station #3 is located near Lincoln School, to the east of the improvement area on the west side of I-5. Garbage collection services in west Vancouver are provided by Waste Management and in the east by Waste Connections, Inc.

Environmental Justice

For the **Vancouver Rail Project**, WSDOT must consider the potential environmental justice effects consistent with Executive Order (EO) 12898 and U.S. Department of Transportation (DOT) Orders 5610.2 and 6640.23, as well as the non-discrimination requirements of Title VI of the 1964 Civil Rights Act. These laws, orders, and the policies they prescribe, provide for consideration of the potential environmental and human health effects of projects on minority and low-income populations. Specifically, agencies must determine whether projects present disproportionately high and adverse environmental effects on minority and/or low-income communities.

FHWA's environmental justice policy, as stated in DOT Order 6640.23, provides guidance for integrating environmental justice into existing operations, preventing disproportionately high and adverse effects, and how to address such effects if they are likely.

Determinations of the presence of environmental justice populations and the potential effects on those populations rely, to a large degree, on analysis of

demographic information, such as the U.S. Census data, and information gathered through public involvement and outreach activities.

How was a study area determined for this analysis?

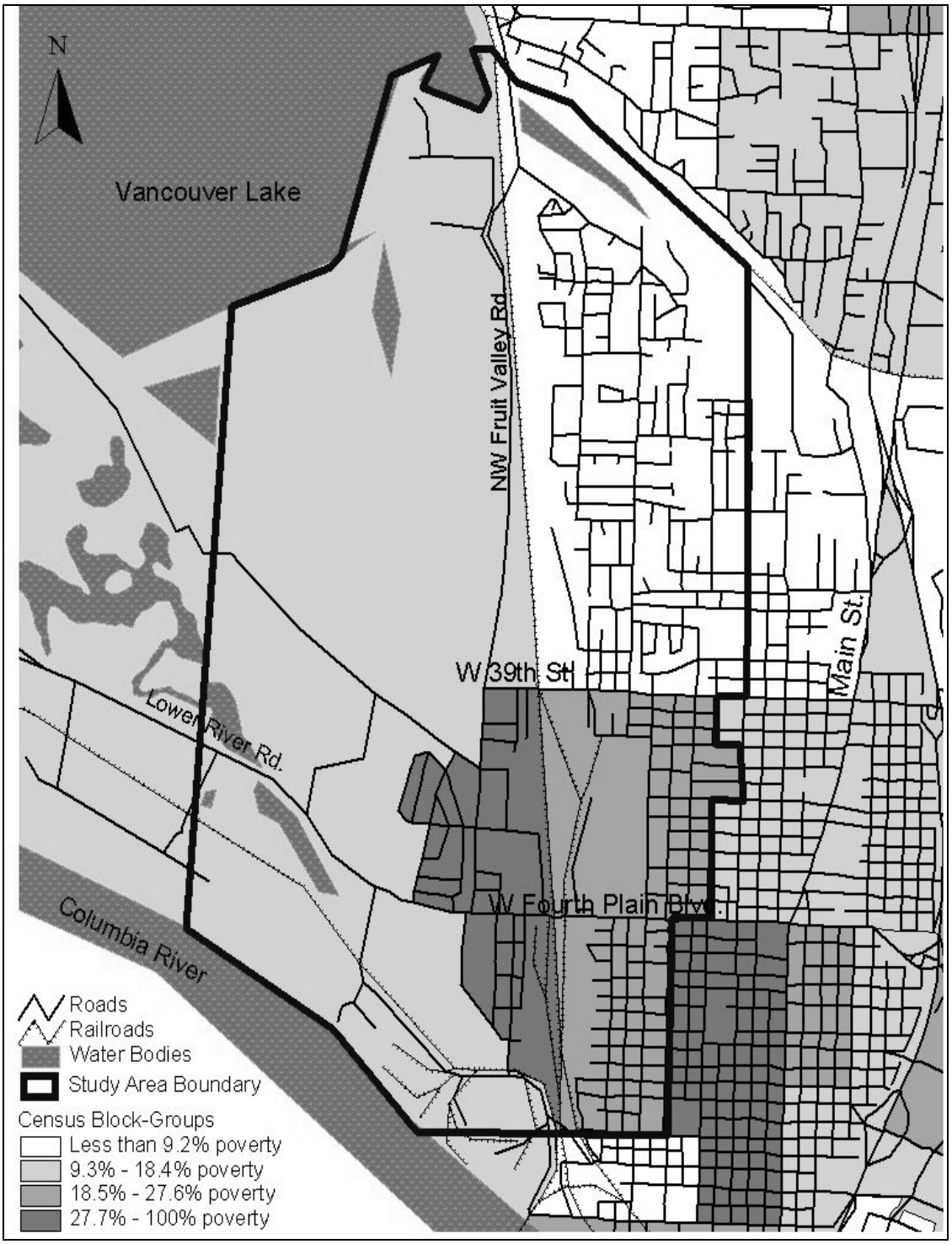
The boundaries of the **Vancouver Rail Project** study area for environmental justice were determined by several factors:

- The area of potential construction and operational effects of the project alternatives; and
- The level of detail of available data to be used for the analysis of demographic characteristics.

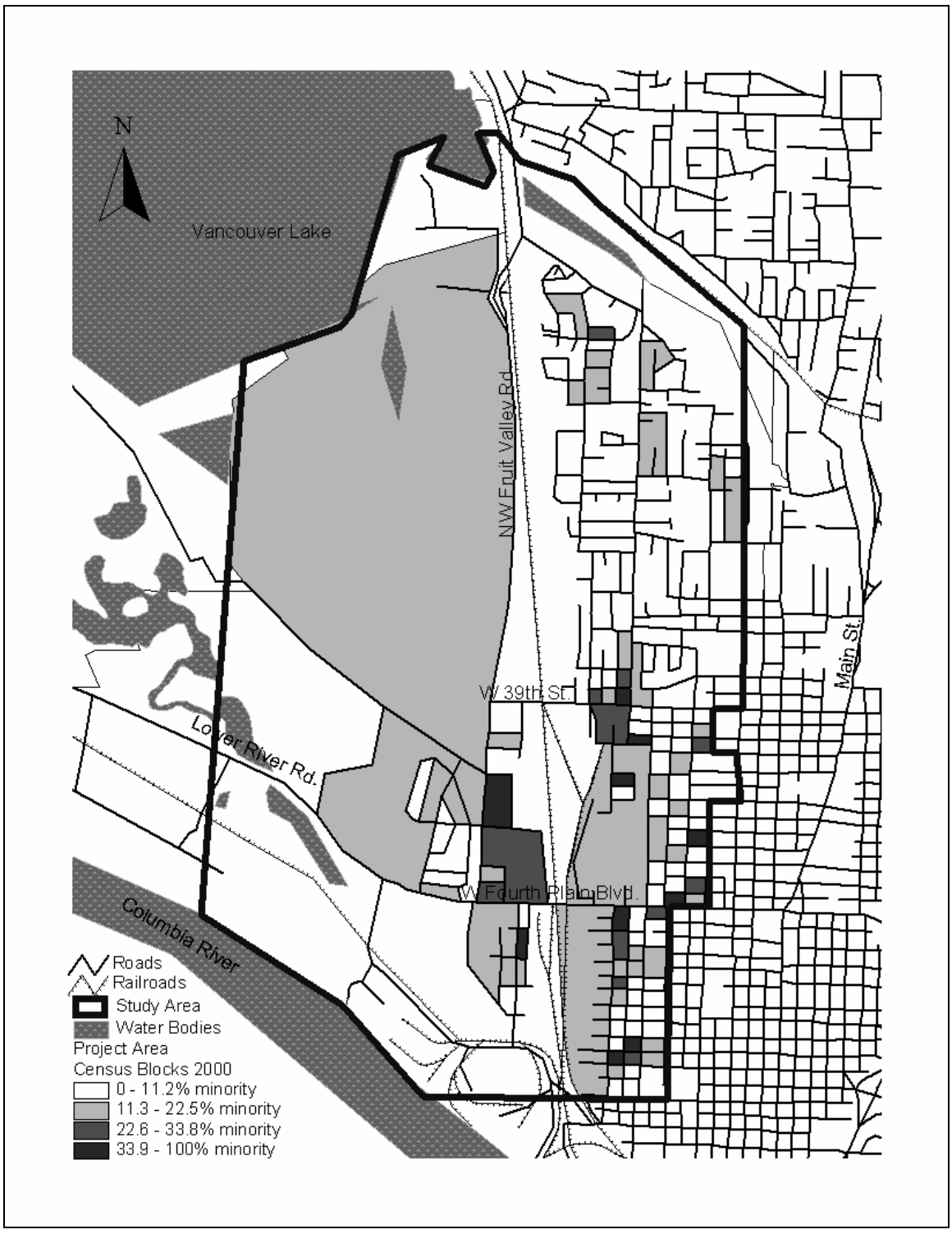
1990 U.S. Census data on poverty and 2000 U.S. Census data on race are the most recent data sets available, and comprehensive data on race and income characteristics for Clark County, Washington, where the **Vancouver Rail Project** is located. The Census uses geographical divisions and subdivisions to gather and present demographic data. Within a county, Census tracts are divisions that are delineated to provide "…relatively homogeneous units with respect to population characteristics, economic status, and living conditions at the time they are established…"[41] and generally contain between one thousand and eight thousand people, with an optimum size of four thousand people. Census tracts are further divided into block groups, which generally contain between three hundred and three thousand people, with an optimum size of fifteen hundred people. In turn, block groups are comprised of Census blocks, the smallest unit for which the U.S. Census tabulates data.

For this environmental justice re-evaluation, the study area includes the Census block groups that would likely be affected by the proposed project alternatives. The study area boundaries are shown in **Exhibits 4-28 through 4-30** and roughly correspond to West Columbia Street on the east, West 13th Street on the south, Vancouver Lake on the west, and Burnt Bridge Creek on the north. The study area contains part or all of Census Block Groups 1 and 2 from Census tract 041005, block groups 1, 2, and 3 from tract 041003, block group 2 from tract 0420, block group 2 from tract 0421, and block group 3 from tract 0423. According to year 2000 Census divisions, the study area also includes parts of block group 4 from tract 041003 and block group 2 from tact 042300.

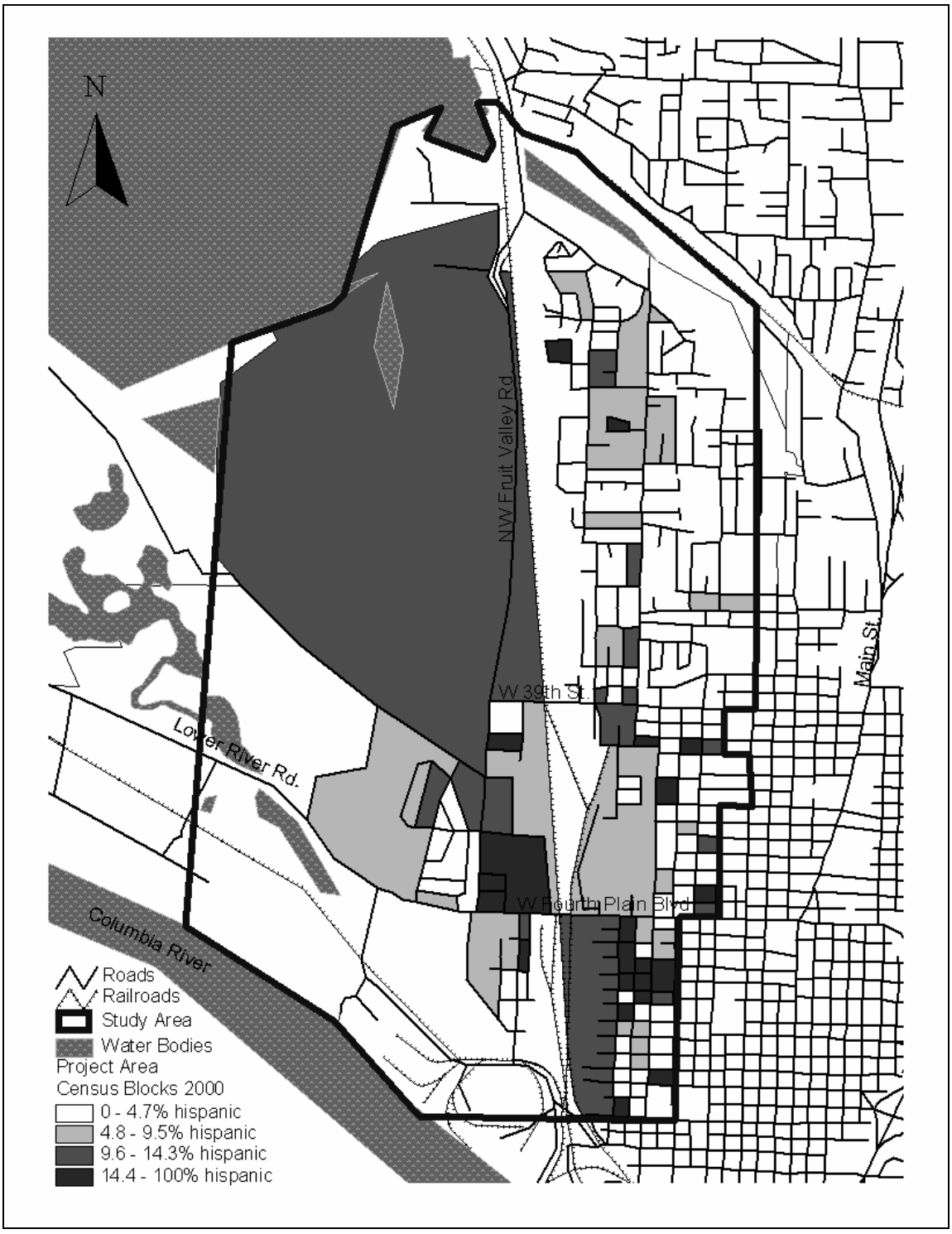
[41] *U.S. Census, 2000.*



Poverty Level by Census Block Group, 1990
Exhibit 4-28



Minority Population by Census Block Group, 2000
Exhibit 4-29



Hispanic Population by Census Block Group, 2000
Exhibit 4-30

What data were used for this analysis?

The most recent detailed demographic data available from the U.S. Census describing poverty characteristics of the population are from 1990, and area available at the Census block group level. The most recent detailed data describing racial characteristics are from the 2000 U.S. Census and are available at the Census block level. Using these most detailed levels of data available is important because the population groups considered in environmental justice analysis are often difficult to identify with less detailed data, such as the census tract level. Additionally, it is important to use detailed data for this project due to the relatively small geographic area affected by the project.

There were three main data sets that were considered for the purpose of determining the locations of potential environmental justice populations. The first data set describes the minority population in each census block in the study area. These data were calculated by adding the populations of all minorities (Black, American Indian, Aleutian, Eskimo, Asian, and Hispanic peoples) in each block and then dividing the sum by the total population of the census block. The result is a measure of the total minorities present in each census block as a percentage of the total population. The second data set shows the percentage of persons in each census block who are identified as Hispanic. These data were calculated by taking the total number of Hispanic persons living in each block and dividing the number by the total population of the block. The source for year 2000 race data, U.S. Census 2000 Summary File 1, reports Hispanic population data separately from the other minorities. There is no way to accurately integrate the Hispanic population data from Summary File 1 with the associated minority data to produce a single figure for all minorities. As such it is necessary to analyze the Hispanic population data separately. The third data set shows the percentage of persons in each census block group living in poverty. These data were calculated by taking the total number of persons living in poverty in each block group and dividing the number by the total population of the block group.

The Clark County averages for each of these data sets were also calculated and used as reference to determine whether a specific block or block-group contained potential environmental justice populations, which would be indicated by minority and/or poverty percentages substantially higher than those for Clark County as a whole. These county data are shown in **Exhibit 4-31**.

Clark County Population Data

Exhibit 4-31

	1990 Total Persons	Living in Poverty (1990)	2000 Total Persons	Minority Persons (2000)	Hispanic Persons (2000)
Persons	238053	21910	345238	38590	16248
Percent	100.0%	9.2%	100.0%	11.2%	4.7%

Study Area Census Block-Group Poverty Data

Exhibit 4-32

	1990 Total Persons	Living in Poverty (1990)	2000 Total Persons	Minority Persons (2000)	Hispanic Persons (2000)
Persons	238053	21910	345238	38590	16248
Percent	100.0%	9.2%	100.0%	11.2%	4.7%

Poverty Characteristics

The study area is made up of all or part of eight Census block groups. The poverty data for these block groups are displayed in **Exhibit 4-32**. Three of the eight block groups (041005, 0421, and 0423) display poverty levels that are significantly higher than the countywide average. In these block groups, the percentage of persons living in poverty is two to three times the county average. These three block groups are located at the southern end of the study area, as shown in **Exhibit 4-28**, and are candidates for further analysis of environmental justice. Project impacts to these identified environmental justice populations are discussed in chapter 5 of this document.

Minority Characteristics

The study area contains 184 Census blocks in the 2000 Census. Many blocks in the study area show substantially higher percentages of minority and Hispanic populations than the county as a whole; these blocks are shown in **Exhibit 4-33**. All of the blocks shown in **Exhibit 4-33** have a percentage of minority inhabitants that is at least twice as great as the countywide average (11.2 percent). All of the blocks shown in **Exhibit 4-33** have a percentage of Hispanic inhabitants that is at least twice as great as the countywide average (4.7 percent). Project impacts to these identified environmental justice populations are discussed in chapter 5 of this document. For the most part, these blocks are evenly distributed throughout the study area, as shown in **Exhibit 4-29** and **4-30**, respectively.

There are a few rather distinct clusters of blocks with high minority and Hispanic populations within the study area. One cluster is located near the intersection of West Fourth Plain Boulevard and Northwest Fruit Valley Road, on the west side of the railroad tracks. Another cluster is located a few blocks east of the railroad tracks to the north and south of West 39th Street. There is also a cluster located in the southeastern corner of the study area, to the south of West Fourth Plain Boulevard and east of West Lincoln Avenue. In addition there are blocks with significant Hispanic populations immediately bordering the railroad on the west to the north of West 39th Street (**Exhibit 4-29**). These two areas however, have populations of less than ten persons each, representing a small overall minority population.

Visual Quality

A typical visual quality analysis entails the use of complicated models developed by the U.S. Department of Transportation. This visual quality assessment used the Federal Highway Administration's (FHWA) Visual Impact Assessment model to examine the vividness, intactness, and unity of the view toward and from the

Minority Population Data for High Minority Blocks Only

Exhibit 4-33

CENSUS TRACT	CENSUS BLOCK	TOTAL PERSONS	TOTAL MINORITIES	PERCENT MINORITIES
041003	208	42	8	19.05%
041005	104	85	24	28.24%
041005	105	173	32	18.50%
041005	108	114	17	14.91%
041005	113	40	7	17.50%
041005	115	87	18	20.69%
041005	123	17	7	41.18%
041005	125	16	4	25.00%
041005	204A	10	3	30.00%
0420	211	16	3	18.75%
0420	214	40	9	22.50%
0420	215	32	10	31.25%
0420	216	26	5	19.23%
0420	217	12	3	25.00%
0420	223	65	13	20.00%
0421	204	37	6	16.22%
0421	205	27	4	14.81%
0421	218	38	18	47.37%
0421	222	61	15	24.59%
0421	228	19	5	26.32%
0421	237	27	4	14.81%
0421	242	7	4	57.14%
0423	302	85	19	22.35%
0423	308	54	14	25.93%
0423	311	29	6	20.69%
0423	312	23	8	34.78%
0423	316	19	3	15.79%
0423	319	49	10	20.41%
0423	321	37	11	29.73%
0423	322	4	2	50.00%
0423	323	5	1	20.00%
0423	325	51	10	19.61%
0423	328	18	6	33.33%
0423	329	19	11	57.89%
0423	330	50	17	34.00%

improvement site. The model uses a scale from zero to ten (zero being very low, and ten being very high). Another technique of visual analysis would include use of Washington State Department of Transportation's Visual Impact Assessment for Highway Improvements.

Views from and toward the rail tracks and yard were evaluated for the area within the rail right-of-way, outside of the rail right-of-way extending to the visible landscape. Although views from the rail tracks were modeled, residential views toward the study area were given more consideration because only general landscape qualities could be viewed from the passenger train due to its existing speed.

How was this assessment performed?

Visual quality assessment definitions and pictorial examples were reviewed prior to site visits. Site visits included visiting the study area and detailing general visual qualities. During the site visit, two to three locations along the railroad were selected to conduct the visual quality assessment. Locations were where visual characteristics altered. At each location, the view from the corridor and towards the rail line was evaluated. Following site visitation, the numerical assessments were entered into the FHWA model.

The model contains a visual quality criteria rating scale (See

Exhibit 4-34). The observer notes the landscape from fifteen differing views and rates each view using a scale from one to ten. A score of 10 for all categories denotes the most desirable visual quality. Low scores indicate lesser visual quality.

Vividness applies to the memorability of the visual impression of landscape elements and pattern. Intactness rates the integrity of the visual order in terms of natural and man-made elements. Unity rates the degree to which a harmonious pattern is created out of landscape elements. The following scales were used to determine the visual quality of the improvement.

Windshield surveys were conducted in July 1997 via passenger train. Field assessments were completed through a series of site visits in the months of September and October 1997. Updated field assessments were conducted in June and July 1999.

What are the general visual characteristics of the study area?

Vividness, Unity & Manmade and Natural Environment Intactness Scale

Exhibit 4-34

10	Very High
9	High
7,8	Moderately High
4,5,6	Average
2,3	Moderately Low
1	Low
0	Very Low

Views from the rail line and views of the rail line and yard area were identified. At the current train speeds and anticipated increased speeds, passengers' views (view from the tracks) are limited to landscape generalities with some vivid features.

The typical landscape viewed by the passenger along the rail line is of mixed land uses in the City of Vancouver and the suburban area north of the city. The area of the Vancouver rail yard is an exception, where views are limited to the industrial train yard and heavy brush that surrounds the tracks in the north end of the study area. Other views include brief glimpses of small rivers, streams, or lakes. The tracks often run adjacent or near roadways. Through the City of Vancouver, the rail line primarily runs through industrial property and along rail support structures. The view is a side view, as passengers cannot see ahead or the tracks the train is riding on. Thus, emphasis of visual quality assessments was placed on the views toward the rail line from surrounding residents or highway users.

Views of the rail yard are obscured by most residences in the study area because the homes are set back from the top of the slope. Train tracks and train activity is visible from overpasses at West Fourth Plain Boulevard and West Mill Plain Boulevard on the south end of the project. Trains may also be noticed by persons in vehicles traveling on West Fruit Valley Road.

The actual rail configuration is often unnoticeable by the viewing public, whether passenger or bystander. The rail corridor is most visible at times when railroad freight or passenger trains pass. Currently trains must stop and wait on sidings for opposing train traffic to pass.

How did the study area score?

The Vancouver rail yard is a typical rail yard facility. It has been operational for over one hundred years and consists of numerous tracks, signals and support structures of various ages. Here the study area is on the perimeter of the rail yard, where views are primarily of rail yard facilities, trains, and tracks. Currently passenger views are totally obscured by cars on adjacent tracks. There are limited residential views in the vicinity due to heavy vegetation in the area, and manufacturing land use adjacent to the rail yard. The Vancouver rail yard scored low for all vividness, unity and intactness, indicating the presence of manmade development and eyesores. Thus, the existing visual quality is poor.

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