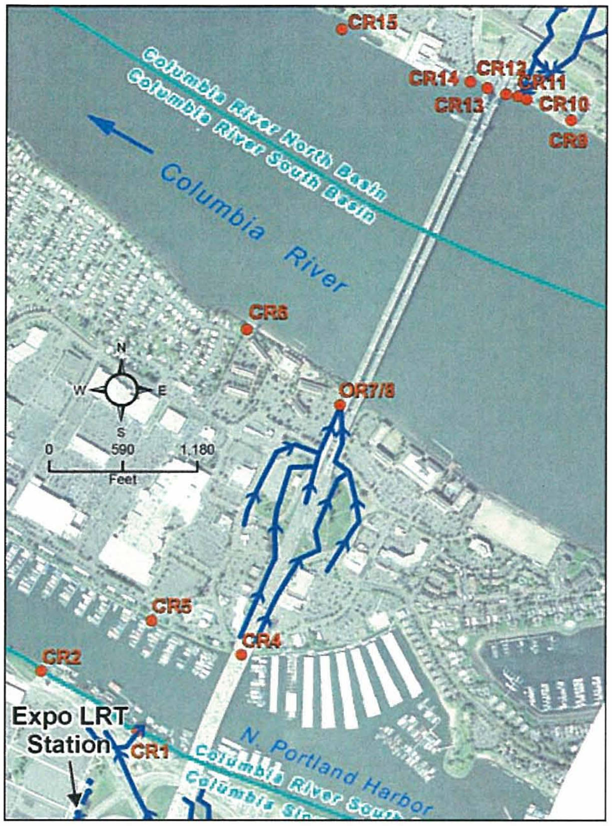
Exhibit 3.16-4
Columbia River Stormwater Map



Source: CRC Stormwater Technical Report.

The solid lines are piped stormwater conveyances, arrows show direction of flow, and points labeled CR are stormwater outfalls.

BURNT BRIDGE CREEK

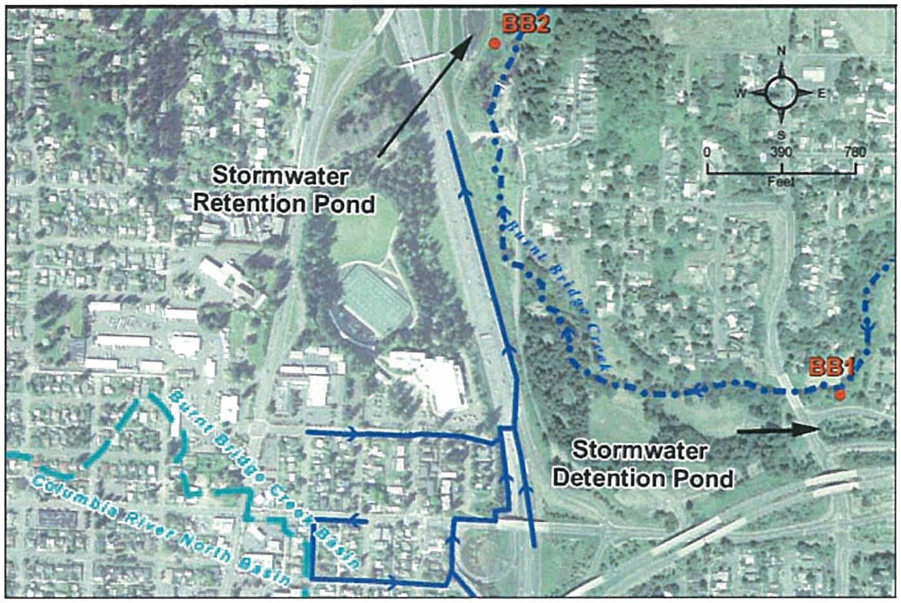
Burnt Bridge Creek originates in East Vancouver from field ditches that drain a large wetland area between NE 112th Avenue and NE 164th Avenue. The creek is approximately 12.9 miles in length and alternates between ditches and natural channels. Except for floodplains, parks, and wetlands, nearly the entire basin is urbanized. In the project area, the creek flows through a small canyon with a narrow floodplain. The creek passes under the existing highway in a culvert north of the project area.

The section of Burnt Bridge Creek in the project area does not meet Washington State water quality standards for temperature or fecal coliform. Of these water quality concerns, the project alternatives could affect fecal coliform. Washington regulations require including flow control measures to reduce runoff flow rates to pre-development conditions for new development that drains to Burnt Bridge Creek.

The Burnt Bridge Creek 100-year floodplain, as mapped by FEMA, is limited to the area immediately adjacent to the stream, as shown in Exhibit 3.16-2. This project would not extend into the 100-year floodplain of this stream.

As shown in Exhibit 3.16-5, several outfalls from I-5 discharge to Burnt Bridge Creek. There are also two constructed stormwater ponds that collect runoff from I-5. These ponds can release water to the creek during high flow events.

Exhibit 3.16-5
Burnt Bridge Creek Stormwater Map



Source: CRC Stormwater Technical Report.

The dotted lines are surface conveyances, and sold lines are pipes. Arrows show direction of flow. Points labeled BB are stormwater outfalls.

3.16.2 Long-term Effects of the Project Alternatives

The differences among the build alternatives are generally much less than the difference between them and the No-Build Alternative. The build alternatives would improve existing stormwater conditions. The No-Build alternative would keep the existing stormwater treatment levels.

All the build alternatives would require placement of material within the 100-year floodplain of the Columbia River. Given the size of the Columbia River in relation to the proposed structure that will be within the floodplain, no adverse impacts are anticipated to occur to the floodplain. In addition, volumes of fill for each of the alternatives are relatively similar when compared to the volume of the Columbia River floodplain. Executive Order 11988 and local and state regulations require more detailed analysis of floodplain impacts, including a no-rise analysis, prior to project approval. This analysis will be completed when more detailed design of piers is available.

Increases in impervious surface area are generally associated with both increased pollutant load in runoff and with increased stormwater flow control problems. Stormwater guidelines for WSDOT, ODOT, and the City of Portland were followed by the project team when developing the conceptual stormwater management plan. After considering areas requiring treatment and after applying technical feasibility criteria per the guidelines, between 35 and 38 acres of untreated impervious surface would remain for each of the build alternatives. The CRC Conceptual Design Stormwater Report fully discusses the applied guidelines.

There are no substantive differences among the build alternatives in the overall amount of new impervious surface area. Although these represent a very small percentage increase in paved area for the watersheds involved, this would be an incremental adverse effect on stream water quality. None of the alternatives is likely to measurably affect flow conditions within the project area. Except for Burnt Bridge Creek, flows in project area waters are controlled by tides, dams, or pumps.

Although the total amount of impervious surface area would increase for each of the build alternatives, the amount of untreated impervious surface would drop dramatically. This is because all new or reconstructed impervious area would be treated, while under the No-Build Alternative runoff from some existing impervious surfaces is not retained or treated, and a portion drains directly into surface water bodies without impediment. Any of the build alternatives would decrease the area contributing untreated runoff to waterways by more than 120 acres.

Total suspended solids and other pollutants entering waterways would decrease substantially in the overall project area from all build alternatives, the Burnt Bridge Creek and Columbia Slough drainages could have increases in certain pollutants compared to current conditions.

Another pollutant, dissolved copper, is known to have a harmful effect on fish.[44] Burnt Bridge Creek and the Columbia Slough could receive increased loads of dissolved copper. However, this increase in copper is due largely to the conceptual stormwater design used to conduct the DEIS analysis. This conceptual design, which is one of many under consideration, would collect runoff from the south portion of the I-5 river bridge and the highway across Hayden Island, and convey it to treatment facilities near Marine Drive before discharging into the Columbia Slough. This stormwater management design is preliminary and would require exceptions from design standards from FHWA and ODOT. Other approaches are also being considered.

Alternative 1: No-Build

If the CRC project does not go forward, several adverse long-term effects to water quality are anticipated.

Stormwater runoff from the I-5 crossing and much of the highway would continue to flow untreated to the Columbia River and other surface waters. As traffic and congestion continue to increase in the future, pollutant loads would also increase. The load of pollutants, like copper, could increase with more start-and-stop traffic, which increases brake pad wear.

The existing I-5 crossing would continue to be more vulnerable to collapse from a severe earthquake, which would cause major adverse impacts to water quality in the Columbia River and North Portland

[44] Hecht et al., 2007.

Harbor channel. In addition, the existing bridge will require repainting in the future that could introduce contaminants into the Columbia River.

Alternative 2: Replacement Crossing with Bus Rapid Transit

Exhibit 3.16-6
Water Quality Effects Associated with Alternative 2

	Alternative 2: Replacement Crossing with Bus Rapid Transit			
Environmental Metric[a]	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College MOS (C)	Mill Plain MOS (D)
Approximate total impervious surface area (acres)	249	249	247	247
Approximate untreated impervious surface area (acres)	38	38	38	38
Total Suspended Solids (lbs./year)	43,293	43,293	43,177	43,177
Total Phosphorus (lbs./year)	109	109	108	108
Dissolved Copper (lbs./year)	8	8	8	8
Dissolved zinc (lbs./year)	49	49	49	49

Source: CRC Conceptual Design Stormwater Technical Report and CRC Hydrology and Water Quality Technical Report.
[a] The Stacked Transit/Highway Bridge design would perform the same as the three-bridge replacement design.

As shown in Exhibit 3.16-6, for the replacement crossing designs terminating at Kiggins Bowl or Lincoln, total impervious surface area would encompass approximately 249 acres, approximately 43 acres more than the existing condition. However, the amount of impervious surface without stormwater treatment would decline by approximately 124 acres, to a total of about 38 acres. Because the MOS designs do not include a guideway extending further north, they would encompass approximately 247 acres of impervious surface, of which 38 acres would remain untreated.

Pollutant loads from Alternative 2 would still be present, but would decline for all pollutants of concern compared to the existing condition, due to proposed treatment methods. Total suspended solids for these alternatives would total approximately 43,293 pounds per year. Total phosphorus loading would be approximately 109 pounds per year, dissolved copper loading would be approximately 8 pounds per year, and dissolved zinc loading would be approximately 49 pounds per year.

While the overall pollutant loading for the project area is expected to decrease, the Burnt Bridge Creek and Columbia Slough basins would experience increases in loads of certain pollutants. For example, dissolved copper would increase by 0.2 pounds per year to total 1.4 pounds per year in the Burnt Bridge Creek basin and by 0.5 pounds per year to total 2.4 pounds per year in the Columbia Slough Basin. Dissolved zinc would increase by 1.3 pounds per year to total 8.0 pounds per year in the Burnt Bridge Creek Basin and by 2.0 pounds per year to total 14.8 pounds per year in the Columbia Slough Basin. Effects on water quality and estimated concentration of pollutants in natural waters will be quantified after designs for infrastructure and treatment elements are advanced.

Alternative 3: Replacement Crossing with Light Rail

Exhibit 3.16-7
Water Quality Effects Associated with Alternative 3

	Alternative 3: Replacement Crossing with Light Rail Transit			
Environmental Metric[a]	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College MOS (C)	Mill Plain MOS (D)
Approximate total impervious surface area (acres)	248	248	246	246
Approximate untreated impervious surface area (acres)	38	38	38	38
Total Suspended Solids (lbs./year)	43,235	43,235	43,119	43,119
Total Phosphorus (lbs./year)	108	108	108	108
Dissolved Copper (lbs./year)	8	8	8	8
Dissolved zinc (lbs./year)	49	49	49	49

Source: CRC Conceptual Design Stormwater Technical Report and CRC Hydrology and Water Quality Technical Report.
[a] The Stacked Transit/Highway Bridge design would perform the same as the three-bridge replacement design.

As shown in Exhibit 3.16-7, for the replacement crossing designs terminating at Kiggins Bowl or Lincoln, total impervious surface area would encompass approximately 248 acres, approximately 42 acres more than the existing condition. However, the amount of impervious surface without stormwater treatment would decline by approximately 124 acres, to a total of about 38 acres. Those replacement crossing designs terminating at the Clark College or Mill Plain would encompass approximately 246 acres of impervious surface, of which 38 acres would remain untreated.

As shown in Exhibit 3.16-7, pollutant loading would be similar to Alternative 2.

Alternative 4: Supplemental Crossing with Bus Rapid Transit

Exhibit 3.16-8
Water Quality Effects Associated with Alternative 4

Alternative 4: Supplemental Crossing with Bus Rapid Transit				
Environmental Metric	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Approximate total impervious surface area (acres)	234	234	232	232
Approximate untreated impervious surface area (acres)	35	35	35	35
Total Suspended Solids (lbs./year)	40,735	40,735	40,619	40,619
Total Phosphorus (lbs./year)	102	102	102	102
Dissolved Copper (lbs./year)	8	8	8	8
Dissolved zinc (lbs./year)	46	46	46	46

Source: CRC Conceptual Design Stormwater Technical Report and CRC Hydrology and Water Quality Technical Report.

For the supplemental crossing designs terminating at Kiggins Bowl or Lincoln, total impervious surface area would encompass approximately 234 acres, approximately 28 acres more than the existing condition (Exhibit 3.16-8). However, the amount of impervious surface without stormwater treatment would decline by approximately 127 acres, to a total of about 35 acres. Those supplemental crossing designs terminating at the Clark College or Mill Plain would encompass approximately 232 acres of impervious surface, of which 35 acres would remain untreated.

Pollutant loads from Alternative 4 would still be present, but would decline for all pollutants of concern compared to the existing condition, due to proposed treatment methods. Total suspended solids for these alternatives would total approximately 40,735 pounds per year. Total phosphorus loading would be approximately 102 pounds per year, dissolved copper loading would be approximately 8 pounds per year, and dissolved zinc loading would be approximately 46 pounds per year.

While the overall pollutant loading for the project area is expected to decrease, the Burnt Bridge Creek and Columbia Slough basins would experience increases in loads of certain pollutants. For example, dissolved copper would increase by 0.2 pounds per year to total 1.4 pounds per year in the Burnt Bridge Creek basin and by 0.2 pounds per year to total 2.1 pounds per year in the Columbia Slough Basin. Dissolved zinc would increase by 1.2 pounds per year to total 7.9 pounds per year in the Burnt Bridge Creek Basin, but would decrease by 0.1 pounds per year to total 12.7 pounds per year in the Columbia Slough Basin. Effects on water quality and ultimate concentration of pollutants in natural waters will be quantified after designs for infrastructure and treatment elements are advanced.

Alternative 5: Supplemental Crossing with Light Rail

Exhibit 3.16-9
Water Quality Effects Associated with Alternative 5

	Alternative 5: Supplemental Crossing with Light Rail Transit			
Environmental Metric	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College MOS (C)	Mill Plain MOS (D)
Total impervious surface area (acres)	233	233	231	231
Untreated impervious surface area (acres)	35	35	35	35
Total Suspended Solids (lbs./year)	40,677	40,677	40,561	40,561
Total Phosphorus (lbs./year)	102	102	101	101
Dissolved Copper (lbs./year)	8	8	8	8
Dissolved zinc (lbs./year)	46	46	46	46

Source: CRC Conceptual Design Stormwater Technical Report and CRC Hydrology and Water Quality Technical Report.

For the supplemental crossing designs terminating at Kiggins Bowl or Lincoln, total impervious surface area would encompass approximately 233 acres, approximately 27 acres more than the existing condition (Exhibit 3.16-9). However, the amount of impervious surface without stormwater treatment would decline by approximately 127 acres, to a total of about 35 acres. Those replacement crossing designs terminating at the Clark College or Mill Plain would encompass approximately 231 acres of impervious surface, of which 35 acres would remain untreated.

Pollutant loading is similar to Alternative 4.

3.16.3 Long-Term Effects of Project Components

This section discusses the specific impacts associated with project components and options. Tolling scenarios and transportation system/demand management options have no notable effect on water quality so are not specifically discussed below.

Multimodal River Crossing and Highway Improvements (Replacement Crossing with Alternatives 2 and 3; Supplemental Crossing with Alternatives 4 and 5)

As discussed above, the replacement crossing would improve stormwater treatment compared to No-Build and the supplemental crossing. The supplemental crossing would improve stormwater treatment when considering the entire project area compared to the No-Build Alternative, but not by as much as the replacement crossing. Highway interchange options would not differ substantially in their stormwater effects. Impacts to the 100-year floodplain would be minor. A detailed no-rise analysis will be performed later in the design process.

The stacked transit/highway bridge design for the replacement crossing would reduce the pollutant load in stormwater from the crossing slightly more than the standard replacement crossing, the supplemental crossing, or No-Build. Transit vehicles would travel in the interior of the bridge structure, reducing the overall impervious surface area, and any pollutants associated with them would be collected and treated prior to discharge.

Transit Mode (BRT with Alternatives 2 and 4; LRT with Alternatives 3 and 5)

Pollutant constituents in runoff from non-electric bus rapid transit vehicles are comparable to those from other road vehicles. Constituents include metals, such as copper from brake-pad wear. Light rail does not use a braking system that contains copper, and light rail is not associated with many other pollutants typically contained in road runoff. The bus rapid transit option would also include slightly more new impervious surface area than light rail options. An additional 1 acre of impervious surface would be needed for bus rapid transit at the Expo Center station to allow for bus turnaround and passenger transfer to light rail. Extending the light rail line across the river would not require this much new impervious area at the Expo Center station. These factors mean that light rail options are likely to have fewer adverse effects to water resources when compared to bus rapid transit.

Bus rapid transit could potentially require expanding the C-TRAN bus maintenance facility in east Vancouver at 65th Avenue by approximately 6.7 acres. No floodplain encroachments are anticipated at this site. Associated stormwater treatment would result in minimal impacts to surface water or ground water resources.

Likewise, light rail would require expansion of the existing Ruby Junction maintenance facility on NW Eleven Mile Avenue in Gresham by approximately 10.5 acres. Portions of the site are located within the 100-year floodplain, however no structures are proposed to be erected within the floodplain. If structures were constructed, or the floodplain were otherwise encroached upon, balanced cut and fill would likely be required. Associated stormwater treatment would result in minimal impacts to surface water or ground water resources.

Even if the No-Build Alternative is chosen and CRC is not built, regional transit services are likely to increase from other projects, and expansion of the vehicle maintenance facilities would likely occur. If one of the build alternatives is chosen for CRC, this project would contribute to the size of that expansion.

Transit Terminus Options (with all Alternatives)

The terminus options would have potentially different effects on water quality only in the northern part of the project area where the Kiggins Bowl terminus is near steep slopes. This could potentially increase erosion that could affect Burnt Bridge Creek. If an accident were to occur in this part of the route during transit operation, then spills or leaks from the accident could potentially affect the creek. The Lincoln terminus does not run near steep slopes or surface waters.

The Kiggins Bowl terminus would also entail a larger increase in impervious area in the Burnt Bridge Creek watershed. The Lincoln terminus would drain into the Columbia River watershed, which is much larger than Burnt Bridge Creek's. Small watersheds are affected more by a small increase in impervious area, so the same acreage of impervious surface could have greater water quality effects in Burnt Bridge Creek (Kiggins Bowl terminus) than the Columbia River (Lincoln terminus).

Compared to the full-length Kiggins Bowl terminus, building shorter-length routes to either the Clark College or Mill Plain transit centers would avoid the potential effects to Burnt Bridge Creek. Both MOS options would also have less impervious surface than the Kiggins Bowl terminus, though not substantially less because the MOS options would still include multiple park and rides. The shorter Mill Plain option would have slightly lower impacts to water resources than the Lincoln terminus option.

Transit Alignment Options (with all Alternatives)

The transit alignment options (adjacent vs. offset; two-way Washington vs. Broadway-Washington; two-way Broadway vs. Broadway-Main; or 16th Street vs. McLoughlin) would have no measurable differences in long-term water quality effects.

3.16.4 Temporary Effects

For the water quality analysis, temporary effects are those that would occur during construction, and that would likely cease once construction is finished. No CRC-related construction would occur if the No-Build Alternative is chosen, so no temporary effects are considered for that option.

Construction involves ground disturbance, which can increase soil erosion substantially. Construction that causes disturbance along river or stream banks would increase the potential for erosion into the water. If runoff contains extra sediment from erosion, waterways can become turbid (cloudy rather than clear), and can build up excessive sediment deposits. Section 3.14, Ecosystems, discusses the harmful effects of turbidity to fish.

The area of potential ground disturbance would differ only slightly among the roadway and terminus options. The Lincoln terminus option would result in ground disturbance of 373 acres for the supplemental crossing alternatives, and 384 acres of disturbance for the replacement crossing alternatives. The Kiggins Bowl terminus option would result in ground disturbance of 354 acres for the supplemental crossing alternatives, and 366 acres of disturbance for the replacement crossing alternatives. The MOS options would result in approximately two acres less disturbance than the Kiggins Bowl terminus for all build alternatives.

In the northern part of the project area the Kiggins Bowl terminus runs alongside Burnt Bridge Creek for about 1,400 feet and would slightly encroach on its protected buffer area. Construction of this alignment would have a higher potential for erosion or releases of hazardous materials that could affect the creek's water quality.

Topography in the area is generally flat, except near Burnt Bridge Creek. Outside of that area, none of the project alternatives are likely to cause substantial amounts of erosion that could create turbidity and sedimentation effects. Roadway construction of the I-5/SR 500 interchange (all build alternatives) may disturb steep slopes near Burnt

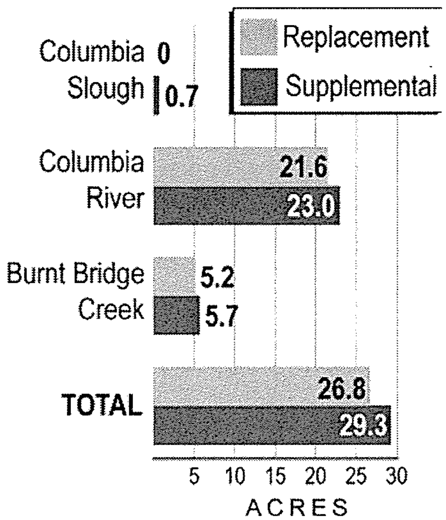
Bridge Creek. These activities could cause temporary degradation of water quality from erosion.

In-water construction work on the bridge piers in the Columbia River could stir up sediments on the river bed, which would increase turbidity and could release any pollutants from the sediment into the water.

Construction material or demolition debris that accidentally drops into the water can stir up sediments or physically harm organisms. Potentially harmful construction or demolition materials could include lead-based paint on portions of the existing I-5 bridges, wet concrete that substantially raises pH levels, or accidental fuel or other chemical releases from construction machinery. The replacement alternatives (2 and 3) would involve demolishing and removing the existing bridges. The supplemental alternatives (4 and 5) would involve extensive structural reinforcement of the existing bridges. Both activities would have the potential to release pollutants into the Columbia River.

Any below-grade construction may require groundwater pumping. Constructing roads or transit lines below the surrounding surface grade can alter groundwater conditions, if pumping is required to keep the site from flooding. If there are nearby hazardous materials sites, this can increase the likelihood of contaminated groundwater spreading out from the site. Exhibit 3.16-10 shows the amount of below-grade construction currently proposed in each watershed for the roadway and crossing options.

Exhibit 3.16-10
Acres Of Below-Grade Roadway



Source: CRC Hydrology and Water Quality Technical Report.

The potential sites for a bridge assembly/casting yard are unknown at this time. However, they are likely to be adjacent to the Columbia River, Willamette River, or other water body in the region. The existing conditions on the assembly/casting yard could range from a developed and paved port terminal to a currently undeveloped site. The casting/assembly yard activities may or may not increase stormwater runoff over existing conditions and may or may not increase pollutant loading. Before any site is selected, a thorough, site-specific environmental impact analysis will be conducted. All necessary permits will be secured prior to site development and operations.

3.16.5 Potential Mitigation for Adverse Effects

State and local regulations require mitigation measures so that long-term water quality and hydrology impacts associated with road or transit construction would be largely avoided or minimized. The project would not be constructed until state, federal, and local agencies approve the proposed impact minimization and mitigation methods.

The CRC project will develop plans to control construction-related risks from erosion, sedimentation, or accidental spills. Construction will not begin until these plans are approved by the appropriate agencies. Plans will specifically address spill prevention, in-water construction work, and could include specific water quality targets with penalties if these are not met. There may be special runoff control requirements to address the 303(d) listings of each of the waterways in the project area.

The project will use best management practices to minimize turbidity and release of pollutants during in-water construction in the Columbia River and North Portland Harbor. The project team will prepare applications

How can I learn more?

The Conceptual Stormwater Design Report includes detailed analysis of the design options for stormwater facilities in each watershed, and discusses the regulatory requirements that they address.

for dredging and fill activities under Section 404 of the Clean Water Act, administered by the U.S. Army Corps of Engineers, and will seek water quality certification under Section 401 of the Clean Water Act, administered by the Oregon Department of Environmental Quality and Washington State Department of Ecology.

Sites with existing soil or groundwater contamination near construction areas will be further studied and tested before any groundwater pumping occurs, in order to avoid causing such contamination to spread.

A flood-rise analysis will be conducted during the final design to calculate the impact that piers in the water will have on flood elevation, in accordance with local and state regulations and Executive Order 11988 – Floodplain Management. A rise, if any, would be very small, given the size of the Columbia River in comparison to the project. If necessary, appropriate compensation would be identified to negate flood rise impacts.

A stormwater collection and treatment system will be developed in final design. Until then, the project team has prepared a conceptual design in order to evaluate general feasibility and water quality effects associated with the build alternatives. The conceptual design was prepared to meet the requirements of Oregon and Washington Departments of Transportation, and the Cities of Portland and Vancouver. However, this is just one possible approach of many that will continue to be considered. In addition, following identification of a locally preferred alternative, the project team will prepare a Biological Assessment and through formal consultation procedures with NMFS and USFWS will further define stormwater treatment requirements.

The conceptual design prepared for DEIS analysis entails gravity pipe drainage systems that would collect and convey runoff from the new bridges, transit guideway, and road improvements. Basic treatment would reduce total suspended solids to the maximum feasible extent before runoff reaches surface waters. Because the transit facilities and roadways will be operated by different agencies with responsibility for maintenance, roadway and transit runoff would likely be directed to different facilities.

No mitigation of potential hydrologic or water quality effects from the No-Build Alternative would occur.

Potential Mitigation in Columbia Slough Watershed

The conceptual stormwater management approach used in the DEIS analysis would convey stormwater from the transit guideway and highway bridges and structures on Hayden Island through the collection system to new treatment swales or ponds near Marine Drive, rather than treating it on Hayden Island. The Marine Drive location has fewer space and land use constraints compared to Hayden Island. It would, however, transfer stormwater currently discharging to the Columbia River to the Columbia Slough. This would likely require a design exception. In addition, because the Columbia Slough is a much smaller waterway than the Columbia River, this could contribute to a more noticeable effect on water quality. This conceptual stormwater design would require exceptions from FHWA and ODOT design standards. Other stormwater treatment approaches will continue to be evaluated and considered, including options that would treat runoff on Hayden Island rather than conveying it to the Marine Drive area.

Potential Mitigation in Columbia River Watershed

The existing stormwater system in this area collects runoff both from I-5 and from about 250 acres of downtown Vancouver. The build alternatives would separate the highway runoff from this system and treat it in several bioinfiltration swales. During high-flow events, water from the highway would reconnect to the existing system and discharge to the Columbia River after a minimum residence time in the swales. Some parts of the highway that will not be reconstructed for this project will remain connected to the existing system and would continue to discharge to the river without treatment.

In the conceptual design used for DEIS analysis, runoff from the high point of the transit bridge over the river to its touchdown point in Vancouver would flow to a swale near SR 14 before discharging to the Columbia River through an existing outfall. In downtown Vancouver, if curbs separate the transit guideway from the existing roadway, engineered water quality treatment devices could treat transit runoff before releasing it to the City stormwater system.

Runoff from the Clark College Park and Ride could be treated either by swales or engineered water quality treatment devices, depending on the final layout.

Potential Mitigation in Burnt Bridge Creek Watershed

Existing stormwater retention ponds near the Main Street interchange and 15th Avenue and 41st Circle could be expanded under all build alternatives to handle highway and guideway runoff.

3.17 Geology and Soils

Understanding potential geologic and soils hazards and impacts is a priority for large infrastructure projects such as CRC. Bridges are vital links in the transportation system and are often especially vulnerable during earthquakes or landslides. The Pacific Northwest is a geologically active region and experiences earthquakes both large and small, as well as landslides and erosion along vulnerable slopes. Careful consideration of design, location, and construction techniques improves the safety of transportation structures during seismic events and increases stability in areas prone to erosion and landslides. This section also considers potential impacts to groundwater. The information presented in this section is based on the Geology and Soils Technical Report.

How can I learn more?

Chapter 4 of the Geology and Soils Technical Report gives a detailed, technical description of geologic conditions and hazards in the project area.

3.17.1 Existing Conditions

The information presented here was gathered from published reports, previous investigations of the project area, and project-related geotechnical borings conducted in 2006. Once a preferred alternative or alignment has been identified, more detailed geotechnical evaluations will be performed in order to finalize design and construction details.

How strong is a 9.0 earthquake?

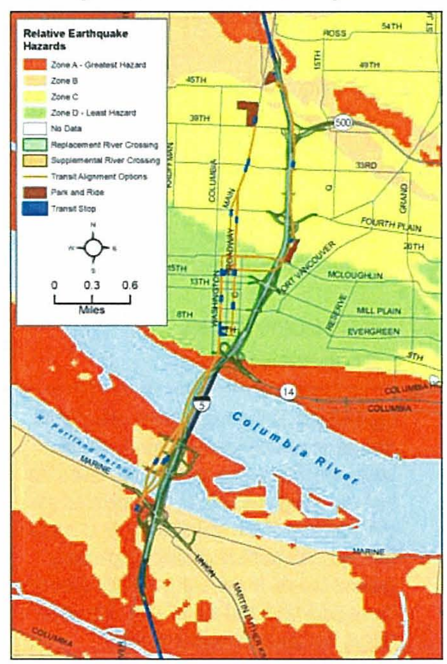
In the Richter scale for earthquake magnitude, each increase of one whole number (for example, from 6.0 to 7.0) is a ten-fold increase in earthquake strength. This means that shaking from a major subduction fault quake at a magnitude of Richter 9.0 could be more than 100 times stronger than from the most severe surface fault quakes with magnitudes of Richter 7.0.

Earthquakes

Several types of earthquakes could occur in the project area. Exhibit 3.17-1 illustrates relative earthquake hazard for this area. There is a large, offshore subduction fault that occurs where the Juan de Fuca tectonic plate plunges under the North American Plate approximately 120 miles west of the I-5 crossing. This subduction fault is capable of producing a large earthquake of magnitude 9.0 on the Richter scale, which is similar in size and type to the Indonesian earthquake of December 2004. Geologists estimate that earthquakes of that size occur here, on average, every 350 to 700 years. The last such earthquake happened a little more than 300 years ago.

Smaller earthquakes are also possible along several near-surface faults located around the project area. Geologists estimate that the largest possible earthquake from these smaller faults would be about a magnitude 6.5 on the Richter scale. Although not as powerful as subduction fault earthquakes, those earthquakes originating from near-surface faults are strong enough to damage structures and destroy those built without adequate seismic considerations. Near-surface faults also produce many smaller earthquakes of lesser intensity, with more than a dozen such quakes large enough to feel every year in Washington and Oregon. Although no near-surface faults have been mapped inside the CRC project area, Exhibit 3.17-2 shows the locations of the closest known faults, located to the south of the project area.

Exhibit 3.17-1
Earthquake Hazard Zone Map



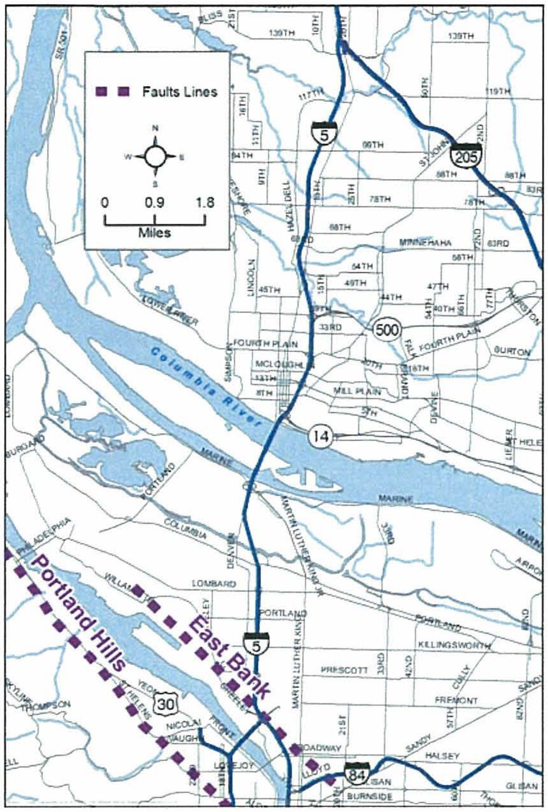
Source: Mabey et al. 1993, 1994.

Seismic activity in the Portland-Vancouver area varies widely in the potential severity of effects. The earthquake hazard zone map shows a map of the relative earthquake ratings in the project area. These ratings take into account a variety of potential earthquake effects to create a scale with A being the greatest hazard, to D being the least. Damage from earthquakes is not always directly related to how hard the shaking is. While shaking can certainly stress or damage structures, often a greater hazard results from how the ground under the structure reacts to the quake.

Loose, sandy soils, such as the first layer of substrate beneath the Columbia River and its historic flood plain, can lose strength in an earthquake, and may begin acting like a liquid. If these soils have roadways or other structures on them, the ground can suddenly stop providing support. Loose, soft soils may act as amplifiers during earthquakes, resulting in stronger shaking near the ground surface than in other areas with different types of soils.

Areas with steep slopes can also be vulnerable to failure during an earthquake. Sideways motion can cause slopes to collapse. Road or transit facilities near steep slopes can be in danger during earthquakes from landslides as well as direct effects of the shaking.

Exhibit 3.17-2
Mapped Faults Closest to the CRC Area



Source: CRC Geology and Soils Technical Report.

Soils and Bedrock

The Columbia River Crossing project is located in a relatively flat area covered by deep, unconsolidated deposits of sand, gravel, cobbles, and boulders.

Underlying these deposits is a rock-like, cemented sand and gravel layer known locally as the Troutdale Formation. The depth to the Troutdale Formation varies across the site, from approximately 100 feet below the North Portland Harbor crossing to more than 200 feet below the southern portion of the main river crossing to less than 50 feet near the north bank of the main river crossing.

In Oregon, the project area is located in the historic floodplain of the Columbia River. Before development and the creation of dikes and dams in the region which now generally limits the 100-year floodplain to the river channel, this area was part of a large river channel wetland complex. Soils were typically deep silts and sands, and the entire area is relatively flat and used to flood regularly. Since development began in the area, dikes and other flood protection techniques have disconnected the river from most areas of its former floodplain. Fill material, usually sand dredged from the Columbia River channel, was used to raise many of these low-lying areas prior to building the commercial, residential, industrial and recreational facilities the land now supports. These soils can be subject to liquefaction or amplification during an earthquake.

TERMS & DEFINITIONS
Liquefaction

Liquefaction is a phenomenon associated with earthquakes in which sandy to silty, water-saturated soils behave like fluids. As seismic waves pass through saturated soil, the structure of the soil distorts, and spaces between soil particles collapse, causing ground failure. In general, recently deposited loose sediment and areas with high water tables are the most vulnerable to liquefaction.

In Washington, the project area is located on a gently sloping terrace that is naturally above the river floodplain. Local areas of filled or excavated soil are not uncommon in the developed areas in or near the project in Washington. The only steep slopes mapped by the City of Vancouver in the primary project area are under the I-5 bridges, and near Burnt Bridge Creek, which is located near the SR 500 interchange.

The project area is not located in an area of where lava and lahar flows associated with volcanic eruptions has occurred within the past 20,000 years. Flows from currently active volcanoes could impact the Columbia River upstream of the project area (Mt. Hood and Mt. Adams), or downstream (Mt. St. Helens).

Groundwater

Near-surface groundwater in the project area is heavily influenced by the height of the water in the Columbia River. The river level can change based on tides or on releases of water from dams upstream. Near-surface groundwater is typically found within 20 feet of the surface in the project area. Local soils, slopes, and stormwater systems can heavily influence this, sometimes providing for better drainage, and sometimes contributing to surface ponding.

Groundwater conditions can affect the cost or practicality of options, alignments, construction techniques, or construction timing. In places where excavation is required, encountering near-surface groundwater requires pumping, diverting, or blocking the water from the construction area.

Deeper groundwater is part of the Troutdale aquifer, and is the source of drinking water in the Washington part of the project area. The EPA has designated this as a "sole-source" aquifer, which means that alternative supplies are not feasible. It is accessed both by private wells and municipal wells. One of Vancouver's municipal wells is located within the project area. This project will require EPA review and approval to ensure that its activities do not create a substantial hazard to public health. In Oregon, although municipal water sources are outside of the project area, some private wells near the project are on record. Project alternatives were analyzed to see whether they have the potential to affect these groundwater resources. The Oregon portion of the project is not located over the Troutdale sole-source aquifer.

Existing Project Facilities

In 2006, a panel of geotechnical and bridge engineering experts reviewed seismic vulnerabilities for the existing I-5 bridges over the Columbia River.[45] The northbound span of the bridge was constructed in 1917, and full details of the foundation and pier construction are not known. In 1958, the southbound bridge span was constructed, and the original bridge was renovated to allow for a wider and higher shipping channel. The piers of the older bridge were also reinforced, although knowledge of and design for earthquakes was not well developed at that time. The piers of both bridges are built on top of wooden and steel pilings that do not extend into the underlying Troutdale Formation at the site. The piles were driven to a depth of not more than 70 feet into the alluvial sands, silts and gravels overlying the Troutdale Formation.

This seismic panel warned that the top layer of this substrate could experience liquefaction during a severe earthquake, and major seismic retrofitting of the existing structures would be required to enable them to withstand such an earthquake without collapsing. Both bridge structures have lift spans that are operated by large counterweights. These counterweights were also identified as a potential source of bridge instability during an earthquake.

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[45] CRC Seismic Panel, 2006.

3.17.2 Long-term Effects of Project Alternatives

Long-term effects are those that continue after the construction of the project is complete, and are summarized in the following discussion. In the case of the No-Build Alternative, long-term effects are those that can be reasonably anticipated if the existing facilities receive only maintenance rather than expansion or replacement.

Alternative 1: No-Build

Under the No-Build Alternative, the CRC project would not go forward, and the seismic improvements planned for the build alternatives would not occur. The I-5 crossing would remain vulnerable to serious damage or collapse during a major seismic event.

The No-Build Alternative would not improve the ability of the elevated roadway on Hayden Island or the touchdown point in South Vancouver to withstand a major earthquake. Under the No-Build Alternative transit buses would continue to travel on the existing I-5 crossing and elevated roadway in the Hayden Island area, and would thus be subject to the existing, higher risk of earthquake damage than with the build options.

The No-Build Alternative would not disturb existing ground surfaces nor pose an additional risk to groundwater supplies.

Alternative 2: Replacement Crossing with Bus Rapid Transit

Exhibit 3.17-3
Seismic Vulnerability, Soils Impacts, and Groundwater Impacts from Alternative 2

	Alternative 2: Replacement Crossing with Bus Rapid Transit			
Environmental Metric[a]	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Seismic vulnerability	Most improved	Most improved	Most improved	Most improved
Soils	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River, with slightly high risk.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River, with slightly lower risk.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River, with slightly lower risk.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River, with slightly lower risk.
Groundwater	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for excavation.	Potential impacts to groundwater if not addressed for excavation.

Source: CRC Geology and Soils technical Report and CRC Seismic Panel Report.

[a] The Stacked Transit/Highway Bridge (STHB) design would perform the same as the three-bridge replacement design.

As shown in Exhibit 3.17-3, the replacement crossing designs would result in long-term benefits by improving the ability of the river crossing to withstand a major earthquake by incorporating modern seismic standards into the design.

Soil disturbance would occur with this alternative. Although soil stabilization techniques would be employed during construction and operation, the potential exists for steep slopes to become destabilized.

The Kiggins Bowl terminus may result in slightly higher risk of steep slope disturbance due to the proposed construction of a transitway closer to steep slopes near Burnt Bridge Creek. The other terminus options, would still require construction activities related to roadways near the steep slopes of Burnt Bridge Creek, but not to the same extent as with the Kiggins Bowl terminus.

Groundwater impacts are not anticipated to occur with this alternative if proper design and implementation of protection measures occurs. The Kiggins Bowl and Lincoln terminus options would result in the excavation for park and ride facilities that could impact groundwater flows and supply. The MOS options would not require excavation for park and ride facilities, but would still require excavation for other construction activities.

Alternative 3: Replacement Crossing with Light Rail

Exhibit 3.17-4
Water Seismic Vulnerability, Soils Impacts, and Groundwater Impacts from Alternative 3

	Alternative 3: Replacement Crossing with Light Rail Transit			
Environmental Metric[a]	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Seismic vulnerability	Most improved	Most improved	Most improved	Most improved
Soils	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River
Groundwater	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for excavation.	Potential impacts to groundwater if not addressed for excavation.

Source: CRC Geology and Soils technical Report and CRC Seismic Panel Report.

[a] The Stacked Transit/Highway Bridge (STHB) design would perform the same as the three-bridge replacement design.

Alternative 3 would have the same impacts for seismic vulnerability, soils and groundwater as Alternative 2, as shown in Exhibit 3.17-4.

Alternative 4: Supplemental Crossing with Bus Rapid Transit

Exhibit 3.17-5
Seismic Vulnerability, Soils Impacts, and Groundwater Impacts from Alternative 4

	Alternative 4: Supplemental Crossing with Bus Rapid Transit			
Environmental Metric	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Seismic vulnerability	Improved	Improved	Improved	Improved
Soils	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.
Groundwater	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for excavation.	Potential impacts to groundwater if not addressed for excavation.

Source: CRC Geology and Soils Technical Report and CRC Seismic Panel Report.

As shown in Exhibit 3.17-5, the supplemental crossing designs would result in long-term benefits by retrofitting the existing bridges to meet seismic standards for northbound traffic and building additional bridges for southbound traffic and public transit that exceeds seismic standards.

The supplemental crossing designs would have the same impacts for seismic vulnerability, soils and groundwater as Alternatives 2 and 3.

Alternative 5: Supplemental Crossing with Light Rail

Exhibit 3.17-6
Seismic Vulnerability, Soils Impacts, and Groundwater Impacts from Alternative 5

	Alternative 5: Supplemental Crossing with Light Rail Transit			
Environmental Metric	**Kiggins Bowl Terminus (A)**	**Lincoln Terminus (B)**	**Clark College MOS (C)**	**Mill Plain MOS (D)**
Seismic vulnerability	Improved	Improved	Improved	Improved
Soils	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.	Mitigable impacts to steep slopes near Burnt Bridge Creek and Columbia River.
Groundwater	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for park and ride facilities and other excavation.	Potential impacts to groundwater if not addressed for excavation.	Potential impacts to groundwater if not addressed for excavation.

Source: CRC Geology and Soils Technical Report and CRC Seismic Panel Report.

Alternative 5 would have the same impacts for seismic vulnerability, soils and groundwater as Alternative 4, as shown in Exhibit 3.17-6.

3.17.3 Long-Term Effects of Project Components

This section describes the impacts of specific project components and options. Transit operations options, tolling scenarios, and transportation system/demand management options do not affect the geology and soils analysis, so are not specifically addressed below.

Multimodal River Crossing and Highway Improvements (Replacement Crossing with Alternatives 2 and 3; Supplemental Crossing with Alternatives 4 and 5)

The replacement crossing designs would likely provide the greatest protection in the event of a severe earthquake, because all of the structures would be new. With the supplemental crossing designs, the existing 1917 and 1958 structures would be retrofitted. For the geologic analysis, there is no other substantial difference between the replacement and supplemental crossings.

The existing and proposed interchanges and bridge touchdown points between Marine Drive and South Vancouver are located in the highest risk earthquake zone. With No-Build, in an earthquake, elevated structures or embankments could be damaged or collapse. The build alternatives would improve the ability of the roadway to withstand a major earthquake because they will follow modern seismic standards.

Near Burnt Bridge Creek in the northern part of the project area, all existing and proposed roadway alignments come within 200-400 feet of a high-hazard earthquake area. Potential landslides and soil liquefaction could occur in this area during an earthquake, which could damage the roadway and any adjacent facilities.

As the stacked transit/highway bridge (STHB) design for the replacement crossing would entail greater weight loading of one bridge, it would likely require an additional set of piers and may require larger piers than the three-bridge replacement crossing. The STHB would be designed to the same standard of seismic safety as the three-bridge design.

Transit Mode (BRT with Alternatives 2 and 4; LRT with Alternatives 3 and 5)

The transit mode choice between bus rapid transit and light rail transit, including their respective maintenance bases, has no meaningful effect geology, soils, and ground water.

Transit Terminus Options (with all Alternatives)

The Kiggins Bowl terminus has a slightly higher risk of landslides and erosion than the Lincoln terminus, although this could be mitigated through design and construction techniques.

The proposed Kiggins Bowl Park and Ride facility is located near steep slopes associated with Burnt Bridge Creek. The design of the Kiggins Bowl terminus would have the transit guideway cross I-5 on an elevated structure near Kiggins Bowl. Without proper construction techniques, construction near these areas could increase the potential for landslides or erosion. The Lincoln terminus would not change the current risk of landslide or erosion.

Park and ride structures could include underground parking. Deeper excavation is more likely to encounter groundwater. There is greater potential for this risk at the Kiggins Bowl Park and Ride facility. Facilities would need to be designed to avoid leaks into or flooding of the lower levels, which could impact groundwater resources.

Both the Clark College and Mill Plain terminus options would avoid the potential groundwater, erosion, or landslide concerns associated with the proposed Kiggins Bowl terminus. They would have all the other effects of the other terminus options.

Transit Alignment Options (with all Alternatives)

OFFSET OR ADJACENT

The proposed transit station and guideway on Hayden Island would be elevated under both alignment options. Hayden Island is in a high-risk earthquake hazard zone, where elevated structures can be at risk of damage or collapse.

BROADWAY-WASHINGTON OR TWO-WAY WASHINGTON

No differences in the geologic analysis are associated with the Broadway-Washington or two-way Washington alignment options in downtown Vancouver.

BROADWAY-MAIN OR TWO-WAY BROADWAY

No differences in the geologic analysis are associated with the Broadway-Main or two-way Broadway alignment options associated with the Lincoln terminus.

16th Street or McLoughlin

No differences in the geologic analysis are associated with the 16th Street or McLoughlin aligns options associated with the Kiggins Bowl and Clark College terminus options.

3.17.4 Temporary Effects Related to Geology

All build alternatives would include excavating surface soils, creating embankments, removing old roadways, and building access roads and equipment staging areas. These activities can increase erosion and downslope sedimentation. Building cut-banks and retaining walls can decrease slope stability in steep areas. Stormwater runoff during construction activity can include pollutants that can adversely affect groundwater quality.

Park and ride structures could include underground parking. Deeper excavation is more likely to encounter groundwater during construction activities. De-watering during construction would require appropriate techniques for ensuring groundwater and surface water quality and hydrology is maintained.

3.17.5 Potential Mitigation for Adverse Effects

Current seismic standards will be incorporated into the design and construction of all new structures for all of the build alternatives. With the supplemental crossing alternative, the old I-5 bridges would be seismically retrofitted to greatly decrease earthquake hazards. However, the retrofitted structures could not be built to the same standards as a new bridge.

For all build alternatives, ground improvement or deep foundations would be required beneath transit and roadway foundations, especially in the high-risk zones on Hayden Island and the touchdown point in South Vancouver.

For the Kiggins Bowl terminus, measures would be required to avoid increasing the risk of slides and erosion on steep slopes near Kiggins Bowl.

For all the build alternatives, construction and operation of park and rides and other project elements will be designed to first avoid, then minimize, and then mitigate for negative groundwater impacts. Continued coordination with EPA will occur to address the review approval process for impacts to the Troutdale sole source aquifer.

Following identification of a preferred alternative, the project team will conduct further site-specific geotechnical evaluation and evaluate construction best management practices. When it is not possible to avoid seismic hazards, steep slopes, or hazardous soil types, the project will seek to minimize the effect of these conditions by using appropriate geotechnical and engineering techniques.

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3.18 Hazardous Materials

The CRC alternatives could have both adverse and beneficial effects related to hazardous materials. The information presented in this section is based on the CRC Hazardous Materials Technical Report, which is included as an electronic appendix to this DEIS.

Project construction and operations employ a variety of hazardous materials (fuels, lubricants, asphalt, paint, solvents, etc.). Any time such materials are used there is a risk that they could be accidentally released to the environment.

Project construction will occur on some properties that are already contaminated, as is normal in a heavily developed area. There is a risk that disturbing these contaminated sites could expose workers and others to health hazards or could cause the contamination to spread. However, by studying and testing these sites prior to construction, and with appropriate measures to clean up contaminated sites, the overall results of the build alternatives are likely to be beneficial for both the environment and the community.

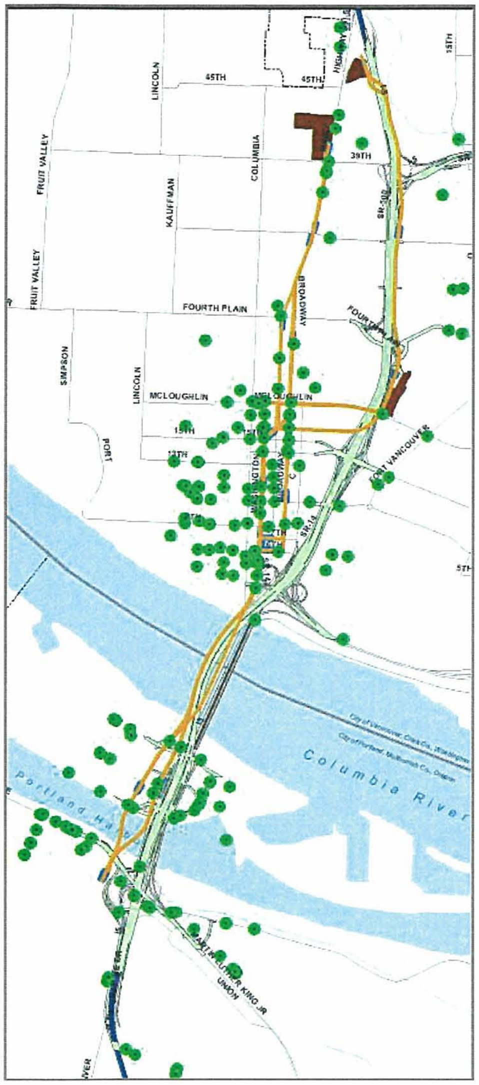
3.18.1 Existing Conditions

As shown on the maps on the following pages, the project alternatives cross properties that have a long history of development and have had varied uses over time. Agriculture, industry, commercial development, and even residential land uses can result in a variety of potentially hazardous materials being left in the soil and groundwater. Many of these contaminants can remain for decades in the ground, and can spread when they reach groundwater. These contaminants can cause harm to the environment, including soils, surface water, and ground water such as the Troutdale sole source aquifer, and to people, including nearby residents, employees, and construction or utility workers that may encounter the hazardous materials directly.

All of the build alternatives would acquire new property, demolish old structures, disturb the ground, and contact groundwater, thus involving a risk of encountering hazardous materials or contaminated soils or groundwater during construction. The existing highway right-of-way and transit maintenance bases also have sites of potential hazardous materials on or adjoining them. These sites may pose environmental, health, or liability concerns even if construction or acquisition related to the CRC project does not occur.

Because of these risks, it is important to look at the history and current uses of land near the project. This research provides a way to screen sites that may have potential hazards. Identifying high-risk sites early in the process provides essential liability protection for the project, both financially and in terms of worker protection. It is not always possible to identify all sites where hazardous material may be encountered, but performing due diligence helps to lower the risk. Once a preferred alternative or alignment is chosen, more detailed investigations of properties near the project will be performed.

Exhibit 3.18-1
Sites with Past or Present Hazardous Materials Concerns



Source: CRC Hazardous Materials Technical Report.

The project area is heavily urbanized, and many properties have a history of creating, using, or storing potentially hazardous material. Sites that are most likely to impact the project are those that could be acquired for right-of-way and those that are closest to the roadway and transit alignments. Exhibit 3.18-1 shows the locations of these potentially high-risk sites.

Based on initial research into land use history and search results of government databases that track sites with environmental concerns, the project identified 427 potential hazardous materials sites within 500 feet of the project area. Of these, 31 sites ranked as potentially high-risk. These sites were ranked based on criteria such as how close they are to the project, what type of environmental concern the site has, and whether contamination was cleaned up in the past or is known to currently exist on the site. The CRC Hazardous Materials Technical Report provides full details on the methods used to analyze the sites, and lists the individual rankings.

Potentially hazardous waste sites vary greatly in scope. Cleaning up a site where a home heating oil tank has leaked is usually relatively easy and inexpensive. Cleaning up a site that has a history of dumping or industrial activity could involve many different kinds of contaminants, and could be very difficult, time consuming, and expensive. All properties directly affected by the preferred alternative will need to be investigated more fully before the cost, delay, or liability associated with existing contamination can be realistically estimated. For this reason, the long-term effects described in the next section are qualitative in nature.

3.18.2 Long-Term Effects of the Project Alternatives

For the hazardous material analysis, long-term effects are those that occur after construction of the project is complete. For the build alternatives, these are typically beneficial effects that result from identifying and remediating existing hazardous sites. Long-term effects are tied closely to the discovery of sites that are discussed in the short-term effects section of this document. Long-term impacts are summarized in the following discussion and tables.

Alternative 1: No-Build

In the case of the No-Build Alternative, long-term effects are those that can be reasonably anticipated if the CRC build alternatives are not constructed.

If no construction or property acquisition occurs for this project, existing hazardous material sites would not be addressed by the project, and cleanup of these sites may not occur. This would present a higher long-term risk to the community and the environment than the build alternatives.

Long-term adverse effects from using the highway could also be greater if the existing crossing and roadway are kept. Much of the pollution that comes from roadways is from day-to-day leaks from vehicles or as a result of spills from accidents. Compared to modern roadway designs, the existing bridges and approaches have numerous sub-standard safety features that can increase the likelihood of accidents. Also, when it rains, contaminants from I-5 in the project area are washed directly into the Columbia River, creating a pathway for exposure.

Alternative 2: Replacement Crossing with Bus Rapid Transit

Exhibit 3.18-2
Summary of long-term Hazardous Materials Effects for Alternative 2

Alternative 2: Replacement Crossing with Bus Rapid Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
Cleanup of existing hazardous materials sites	More cleanup sites – high environmental benefit.	Most cleanup sites – highest environmental benefit.	Fewer cleanup sites – some environmental benefit.	Fewer cleanup sites – some environmental benefit.
New hazardous materials spill potential	Reduce spill risk w/ lower congestion and collisions. BRT would slightly increase risk from transit. Separation of guideway would decrease transit spill risk.	Reduce spill risk w/ lower congestion and collisions. BRT would slightly increase risk from transit. At-grade transit would increase transit spill risk.	Reduce spill risk from lower congestion and collisions. BRT would slightly increase risk from transit.	Reduce spill risk from lower congestion and collisions. BRT would slightly increase risk from transit.
Risks of construction exposure	Low	Low	Low	Low
Pathways to groundwater	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.

Source: CRC Hazardous Materials Technical Report.

[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

The Lincoln terminus option is associated with the highest number of sites with potential contamination, so the long-term beneficial effect of investigating and/or cleaning up these sites would be slightly higher than for the other terminus options. As discussed in the Temporary Effects discussion of this section, most known hazardous materials sites would be affected by all terminus options, so the differences would be relatively minor.

For all the terminus options and the stacked transit/highway bridge design, replacing the river crossing and making the associated highway interchange improvements would improve safety and reduce congestion in the project area, which would lower the risk of hazardous materials from leaks and accidents over existing conditions. Roadway runoff from the new crossing and improved interchanges would be treated before entering streams or rivers, lowering the risk that hazardous materials spilled on the roadway or transit lines would enter the environment.

Alternative 2 includes bus rapid transit, which would have a slightly elevated risk of hazardous materials related to transit operations being released into the environment. Bus rapid transit would involve more vehicles, which would most likely be powered by on-board fuel tanks. More vehicles would increase the potential for transit-related collisions, and because buses carry fuel on board, this would increase the potential for leaks or spills of hazardous materials from transit vehicles.

The Lincoln terminus option travels through Vancouver primarily at grade, where intersections and streets shared with traffic could increase the potential for collisions and leaks or spills of hazardous materials compared to the Kiggins Bowl terminus option which routes the northern part of the transit guideway on a grade-separated structure in the highway right-of-way. The MOS options, are shorter, but additional driving in privately owned vehicles to reach these termini could result in the potential for collisions and leaks or spills of hazardous materials.

Alternative 3: Replacement Crossing with Light Rail

Exhibit 3.18-3
Summary of long-term Hazardous Materials Effects for Alternative 3

Alternative 3: Replacement Crossing with Light Rail Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
Cleanup of existing hazardous materials sites	More cleanup sites – high environmental benefit.	Most cleanup sites – highest environmental benefit.	Fewer cleanup sites – some environmental benefit.	Fewer cleanup sites – some environmental benefit.
New hazardous materials spill potential	Reduce spill risk from lower congestion and collisions. Separation of guideway would decrease transit spill risk.	Reduce spill risk from lower congestion and collisions. At-grade transit would increase transit spill risk.	Reduce spill risk from lower congestion and collisions.	Reduce spill risk from lower congestion and collisions.
Risks of construction exposure	Low	Low	Low	Low
Pathways to groundwater	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.

Source: CRC Hazardous Materials Technical Report.

[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

As shown in Exhibit 3.18-3, Alternative 3 would have the same long term benefits from cleanup of sites with known hazardous materials concerns and improved collection of roadway runoff as described above for Alternative 2.

Alternative 3 includes light rail, which would have fewer vehicles and would be powered with electricity rather than fuel carried on-board. Fewer vehicles would decrease the potential for collisions and electric power would decrease the likelihood of spills or leaks of petroleum from transit vehicles.

Alternative 4: Supplemental Crossing with Bus Rapid Transit

Exhibit 3.18-4
Summary of long-term Hazardous Materials Effects for Alternative 4

Alternative 4: Supplemental Crossing with Bus Rapid Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
Cleanup of existing hazardous materials sites	More cleanup sites – high environmental benefit.	More cleanup sites – high environmental benefit.	Fewer cleanup sites – some environmental benefit.	Fewer cleanup sites – some environmental benefit.
New hazardous materials spill potential	Some reduction in spill risk from lower congestion and collisions. BRT would slightly increase risk from transit. Separation of guideway would decrease transit spill risk.	Some reduction in spill risk from lower congestion and collisions. BRT would slightly increase risk from transit. At-grade transit would increase transit spill risk.	Some reduction in spill risk from lower congestion and collisions. BRT would slightly increase risk from transit.	Some reduction in spill risk from lower congestion and collisions. BRT would slightly increase risk from transit.
Risks of construction exposure	Low	Low	Low	Low
Pathways to groundwater	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.

Source: CRC Hazardous Materials Technical Report.

[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

As shown in Exhibit 3.18-4, sites with known environmental concerns would be investigated or cleaned up under Alternative 4, providing environmental benefit that would vary slightly with each terminus option, as further discussed in the Temporary Effects discussion below.

Alternative 4 would lower the risk of hazardous materials from leaks or traffic accidents compared to existing conditions. Higher accident rates increase the potential for spills of petroleum or other hazardous materials to the environment. The existing bridges, with sub-standard design features and high accident rates, would remain in service northbound, so risks in the northbound direction would remain the same or increase as the number of vehicles increases in the future. The southbound highway traffic would be placed on the new bridge where improved congestion and safety design would lower the risk of leaks and spills resulting from accidents.

Runoff from the existing bridges would continue to be discharged into the river, which would increase the potential for spills or leaks occurring on this portion of the roadway to reach surface water. Runoff from the new bridge would be treated before release.

Alternative 4 includes bus rapid transit, with slightly elevated operational risk of hazardous materials releases as described for Alternative 2.

Alternative 5: Supplemental Crossing with Light Rail

Exhibit 3.18-5
Summary of long-term Hazardous Materials Effects for Alternative 5

Alternative 5: Supplemental Crossing with Light Rail Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
Cleanup of existing hazardous materials sites	More cleanup sites – high environmental benefit.	More cleanup sites – high environmental benefit.	Fewer cleanup sites – some environmental benefit.	Fewer cleanup sites – some environmental benefit.
New hazardous materials spill potential	Some reduction in spill risk from lower congestion and collisions. Separation of guideway would decrease transit spill risk.	Some reduction in spill risk from lower congestion and collisions. At-grade transit would increase transit spill risk.	Some reduction in spill risk from lower congestion and collisions.	Some reduction in spill risk from lower congestion and collisions.
Risks of construction exposure	Low	Low	Low	Low
Pathways to groundwater	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.	Improved stormwater containment.

Source: CRC Hazardous Materials Technical Report.

[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

As shown in Exhibit 3.18-5, Alternative 5 would have the same long-term risks and benefits as Alternative 4, described above for the improved management of roadway runoff and the reduction of leaks and spills caused by collisions and leaks. It would improve these risks and benefits compared to the No-Build Alternative.

Alternative 5 includes light rail transit. As discussed above for Alternative 3, light rail would have fewer vehicles and would be powered with electricity. This would decrease the potential for collisions and would decrease the likelihood of fuel spills or leaks from transit vehicles.

3.18.3 Long-Term Effects of Project Components

This section describes the effects associated with project components and options. Certain components and options, including the stacked transit/highway bridge design, tolling scenarios, and transportation system/demand management do not affect the hazardous materials analysis, and are not specifically discussed below.

Multimodal River Crossing and Highway Improvements (Replacement Crossing with Alternatives 2 and 3; Supplemental Crossing with Alternatives 4 and 5)

Improved traffic safety with a new bridge and interchanges could result in a long-term benefit by reducing the number of accidents that result in spills of fuel or hazardous cargos. The replacement crossing would involve the most safety improvements and result in the largest reduction of congestion and crashes. The replacement crossing would generate the largest improvement in long-term operational risks. The supplemental crossing would improve operational risk over the No-Build Alternative, but less than the replacement crossing.

The Marine Drive southern alignment is located adjacent to the Harbor Oil Superfund site on N. Force Avenue. Construction and operation of this alignment may involve exposure to petroleum, pesticides, PCBs, and other contaminants at the Harbor Oil site.

If hazardous sites are identified that cannot be avoided by the project, cleanup or maintenance activities would occur. Legal restrictions could also be placed on hazardous sites that could interfere with construction or operation of the highway or transit options. The replacement crossing has a slightly higher range of hazardous sites likely to be encountered. This could result in the benefit of more long-term cleanup than the supplemental crossing.

Long-term health or liability consequences could occur if construction exposes people to contamination, or causes it to spread. The replacement crossing has a slightly higher range of hazardous sites likely to be encountered. This could result in more risk of health or liability consequences from construction exposure.

Transit Mode (BRT with Alternatives 2 and 4; LRT with Alternatives 3 and 5)

Bus rapid transit would involve buses, which may be powered by on-board fuel tanks. The larger number of vehicles would increase the potential for collisions, and because buses carry fuel on board, this would increase the potential for leaks or spills of hazardous materials from transit vehicles.

Light rail would have fewer vehicles and would be powered with electricity. This would decrease the potential for collisions and would decrease the likelihood of spills or leaks from transit vehicles.

Both the bus and light rail maintenance facilities would use and store potentially hazardous materials such as fuel, oil, solvents, paint, and other potentially hazardous materials needed to maintain the vehicles. The CRC transit alternatives would contribute to an increase in the use of these materials, and could increase the long-term risk of spills or leaks to the environment or exposure to workers. TriMet and C-TRAN have both substantially reduced their use of such materials in the past decade and reduced the risk of spills or leaks.

Transit Terminus Options

The Lincoln terminus would entail detailed investigation and likely cleanup of the potentially hazardous materials site where the Lincoln Park and Ride is proposed. This would have beneficial long-term effects by reducing existing environmental or health concerns associated with that site.

Fewer potential hazardous materials sites are associated with the Kiggins Bowl terminus, which may therefore entail the least long-term health and environmental benefit from cleanup of existing sites. The Kiggins Bowl terminus would entail detailed investigation and possible cleanup of one high-risk hazardous materials site north of Clark College. If cleanup occurred, this would have beneficial effects by reducing existing environmental or health concerns associated with that site.

The Kiggins Bowl terminus would entail fewer at-grade intersections than the Lincoln terminus and would have a lower risk for leaks or spills of hazardous materials resulting from transit operations.

The Clark College terminus would avoid one high-risk site associated with the Kiggins Bowl terminus and therefore would potentially provide less long-term health and environmental benefit than an investigation and possible cleanup of the site.

The fewest potential hazardous materials sites are associated with the Mill Plain terminus, and this option may therefore entail the least long-term health and environmental benefit from investigation and cleanup of existing sites.

TRANSIT ALIGNMENT OPTIONS (WITH ALL ALTERNATIVES)

Offset or Adjacent

No differences in long-term hazardous materials risks or benefits are associated with the offset or adjacent alignment options.

Broadway-Washington or Two-way Washington

The Broadway-Washington couplet is associated with more potential hazardous materials sites and therefore could provide greater long-term benefit to human health and the environment by investigation and cleaning up of those sites. The two-way Washington option would encounter fewer sites.

Broadway-Main or Two-Way Broadway

These two alignment options are part of the Lincoln terminus. The Broadway-Main couplet is associated with more potential hazardous materials sites and therefore could provide greater long-term benefit to human health and the environment by investigation and cleaning up of those sites. This route would entail more at-grade intersections and would have a higher risk for leaks or spills of hazardous materials resulting from transit operations.

The two-way Broadway option would encounter fewer sites and therefore may entail less long-term benefit from investigation and cleanup. This route would entail fewer at-grade intersections and would have a lower risk for leaks or spills of hazardous materials resulting from transit operations.

Both would encounter substantially more sites and are likely to provide more long-term cleanup benefit than options associated with the Kiggins Bowl terminus. Both would also have more at-grade intersections and would have a higher risk for leaks or spills of hazardous materials than the Kiggins Bowl terminus options.

16th Street or McLoughlin

These two alignment options are part of the Kiggins Bowl terminus. Both options are associated with one known low-risk site. Because the McLoughlin option entails acquiring slightly more property, it has a higher potential for encountering sites with potential hazardous materials concerns than the 16th Street option.

Transit Operations

Efficient transit operations would entail fewer vehicles and would therefore slightly reduce the risk of leaks or spills resulting from collisions involving transit vehicles at shared intersections. The Increased operations option would slightly increase this risk.

3.18.4 Temporary Effects

This section outlines two types of potential temporary effects:

- The risk of a leak or spill associated with construction equipment and materials including fuels, lubricants, and other hazardous substances
- The risk of exposure or contaminant migration associated with encountering contamination in soil or groundwater during construction

Unlike the previous discussion of long-term effects, the risk of exposure can be estimated quantitatively, based on sites with known hazardous materials concerns located near or in the project footprint. Exhibit 3.18-1 illustrates the number of known sites. These are estimates only; new sites or currently existing but unknown concerns may be identified in the future.

Construction uses heavy machinery that relies on petroleum products for operation. These can spill or leak, potentially contaminating soil or groundwater, which would have to be cleaned up. Other potentially hazardous materials used during construction or demolition include paints, cleaning solvents, asphalt products, and other products that could leak or spill, requiring cleanup.

In addition, the potential sites for a bridge assembly/casting yard are unknown at this time. However, they are likely to be adjacent to the Columbia River, Willamette River, or other water body in the region. The existing conditions on the assembly/casting yard could range from a developed and paved port terminal to a currently undeveloped site. The construction activities on the site would include using fuels and other hazardous materials, as well as the risk of release. The project could involve rehabilitation, demolition, or removal of structures that contain hazardous materials, such as lead paint, asbestos, or other chemicals that are known to have adverse health effects. In such cases, special testing, worker and environmental protection techniques, and waste disposal practices are required.

If the project cannot reasonably avoid a known hazardous site, or if a previously unknown hazardous site is discovered during construction, adverse temporary effects could occur:

- Project workers, neighboring communities, or the environment could be exposed to hazardous materials by construction activity.
- Work could stop in the area near the hazardous site.
- Delays in the project schedule and increases in cost could result from notifying the appropriate government agency, identifying who is responsible for the hazardous material, and finding out the type of contamination and how far it has spread.
- Cleaning up the hazardous site and disposal of any contaminated material would likely be required and could be complex and expensive.

Alternative 1: No-Build

As no CRC-related construction would occur with the No-Build Alternative, there would be no elevated risk of leaks or spills during construction or exposure or migration of hazardous materials due to construction.

Alternative 2: Replacement Crossing with Bus Rapid Transit

Exhibit 3.18-6
Known Hazardous Materials Sites Associated with Alternative 2

Alternative 2: Replacement Crossing with Bus Rapid Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
High-risk sites	21-27	23-29	20-26	20-26
Total sites	134-167	159-201	133-166	132-165

Source: CRC Hazardous Materials Technical Report.

[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

Between 20 and 29 relatively high-risk sites and between 131 and 201 total sites are associated with the Alternative 2 terminus options, as shown in Exhibit 3.18-6. These include sites in the construction footprint and the C-TRAN maintenance facility.

Alternative 3: Replacement Crossing with Light Rail

Exhibit 3.18-7
Known Hazardous Materials Sites Associated with Alternative 3

Alternative 3: Replacement Crossing with Light Rail Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
High-risk sites	21-27	23-29	20-26	20-26
Total sites	134-167	159-200	133-165	131-164

Source: CRC Hazardous Materials Technical Report.

[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

As the highway and transit routes would be the same, all terminus options for Alternative 3 would have the same short-term risks as the corresponding terminus associated with Alternative 2, as shown in Exhibit 3.18-7. These totals include the TriMet Ruby Junction maintenance base.

Alternative 4: Supplemental Crossing with Bus Rapid Transit

Exhibit 3.18-8
Known Hazardous Materials Sites Associated with Alternative 4

Alternative 4: Supplemental Crossing with Bus Rapid Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
High-risk sites	20-21	21-22	20-21	20-21
Total sites	124-157	149-191	123-156	122-155

Source: CRC Hazardous Materials Technical Report.

[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

Between 20 and 22 relatively high-risk sites and between 122 and 191 total sites are associated with the Alternative 2 terminus options, as shown in Exhibit 3.18-8. These include sites in the construction footprint and the C-TRAN maintenance facility.

Alternative 5: Supplemental Crossing with Light Rail

Exhibit 3.18-9
Known Hazardous Materials Sites Associated with Alternative 5

Alternative 5: Supplemental Crossing with Light Rail Transit[a]				
	Kiggins Bowl Terminus (A)	Lincoln Terminus (B)	Clark College Terminus (C)	Mill Plain Terminus (D)
High-risk sites	20-21	21-22	20-21	20-21
Total sites	124-157	149-191	123-156	122-155

Source: CRC Hazardous Materials Technical Report.

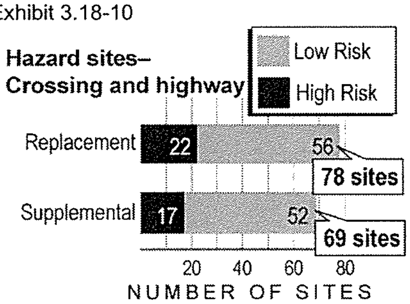
[a] Values for the replacement design and the STHB design are the same unless otherwise noted.

As the highway and transit routes would be the same, all terminus options for Alternative 5 would have the same short-term risks as the corresponding terminus associated with Alternative 4, as shown in Exhibit 3.18-9. These totals include the TriMet Ruby Junction maintenance base.

Multimodal River Crossing and Highway Improvements (Replacement Crossing with Alternatives 2 and 3; Supplemental Crossing with Alternatives 4 and 5)

Exhibit 3.18-10

Hazard sites–Crossing and highway



Source: CRC Hazardous Materials Technical Report.

Both the replacement crossing and associated highway improvements would acquire land for highway right-of way. As illustrated in Exhibit 3.18-10, seventy-eight total sites, with 22 of those considered high risk, are associated with the replacement crossing and highway improvements. Sixty-nine total sites, with seventeen of those considered high-risk, are associated with the supplemental crossing and highway improvements.

Transit Mode (BRT with Alternatives 2 and 4; LRT with Alternatives 3 and 5)

The bus rapid transit and light rail components of the project would entail the expansion of the associated maintenance bases. Expanding C-TRAN's existing bus maintenance facility in Vancouver to accommodate bus rapid transit or expanding TriMet's existing light rail maintenance facility in Gresham for light rail would have similar risks for exposure to hazardous materials.

Even if the No-Build Alternative is chosen and CRC is not built, regional transit services are likely to increase from other projects, and expansion of the vehicle maintenance facilities would likely occur. If one of the build alternatives is chosen for CRC, this project would contribute to the size of that expansion.

Both proposed maintenance base sites have past environmental concerns, such as fuel spills or leaks from underground tanks, reported in agency databases. These past problems are recorded as currently cleaned up. Both are located near manufacturing or auto-maintenance facilities that have also reported past environmental concerns. At this time, no serious, ongoing concerns are known near either maintenance base site. However, the land use history of both sites gives them a relatively high risk for encountering hazardous material during acquisition of property or construction.

Transit Terminus Options (with all Alternatives)

The different transit terminus options would affect the likelihood of encountering hazardous materials sites during construction. The site totals listed in the summary tables for each Alternative include transit-affected sites only when they would not already be affected by the associated highway options. This section considers the transit terminus options without regard to the highway alternatives, in order to clearly compare the terminus options. Maps and comparative charts on this and the following pages show the total number of sites and their approximate locations near each terminus option.

The terminus options have identical routes and risk potential between the Expo Center station in Oregon and the proposed Mill Plain station in Vancouver. This portion of the route would contain between three and six high-risk hazardous materials sites, and between 51 and 83 total sites.

The Lincoln terminus would encounter 15 high-risk sites, and between 86 and 137 total sites. The Kiggins Bowl terminus would encounter 14 high-risk sites, and between 70 and 101 total sites. The ranges result from the alignment options described below. The Lincoln terminus options would entail construction near the City of Vancouver Well Field #3 facility. Possible spills, leaks, or accidents during construction activity could increase the risk of contamination to the well field.

The Lincoln terminus Park and Ride location has been identified as having potential contamination. This could potentially increase costs and cause delays during construction, and would have a risk of contaminant exposure or spreading from construction activities.

The Clark College terminus is associated with twelve high-risk and between 70 and 100 total sites. The Clark College terminus would also entail constructing a park and ride at the Lincoln site, which is an additional high-risk site.

The Mill Plain terminus is associated with 12 high-risk sites and between 68 and 99 total sites. This terminus would also entail constructing a park and ride at the Lincoln site, which is an additional high-risk site.

TRANSIT ALIGNMENT OPTIONS (WITH ALL ALTERNATIVES)

Offset or Adjacent

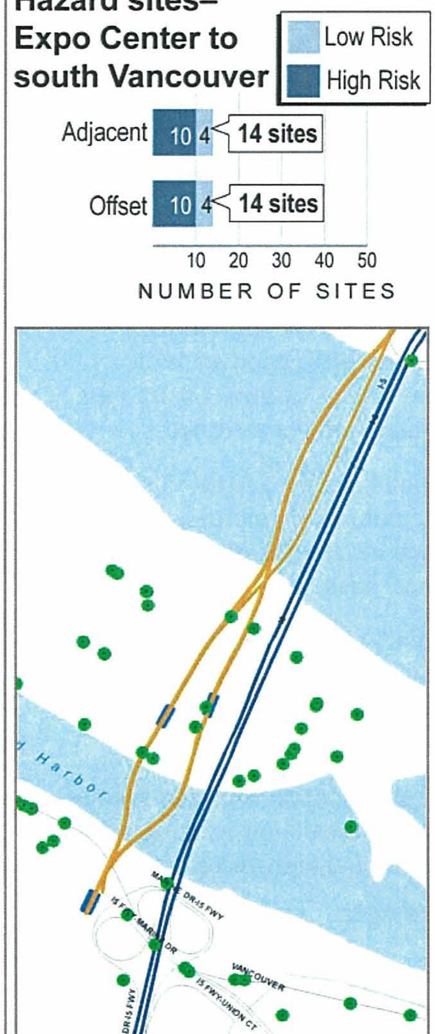
As illustrated in Exhibit 3.18-11, the same number of both high and low risk sites could affect either the offset or the adjacent alignment options. Of the 14 total sites, 10 could affect both options, while four sites would be more likely to affect one or the other.

Broadway-Washington or Two-way Washington

As illustrated in Exhibit 3.18-12, both the two-way Washington Street option and the Washington-Broadway couplet have two potentially high-risk sites identified. Construction of the Washington-Broadway couplet option could be affected by 83 low-risk sites. Because the two-way Washington Street alignment would acquire right-of-way and break ground on one street rather than two, it is likely to encounter fewer low-risk sites, with 52 known.

Exhibit 3.18-11

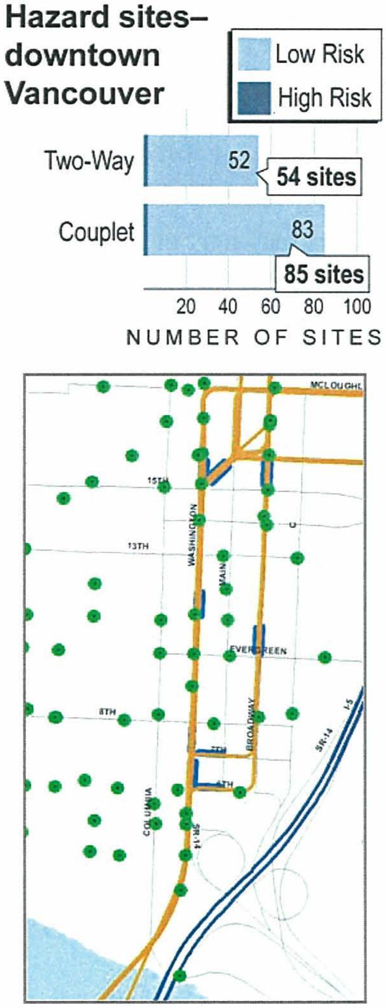
Hazard sites–Expo Center to south Vancouver



Source: CRC Hazardous Materials Technical Report.

Exhibit 3.18-12

Hazard sites–downtown Vancouver

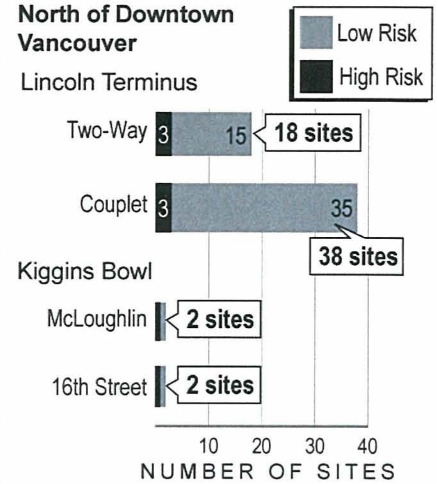


Source: CRC Hazardous Materials Technical Report.

Broadway-Main or Two-Way Main

As illustrated in Exhibit 3.18-13, three high-risk sites could affect either of the Lincoln Terminus alignment options. Fifteen low-risk sites are associated with the two-way Broadway option, for a total of 18 known sites along the route. Because the couplet design would run transit along two streets rather than one, a larger number of low-risk sites (35) were identified for that option.

Exhibit 3.18-13
Hazard sites– North of Downtown Vancouver

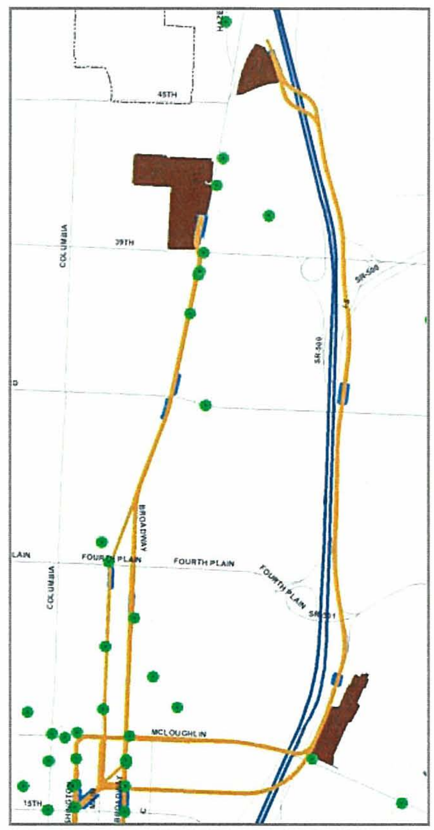


Source: CRC Hazardous Materials Technical Report.

16th Street or McLoughlin

As illustrated in Exhibit 3.18-14, both the 16th Street and McLoughlin Boulevard alignment options have one low-ranked site along the route. North of Clark College, one high-risk hazardous site has been identified along the Kiggins Bowl terminus route.

Exhibit 3.18-14
Hazard Sites North of Downtown Vancouver



Source: CRC Hazardous Materials Technical Report.

3.18.5 Potential Mitigation for Adverse Effects

Potential Mitigation Related to Construction and Acquiring Right-of-Way

Specific measures for avoiding or reducing adverse hazardous materials impacts during construction would be developed during final design. To reduce the risk of liability and decrease the short-term effects of hazardous materials sites to the project, an environmental site assessment would be completed at each site proposed for acquisition or easements. Performing this as part of legal due diligence provides liability protection, both when potential contamination is identified during the investigation, and if previously unknown contamination is discovered after acquiring a site.

If these investigations indicate uncertainty about the environmental conditions on the site or show the potential for contamination or hazardous materials, the project team would conduct further onsite testing. Testing could include sampling soil, groundwater, or building materials, as applicable, to determine the type and extent of potential contamination, and reduce the risk of exposure to workers, neighbors, and the environment.

Detailed investigation of potentially contaminated sites may be followed by negotiation with potentially responsible parties and state environmental agencies to determine responsibility for the cost of cleaning up hazardous materials sites.

Certified inspectors would survey all structures that will be demolished or modified for asbestos-containing materials. Where asbestos is identified, the project team would prepare abatement plans, and abatement would be performed by a licensed abatement contractor. This would reduce the risk of asbestos exposure to workers and neighbors.

Lead-based paint surveys would also be conducted on all structures where lead is likely to be present. The risk of exposure would be minimized by following best management practices for lead abatement.

In addition, to reduce the risk that hazardous materials used during construction, such as asphalt, fuel, raw concrete, paint, solvents, or landscaping chemicals, could be released, the construction contractor would prepare a pollution control plan. The plan would outline methods for safely storing, using, and disposing of these products, and construction will follow best management practices to reduce the risk of spills or leaks.

Cleanup of Hazardous Sites

Removal actions, remediation, or containment would be conducted on each site directly impacted. These activities would vary by site depending on conditions, the type and extent of contamination, the likely paths of exposure, and whether soil, groundwater, or building materials are contaminated. Impacts to groundwater would be assessed in relation to the Troutdale sole-source aquifer. The project team would develop cleanup plans together with the appropriate regulatory agencies.

In order to protect workers, plans would be developed that provide emergency procedures and practices for safe working conditions. Personal protective equipment and other safety equipment would be provided and used appropriately.

Contaminated or hazardous materials removed from project sites would be stored and disposed of as specified by the appropriate regulatory agencies.

For sites where cleanup systems may operate beyond the construction phase, such as certain groundwater treatment systems, appropriate monitoring would occur to ensure that the system functions and to determine when the site has been adequately cleaned up.

3.19 Cumulative Effects

Cumulative effects refer to the impacts from the CRC project when added to the impacts from other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively substantial actions that take place over a period of time. Input from resource agencies, Tribes, and the public helped define the scope and scale of the cumulative effects analysis.

To address cumulative effects, the project team established a time-frame of reference for evaluating how past actions have shaped existing conditions, and how future actions might further change them. For the built environment, the "past" runs from 1960 (prior to the opening of I-5) to the present day. For the natural environment, an earlier base year is evaluated to capture a longer history of the effects of development on natural resources in the area. To determine base thresholds the cultural environment team solicited input from the Cultural Resources/Section 4(f) Workgroup, which is composed of local and state agency representatives, the Washington Department of Archaeology and Historic Preservation (DAHP), and the Oregon State Historic Preservation Office (SHPO).

Past Actions

Native Americans have occupied or traveled through the CRC project area for thousands of years. Those activities had little effect on current environmental conditions in the CRC project area. In the 1800s European-American settlement began and the Portland and Vancouver area population began to increase dramatically. The following key historic events provide a basis for analysis of past actions that have helped shape current environmental conditions:

- Pre-1800s – Native American paths along Siskiyou Trail on what is now the I-5 Corridor connected tribes from the Pacific Northwest to California's Central Valley.
- 1810 to 1850 – Settlement of Fort Vancouver and the Hudson Bay Company. Commercial fur trapping on the Columbia and associated waterways. Fur trappers from the Hudson Bay Company operating out of Fort Vancouver adopted the Siskiyou Trail as a major transport corridor between the Northern Oregon Territory and California.
- 1846 – Ferry service across the Columbia between Vancouver and Portland was established and offered intermittently by various operators.[46]
- 1890s – Trolley line system in Portland and Vancouver encouraged greater urbanization and development of neighborhoods east of the Willamette in Oregon, and north to Fourth Plain Boulevard in Vancouver.
- 1905 – Pearson Airfield became a dirigible landing area. It was officially dedicated as Pearson Airfield in 1925. The automobile was

[46] http://www.columbian.com/history/transportation/ferry1.cfm, accessed on September 27, 2007.

introduced in the early 1900s and by the 1930s many middle class families could afford cars and travel greater distances for work, shopping, or leisure.

- 1910 to present – Railroad construction, including a rail bridge over the Columbia River in 1910 allowed increased freight transport and increased the viability of the ports of Vancouver and Portland in interstate trade. Industrialized farming, irrigation and water impoundment, and grain shipment increased.
- 1917 – The Columbia River Interstate Bridge opened in 1917 and allowed easier transport of cargo and people between Vancouver and Portland, as well as the broader Pacific Northwest.
- 1930s to 1970s – Several dams were built on the Columbia River between the 1930s and 1970s to provide electricity and irrigation water for the Pacific Northwest. Over-fishing and construction of these dams dramatically decreased salmon runs. This had a negative impact on the economic well-being of Native American tribes, for whom the salmon are an important material and cultural resource.
- 1940s – Mobilization of shipyard manufacturing in support of World War II brought wartime employment in the Portland and Vancouver area and created a housing shortage. Many nearby areas were impacted by this temporary increase in housing demand and resulting building boom.
- 1948 – In 1948 the Columbia River flooded and displaced approximately 20,000 public housing residents in the City of Vanport, including many minorities. Relocation occurred throughout the area and the Vanport community's residential base never recovered to those levels supported in 1948.
- 1950s – Post World War II housing construction was financed through federal grants and GI loans and created a greater supply and demand of outer urban and suburban housing both in Oregon and Washington.
- 1952-60s – Construction of the interstate highway system in the 1950s and early 1960s greatly increased freight and automobile traffic. The new highway separated neighborhoods in Portland and Vancouver. Construction of the interstate highway system also increased access to downtown Vancouver.
- 1958 – The Vancouver-Portland Interstate Toll Bridge was constructed in 1958. This development doubled automobile capacity across the Columbia, reduced congestion and allowed further commuting across the Columbia. This bridge now carries southbound traffic.
- 1960s – Portland International Raceway and Delta Park were established on former roads and land from the Vanport Community that was destroyed by floods in 1948.
- 1970s to present – Growth management and implementation of Oregon planning laws in the 1970s have limited urban sprawl in the Portland metropolitan area. As the area's economy shifted from timber processing and sales to high tech and services, there was a high demand for professional workers. This encouraged commuting

from throughout the Portland Metropolitan Area, including Vancouver, which increased commuting across the Columbia.

- 1990 – The Washington Growth Management Act passes in 1990. This act seeks to restrict unplanned urban sprawl and concentrate growth in existing urban areas.

Recently Constructed Projects

Some of the more noteworthy recent transportation and development projects in or near the CRC area are listed below. The development projects give a sense of the recent development trends in the area. The projects will create additional travel demand, and generally increase the density of housing, commercial, and retail enterprises in the project area.

RECENT TRANSPORTATION PROJECTS

- Failing Street Pedestrian Bridge rehabilitation
- Interstate Max (Max, Yellow line along Interstate Boulevard)
- Widening of I-5 north of the CRC project area

RECENT DEVELOPMENT

- Esther Short Park and Propstra Square (Vancouver)
- Heritage Place retail development (Vancouver)
- The Vancouver Center mixed use development (Vancouver)
- The Lewis and Clark Plaza housing and public space (Vancouver)
- The Esther Short Commons residential and retail development (Vancouver)
- The Vancouver Convention Center and Hilton Hotel (Vancouver)
- The Columbian Building office space (Vancouver)
- The West Coast Bank Building commercial and residential mixed use (Vancouver)
- The Northwynd at Columbia Shores commercial and residential mixed use (Vancouver)
- The Waterside Condominiums (84 units) Portland
- Salpare Bay Condos (204 units) Portland

Reasonably Foreseeable Future Projects

Multiple plans lay out lists of reasonably foreseeable future projects. These plans include Transportation System Plans, neighborhood plans, and comprehensive plans, among others. A list of the projects and plans considered is included in the Cumulative Impacts Technical Report.

The No-Build Alternative includes a list of projects through 2030, including present projects and planned improvements for which need, commitment, financing, and public and political support are identified and are reasonably expected to be implemented. These projects meet the criteria of being "reasonably foreseeable". All transportation improvements included in the No-Build Alternative are included in either Metro's 2025 Regional Transportation Plan (RTP) (including amendments) or the Regional Transportation Council's (RTC) 2030

Metropolitan Transportation Plan (MTP). Transportation infrastructure projects under way or planned through 2030 within the CRC project limits are listed in Appendix A, which includes highway and transit projects on both sides of the Columbia River.

With the exception of the I-5 widening to six lanes from Lombard Street to Victory Boulevard (the Delta Park Highway Widening Project), the No Build alternative does not assume any major capacity improvements on I-5 near the CRC project. Outside of the project area, there are minor I-5 capacity enhancements and several major maintenance projects, specifically identified in the financially constrained regional transportation plans of both Metro and RTC. Capacity improvements on Interstate 5 will provide additional vehicular and freight mobility and reduce travel times. The projects will also require materials, equipment, and energy to complete. The projects have temporary traffic impacts associated with construction.

Projects more specific to the immediate area include local transportation improvements, infrastructure associated with higher density residential communities along Marine Drive in Portland, the revitalization of downtown Vancouver, and general infrastructure improvements such as sewer and water facility expansions which further enable development.

Some of the other anticipated projects near the CRC projects include:

Riverwest – This site adjoins the I-5 right-of-way, just south of Evergreen Boulevard. The development will include a new main library for the Fort Vancouver Regional Library System. Riverwest is a $165 million public-private mixed-use development that includes four multi-story buildings. During project construction, there may be temporary traffic impacts, though these should conclude before the CRC project begins construction.

Columbia West Renaissance – The project is a large-scale mixed-use development. Significant amounts of new office space, public space, and residential uses are planned. Pedestrian amenities from the east side of the Vancouver shoreline would cross under the CRC improvements and extend through the Columbia West development. The project will provide new parking, and substantial new traffic generation. It is related to new underpasses through the BNSF berm, and the possible extension of Main Street to the Columbia River. During project construction, there may be temporary traffic impacts, although these should conclude before the CRC project begins construction.

West Barracks - The federally-established Vancouver National Historic Reserve (VNHR) includes many buildings previously used by the United State military. The VNHR partners—including the City of Vancouver, National Parks Service, State of Washington, U.S. Army and the VNHR Trust—are working with private sector partners to renovate 16 historic buildings on the West Barracks for a variety of uses, from education and the arts to recreation and hospitality.

Planning is in its early stages for transferring the south and east barracks to the City. These areas will later be integrated with the master plans for the West Barracks. The rehabilitation of the Reserve is closely related to the east-west circulation issues between the east and west sides of the Interstate.

Closed Denny's site – On the site of a closed Denny's restaurant, private developers are planning 60,000 sf of office space. The site is just west of the Mill Plain interchange. It should be completed in 2008. The project will need a design that is integrated with or at least compatible with the Mill Plain interchange. During project construction, there may be temporary traffic impacts, though these should conclude before the CRC project begins construction.

Columbia River Channel deepening – The Columbia River Channel Deepening project is a major transportation, economic development, and international trade project for the region. Nearly half of the Columbia River federal deep-draft navigation channel was deepened from 40 to 43 feet by the end of 2006. The channel deepening includes both navigation improvement and expanded restoration components. Most of the dredge material will be disposed at upland sites for beneficial uses. The project minimizes unavoidable impacts and compensates for any unavoidable impacts through substantial mitigation endeavors. There will be 15.4 acres of wetland, 50 acres of riparian habitat, and 171.4 acres of agricultural land impacted. These impacts will be offset by 736 acres of wetland and riparian mitigation.

Favorable Biological Opinions were issued by the federal environmental agencies in May 2002, and Oregon and Washington state environmental agencies approved and issued permits for 401 Water Quality Certifications and Coastal Zone Management Consistency in June 2003. On January 9, 2004, the Corps issued their Record of Decision (ROD) for the project.

Hayden Island Neighborhood Plan and Jantzen Beach Center Redevelopment - The Portland Bureau of Planning is developing and implementing an area plan for Hayden Island. The Hayden Island Plan will include: comprehensive plan and zoning designations, a street plan, development standards, a conservation strategy, and an affordable housing preservation strategy. This process will take into consideration both East and West Hayden Island and the Columbia River Crossings Project. The entire project is being conducted with a large amount of community and stakeholder involvement.

Redevelopment plans for the shopping center are in preliminary stages. The redevelopment project intends to transform the area from a conventional suburban shopping center to a more Main Street atmosphere. The City of Portland, the developers, and the CRC project team are sharing information, such as the preliminary transportation circulation plan for the Center. An important element of the plan is to construct a connecting facility that would allow traffic to move across the Interstate without interfering with traffic on the I-5 ramps.

3.19.1 Acquisitions

Most of the area directly affected by the CRC alternatives is already occupied by public right-of-way resulting from previous transportation projects. The original construction of I-5 during the later 1950s and early 1960s had substantial property acquisitions and displacements near the immediate project area. For example, when the segment of Interstate 5 known as the Minnesota Freeway was constructed from the Rose Garden area to the Columbia River Slough in northeast Portland, it removed over 180 dwellings and displaced more than 400 residents.[47]

The real estate acquisitions required for the CRC alternatives are relatively minor for a project of this size, and are substantially smaller when compared to the acquisitions associated with past major transportation projects in the corridor. There will be very few residential displacements in neighborhoods that were directly affected by the original construction of I-5. Most of the full acquisitions would be commercial properties and the likelihood of finding suitable, local replacement space for the businesses is high.

The highest potential for cumulative acquisition-related impacts of concern is on Hayden Island, where the alternatives would acquire or cause the relocation of 13 to 23 floating homes and the relocation of four to 14 businesses. Effects on the floating home residents may be exacerbated by unrelated future land use changes on Hayden Island and shortages in the supply of available moorage space, as state and federal regulations make it difficult to permit new moorages. While the commercial property acquisition is a very small share of the total retail space on Hayden Island, unrelated, future land use changes are expected that could also result in business displacements. The City of Portland is currently preparing a sub-area plan for the island that contemplates allowing substantial changes to the island's development, which could result in substantial changes in the land use and business mix on the island.

It will be important to carefully consider mitigation for displaced floating homes, and to coordinate with the City of Portland's on-going land use planning efforts for Hayden Island.

3.19.2 Economics

Past transportation and development projects have helped to solidify I-5 as a critical component of the region's transportation network and regional infrastructure. Demand on I-5 comes from freight, public, and personal vehicle use. Freight needs are a major driver for future improvements needed along the I-5 corridor.

The ports of Portland and Vancouver are critical to the economic growth and prosperity of the region. In order for the ports to remain competitive, efficient and cost-effective multimodal transportation systems must be available. Reducing freight travel times by investing in transportation infrastructure improvements that improve access and decrease congestion helps maintain the area's competitiveness. The total annual tonnage moving through the two ports is expected to double from approximately 300 million tons in 2000 to almost than 600 million tons in 2035. This growth has implications for the transportation network as products move to and from the regional marketplace.

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[47] Kramer, 2004.

The No-Build Alternative would retain the existing I-5 crossing and makes only minor preservation improvements to the highway within the project area. However, many other projects are planned that will improve I-5 access to and from regional centers, local collectors, and arterials.

The CRC project would positively contribute to other projects aimed at reducing congestion and enhancing freight mobility by further relieving congestion. Congestion relief in this area would greatly benefit freight traffic generated by Swan Island, the Rivergate area, the Port of Portland, and the Port of Vancouver. Incremental benefits would include decreased travel times, increased mobility, and increased reliability of travel times.

If proposed CRC improvements are not constructed, economic development planned for the area may occur more slowly as business owners may be more reluctant to locate in an area with poor access and mobility for employees and customers. Customers may elect to shop in other areas with easier access and mobility.

3.19.3 Environmental Justice

The construction of I-5 in the early 1960s cleared entire blocks for the development of the roadway, dividing neighborhoods and displacing residents. Some of these neighborhoods were composed of more minority and low-income persons than in Portland and Vancouver as a whole. The construction of I-5 through Vancouver changed the city by closing Fifth Street (the route heading east) and encouraging development of housing to the north of downtown. Fewer displacements occurred in Vancouver than Portland because the area was less densely developed than Portland at that time.

More recent transportation projects, similar to the CRC project, have not had disproportionate high and adverse effects on low-income and minority populations. The CRC build alternatives create only slightly widened roadway profiles along I-5, and will not divide existing communities. They are also likely to reduce highway-related noise impacts at homes adjacent to I-5. Tolling scenarios could result in negative impacts to low-income populations, but could be mitigated via program funding.

Additionally, recent emphases on transit and alternative transportation mode development generally provide greater benefit to lower-income populations who ride transit in higher proportions than higher-income populations.

There is now increased attention to community outreach and input associated with highway and transit project development. Historically, most projects were not planned and implemented with extensive input and communication with the public. It is now an important component of project development to involve communities who would be affected by a proposed project. Thus, project teams attempt to minimize the impacts via extensive outreach and incorporation of community input.

3.19.4 Land Use

The build alternatives are consistent with local plans and policies, which encourage investment in inner urban infrastructure, multimodal transportation, freight mobility, economic development, and compact urban development. The greatest direct impacts on land use would occur as a result of the park and ride facilities. Adding transit stations in Hayden Island and downtown Vancouver could result in more mixed use and compact housing development around stations.

Vancouver's downtown has changed greatly during the past decade. The focus of the downtown and waterfront areas has broadened from employment-related uses to tourism and recreation development, retail shopping, meeting and convention activities, housing, and entertainment. Along with revitalizing overall downtown activity, new residential opportunities and revitalization of the retail core and central waterfront have been emphasized. New office and mixed-use development has increased in the last decade, with projects such as the Vancouver Center, West Coast Bank Building, Public Service Center, Convention Center, and numerous smaller projects. New and growing uses in the downtown include eateries, bars/taverns, a new playhouse, and personal services.

On Hayden Island the primary land use close to I-5 is commercial, including the Jantzen Beach Center (a large shopping mall) and surrounding retailers. Residential uses in the area include manufactured homes and floating homes associated with small marinas, as well as other low to medium density developments. The City of Portland has initiated a planning effort for Hayden Island, which could change the development patterns on the island.

Under any of the build alternatives, subsequent development would be planned according to the local jurisdictions. The build alternatives will continue the trend of roadway development, and will balance that development with the improvement of transit, bicycle, and pedestrian infrastructure.

Transit, particularly high-capacity transit, can be a catalyst for development around stations, a process often referred to as transit-oriented development (TOD). Transit-oriented development is generally pedestrian-oriented and higher-density, which further supports the nearby transit service. This type of development is sought after by jurisdictions because it reduces demand for additional roadway capacity and advances local and regional planning goals for focusing development along transportation corridors. The Cities of Vancouver and Portland are supportive of TOD where it is appropriate with the neighborhood character, zoning, and plan policies. Such development is encouraged by both the Vancouver City Center Vision and the draft Hayden Island Concept Plan, and is generally within the limits of the planned growth envisioned and modeled for urban centers.

3.19.5 Neighborhoods

There would be a range of adverse effects and benefits to neighborhoods resulting from the build alternatives, including limited acquisitions, sound walls to reduce highway noise, the addition of high-capacity transit and transit-oriented development near stations.

On Hayden Island, the CRC project would displace approximately 13 to 23 floating homes. By removing several homes within this neighborhood, and more importantly separating one group of homes from the larger collection of floating homes in this particular community, cohesion may be impacted. Also on Hayden Island, the project could displace the existing Safeway, the only grocery store on the island. This could be avoided through design changes still under study or potentially mitigated through relocation assistance that would allow the grocery store to move elsewhere on Hayden Island prior to project construction.

High-capacity transit in Vancouver will influence neighborhood development, from the look and feel of the neighborhoods, to improving access, to adding the potential for transit-oriented development.

Past projects (such as the displacements associated with the 1960 construction of I-5 through North Portland) directly impacted neighborhoods in the I-5 corridor. These neighborhoods have experienced both incremental adverse effects as well as improvements since then. More recent transportation projects have generally provided net benefits through improved access, pedestrian oriented development, mitigation, and other amenities. The CRC project is expected to continue this more recent trend. Historically, projects were not necessarily planned and implemented with extensive input and communication with the public. Now, it is an important component of project development to involve communities who would be affected by a proposed project. Thus, project teams attempt to minimize the impacts of proposed projects via extensive outreach and incorporation of community input.

3.19.6 Public Services and Utilities

The combined impact of the CRC alternatives, and unrelated population and employment growth, will likely create an increased demand for public services. However, because the growth in population and employment and changes in land use are included in local and regional plans, it is reasonable to assume that the public service and utilities sectors will have adequate time to adjust for future conditions.

3.19.7 Air Quality and Air Toxics

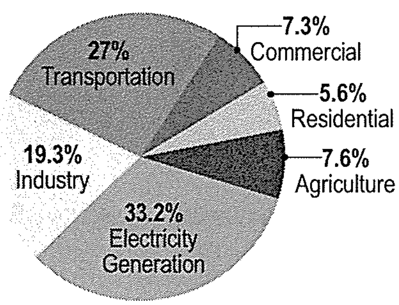
During the 1970s, pollutant concentrations in the Portland-Vancouver area exceeded the standards for carbon monoxide on one out of every three days, and ozone levels were often as high as 50 percent over the federal standard. Programs and regulations put into effect during the 1970s in order to control air pollutant emissions have been effective, and air quality in the area has improved. Recent regulations promulgated in the early 2000s, and most recently in February 2007, adopted further controls on vehicles, and control of fuel formulations. These standards apply to all vehicles on the highway system and are responsible for substantial reductions in vehicle emissions since the 1970s and projected vehicle emissions reductions over the next 25 to 30 years.

Traffic data used in the air quality analysis are based on projected 2030 population and employment information and include expected overall growth in the region and the project area. Background concentrations representing the cumulative emissions of other sources in the area are added into the predicted local concentrations for carbon monoxide at intersections. For all pollutants analyzed, future 2030 emissions with or without the CRC project are projected to be about 30 to 90 percent lower than existing conditions.

Greenhouse Gases

Greenhouse gases generally include six types of gas. Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perflourocarbons (PFCs), and sulfur hexafluoride (SF_6).

Exhibit 3.19-1
Source of U.S. Greenhouse Gas Emissions, 2004[a]



Source: EPA 2006.

[a] Excluding emissions in U.S., territories, which accounted for 0.88% of total emissions.

What is included in the transportation sector?

The transportation sector includes domestic air transport, road vehicles, rail, pipeline transport, national navigation, and non-specific transport. Consistent with IPCC guidelines, it does not include international aviation or marine bunker fuels.

3.19.8 Climate Change

This section summarizes potential cumulative impacts associated with climate change and discusses future uncertainty and risk associated with climate change. Climate change, also referred to as global warming, is an increase in the overall average atmospheric temperature of the earth. The Intergovernmental Panel on Climate Change (IPCC) stated: "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations."[48] In the coming decades, scientists anticipate that as atmospheric concentrations of greenhouse gases continue to rise, average global temperatures and sea levels will continue to rise as a result and precipitation patterns will change.

Virtually all human activities have an impact on our environment, and transportation is no exception (Exhibit 3.19-1). Transportation is a substantial source of greenhouse gas emissions, and contributes to global warming through the burning of petroleum-based fuel. Any process that burns fossil fuel releases carbon dioxide into the air. Carbon dioxide is the primary greenhouse gas emitted by vehicles, and therefore it is the focus of this analysis.

Changes in CO_2 emissions from fossil fuel combustion are influenced by many long-term and short-term factors, including population and economic growth, energy price fluctuations, technological changes, and seasonal temperatures. On an annual basis, the overall consumption of fossil fuels in the United States generally fluctuates in response to changes in general economic conditions, energy prices, weather, and the availability of non-fossil alternatives.[49] Over time, carbon emissions increase with population growth. The population, as well as the number of miles being driven, has grown and is expected to continue growing, but standards for vehicle fuel efficiency have not changed since 1991.

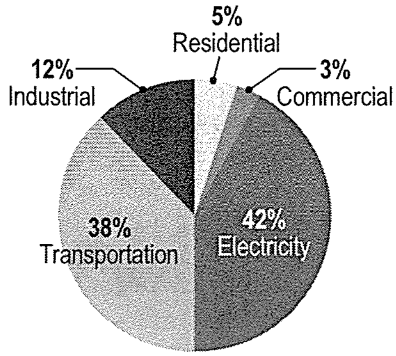
Transportation accounts for an estimated 38 percent of Oregon's carbon dioxide emissions, with vehicle CO_2 emissions predicted to increase by 33 percent by 2025 because of increased driving (Exhibit 3.19-2).

Washington State predicts that, with the state's reliance on in-state hydropower for electricity generation, the transportation sector accounts for almost 50 percent of greenhouse gas emissions in Washington (Exhibit 3.19-3).

[48] IPCC, 2007.

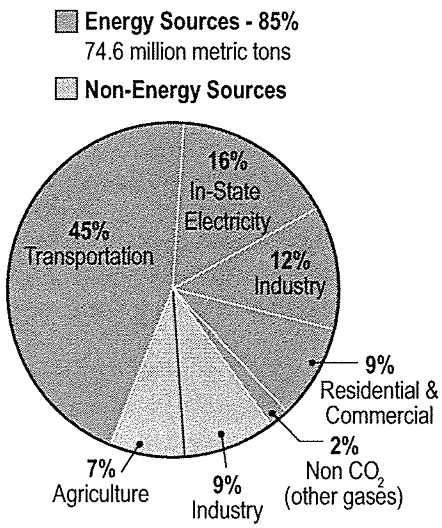
[49] Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks. 1990-2006 February 2008).

Exhibit 3.19-2
Greenhouse Gas Emissions in Oregon, 2008



Source: Oregon Department of Energy January 2008.

Exhibit 3.19-3
Greenhouse Gas Emissions in Washington, 2004
TOTAL=88.3 million metric tons of CO_2 equivalent



Source: Washington Department of Community, Trade and Economic Development (Preliminary Estimate)

Future carbon emissions for the CRC project are difficult to estimate precisely because such a wide variety of factors could influence carbon emissions by 2030. Some of the factors that could change between now and 2030 include government regulations, price and availability of fuel and alternative energy sources, and vehicle technology (such as electric hybrid or fuel cell vehicles).

The National Highway Traffic and Safety Administration (NHTSA), which is part of U.S. DOT, establishes and amends the Corporate Average Fuel Economy (CAFE) standards for vehicles. The CAFE program gives manufacturers an incentive to sell more fuel-efficient light trucks and automobiles. Congress sets CAFE standards for cars. EPA reports the CAFE results for each manufacturer to NHTSA annually, and NHTSA determines if they comply with CAFE standards and assesses penalties as required. A tax is imposed on makers of new model year cars that fail to meet the minimum fuel economy level of 22.5 mpg. In 2011, the standard will change to include many larger vehicles.

A discussion of greenhouse gas emissions, as well as the calculations of emissions by alternative, are found in Section 3.12, Energy.

On December 19, 2007, President Bush signed into law the Clean Energy Act of 2007, which requires in part that automakers boost fleetwide gas mileage to 35 mpg by the year 2020. The current CAFE standard for cars, set in 1984, requires manufacturers to achieve an average of 27.5 miles per gallon, while a second CAFE standard requires an average of 22.2 miles per gallon for light trucks such as minivans, sport utility vehicles, and pickups. The new rules require that these standards be increased such that, by 2020, the new cars and light trucks sold each year deliver a combined fleet average of 35 miles per gallon. It is unclear how the phase-in of these new cars will impact the overall fuel efficiency of the fleet mix between now and 2030. It is partially dependent on the economy; for example, how many people buy new vehicles before 2030.

If historic and recent transportation trends continue, CO_2 emissions will continue to increase. By 2030, CO_2 emitted from vehicles on all regional roadways, including I-5 and I-205, are expected to increase over existing conditions. For example, the population is expected to increase in Clark County by 66 percent between 2005 and 2030, which could have a dramatic effect on vehicle miles traveled in the region. Without the CRC improvements, the highway crossing would produce 40 percent more greenhouse gas emissions by 2030 than under existing conditions and the regional transit system would produce 30 percent more.

Several jurisdictions in the project area have goals to reduce greenhouse gases. The Washington legislature passed a statute that aims to achieve 1990 greenhouse gas levels by 2020, and a 50 percent reduction below 1990 levels by 2050. The goals of the Oregon Climate Change Integration Act seek to reduce emissions 10 percent below 1990 levels by 2020 and achieve a 75 percent reduction below 1990 levels by 2050. Regulations implementing these goals have not been issued yet. Both Oregon and Washington are members of the Western Climate Initiative, which announced a regional, economy-wide greenhouse gas emissions target of 15 percent below 2005 levels by 2020, or approximately 33 percent below business-as-usual levels.[50]

In 1993, Portland was one of the first U.S. cities to adopt a plan to address global warming. In 2001, Multnomah County joined Portland in adopting a revised plan, the Local Action Plan on Global Warming, outlining more than 100 short- and long-term actions to reduce emissions 10 percent below 1990 levels by 2010.[51] In addition, mayors of Portland and Vancouver signed the U.S. Mayors' Climate Protection Agreement committing to reduce carbon emissions in cities below 1990 levels.

[50] See Western States Initiative webpage at http://www.westernclimateinitiative.org/Index.cfm.

[51] See 2005 Global Warming Progress Report by City of Portland and Multnomah County on more information regarding CO2 reductions in the metro region.

3.19.9 Long-Term Impacts

The CRC project constitutes small section of I-5; nevertheless, the consumption of fuel for the movement of people and goods on I-5 across the Columbia River could potentially cause cumulative long-term impacts on the environment. CRC project could reduce greenhouse gas emissions in the project area with the build alternatives. The guidelines set out by international, national, and state organizations primarily focus on improving vehicle efficiency and low-carbon fuel[52]; however, they do suggest measures for infrastructure that could reduce greenhouse gas emissions, such as:

- **Providing bicycle and pedestrian infrastructure**. The build alternatives include a bicycle and pedestrian multi-use path across the river, completely separated from vehicle traffic.
- **Providing transit options**. Currently, the only transit option from Portland to Vancouver or vice-versa is on buses that flow and stop with traffic. The build alternatives will provide high capacity transit (light rail or bus rapid transit) that will operate on a separate guideway, unaffected by vehicle congestion.
- **Implementing tolls**. The CRC project is considering a wide-range of scenarios for tolling the build alternatives, including increasing tolls during peak-periods to encourage off-peak driving. Traffic modeling shows that variable tolls would cause mode shift to transit and non-motorized transit (bicycle and pedestrian), or encourage people to not make certain trips.
- **Increasing efficiency of transportation systems**. The elimination of bridge lifts, variable pricing with tolls, the addition of auxiliary lanes between closely spaced interchanges in the project area, and the intersection improvements proposed for the CRC project will minimize congestion and stop-and-go conditions, which lead to inefficient use of energy.
- **Supporting transit orientated development**. The build alternatives provide an opportunity for transit-oriented development, consistent with existing land use plans for the City of Portland and the City of Vancouver.
- **Replacing aging infrastructure in existing corridors**. The build alternatives will upgrade an existing structure in an urban area instead creating a new transportation corridor.

The project team estimated greenhouse gas emissions for the CRC alternatives. The methodology for estimating long-term energy use was based on methodologies outlined in the Oregon Energy Manual, and CO_2 emissions were estimated using data provided by the Environmental Protection Agency (EPA). Other factors taken into account were:

- Vehicle trips[53]
- Expected advancements in vehicle technology

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[52] IPCC (2007), The State of Oregon Governor's Climate Change Integration Group (January 2008).

[53] Vehicle demand and transit demand is based on the regional, system-wide demand for people to drive their cars or take transit in the project area, including I-5 and I-205 river crossings.

- Expected advancements in fuel technology
- Current and future transit technology (electric for light rail and bio-diesel for buses)

The analysis shows that all build alternatives are projected to reduce personal vehicle travel demand over No-Build conditions and improve the operations of the I-5 crossing, as described in the Traffic section of this DEIS.

CO_2 emissions account for 94 to 95 percent of greenhouse gases emitted by the transportation sector.[54] As a result, the EPA uses CO_2 emission estimates as a representative indicator of greenhouse gas emissions. The general equation for estimating CO_2 emissions can be expressed as:

$$EM = FC \times EF$$

EM = Emissions of CO_2 (lbs)
FC = Fuel consumed (gallons)
EF = Emission factor (lbs of CO_2/gallon) (based on fuel type)

The CRC Energy Technical Report has more information on CO_2 emissions, and the methodology for calculating alternatives' potential affect on climate change

The fuel consumed (FC) is the amount of fuel that would be used to operate a vehicle or bus. The emission factor (EF) is the amount of CO_2 that would be emitted during combustion of a gallon of fuel. Based on data from the EPA, the emission factors used in this analysis were 19.4 pounds of CO_2 per one gallon of gasoline and 22.2 pounds for one gallon of diesel.[55] The emission factor for biodiesel can vary slightly depending on the blend, but was assumed to be equal to diesel (22.2 lbs of CO_2/gallon of biodiesel) for this analysis, which is consistent with EPA conclusions that biodiesel emits the same amount of CO_2 compared to diesel.[56]

When fuel burns, the carbon and hydrogen separate. The hydrogen combines with oxygen to form water and carbon combines with oxygen to form carbon dioxide (CO_2). The carbon content of fuel assumed in this analysis is the recommended EPA quantities for the amount of carbon in a typical gallon of gasoline or diesel.[57]

Light rail is operated by electricity. Although light rail vehicles do not individually emit CO_2 during travel, the process of converting fuel to electricity does. The electricity used to operate light rail would most likely come from sources available in the project area. Approximately 40 percent of the total electricity needed for light rail would be provided by Portland General Electric, based on the location of two substations in the Portland area. From these substations, 42 percent would come from coal and 13.9 percent would come from natural gas (the remaining portions would come from non-CO_2 emitting sources, such as hydropower, nuclear, wind, etc). Approximately 60 percent of the total electricity needed would be provided by Clark County Public Utilities, based on the location of three substations in the Vancouver area. From

[54] EPA (2005). Other greenhouse gases cover a broad array of gases other than CO2, principally methane (CH4), nitrous oxide (N2O) and sulfur hexaflouride (SF6).

[55] EPA, 2005a.

[56] The reduction in CO2 emissions from using biodiesel comes from the energy saved in harvesting the fuel, which was not computed in this analysis.

[57] EPA, 2005b.

these substations, 7 percent would come from coal and 28 percent would come from natural gas. The remaining portions would come from non-CO_2 emitting sources, primarily hydropower.

Exhibit 3.19-4 summarizes the potential daily energy use and CO_2 emissions for the alternatives in 2030.

Exhibit 3.19-4
Full Alternatives Summary of Daily Energy Use and CO_2 Emissions

Alternative	Energy Consumed (mBtu)	Electricity Consumed (kWh)	Gasoline Consumed (gal)	Bio/Diesel Consumed (gal)	CO_2e Emissions (tons)
Existing	4,014.4	77,355.3	8,343.0	19,585.2	342.5
Alternative 1 (No-Build)	5,384.2	152,628.0	10,661.0	25,536.6	463.3
Alternative 2 (Replacement, BRT)	5,248.1	152,628.0	9,598.0	25,520.9	452.3
Alternative 3 (Replacement, LRT)	5,242.3	162,063.3	9,598.0	25,231.8	452.4
Alternative 4 (Supplemental, BRT)	5,729.2	160,645.6	9,622.0	28,790.3	493.7
Alternative 5 (Supplemental, LRT)	5,687.1	172,053.3	9,622.0	28,172.0	490.7

Source: CRC Cumulative Effects Technical Report.

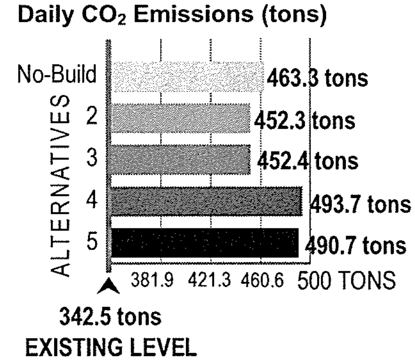
The replacement crossing with associated highway improvements, a toll on I-5, and light rail or bus rapid transit (Alternative 2 or 3) would reduce CO_2 emissions about two to three percent lower than the No-Build Alternative. This reduction is due to fewer auto trips over the river, more people riding on public transit, and reduced traffic congestion, which improves fuel efficiency.

Alternatives 4 and 5 were estimated to increase CO_2 emissions relative to No-Build, primarily because they include aggressive increases in the frequency of light rail or bus rapid transit and other bus routes without realizing proportional decreases in auto travel. Buses powered by petroleum diesel or bio-diesel emit CO_2, and a portion of the electricity that powers light rail comes from power plants that emit CO_2.

It is important to note that the total CO_2 emission estimates do not capture all of the potential reductions in CO_2 emissions associated with the highway improvements. They capture only the reductions associated with changes in highway travel speeds and the number of vehicles on the crossing itself. It is likely that the decreased congestion both north and south of the river, due to the replacement crossing and to a lesser extent the supplemental crossing, would further reduce CO_2 emissions compared to No-Build. In addition, the model does not capture a potential mode shift to bicycle and pedestrian that is expected with a toll and an improved bicycle and pedestrian path.

Carbon emissions will tend to be lower with a higher toll, or by tolling both I-5 and I-205, because tolling decreases the number of cars driving over the crossing and increases the number of people riding transit or carpooling.

Exhibit 3.19-5
Daily CO_2 Emissions (tons)



Source: CRC Energy Technical Report

According to the U.S. Department of Energy, the average American household produces 59 tons of carbon per year, and 11.7 tons of it is related to transportation

Potential Mitigation and Adaptation

Currently no local, state, or federal regulations identify a threshold for CO_2 emissions for transportation projects. However, potential measures for reducing adverse impacts to climate change from all alternatives could include:

- Implement programs that further encourage use of public transit
- Promote compact and transit-oriented development which encourages walking
- Provide safe and well-lighted sidewalks to encourage walking
- Provide safe and more accessible connections to paths for bicyclists and pedestrians
- Offer ride-share and commute choice programs
- Construct with materials and build systems that meet efficiency standards for equipment and lighting design
- Recycle building materials, such as concrete, from project
- Use sustainable energy to provide electricity for lighting and other operational demands
- Plant vegetation to absorb or offset carbon emissions
- Promote fuel-efficiency improvements, such as a low carbon fuel standard
- Promote diesel engine emission reduction
- Consider clean energy certificates or other carbon offsets for energy used

In addition to reducing CO_2 emissions, the CRC project may need to adapt to the effects brought about by climate change. The IPCC defines adaptation as "adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. Adaptation refers to changes in processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change."[58] In October 2002 the U.S. DOT Center for Climate Change and Environmental Forecasting, with the support of the EPA, Department of Energy, and the U.S. Global Change Research Program sponsored an interdisciplinary workshop to define research priorities regarding the potential impacts of climate variability and change on transportation. The priority areas identified at the workshop include: 1) assessment of potential impacts on critical infrastructure locations and facilities, 2) development of improved tools for risk assessment and decision-making, and 3) assessment of response strategies. The CRC project is proposed infrastructure that could be impacted by climate change.

The CRC project team considered some of the potential risks that could be caused by climate change, and potential adaptation measures to mitigate risk. The CRC project's location relative to the Columbia River

TERMS & DEFINITIONS

Adaptation

The intergovernmental Panel on Climate Change (IPCC 2001) defines adaptation as "adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts. It refers to changes in human processes, practices, and structures to moderate potential damages or to benefit from opportunities associated with climate change."

How do you estimate the impact of climate change on river levels?

Studies that have modeled future climate and river flow used existing data about the Columbia River Basin to predict trends over the next 50 to 100 years, taking into account the effects of global warming and other emergent conditions in the basin. These studies suggest that in the next century the flow pattern of the Columbia River could be transformed from a primarily snow-melt fed river to one supported by a mix of rainfall and diminished snow-melt.

[58] IPCC, 2001.

raises special concerns related to climate change. The Columbia River's water levels are affected by the amount of snow that falls during the winter and the amount of precipitation that falls as rain year round. The factor that affects these precipitation patterns most is the temperature of the atmosphere.

The effects of climate change on the river's flow and peak flow cycle have been the focus of several climate prediction models[59] over the last 10 years. Studies conclude that the increase in winter rain (which would historically fall as snow) will lead to increased winter flow of the Columbia River and a weaker snow-melt increase during the spring and summer. Under the worst case scenario, the water level of the Columbia River would rise another 5 feet during winter flow in 2030 compared to existing conditions.

Based on the information available, potential adaptation measures could include:

- Raising the height of the crossing to account for potential rise in the Columbia River water level
- Ensuring that the design and the materials used to build the crossing can withstand major storms and droughts
- Avoiding and minimizing construction in 100-year or 500-year floodplains

3.19.10 Electric and Magnetic Fields

Standards for electric and magnetic field (EMF) exposure guidelines are established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the American Conference of Governmental Industrial Hygienists. A survey conducted under the National Institutes of Health characterizes the personal magnetic field exposure in the general population.[60] The results indicate that approximately 14 percent of the general population is exposed to a 24-hour average magnetic field strength exceeding 2 mG. About 25 percent of people spend more than one hour at fields greater than 4 mG, and 9 percent spend more than one hour at fields greater than 8 mG. Approximately 1.6 percent of people experience at least one gauss (1,000 mG) during a 24-hour period.

Any of the CRC alternatives that involve extending light rail would add to EMF exposure. However, EMF levels from the light rail system are well below the ICNIRP exposure standards. There would be a slight cumulative increase for those persons riding or working on the light rail system. However, it is not anticipated that human health would be adversely affected by light rail-generated EMF.

3.19.11 Energy and Peak Oil

Cumulative effects related to energy use are partially incorporated into the long-term energy demand estimates prepared for the CRC project. Those estimates are based on travel demand forecasts that factor in

[59] Hamlet and Lettenmaier, 1999.

[60] Enertech Consultants, 1998.

projected local changes in land use patterns, employment, population growth, and other programmed transportation improvements.

The cumulative energy impact of primary concern is "peak oil." Peak oil refers to the point in time at which the maximum global petroleum production rate is reached, after which the rate of production enters a terminal decline. Peak oil results from many incremental actions, few of which are individually important. However, the potential impact of reaching peak global petroleum production is an important consideration for projects, such as CRC, intended to address transportation needs for decades to come.

Oil production in the United States—the world's third largest oil producing nation—reached its peak around 1970 and has been in a declining trend since then. Most estimates place peak global production occurring some time between 1990 and 2040.

When oil production drops below oil demand, it is likely to cause petroleum prices to increase. There are uncertainties, however, regarding peak oil's timing and the availability of substitute fuels. Peak oil's effect on transportation fuel prices and travel behavior will depend largely on when peak oil occurs and the availability of substitute fuels.

Peak oil's potential effects on economic activity and travel behavior could affect the CRC project. The concern is that if substitute fuels are not readily available as petroleum supplies decrease, the rising cost and reduced supply of petroleum could directly reduce auto and truck travel, and could result in dramatic reductions in economic activity, which, among other effects, could further reduce vehicle trips below forecasts. These vehicle trip forecasts influence the proposed size, design, and financing of transportation facilities. If fuel prices increase faster than expected, then the number of 2030 highway trips could be lower than forecasted. However, even with relatively substantial fuel price increases, the future demand would still be greater than the expanded highway capacity. Because fuel costs represent only a portion of total transportation costs (which include everything from car payments, to insurance and maintenance) even large growth in fuel costs translates to a smaller growth rate in total transportation cost, which is what most directly affects travel demand in the long term.

Global oil demand is projected to grow by 37 percent by 2030, driven in large part by transportation needs;[62] local transportation energy demand is expected to grow as well, although the CRC build alternatives are projected to reduce future transportation petroleum demand compared to No-Build. At the global scale, these fuel savings will be very small but incrementally beneficial over the No-Build Alternative.

The CRC alternatives include a number of elements that would reduce adverse impacts related to peak oil. These include:

- The bridge and highway improvements are focused on replacing or updating aging infrastructure, not on building new highway corridors

What does the U.S. Department of Energy say about peak oil?

A report by the US Department of Energy[61] included the following conclusions:

- World oil peaking is going to happen, and will likely be abrupt.
- The problem is the demand for liquid fuels (growth in demand mainly from the transportation sector).
- Mitigation efforts will require substantial time.
- Both supply and demand will require attention.
- More information is needed to more precisely determine the peak time frame.

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[61] Hirsch, 2005.

[62] EIA, 2006.

- They include substantial improvements to public transportation, with projected increases in transit mode share in the afternoon peak direction from 13 percent with the No-Build to as much as 21 percent with light rail transit
- They provide substantially improved facilities for non-motorized transport
- They support land use planning that seeks to control sprawl, concentrate development, and decrease auto dependency
- They include road use pricing (highway tolling)
- Because of the addition of high-capacity transit and the bridge toll, all build alternatives are projected to have lower daily I-5 river crossings than under the no-build.
- They improve highway operations at a key pinch point which improves fuel efficiency and lowers emissions.
- They increase highway safety which decreases collisions and congestion, further improving fuel efficiency.

Another concern is the ability of current transportation infrastructure to adapt to post-peak oil vehicles and technology. Based on the alternative fuel vehicles that are currently being researched and developed, it is highly likely that the CRC infrastructure (transit guideway, bridges, highway, and bike and pedestrian paths) will be able to accommodate foreseeable changes. Electric hybrids, electric plug-ins, and vehicles powered by bio-diesel, ethanol, or hydrogen fuel cells are being designed to operate on modern roads and highways. The CRC transit guideway, whether built for bus rapid transit or light rail, can be used by vehicles powered by a variety of fuels. The capacity of the proposed bicycle and pedestrian facilities can accommodate substantial growth in non-motorized transportation demand. It is likely that the proposed CRC infrastructure could readily accommodate or adapt to the transition to substitute fuel vehicles, higher than projected growth in non-motorized modes, and higher growth in transit demand.

There is substantial uncertainty regarding the timing of peak oil, the future availability of substitute fuels and technology, and the effects of peak oil on transportation. It is reasonable, however, to conclude that the CRC project can be relatively prepared, at the project level, to address reasonably foreseeable impacts associated with peak oil, and to reduce the project's incremental adverse impact.

Outside the purview of CRC, numerous other measures will influence the timing and impact of peak oil at the global and local scale. These other actions include national and international energy policies, international relations, fuel and transportation taxes and fees, alternative fuel and technology research and development, agricultural policy and practices, local land use regulations, and other measures.

Has transportation infrastructure been able to adapt to change?

Transportation infrastructure has proven to be relatively adaptable. For example, the northbound I-5 bridge over the Columbia River was built in 1917 as a two-lane bridge that originally carried electric trolley cars and Model T autos (which ran on either gasoline or ethanol). While it is now obsolete in terms of seismic safety and traffic safety design standards, it was able to periodically adapt to nearly a century of changes in transportation technology, energy policy and prices, vehicle types, and travel behavior.

3.19.12 Noise and Vibration

The analysis of noise impacts is based on reasonably foreseeable changes in traffic resulting from background land use, population, and employment changes through 2030. In the project area there are currently an estimated 211 traffic noise impacts to noise sensitive land uses and that number would rise to 221 under the No-Build Alternative. Under the No-Build Alternative, routine maintenance of existing noise walls in Vancouver would occur but no new noise walls would be constructed. Background traffic growth would cause a general increase in traffic noise levels throughout the project area. Growth in aviation activity would likely also increase noise levels in some areas.

The build alternatives, which would include noise walls, would reduce noise levels substantially along I-5 compared to existing conditions and the projected No-Build Alternative. Several noise-sensitive land uses currently with no or only partial noise wall mitigation are exposed to traffic noise levels that exceed the relevant criteria. Many of these land uses would receive long-term noise reduction benefits with the proposed mitigation. While noise from other sources could continue to grow over time, the CRC alternatives would likely reduce noise impacts, compared to the No-Build Alternative. Vibration impacts are very modest for all build alternatives and can be mitigated.

3.19.13 Archaeological Resources

Based on extensive background research, archaeological reconnaissance, and predictive models, the construction of the CRC project is highly likely to encounter historic and could encounter prehistoric archaeological resources. Recent archaeological investigations demonstrate the potential for encountering archaeological remains associated with early residences, businesses, and industries, as well as Native American use.

Both shores of the Columbia River have been the location of extensive development in the past 200 years. Several types of historic era development occurred within or immediately adjacent to the present I-5 transportation corridor. Over time, dredging and filling along the shores have altered the banks of the Columbia River. Intensive residential, commercial, and transportation investments have had major impacts on the cultural and historic landscape in the I-5 corridor and vicinity.

Past activities have had a dramatic impact on the preservation of archaeological resources in the project area. Many have been lost. Unrelated future actions are likely to disturb or destroy additional archaeological resources, although some will likely be preserved or restored as well.

The project's incremental impact to the loss of the area's archaeological resources is not certain. There is a high likelihood that archaeological resources will be discovered prior to and during construction of any of the CRC build alternatives. Measures will be taken to protect, preserve, or document the presence of these resources.

3.19.14 Historic Resources

Past activities have had a dramatic impact on the preservation of historic resources in the project area. Many were demolished and the historic contexts largely altered to the extent that, except for few places such as the Vancouver National Historic Reserve, the northbound I-5 bridge, and other existing National Register sites in the project area, the area would be not easily recognized by people from the historic periods prior to the 1950s. Unrelated future actions are likely to demolish additional historic resources, although some future actions will likely preserve or restore others.

The project's incremental impact to the loss of the area's historic fabric is relatively small compared to the combined effects of these other projects and developments. The options are being designed to avoid most of the areas with large concentrations of historic resources.

3.19.15 Parks and Recreation Areas

The CRC project would improve access to recreational resources in Portland and Vancouver, and would result in improved pedestrian and bicycle access in the area, particularly between Oregon and Washington. The project would also have relatively minor impacts to a variety of public parks and recreational facilities. None of these resources would be displaced.

Park and trail development have been ongoing efforts in the region. These efforts will continue and are supported by current plans and programs. The impacts from the project would be small in the context of local park resources and are balanced by public investments in parks elsewhere in the area, such as Esther Short Park in downtown Vancouver, the development of the Confluence Land Bridge over SR 14 in Vancouver, and the potential opening of the Vanport wetland mitigation site to the public.

Other development unrelated to CRC could result in loss of park or historic properties; the extent of such loss is currently not known but likely small. Park impacts that would result from the CRC project, combined with other past and foreseeable future changes (including park expansions), are not expected to result in adverse cumulative effects.

3.19.16 Visual Quality and Aesthetics

Cumulative visual impacts occur when the character of a place changes (for example from an agricultural landscape to residential development) or when the vividness, unity, or intactness of the visual environment changes. In the project area, visual character has steadily progressed from frontier and rural to suburban and urban. The I-5 corridor has steadily grown in footprint and intensity of use as a major transportation route. Overall, impacts from the project will continue and reinforce the I-5 urban transportation corridor character.

Visual impacts from the proposed CRC project would occur from the greater height and width of the Columbia River bridges, the widened or higher ramps for reconfigured interchanges at Marine Drive, Hayden Island, SR 14, Mill Plain, and SR 500, and the effective widening of the

I-5 corridor due to adding auxiliary lanes, a transit guideway, and guideway ramps along I-5.

3.19.17 Ecosystems

Historically, many activities, including deforestation, urbanization, agriculture, over-fishing, and hydroelectric, irrigation and flood control projects have contributed to a loss of habitat and a reduction in fish and wildlife. Growth and development will likely continue to impact portions of the project area. Environmental protection legislation began in the 1960s and has grown since then. Local, state, and federal regulations require certain protections of natural areas, which has slowed the destruction of these habitats and mandated replacement, and in some cases recovery, of their functions.

The direct effects resulting from the CRC project include disturbance to native vegetation and trees, wetlands impacts, removal and fill in the Columbia River, and impacts to fish. Disturbance to native vegetation and trees is anticipated in three areas: cottonwood trees near the Expo Center in Oregon, vegetation along the banks of the Columbia River, and the loss of trees at Kiggins Bowl. Alternatives 2 and 3 would also remove peregrine falcon habitat on the existing I-5 bridges. In the Columbia River, fill could impact fish habitat and fish both during construction and long term.

The impacts resulting from the project are small, but historic development and expected growth throughout the region will likely continue to have impacts on ecosystems. The mitigation measures that are likely under any of the build alternatives will serve to reduce harmful effects, and may improve parts of the local ecosystem relative to existing conditions.

3.19.18 Geology and Soils

Past activities in the project area include settlement and development of the region, clearing of native vegetation, filling of lowland areas, grading of slopes, and construction in earthquake prone areas. Current development projects, including roads, bridges, and buildings, are being constructed under updated codes which require additional protection against earthquakes or in sensitive zones (for example, landslide-prone areas). However, in some cases, future activities may include development and regrading in the area that could lead to soil erosion, even with erosion control practices in place.

The CRC project would have little direct impact on geology or soils, other than land clearing during construction and the potential for erosion. The primary geologic concern is high earthquake hazard rating of the soils underlying the river crossing area. The soils are susceptible to liquefaction in a major seismic event. The build alternatives would replace or upgrade the existing bridges to reduce the potential for collapse or other damage.

Small changes that would occur from the CRC project include: reworking disturbed soil, localized minor grade changes, minor changes in slope stability, and ground improvements. These activities would have little or no meaningful impact to geology or soils and are not expected to materially cause or increase any substantial cumulative impacts.

3.19.19 Water Quality and Hydrology

Increased urbanization and land use changes have decreased the amount of natural area and natural flow regimes in the project area. Flood control measures affect the entire lower Columbia River environment. Levees and river embankments were constructed in the early 1900s on both sides of the river, which isolated the majority of the historic floodplain from all but the highest flows.

A decrease in upstream heavy industrial activities and an emphasis on addressing known contamination sources have improved water quality in the Columbia Slough over the last 10 years, although the water quality remains substantially impaired.

All of the build alternatives would increase stormwater runoff volumes, but with mitigation will likely result in lower pollutant loading than under existing conditions. In the Columbia River basin, the increased water quantity is not a critical issue, due to the total volumes handled in the basin. Stormwater treatment plans for the crossing have not yet been finalized, but net benefits are likely given adequate water treatment options.

Past projects and land use actions followed then-current water quality regulations that were not as stringent as they are now. Local, state, and federal regulations require protection of water quality. Increased scrutiny by regulatory agencies on chemicals at much lower concentrations than current standards is occurring and may result in new standards. The combination of impacts from the CRC project, regulations, and other foreseeable actions is likely to result in water quality improvements relative to existing conditions.

3.19.20 Wetlands

Compared to historical conditions, there are very few wetlands remaining in the project area. This increases the importance of the remaining wetlands in providing habitat, water quality, and other benefits. Mechanical methods introduced to control water flow (dikes in the project vicinity and dams on the Columbia River), have reduced the presence of wetlands in the project area. Many of the habitat losses due to these activities are probably irrecoverable. Urbanization has further affected wetlands locally and regionally. Foreseeable growth in the region will likely affect portions of the project area. Local, state, and federal regulations require protection of wetlands and jurisdictional waters, slowing the destruction of these habitats and mandating replacement of their functions.

Functional improvements have occurred to some wetlands near the southern portion of the project since the original construction of I-5. The Port of Portland has an ongoing wetland restoration project at the 90-acre Vanport wetlands parcel adjoining the existing highway and light rail line to the west.

Impacts from the proposed CRC bridge piers would include minor fill to the Columbia River. The transit and highway improvements would impact less than 0.25-acre of wetlands (unless the Marine Drive southern realignment option is chosen, which would additionally impact approximately one-half acre of the Vanport Wetlands). In the context of widespread urban development in the project area, the potential impacts to wetlands resulting from the build alternatives are minor. Additionally, mitigation for these impacts would replace or likely improve local wetland functions.

3.19.21 Hazardous Materials

The CRC project area is heavily urbanized, and has a history of generation, use, and storage of hazardous materials. Hazardous material sites that are most likely to impact the project are those being acquired for right-of-way or near roadway or transit options. Disturbances to hazardous materials sites that might not otherwise occur would result in site cleanup and could increase demand for contaminated soil disposal facilities.

The evaluation of existing hazardous materials risks to the CRC project is based on a review of past actions, and their effects on existing and potential soil and groundwater contamination. There may also be unknown contamination that poses additional risk, caused by past land uses and actions in the corridor.

Future, unrelated development in the project area could both add exposure risks and add cleanup and remediation benefits. Population and employment growth could cause increased traffic that may result in slightly higher incidents of hazardous materials spills. Since 1964, several laws have been implemented that have led to improved handling of hazardous materials, reducing the amount of new hazardous materials releases into the soil and groundwater. Environmental liability laws generally require identification and cleanup of hazardous materials during property transfers, which have resulted in the overall reduction of hazardous material contamination near the project area.

Because the project is unlikely to create new hazardous material sites, and may identify or remediate existing hazardous material sites, it could contribute to a cumulative beneficial impact to groundwater, human, and ecological receptors in the project area.

3.19.22 Irreversible and Irretrievable Commitments of Resources

NEPA regulations from the Council on Environmental Quality (CEQ) require environmental analysis to identify "...any irreversible and irretrievable commitments of resources, which would be involved in the proposed action should it be implemented." (CFR 1502.16) Implementing the proposed improvements involves committing natural, physical, human, and fiscal resources. CEQ guidelines describe primary irreversible and irretrievable resource commitments as uses of nonrenewable resources throughout a project that may be irreversible if removal of the resources occurs and cannot be replaced within a reasonable time frame (for example, extinction of a threatened or endangered species), or if obstruction of the use of resources occurs after the project.

The proposed transportation improvements would involve a long-term conversion of land resources to provide right-of-way for the build alternatives. Although these transportation facilities conceivably could revert to urban land and open space, there is no reason to expect that such a conversion would be necessary or desirable. Wetlands would be filled where they cannot be avoided or impacts minimized. Unavoidable wetland impacts will be offset by compensatory mitigation. Fossil fuels used to power construction and daily vehicle operation are the major nonrenewable resource that would be consumed by the construction of the proposed project, and the energy consumption resulting from daily vehicle operations.

Considerable amounts of labor, and construction materials such as cement, aggregate, asphalt, sand, fill materials, lime, and steel would be expended on the road construction. Large amounts of labor and natural resources are used in the fabrication and preparation of construction materials. These materials are generally not retrievable, although they are not in short supply, and their use would not have an adverse impact upon continued availability of these resources. Any construction would also require a substantial one-time expenditure of both state and federal funds that are not retrievable.

3.19.23 Temporary Construction Effects

Cumulative impacts during construction could result if other projects in the area are constructed at the same time or nearly the same time as CRC project construction. Simultaneous or sequential construction projects can increase congestion, employment and spending, community impacts, and natural resource impacts. The construction of CRC is likely to overlap with construction of many of the specific developments listed at the beginning of this section, as well as private developments that are not yet proposed. For example, bridge construction activity for this project will need to be coordinated with other in-water work that could occur simultaneously, such as the Columbia River Channel Improvement project, as well as with construction immediately adjacent to the project, such as the Riverwest project.

The temporary effects from the CRC construction, in combination with other construction, will cause delays and disruptions to local residents and businesses. Mitigation plans, including traffic control plans and business assistance, will reduce the negative consequences of the construction project, while the employment demands will result in positive economic outcomes for the region.

Other projects would have their own traffic control plans, but some may influence the travel route of commuters and trucks and could place more traffic in the CRC project corridor. Likewise, some of the projects are on planned haul routes and could influence the delivery of supplies and materials to the job sites for the CRC project.

Community impacts due to local traffic congestion and rerouting, as well as noise and air quality impacts, could occur where CRC construction overlaps with the construction of other projects. The highest potential for such impacts is likely near the bridge landing in Vancouver and on Hayden Island where other large construction projects are likely and where CRC construction duration and intensity will be high.

For the natural environment, most of the construction impacts would be localized such that cumulative effects would not be a serious additional concern. Other projects in the area would not be likely to directly impact the same localized waters, wetlands, or regulated habitats that the CRC project would affect. However, in the project area, there could be increased erosion potential during the construction period. This, combined with other construction projects in the area, could increase the risk of erosion and water pollution in the event of a storm while ground surfaces are exposed.

To reduce potential cumulative construction impacts, the project team would consider other planned projects while developing CRC construction and mitigation plans and traffic control plans.

CHAPTER 4
Financial Analysis

Columbia River
CROSSING

CHAPTER 4

Financial Analysis

This chapter describes the capital and operating costs, revenue options, and financial plan scenarios to implement and operate the highway and transit elements of the CRC alternatives.

CHAPTER CONTENTS

4.1 Introduction

This DEIS provides a preliminary assessment of project costs, institutional issues, potential revenue options, and financial plan scenarios for each of the CRC alternatives examined in this DEIS. Both capital and operating costs and revenues are addressed.

4.2 CRC Capital Costs

4.2.1 Background

The capital cost estimates shown in this chapter cover all capital costs anticipated after the selection of the locally preferred alternative, and include engineering, project administration, right-of-way acquisition, system procurement and installation, vehicle procurement, construction, and start-up costs. The capital costs are based on a Cost Risk Assessment[1] that accounts for a wide range of risks and uncertainties that may cause project costs to increase.[2] The Cost Risk Assessment adds contingency to the capital cost estimates to account for these uncertainties and produces a range of costs reflecting the probability, or confidence, that the actual cost of the project will be less than the estimated cost. This DEIS provides a range of capital costs for each project alternative. It uses the 60 percent confidence cost estimate (i.e., 60 percent certain that the actual cost will be less than cost estimate

[1] CRC, Cost Risk Assessment, 2007.

[2] Note that the Cost Risk Assessment included the cost of preparing this DEIS and selecting the locally preferred alternative; the financial analysis shown in this DEIS excludes these costs.

shown) as the Low estimate and the 90 percent confidence cost estimate as the High estimate.

For projects seeking New Starts funding, FTA requires the use of a capital cost estimating methodology based on Standard Cost Categories (SCC). Accordingly, the transit-related capital cost estimates resulting from the Cost Risk Assessment were translated into the Standard Cost Categories (SCC). The SCC cost estimate for the transit component of each alternative is shown below. All transit capital cost estimates submitted to FTA as part of the on-going New Starts review will be prepared in the SCC framework.[3]

Capital costs are shown in "year-of-expenditure" dollars, which show the aggregate cost of the alternative through the year in which construction is completed, in inflated dollars. To develop the year-of-expenditure cost estimates, a range of cost escalation rates were developed for each project component and applied in the Cost Risk Assessment. Over the project development and construction period, the median rate of construction cost escalation ranged from 2.5 to 5.2 percent per year, with the greater escalation expected in the early years of the project. [4] The median escalation rate for engineering cost was 2.8 percent per year and for right-of-way cost was 6.8 percent per year; both of which remained constant throughout the construction period.

While the CRC Project is an integrated multi-modal project, some funding sources for meeting these capital costs have legal restrictions as to their use (for example, fuel tax revenues in Oregon and Washington may only be used for highway-related improvements). Thus, it is informative to divide the capital costs of the CRC alternatives into their highway and transit components.

Many capital costs are directly attributable to a transit or highway component; for example the costs of highway interchange improvements where there is no transit alignment or the cost of transit alignments in downtown Vancouver where there is no highway improvement. However some costs overlap the highway and transit components and must be allocated between these components. These cost allocation issues will ultimately be addressed in funding agreements between the federal, state, and local agencies. For now these issues are addressed by preliminary cost allocation assumptions used in this DEIS. The major areas of cost overlap and the preliminary cost allocation assumptions used in this DEIS are summarized below:

- *Columbia River Crossing:* For all of the river crossing options, whether the replacement bridge, supplemental bridge, or the Stacked Transit/Highway Bridge, the bridge used by the transit alternative shares a foundation with the bridges used for highways and, in some cases, the superstructure used for the highway bridge. To divide the bridge cost into highway and transit components, the foundation cost was allocated to transit based on transit's proportionate share of the

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[3] A risk assessment, following FTA's Risk Assessment process, will be performed as part of the New Starts analysis after the selection of an LPA.

[4] This is based on the cost risk assessment conducted in 2007 (CRC Cost Risk Assessment, 2007). Inflation rates could change in later cost risk assessments.

"live load" on the foundation, and the superstructure cost of the bridge was allocated to transit based on transit's proportionate share of the deck area on the bridge. This preliminary cost allocation methodology will be examined in more detail during the FEIS stage; FTA and FHWA must concur with the final methodology.

- *Bicycle/Pedestrian Improvements*: Each of the river crossing options incorporates bicycle and pedestrian improvements that could be allocable to either the highway or transit components, or some combination of the two. The cost estimates shown in this DEIS assume that the capital cost of these improvements are fully allocated to the highway component.[5]
- *Right-of-Way*: Because the right-of-way costs occur on either side of the river crossing where the transit and highway improvements are separated, there is no material overlap in these right-of-way costs. Thus, the highway costs include the cost of acquiring the right-of-way used for the highway improvements, and the transit costs include right-of-way used for the transit improvements.
- *Engineering and Project Management/Administration*: These costs were allocated between highway and transit components according to the engineering and administration costs of their distinct facilities and their proportionate share of the engineering and administration costs of shared facilities.

Based on these assumptions the:

- *Highway capital costs* shown in this DEIS include the costs of designing, acquiring right-of-way for, and constructing the highway sections of the river crossing, mainline I-5 improvements, highway interchange improvements, and the bicycle and pedestrian improvements incorporated in the CRC alternatives.
- *Transit capital costs* shown in this DEIS include the costs of designing, acquiring right-of-way for, and constructing the transit guideway, stations and park-and-ride facilities described in Section 2.3.3, maintenance facilities described in Section 2.3.4; procuring and installing systems and equipment; acquiring the vehicles described in Exhibit 2.3-23 ; and start-up costs.

Value engineering is proceeding on these alternatives. Preliminary options have been identified, most notably the stacked transit/highway bridge design described in Chapter 2, which could result in lowering the estimated capital costs of the alternatives in future project development stages. The feasibility of the stacked transit/highway bridge will be analyzed during the FEIS stage. A finance plan will be developed during the FEIS stage and will incorporate both the FHWA and FTA methodologies.

[5] The current estimates allocate these costs to the highway component. This could be revised during the FEIS if it is determined that all or a portion of the bicycle and pedestrian improvements should be funded as part of the transit component.

4.2.2 Capital Costs of CRC Alternatives with Kiggins Bowl or Lincoln Terminus

Exhibit 4.2-1 shows the capital cost estimates in year-of-expenditure dollars for the CRC alternatives with full-length transit terminus options.

Exhibit 4.2-1
Project Capital Costs by Alternative and Full-Length Transit Terminus

	Alternative 2[c]		Alternative 3[c]		Alternative 4		Alternative 5	
Terminus	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**
Low Cost Estimate[a]								
Highway	$2,846	$2,866	$2,857	$2,869	$2,658	$2,670	$2,665	$2,675
Transit	$863	$669	$1,045	$850	$939	$744	$1,102	$906
Total	**$3,709**	**$3,535**	**$3,902**	**$3,719**	**$3,597**	**$3,414**	**$3,767**	**$3,581**
High Cost Estimate[b]								
Highway	$2,997	$3,011	$2,983	$3,042	$2,799	$2,809	$2,802	$2,813
Transit	$918	$725	$1,108	$881	$981	$778	$1,148	$946
Total	**$3,915**	**$3,736**	**$4,091**	**$3,923**	**$3,780**	**$3,587**	**$3,950**	**$3,758**

Source: CRC, Cost Risk Assessment, 2007.

a Low cost assumes the 60 % confidence estimate; which is traditionally regarded as the most likely estimate.

b High cost assumes the 90% confidence estimate.

c These capital costs do not reflect the stacked transit/highway bridge, which will be analyzed during the FEIS. Cost estimates may be lower than those shown above if this option is feasible.

Note: Costs are in millions of year-of-expenditure dollars.

The total capital cost of the CRC alternatives with a full-length transit terminus ranges between $3.414 billion and $4.091 billion in year-of-expenditure dollars. The High and Low Cost Estimates for the CRC alternatives with a replacement crossing (Alternatives 2 and 3) cost $112 to $165 million in year-of-expenditure dollars more than alternatives with a supplemental crossing (Alternatives 4 and 5).

As required by FTA, Exhibit 4.2-2 shows the capital cost estimates for the transit component of the full length terminus options in FTA's Standard Cost Categories (SCC).

Exhibit 4.2-2

Transit Capital Costs by FTA Standard Cost Category: Full Length Transit Terminus [a]

	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Terminus	Kiggins Bowl	Lincoln	Kiggins Bowl	Lincoln	Kiggins Bowl	Lincoln	Kiggins Bowl	Lincoln
FTA Standard Cost Category[b]								
Guideway and Track Elements	$299	$242	$355	$295	$214	$171	$268	$222
Stations, Stops, Terminals and Intermodal	$124	$100	$117	$97	$42	$34	$33	$27
Support Facilities, Yards, Shops, Admin Buildings	$25	$20	$31	$26	$46	$37	$63	$52
Sitework and Special Conditions	$174	$141	$188	$156	$176	$140	$172	$142
Systems	$34	$27	$67	$55	$39	$31	$66	$54
Right-of-Way and Land Improvements	$45	$36	$45	$37	$109	$87	$107	$89
Vehicles	$51	$41	$105	$88	$188	$150	$243	$201
Professional Services	$167	$127	$200	$127	$169	$129	$197	$159
Total Transit Cost	**$918**	**$725**	**$1,108**	**$881**	**$981**	**$778**	**$1,148**	**$946**

[a] Table shows "High" cost estimates, which assumes the 90% confidence estimate from Cost Risk Assessment; an FTA risk assessment will be performed for the LPA.

[b] Standard Cost Categories are established by FTA.

Note: Costs are in millions of year-of-expenditure dollars.

4.2.3 Capital Costs of CRC Alternatives with Clark College or Mill Plain Minimum Operable Segments (MOS)

Exhibit 4.2-3 below shows the capital cost of the alternatives paired with the Mill Plain District MOS and the Clark College MOS options.

Exhibit 4.2-3
Project Capital Costs by Alternative and Minimum Operable Segment

	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Terminus	Mill Plain	Clark College	Mill Plain	Clark College	Mill Plain	Clark College	Mill Plain	Clark College
Low Cost Estimate[a]								
Highway	$2,741	$2,763	$2,772	$2,773	$2,560	$2,575	$2,586	$2,586
Transit	$519	$555	$596	$654	$565	$617	$629	$697
Total	**$3,260**	**$3,318**	**$3,368**	**$3,427**	**$3,125**	**$3,192**	**$3,214**	**$3,283**
High Cost Estimate[b]								
Highway	$2,911	$2,905	$2,920	$2,920	$2,719	$2,711	$2,743	$2,699
Transit	$559	$594	$628	$689	$597	$637	$704	$787
Total	**$3,470**	**$3,499**	**$3,548**	**$3,609**	**$3,316**	**$3,348**	**$3,447**	**$3,486**

Source: CRC, Cost Risk Assessment, 2007.

[a] Low cost assumes the 60% confidence estimate; which is traditionally regarded as the most likely estimate.

[b] High costs assume the 90% confidence estimate.

Note: Cost in millions of year-of-expenditure dollars.

The High and Low Cost Estimates for Alternative 2 is estimated to cost between $217 and $449 million less (in year-of-expenditure dollars) with the MOS options than with the full-length transit terminus options The MOS options exhibit a reduced schedule risk due to their shorter length, therefore the risk-adjusted cost of the highway component of Alternative 2 would cost $86 to $106 million less with a MOS terminus option than with a full-length transit terminus option.

The High and Low Cost Estimates for Alternative 3 range between $292 and $543 million less with an MOS option than with a full-length alignment option. The lower cost of the highway component comprises $85 to $122 million of the overall cost reduction.

The High and Low Cost Estimates for Alternative 4 range between $222 and $472 million less (in year-of-expenditure dollars) with the MOS options than with the full-length transit terminus options. The highway component of Alternative 4 would cost $80 to $98 million less than with the full-length transit terminus options due to the lower risk associated with a MOS terminus option.

The High and Low Cost Estimates for Alternative 5 may cost between $272 and $553 million less with a MOS option than with a full-length terminus. The lower cost of the highway component comprises $79 to $159 million of this overall cost reduction.

Exhibit 4.2-4 shows the capital cost estimates for the transit component of the MOS options in FTA's Standard Cost Categories (SCC).

Exhibit 4.2-4

Transit Capital Costs by FTA Standard Cost Category: Minimum Operable Segment Terminus Options[a]

Terminus	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
	Mill Plain	Clark College	Mill Plain	Clark College	Mill Plain	Clark College	Mill Plain	Clark College
FTA Standard Cost Category[b]								
Guideway and Track Elements	$187	$194	$220	$232	$156	$163	$180	$195
Stations, Stops, Terminals and Intermodal	$53	$61	$47	$51	$54	$61	$47	$52
Support Facilities, Yards, Shops, Admin Buildings	$24	$24	$30	$29	$24	$27	$30	$30
Sitework and Special Conditions	$113	$112	$119	$124	$114	$113	$109	$107
Systems	$18	$24	$37	$44	$30	$35	$37	$45
Right-of-Way and Land Improvements	$24	$38	$21	$35	$69	$83	$64	$78
Vehicles	$35	$35	$48	$59	$43	$44	$124	$163
Professional Services	$104	$107	$107	$115	$108	$111	$114	$117
Total Transit Cost	**$559**	**$594**	**$628**	**$689**	**$597**	**$637**	**$704**	**$787**

[a] Table only shows "High" cost estimates, which assumes the 90% confidence estimate.

[b] Standard Cost Categories are established by FTA.

Note: Costs are in millions of year-of-expenditure dollars.

As shown in Exhibit 4.2-4, the light rail (LRT) alternatives (Alternatives 3 and 5) cost $69 to $150 million more than the equivalent bus rapid transit (BRT) alternatives (Alternative 2 and 4), primarily due to the track, electrification, and system costs associated with light rail. The Mill Plain MOS would cost $35 to $83 million less than the equivalent Clark College MOS, primarily due to its shorter length. The equivalent transit mode and terminus would cost $38 to $108 million less with the replacement crossing (Alternatives 2 and 3) than with the supplemental crossing (Alternatives 4 and 5), largely because the replacement crossing has more direct access into Vancouver.

4.2.4 Capital Costs of River Crossing Options

Exhibit 4.2-5 shows the capital costs, in year-of-expenditure dollars, for the river crossing options. As shown, the Replacement Bridge options are estimated to cost $1.323 to $1.57 billion. The Supplement Bridge options are estimated to cost $1.241 to $1.436 billion in year-of-expenditure dollars, $88 to $166 million less than the Replacement Bridge options.

Preliminary estimates indicate that the Stacked transit/Highway Bridge may lower the costs of the Replacement Bridge by $35 to $40 million; the feasibility and cost of the Stacked Transit/Highway Bridge will be examined further in the FEIS.

Exhibit 4.2-5
Capital Costs of River Crossing Options

	Alternative 2[a]		Alternative 3[a]		Alternative 4		Alternative 5	
Terminus	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**
Low Cost Estimate								
Highway	$1,212	$1,216	$1,299	$1,306	$1,032	$1,038	$1,175	$1,182
Transit	$173	$174	$186	$187	$135	$136	$154	$155
Total	**$1,385**	**$1,390**	**$1,485**	**$1,493**	**$1,167**	**$1,173**	**$1,328**	**$1,336**
High Cost Estimate								
Highway	$1,308	$1,302	$1,397	$1,392	$1,126	$1,122	$1,269	$1,270
Transit	$187	$186	$200	$199	$147	$147	$166	$166
Total	**$1,495**	**$1,488**	**$1,597**	**$1,591**	**$1,273**	**$1,269**	**$1,435**	**$1,436**

	Alternative 2[a]		Alternative 3[a]		Alternative 4		Alternative 5	
Terminus	**Mill Plain**	**Clark College**	**Mill Plain**	**Clark College**	**Mill Plain**	**Clark College**	**Mill Plain**	**Clark College**
Low Cost Estimate								
Highway	$1,157	$1,158	$1,210	$1,230	$1,010	$1,016	$1,153	$1,160
Transit	$166	$166	$173	$176	$129	$130	$148	$149
Total	**$1,323**	**$1,323**	**$1,383**	**$1,406**	**$1,139**	**$1,145**	**$1,300**	**$1,308**
High Cost Estimate								
Highway	$1,240	$1,247	$1,288	$1,311	$1,104	$1,100	$1,247	$1,248
Transit	$177	$179	$184	$188	$141	$141	$160	$160
Total	**$1,417**	**$1,426**	**$1,472**	**$1,499**	**$1,245**	**$1,241**	**$1,407**	**$1,408**

Source: CRC, Cost Risk Assessment, 2007.

[a] Based on preliminary cost estimates, the Stacked Transit/Highway Bridge may result in a $35 to $40 million savings compared to the numbers shown.

Note: Costs in millions of year-of-expenditure dollars.

4.3 Capital Revenue Options

This section describes the potential federal, state, and local revenues that may be used to fund CRC capital costs. Many of these revenue sources can be used for the highway, transit, and bicycle/pedestrian components of the CRC alternatives. However, several have legal requirements or restrictions that may limit their application to only the highway or transit component. Exhibit 4.3-1 outlines the federal, state, and local revenue options potentially applicable to the CRC alternatives, including any key restrictions on their use. The paragraphs below provide further detail on each of these revenue options.

Exhibit 4.3-1 (page 1 of 2)
Summary of Revenue and Financing Options

Funding Source	Highway Eligible	Transit Eligible	Comments
Federal Formula Funds			
National Highway System Funds (NHS)	X	X	Certain conditions required for transit uses.
Surface Transportation Program Funds (STP)	X	X	
National Highway Traffic Safety Administration (NHTSA) grants	X		
Congestion Mitigation Air Quality Funds (CMAQ)	X	X	Limited to projects with air quality benefits.
Interstate Maintenance Funds (IM)	X		
Urbanized Area Formula Grants Section 5307		X	
Fixed Guideway Modernization Funds Section 5309		X	
Jobs Access and Reverse Commute Funds Section 5316		X	Targeted for particular transit uses.
New Freedom Funds Section 5317		X	Targeted for particular transit uses.
Federal Discretionary Funds			
Reauthorization Bill Programs: High Priority Project/Projects of National Significance, etc.	X	X	Can be any type of improvement specified in reauthorization bill.
Interstate Maintenance Discretionary Funds IMD	X		
Transportation Community and System Preservation Program Funds TSCP	X	X	
Innovative Bridge Research and Deployment Program (IBRD)	X		
Highways for Life Program (HfL)	X		
Value Pricing Program	X		
Transportation Infrastructure Finance and Innovation Act (TIFIA) Program	X	X	Loan and credit enhancement program.
Grant Anticipation Revenue Vehicles (GARVEE Bonds)	X	X	Allows future federal grants to be bonded.
National Research Program Funds Section 5314		X	
Alternative Analysis Funds Section 5339		X	
Alternative Transportation in Parks and Public Lands Funds (Section 5320)		X	Other Federal Agencies, such as NPS, can administer funds.
Capital Investment Program Section 5309 Discretionary Bus and Bus Facilities Bus and New Starts Funds		X	
State Funds			
Fuel Tax Revenue Oregon and Washington	X		Oregon and Washington state constitutions restrict use of these revenues.
Oregon Motor Carrier Taxes and Fees and DMV Fees	X		Restricted by Oregon Constitution.
Oregon Lottery Funds	X	X	
Washington Licensing Fees on Trucks, Buses and For-Hire Vehicles and for Passenger Vehicles	X		Uses described in statute.
Washington Sales and Use Tax	X	X	
Private Sector Funds	X	X	
Tolling	X		Oregon toll revenues limited to highway uses by Oregon Constitution. Use in Washington must be authorized by legislature, currently limited to highway purposes.
Toll Credits	X	X	Administrative method to address local match.

Exhibit 4.3-1 (page 2 of 2)
Summary of Revenue and Financing Options

Funding Source	Highway Eligible	Transit Eligible	Comments
Regional Funds			
Existing TriMet Revenues and Additional Revenues Available to TriMet		X	Can be used for certain road purposes, but not applicable to CRC alternatives.
Existing C-TRAN Revenues and Additional Revenues Available to C-TRAN		X	Existing sales and use tax can be increased with voter approval. Additional funding sources are provided by High Capacity Transit.
Transportation Benefit District (TBD) Revenues	X	X	There are several funding sources available to TBDs, most require voter approval.

4.3.1 Federal Revenue and Financing Options

Federal Formula Funds Administered by States, Transit Agencies, and MPOs

ODOT, WSDOT, C-TRAN, TriMet, Metro and RTC receive transportation funding from a variety of federal formula grant programs. The eligible uses of these formula grants are established by federal statutes and rules. In an urban area, the MPOs have the authority to program these funds to specific eligible uses. This is accomplished through Metro's and RTC's Metropolitan Transportation Improvement Program (MTIP) processes and then incorporated into ODOT's and WSDOT's State Transportation Improvement Program (STIP). The CRC project, through the co-leads, is eligible to compete for federal formula funds. Grant Anticipation Revenue Vehicle (GARVEE) bonds, a debt financing instrument using federal formula funds, can also be employed in the finance plan.

While federal formula grant programs potentially could be used to fund the CRC alternatives, or certain components of the alternatives, many of these funds are currently programmed other uses. Additional analyses will be undertaken during preparation of the FEIS to determine the future availability of these funds for the CRC alternatives. Formula grant program funds that will be considered for incorporation in the FEIS funding plan include the following.

National Highway System (NHS) funds

NHS funds are apportioned to states by formula for such improvements as construction, reconstruction, resurfacing, restoration, and rehabilitation of segments of the national highway system; operational improvements; capital and operating costs for traffic monitoring and control facilities; corridor parking facilities; carpool and vanpool projects; and bicycle and pedestrian facilities. NHS funds may be used for transit improvements provided these improvements are in the same corridor as a NHS highway, the transit improvements will improve the level-of-service on the NHS highway, and the transit improvement is more cost-effective than an improvement to the NHS highway. The FY 2008 apportionment of NHS funds to Oregon was about $93 million and to Washington about $111 million.

Surface Transportation Program (STP) funds

STP funds are apportioned to states by formula, a portion of which must be used for safety (10 percent), enhancement (10 percent), and allocated by formula to urbanized and rural areas in the state. STP funds may be used for planning, construction, reconstruction, rehabilitation, and operational highway improvements and any eligible activity under FTA's Section 5307 formula program including planning, equipment, right-of-way acquisition, design and construction. The FY 2008 apportionment of STP funds to Oregon was about $90 million and to Washington about $124 million.

Interstate Maintenance (IM) funds

IM funds are apportioned to states by formula for resurfacing, restoration, rehabilitation, and reconstruction of interstate highways; reconstruction or new construction of bridges, interchanges, and over crossings along existing Interstate routes; and capital costs for operational, safety, traffic management, or intelligent transportation systems (ITS) improvements. Construction of new travel lanes other than high-occupancy vehicle (HOV) or auxiliary lanes are not eligible for IM funding. The FY 2008 apportionment of IM funds to Oregon was about $65 million and to Washington about $98 million.

Urbanized Area Formula (Section 5307) Funds

Section 5307 funds are formula grants to eligible recipients in urbanized areas for transit-related purposes. In the Portland/Vancouver urban area TriMet, C-TRAN, Metro and the City of Wilsonville currently receive funds. For FY2008 TriMet received approximately about $31.4 million per year and C-TRAN about $4.3 million per year in Section 5307 funds. Section 5307 funds may be used for many purposes including planning, environmental, engineering, design, right-of-way, construction and equipment.

Fixed Guideway Modernization (Section 5309) Funds

Fixed Guideway Modernization Funds are allocated by statutory formula to urbanized areas with fixed guideway systems that have been in operation for at least seven years. The formula considers the amount of route miles and route miles and revenue vehicle miles operated on fixed guideway segments. The term "fixed guideway" refers to any transit service that uses exclusive or controlled rights-of-way or rails, entirely or in part, and includes among others, commuter rail, light rail, electric trolley bus, streetcar, trams and public transportation routes traveling in high-occupancy-vehicle (HOV) lanes. Fixed guideway modernization funds may be used for capital projects to modernize or improve existing fixed guideway systems such as purchase and rehabilitation of rolling stock, track, line equipment, structures, signals, communications, power equipment and substations, stations, maintenance facilities and equipment, system extensions, and preventive maintenance.

TriMet currently receives about $9.4 million per year in Fixed Guideway Modernization funds for its MAX system, and that total will grow over time as its newer lines reach the seven-year threshold. It is estimated that after seven years of operations, TriMet and C-TRAN would cumulatively begin to receive $260,000 to $460,000 per year (depending on the alternative) in Fixed Guideway Modernization funds for the light rail transit or bus rapid transit component of the CRC project. These funds would not be available for the initial construction of the CRC alternatives.

Jobs Access and Reverse Commute (JARC) Funds and New Freedom Funds

JARC and New Freedom funds are formula grants for certain specific transit purposes. JARC funds are targeted to meet the transportation needs of low-income individuals and, regardless of income, of reverse commuters. New Freedom Program funds are available for capital and operating expenses that support new public transportation services beyond those required by the Americans with Disabilities Act of 1990 (ADA) and transportation alternatives to assist individuals with disabilities with accessing transportation services. Currently TriMet receives in the aggregate about $1 million per year in JARC and New Freedom Funds; C-TRAN receives about $120,000 per year.

Federal Discretionary Funds and Financing Programs

While the federal transportation funds discussed above are granted to states or urban areas by formula, other federal funds are allocated to projects on a case-by-case basis through Congressional "earmarks" or U.S. DOT agency discretionary allocations. Collectively these sources are referred to as discretionary funds.

The CRC project intends to seek federal discretionary funds (highway and transit) through earmarks in the transportation reauthorization bill and through U.S. DOT programs. The preliminary financial scenarios target a cumulative total of $400-$600 million from congressionally and administratively approved federal highway discretionary grants throughout project development and construction. In addition, the financial scenarios target $750 million in federal transit discretionary grants.

A project's ability to obtain federal discretionary funds in the upcoming reauthorization bill or through administrative approvals depends on many factors, including the importance of the project, amount of funding in the bill, competition for funds, administrative criteria and practices, and Congressional procedures and politics. While it is difficult to secure a large amount of federal discretionary funds, the CRC project may be uniquely able to secure such funds given its national significance, as exemplified by its status as a Corridor of the Future, and its ability as a bi-state project to garner active support from two Congressional delegations. Potential sources of discretionary funds are discussed below.

Discretionary Programs in the Transportation Reauthorization Bill

The transportation reauthorization bill typically incorporates funding earmarks for transportation projects, including highway, transit and other modes. The current transportation authorization act, SAFETEA-LU[6], has several discretionary funding programs that were fully earmarked by Congress. SAFETEA-LU authorizes highway discretionary funds as well as FTA-administered funds, such as New Start grants for fixed-guideway transit systems. Some of these discretionary programs represented new dollars brought into a state (above-the-line earmarks); while others factored into the overall formula funding that is guaranteed to each state

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[6] Safe, Accountable, Flexible, and Efficient Transportation Equity Act-A Legacy for Users, signed into law in August 2005.

(below the line earmarks). Oregon and Washington each received above-the-line discretionary grants in SAFETEA-LU.

Interstate Maintenance Discretionary (IMD) Funds

IMD funds may be used for resurfacing, restoring, rehabilitating, and reconstructing most existing routes on the Interstate System, including providing additional Interstate capacity. Currently about $100 million per year is allocated nationwide under this program. Over the five-year period between FY2003 and FY 2007, Oregon and Washington combined averaged $10.5 million per year in IMD discretionary grants. In FY 2007 CRC Project received a $15 million grant from this discretionary program.

Transportation, Community, and System Preservation Program Funds (TCSP)

TCSP funds are allocated to plan and implement strategies that improve the efficiency or reduce environmental impacts of transportation, reduce the need for costly future public infrastructure investments, ensure efficient access to jobs, and encourage private sector development patterns. In FY 2007 the allocations of TCSP funds to projects were generally in the in the $500,000 to $1,000,000 range. Over the five-year period between FY2003 and FY 2007, Oregon and Washington combined have averaged $6.3 million per year in TCSP discretionary grants.

The Innovative Bridge Research and Deployment (IBRD) Funds

The IBRD Program was established to (i) demonstrate the application of innovative designs, materials, and construction methods in constructing, repairing, and rehabilitating bridges and other highway structures, (ii) increase safety, (iii) reduce construction time, and (iv) reduce traffic congestion. IBRD funds may be used for costs of preliminary engineering, repair, rehabilitation, or construction of bridges or other highway structures, and costs of project performance evaluation and performance monitoring of the structure following construction. Congress authorized $13.1 million per year nationwide through fiscal year 2009 for the IBRD program, $4.125 million of which is designated for high performance concrete technology research and deployment. WSDOT received a $5.1 million grant under this program in FY 2007 as part of its Urban Partnerships Agreement for the Seattle area.

Highways for Life (HfL)

HfL provides incentive funding for the construction of highway projects that incorporate innovations that improve safety, reduce construction congestion, and improve quality. A highway project is eligible to apply for HfL funding if it constructs, reconstructs or rehabilitates a route on a Federal-aid highway and uses innovative technologies, manufacturing processes, financing, or contracting methods that meet performance goals for safety, congestion, and quality. Individual project funding levels are generally in the $500,000 to $1,000,000 range. Oregon has received one $1 million award under this program, Washington has not received any.

Value Pricing Pilot Program

Value Pricing Pilot Program funds may be used to establish, maintain, and monitor value pricing programs. Funds may support pre-implementation study costs, including for public participation and planning, and implementation costs, including development and start-up costs for up to three years. Funds to carry out the Value Pricing Pilot Program are authorized at $12 million annually, one-quarter of which is available only for projects not involving highway tolls. WSDOT received a $10 million grant under this program as part of its Urban Partnership Agreement for the Seattle area.

Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA)

TIFIA is a Federal credit program for transportation projects of national or regional significance under which the USDOT may provide secured (direct) loans, loan guarantees, and standby lines of credit. Eligible facilities include interstates, state highways, bridges, toll roads, transit ways and any other type of highway or transit facility eligible for federal grant assistance. TIFIA may also be used for the design and construction of stations, track, and other transit-related infrastructure, purchase of transit vehicles, and any other type of transit project eligible for federal grant assistance. TIFIA assistance is awarded through a formal application process based on established criteria.

New Starts (Section 5309)

New Start grants are discretionary federal funds for new fixed-guideway transit systems and extensions to existing fixed-guideway systems. Congress establishes the year-by-year amounts of New Starts funds available nationally in each federal transportation authorization act. A fixed-guideway project customarily obtains New Starts funds through a Full Funding Grant Agreement (FFGA) with FTA. The FFGA establishes the maximum amount of New Starts funds available to the project and the terms and conditions of receiving the New Starts funds.

Federal law establishes a process administered by FTA to determine if a project is eligible for New Starts funding. While the process addresses many factors, it is chiefly affected by its cost-effectiveness and financial plan ratings. For the CRC project, these ratings will occur in future stages of project development. Obtaining a New Starts FFGA will not be settled until the New Starts process is complete and certain threshold criteria are met.

The finance plan for the high-capacity transit guideway assumes that New Starts funding will be sought. The amount of New Starts funds that may be available to the CRC project depends on many factors beyond the project itself, including the amount of New Starts monies authorized and appropriated by Congress, and the national competition for those funds. Based on FTA's historic practices, this DEIS assumes that up to $750 million in New Starts funds could be available to the CRC project, assuming the project receives a sufficiently high New Starts rating.

Discretionary Bus and Bus Facilities Program (Section 5309-Bus)

Section 5309-Bus grants provide capital assistance for new and replacement buses and related equipment and facilities. This is a discretionary funding program, although most funds are earmarked to specific projects by Congress. Eligible capital projects include the purchasing of buses for service expansion, bus maintenance and administrative facilities, transfer facilities, bus malls, transportation centers, intermodal terminals, park-and-ride stations, acquisition of replacement vehicles, bus rebuilds, bus preventive maintenance, passenger amenities, and miscellaneous equipment. Discretionary bus funding can be used for specific elements of the CRC alternatives such as park-and-rides, bus procurement, maintenance facilities, security, intelligent transportation systems, design, right of way acquisition, transit stations, pedestrian and bike improvements, and other elements.

Congestion Mitigation and Air Quality (CMAQ)

The CMAQ program provides funds to State DOTs, MPOs, and transit agencies to invest in projects that reduce air pollutants. Eligible projects/programs under the CMAQ program include such expenditures as transportation activities in an approved State Implementation Plan, transportation control measures, pedestrian/bicycle facilities, traffic management/congestion relief strategies, transit (new system/service expansion or operations), alternative fuel projects, inspection and maintenance programs, intermodal freight, telecommunications, ride share programs, and travel demand management. Construction of projects which add new capacity for single-occupancy vehicles is not allowed under the program. In FY 2007 Oregon was apportioned about $16 million in CMAQ funds, Washington was apportioned about $32 million.

National Highway Traffic Safety Administration (NHTSA)Funds

To assist states in carrying out the highway safety program, the National Highway Traffic Assistance (NHTA) provides formula and incentive annual grants for highway safety programs designed to reduce traffic crashes and resulting deaths, injuries, and property damage. A state may use these grant funds only for highway safety purposes. The grants support planning to identify and quantify highway safety problems, provide start up "seed" money for new programs, and give new direction to existing safety programs. The funds are intended to catalyze innovative programs at the state and local level, and leverage commitments of state, local, and private resources

Alternative Analysis Funds

The objective of the Alternatives Analysis program is to assist in financing the evaluation of modal and multimodal alternatives and general alignment options for identified transportation needs in a particular, broadly defined travel corridor. Funds may be used to assist state and local governmental authorities in conducting alternatives analyses when at least one of the alternatives is a new fixed guideway system or an extension to an existing fixed guideway system.

Alternative Transportation in Parks and Public Lands Funds

The Alternative Transportation in Parks and Public Lands program funds capital and planning expenses for alternative transportation systems such as shuttle buses in national parks and other federal lands. Federal land management agencies and state, local, and tribal governments are eligible recipients. The goals of the program are to conserve natural, historical, and cultural resources; reduce congestion and pollution; improve visitor mobility and accessibility; enhance visitor experience; and ensure access to all, including persons with disabilities.

Grant Anticipation Revenue Vehicles ("GARVEE" bonds)

Grant Anticipation Revenue Vehicle (GARVEE) bonds provide an increasingly popular method to finance highway and transit projects. GARVEE is a debt-financing instrument that pledges future federal funds to repay investors, although the project sponsor may elect to pledge other sources of revenue in the event that future federal-aid funds are not available.[7] In technical terms, GARVEE refers to any debt financing instrument backed by future federal funds, including bonds, notes, certificates, mortgages, leases, or others. GARVEE bonds have been used by TriMet to fund potions of the South Corridor Light Rail Project and the Wilsonville-Beaverton Commuter Rail Project.

4.3.2 State Revenue and Financing Options

In addition to administering federal formula funds, ODOT and WSDOT also administer state funding programs, primarily from fuel taxes, fees on motor carriers, and licensing, and registration fees. The only existing funds currently committed to the project by WSDOT are the $20 million of Transportation Partnership Account funds programmed for project development activities in FY 2009; the FEIS will consider the potential for other existing funds to be committed to the CRC Project.

New revenues may be created by increasing one or more of the statewide fees or taxes. While the actual package of taxes, fees, and other revenue sources that may be used to fund each state's share of CRC capital costs must be developed through their legislative processes, potential sources of new revenues include the following.

Fuel Tax

Oregon currently levies a 24¢ per gallon tax on all fuels used for vehicle transportation, primarily gasoline and diesel fuel. In fiscal year (FY) 2008 the fuel tax is projected to gross about $17.6 million per penny of tax.[8] State law requires certain transfers and expenses be paid from gross fuel tax revenues; as a result, a 1¢ fuel tax in FY 2008 produces about $16.1 million net revenues for transportation projects.[9] The net fuel tax revenues are generally allocated between the state, cities, and counties

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[7] 23 USC 122(a) and (b).

[8] Revenue estimates for fuel tax and weight-mile tax from ODOT, Summary of Transportation Economic and Revenue Forecasts, December 2007 (released February 2008).

[9] The fuel tax is customarily paired with an equivalent amount of motor carrier fees and taxes; the net proceeds in FY 2008 from a 1¢ fuel tax with these equivalent taxes and fees is about $24.5 million.

throughout the state. The Oregon Constitution restricts the use of fuel tax revenues to highway purposes only.

The Oregon legislature may increase the fuel tax rate by vote of the legislature, with or without referral to the voters. From 1976 through 1982, Oregon voters rejected a proposed fuel tax increase four times. Notwithstanding these voter rejections, the Oregon legislature enacted a fuel tax increase in every legislative session from 1981 through 1991. The last fuel tax increase went into effect in 1993. The voters rejected a proposed increase in 1996, and the legislature has not enacted an increase since. The use or allocation of any future increases to the fuel tax could be set in the legislation enacting the increase, provided that constitutional limitations are not exceeded. Any funding package passed by the legislature can be referred to a statewide vote if petition requirements are met.

As of July 2007, Washington levies a 36¢ per gallon fuels tax on gasoline and other "special" fuels used by transportation vehicles. Effective July 2008, the fuels tax will increase to a 37.5¢ per gallon tax under the Transportation Partnership Account Act. In FY 2008 the combined gas tax and special fuels tax is projected to gross about $34.4 million per 1¢ of tax.[10] State law requires a variety of transfers and expenses be paid from gross revenues; as a result, a 1¢ combined gas and special fuels tax produces about $33.0 million in net revenues in FY 2008. The Washington state constitution limits the use of state fuels tax to highway purposes.

The allocation of the fuels tax proceeds in Washington depends on the provision in the legislation enacting each increase. A share of existing fuels tax revenues is generally allocated among the state, cities, and counties; the allocation formula among these recipients has varied in different fuels tax legislation. On occasion the Washington legislature has dedicated 100 percent of the proceeds from a fuel tax increment to a special program without any direct allocation to cities and counties. The use or allocation of any future increases to the fuel tax would be set forth in the legislation enacting the increase. If, for example, the entire proceeds of a 1¢ fuels tax increase (no allocation to cities and counties) in Washington were dedicated to the CRC proposal in FY 2008, the revenue increase would produce about $450 million in net bond proceeds for highway projects.[11]

Motor Carrier Taxes and Fees

Oregon levies several fees and taxes on heavy trucks, including weight-mile taxes (which include the flat-fee paid by qualifying carriers), heavy vehicle registration fee, trip permits, and other fees paid by motor carriers. In the aggregate these are referred to as "motor carrier fees and taxes." Motor carrier fees and taxes are estimated to generate about $272.7 million in gross revenues and $200.5 million in net revenues in

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[10] WSDOT, Transportation Revenue Forecast Council, November 2007 Forecast, adjusted per WSDOT, Transportation Revenue Summary for the February 2008 Forecast.

[11] Assumes uniform-payment highway revenue bonds with a 30-year term, 6 percent annual interest, 2 percent issuance costs, and coverage supplied by other revenues.

FY 2008. The Oregon Constitution restricts the use of these revenues to highway purposes only.

The Oregon legislature may increase motor carrier fees and taxes by vote of the legislature, with or without referral to the voters. The use or allocation of any future increases could be set forth in the legislation enacting the increase; provided that constitutional limitations are not exceeded.

The Oregon Constitution also requires that the proportion of highway revenues paid among the major vehicle classes, primarily passenger vehicles and heavy trucks, match the relative financial burden each places on the transportation system. This concept is commonly referred to as cost responsibility. To maintain cost responsibility, any increase in fuels tax would be paired with a proportionate increase in taxes on heavy trucks. An increase in motor carrier fees and taxes proportionate to a 1¢ increase in fuel tax generates about $8.4 million in FY 2008. Thus, 1¢ increase in fuels tax plus an equivalent increase in motor carrier taxes and fees would produce $24.5 million in net revenues in FY 2008.

If, for example, the entire proceeds (no allocation to cities and counties) of a 1¢ fuels tax increase plus and equivalent increase in motor carrier taxes and fees in Oregon were dedicated in FY 2008 to highway improvements, the revenue increase would produce about $310 million in net bond proceeds for the improvements.[12]

Registration and Licensing Fees

Oregon collects a variety of Department of Motor Vehicle (DMV) fees including vehicle registration fees, title fees, driver license fees, and other fees. One or more of these fees can be increased to fund a transportation improvement program. For example, the Oregon Transportation Investment Act (OTIA) program was funded through a vehicle registration fee increase. In FY 2008, DMV fees, in the aggregate, produced about $220 million in gross revenues and only about $40 million in net revenues, primarily due to the DMV administrative costs and the transfers to the OTIA program. An increase to one or more of these fees could be part of a transportation funding package to pay for the CRC project.

In Washington, licensing fees for trucks, buses, and for-hire vehicles consist of combination of a fee based on the gross weight of the vehicle (gross weight fee) and an additional fee of one dollar. The gross weight fee schedule for trucks was increased by 15 percent as part of the Nickel Package. The Transportation Partnership Account legislation increased the licensing fee for light trucks, except for farm vehicles, by $10–$30, depending on weight. Each $1 increase on licensing fees for trucks less than 10,000 pounds in Washington would produce about $1.3 million. Each 10 percent increase in gross weight fees on trucks over 10,000 pounds in Washington would produce about $12.2 million in 2008.[13]

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[12] Assumes uniform-payment, subordinated highway revenue bonds with a 25-year term, 6 % annual interest, 2% issuance costs, and coverage supplied by other revenues.

[13] WSDOT, Transportation Revenue Forecast, November 2007.

In Washington, registration fees for passenger cars consist of a combination of a $30 license fee plus a fee that depends on the gross weight of the vehicle (vehicle weight fee). The vehicle weight fee was introduced as part of the Transportation Partnership Account legislation.

Sales and Use Tax

The sales and use tax is currently used in Washington to fund the multi-modal account for transit projects included in the 2003 "Nickel Funding Package." The current rate is 0.3 percent (3/10th of 1 percent) on new and used motor vehicles. A 1/10th of 1 percent increase in the sales and use tax would produce about $12 million in 2008.

State Lottery Funds

In Oregon, state lottery funds have been used to fund capital bonds for major transit projects including TriMet's Westside Light Rail Project ($125 million), the Wilsonville-Beaverton Commuter Rail Project ($35 million), and most recently for the proposed Milwaukie Light Rail Project ($250 million). These lottery funds have been obtained by securing state legislation authorizing a specified amount of lottery bonds for each project. To date the legislature has not allocated lottery funding for a highway project, but there is no prohibition for such an allocation.

In-Kind Contributions

Both ODOT and WSDOT may make in-kind contributions for the CRC alternatives by providing staffing for project management and administration that is not paid with project revenues, by making right-of-way owned by the DOT (such as the WSDOT parcels at Kiggins Bowl and Lincoln Street that are proposed for park-and-rides) available for the CRC alternatives at no cost to the project, or by other similar actions.

Toll Credits

Under Federal law, a project is permitted to use certain toll revenue expenditures as a credit toward the local matching share of federally-eligible highway and transit projects. This concept is frequently referred to as toll credits.

Toll credits are earned when a state or toll authority funds an eligible capital investment with toll revenues from an existing facility. Project sponsors may use toll credits as local match on a Federal project. By using a sufficient amount of toll credits, the federal funding for a project can be increased to 100 percent.

Fares paid by ferry riders, in places where ferry routes are considered part of the highway systems (such as the Washington State Ferry System), can earn toll credits in the same manner as a tolled highway. WSDOT has earned toll credits through this mechanism, and may provide an allocation of toll credits to the CRC project.

In this assessment, up to $750 million in New Starts funds are assumed to be available to the high-capacity transit project. With toll credits, alternatives costing $750 million or less can be funded with New Starts funds, provided a sufficient amount of toll credits are applied to meet the local match requirement. Project alternatives costing more than $750 million must incorporate sufficient local cash match to cover the difference between the project cost and the assumed $750 million New Starts grant. There can be alternatives in which a portion of the local match requirement is met by toll credits and a portion met with local funds or in-kind match.

Some issues arise with the use of toll credits. First, the project staff must work with FTA to ensure that the use of toll credits does not negatively affect FTA's New Starts rating of the project. Second, as part of any Full Funding Grant Agreement, FTA will establish a maximum amount of New Starts funds available to the project, and will obligate the project sponsors to cover any cost overruns with non-New Starts funds. During the rating of the financial plan, FTA will complete a financial capacity review to determine the ability of the project sponsors to meet this obligation. Thus, even when they can be used, toll credits do not entirely eliminate the need for local capital funding capacity. Lastly, in order to use toll credits, WSDOT must provide a letter committing the necessary amount of toll credits to the CRC project.

Private Sector Contribution

Both FHWA and FTA seek to foster the use of public-private partnerships (PPP) in the design and construction of transportation improvements. Over the past few years both agencies have revised their rules and policies to facilitate such arrangements. ODOT and WSDOT have the authority to employ a public-private partnership (PPP) method of project delivery.

PPP is used for any scenario under which the private sector assumes a greater role in the planning, financing, design, construction, operation, and maintenance of a transportation facility compared to traditional procurement methods. Typical PPP procurement packages include: (i) private sector operations and maintenance on a performance basis; (ii) private sector program management for a fee and/or with program costs and schedule maintenance incentives; (iii) design-build for fixed fee on fixed time frame; (iv) project build-operate-transfer, (v) design-build finance-operate-transfer, and (vi) build-own-operate. Private sector financial participation may be possible under some of these approaches. The method of project delivery, including PPP, will be considered during preparation of the FEIS.

4.3.3 Toll Bond Proceeds

Background

The CRC alternatives include toll and non-toll scenarios. The toll scenarios assume that toll collection will be Open Road (all-electronic) toll collection. Open Road toll collection allows tolls to be collected without stopping traffic at toll booths to pay tolls. Instead customers either have (i) a transponder that electronically transmits charges to a computer system that invoices or debits a vehicle-owners account, or (ii) the vehicle is identified by a license plate recognition (pay-by-plate) system that identifies and invoices the vehicle owner.

The toll rate policies assumed in this DEIS, which are described in Chapter 2, differ for the replacement crossing alternatives (Alternatives 2 and 3) and the supplemental crossing alternatives (Alternatives 4 and 5).

While these assumed toll rate policies provide a practical basis for analyzing the impacts of the toll/no-toll decision, they will be refined throughout the project development process, if tolling is incorporated in the locally preferred alternative.

This DEIS shows the toll bond funding capacity resulting from three representative financing structures: [14]

- 40-year non-recourse debt[15], where the bonds are backed by toll revenues but without any other governmental guarantee
- 40-year non-recourse debt with a federal loan under USDOT's TIFIA Program[16]
- 30-year state-backed bonds

Capital Funding Capacity of Toll Revenues

Exhibit 4.3-2 shows the financial capacity of tolling the I-5 Bridge for a Base estimate that uses the traffic volumes modeled for the year 2030 and a Low estimate that is more conservative. Because the toll capacity of the alternatives is primarily affected by the traffic capacity of the river crossing, Exhibit 4.3-2 focuses on the differences in toll bond capacity between the replacement crossing alternatives (Alternatives 2 and 3) and the supplemental crossing alternatives (Alternatives 4 and 5). The funding capacities shown in Exhibit 4.3-2 are net of the capitalized interest that must be paid from bond proceeds during the construction period; they represent the amount of funds available to pay project costs.

Exhibit 4.3-2
Financial Capacity of Toll Bonds by Alternative[c]

	Alternatives 2 and 3 (Replacement Crossing)[a]		Alternatives 4 and 5 (Supplemental Crossing)[b]	
Bond Structure	**Low**	**Base**	**Low**	**Base**
40-year non-recourse bonds	$750	$950	$ 640	$820
40-year non-recourse bonds with TIFIA loan[d]	$980	$1,230	$ 810	$1,030
30-year state-backed bonds	$1,070	$1,350	$ 910	$1,160

Source: CRC, Toll Financial Capacity Analysis Results, November 2007.

[a] The toll rates for the replacement crossing alternatives (Alternatives 2 and 3) vary by time of day, with a $2.00 (in 2006 dollars) toll during peak periods for passenger cars with transponders.

[b] The toll rates for the supplemental crossing alternatives (Alternatives 4 and 5) are similar to the replacement crossing alternatives (Alternatives 2 and 3), except that the peak-period toll for passenger cars with transponders is $2.50 (in 2006 dollars).

[c] Financial capacities are net of capitalized interest.

[d] TIFIA is a USDOT loan and credit enhancement program, described in Section 4.3.1.

Note: Bond capacities are shown in millions of dollars, rounded to nearest ten million.

[14] The toll analysis is documented in CRC, Toll Financial Capacity Analysis Results, November 2007.

[15] Borrowings that rely on revenue from a project and are not guaranteed by other revenue sources are referred to as non-recourse debt.

[16] The TIFIA program is discussed in Section 4.3.1.

Even though, as described in Section 2.3.5, a 50¢ higher peak-period toll rate is assumed for the supplemental crossing alternatives (Alternatives 4 and 5), the replacement crossing alternatives (Alternatives 2 and 3) would generate \$110–\$200 million more bond capacity because the replacement crossing accommodates more peak-period and all-day traffic than the supplemental crossing.

The bond capacity of the tolling alternatives also differs by the bond structure employed. The more the bonds are backed by governmental sources, the higher their financial capacity. For example, a 30-year state-backed bond can create about \$270–\$400 million more capital funding than a non-recourse bond without any guarantee.

Toll Revenue Sensitivity Analysis

The toll rate policy assumed in this DEIS may be revised as the financial plan is refined; this would affect the bond capacity of the toll revenues. As shown in Exhibit 4.3-3, a 50¢ decrease in the peak-period toll rate would reduce the bond capacity of the supplemental crossing alternatives (Alternatives 4 and 5) by \$60–\$100 million. The impact on bond capacity caused by a 50¢ decrease in peak-period tolls for the replacement crossing alternatives (Alternatives 2 and 3) would be greater because the replacement crossing has higher peak-period traffic volumes than the supplemental crossing.

Exhibit 4.3-3
Sensitivity Analysis: Financial Impact of Alternative Toll Rates[c]

	Alternatives 4 and 5 with \$2.00 Peak Toll[a]		Alternatives 4 and 5 with \$2.50 Peak Toll[a]	
Bond Structure	**Low**	**Base**	**Low**	**Base**
40-year non-recourse bonds	\$580	\$740	\$640	\$820
40-year non-recourse bonds with TIFIA loan[b]	\$730	\$940	\$810	\$1,030
30-year state-backed bonds	\$830	\$1,060	\$910	\$1,160

Source: CRC, Toll Financial Capacity Analysis Results, November 2007.

[a] Off-peak period tolls are the same.

[b] TIFIA is a USDOT loan and credit enhancement program, described in Section 2.3.1.

[c] Financial capacities are net of capitalized interest.

Note: Bond capacities are shown in millions of dollars, rounded to nearest ten million.

The alternatives considered in this DEIS propose tolling only the I-5 crossing. Under current federal law the I-205 crossing could only be tolled if the I-205 crossing was reconstructed or approved as an FHWA tolling demonstration program. A sensitivity analysis of the replacement crossing alternatives (Alternatives 2 and 3) was undertaken to illustrate the impacts of tolling both the I-5 and I-205 bridges. As shown in Exhibit 4.3-4, the financial capacity of tolling both the I-5 and I-205 bridges would be more than twice that of tolling only the I-5 crossing. A similar proportionate increase would be expected if both river crossings were tolled with the supplemental crossing alternatives (Alternatives 4 and 5).

Exhibit 4.3-4
Sensitivity Analysis: Financial Impact of Tolling Both River Crossings[b]

	Alternatives 2 and 3 Toll I-5 Only		Alternatives 2 and 3 Toll I-5 and I-205	
Bond Structure	**Low**	**Base**	**Low**	**Base**
40-year non-recourse bonds	$750	$950	$1,570	$1,980
40-year non-recourse bonds with TIFIA loan[a]	$980	$1,230	$2,040	$2,560
30-year state-backed bonds	$1,070	$1,350	$2,220	$2,800

Source: CRC, Toll Financial Capacity Analysis Results, November 2007.

[a] TIFIA is a USDOT loan and credit enhancement program, discussed in Section 2.3.1.

[b] Financial capacities are net of capitalized interest.

Note: Bond capacities are in millions of dollars rounded to nearest ten million. Toll rates on both bridges are those assumed for Alternatives 2 and 3 in Chapter 2.

Use of Toll Revenues and Bond Proceeds

In Oregon, toll revenues and bond proceeds are restricted by the state constitution to highway purposes. The Washington state constitution does not have a similar prohibition. However, under recent Washington law the use of toll revenues must be specifically authorized by the legislature, which to date has not authorized toll revenues to be used for transit purposes. Thus, the financial plan scenarios discussed in Section 4.4 assume that toll revenues would only be used for the capital and operations costs related to the highway component of the CRC alternatives.

4.3.4 Regional Revenue and Financing Options

Currently Available C-TRAN Revenues

The Clark County Public Transportation Benefit Area (C-TRAN) operates the transit system within the project area in the State of Washington. C-TRAN provides fixed-route bus service and demand-responsive paratransit service within the urban growth boundary of Vancouver, Camas-Washougal, and Battle Ground, Washington; and dial-a-ride and connector service using paratransit vehicles in Battle Ground, Camas, Ridgefield, and La Center, Washington. C-TRAN is governed by a nine-member Board of Directors comprised of all three Clark County Commissioners; three representatives from the Vancouver City Council; and one representative each from the Camas/Washougal, Battle Ground/Yacolt, and Ridgefield/La Center City Councils.

C-TRAN currently has about $35 million in continuing annual revenues. Under its basic Public Transportation Benefit Area (PTBA) authority, C-TRAN may impose a sales and use tax of up to 9/10th of 1 percent for transit service and facilities in its district.[17] Currently C-TRAN is only authorized to levy a 5/10th of 1 percent sales and use tax; it could impose an additional 4/10th of 1 percent tax under its PTBA authority with voter approval. The sales and use tax is C-TRAN's largest revenue source, accounting for slightly over $26 million in 2006. Passenger fares are

[17] RCW 36.57A authorizes the creation of Public Transportation Benefit Areas (PTBA) and RCW 82.14.045 authorizes PBTAs, such as C-TRAN, to levy a sale and use tax, subject to voter approval.

C-TRAN's second largest revenue source, accounting for about $4.8 million in 2006. Grants, interest income, and other operating revenues comprise the remainder of C-TRAN's existing revenue sources. The federal formula grants available to C-TRAN are described in Section 4.3.1.

C-TRAN's existing revenues are generally required for meeting C-TRAN's fixed-route and paratransit service costs and maintaining a prudent reserve; existing C-TRAN resources are generally not available for meeting the capital or operating costs of the CRC alternatives. Any material local match obligation owed by C-TRAN would require implementation of a new or increased revenue source.

Additional Transit Revenue Options available to C-TRAN

As stated above, C-TRAN could seek approval of up to an additional 4/10th of 1 percent sales and use tax under its basic PTBA authority. However, C-TRAN is considering a 20-year plan that would expand paratransit and fixed-route services unrelated to the CRC project. Thus unused PBTA sales and use tax authority may be used for C-TRAN's long-term plans and may not available for the CRC alternatives. In this case, C-TRAN may use the additional funding authorities provided by the State of Washington's HCT Act[18] to pay its share of CRC costs. These taxing sources include:

- **Employer Tax:** an excise tax of up to two dollars per month per employee on all employers located within the agency's jurisdiction. The employer tax may only generate $2.8 million year within the C-TRAN district,[19] which would be insufficient by itself to support most of the CRC alternatives.
- **Sales and Use Tax on Car Rentals:** a maximum of a 2.172 percent sales and use tax upon retail car rentals within the agency's jurisdiction. This revenue option will also would be insufficient by itself to support most CRC alternatives.
- **Sales and Use Tax:** not to exceed 9/10th of 1 percent. This is separate from and in addition to the 9/10th of 1 percent sales and use tax allowed, with voter approval, under C-TRAN's PBTA authority. Currently each 1/10th of 1 percent sales and use tax generates $5.2 million within the full C-TRAN district.

Under the HCT Act, a transit agency must receive voter approval of a "high capacity transportation system plan and financing plan" as a pre-requisite to levying the funding sources listed above. To seek voter approval, the C-TRAN Board of Directors must enact a resolution placing the system plan on the ballot. It is anticipated that, if needed, the measure would be placed on the ballot prior to the issuance of the record of decision (ROD) by FTA and FHWA. Voter approval of a systems plan that includes the taxing authorities outlined above constitutes approval of the tax. A single ballot proposition may seek approval for one or more of the authorized taxing sources.

[18] RCW 81.104.

[19] Washington State Joint Transportation Committee, Transportation Resource Manual, updated January 2007.

There is continuing discussion regarding whether HCT funding should be derived from a C-TRAN district-wide tax, or through a HCT sub-district covering the City of Vancouver or the Vancouver urban growth boundary. There are two potential ways to implement sub-district funding if sought under the HCT Act:

- C-TRAN could establish a sub-district on its own, and hold a systems plan and funding vote under the HCT Act within the sub-district. A statutory amendment is required for this approach; or
- Through an interlocal agreement with C-TRAN, the City of Vancouver could be authorized as the HCT transit agency, and the City could seek voter approval within its boundaries of the HCT system plan and funding under the HCT Act.

Transportation Benefit District Revenue Options

The Vancouver City Council has the authority to establish a Transportation Benefit District (TBD) within the City. With Clark County Commission agreement, the City Council could establish a TBD covering the Vancouver urban growth area, which includes areas outside the current city boundary. A TBD could have the authority to construct and operate public transportation, including high capacity transit, and other transportation improvements. A public vote is not required to establish a TBD, but may be required to provide funds. Potentially applicable funding options of a TBD include:

- **A Sales and Use Tax not to exceed 2/10th of 1 percent:** Voter approval is required. The tax may not be in effect longer than 10 years unless reauthorized by voters.
- **Excess Property Tax Levies:** which can be levied for one year for any eligible purpose or for multiple years if used to repay general obligation bonds; voter approval is required.
- **Motor Vehicle License Renewal Fee on vehicles of 6,000 pounds or less:** An annual License Renewal Fee of up to a $20 can be levied by approval of the TBD Board. An annual License Renewal Fee of up to $100 can be levied with voter approval.

Implementation of TBD funding, if desired, could be undertaken in two ways:

- Through an interlocal agreement with C-TRAN, the City of Vancouver could be authorized to be the HCT transit agency, and the City could then establish a TBD within the city boundaries to develop and operate the HCT alternative and, subject to voter approval within the TBD, if required, use the funding authorities of the TBD to fund the HCT project; or
- Through an interlocal agreement with C-TRAN, the City of Vancouver could be authorized to be the HCT transit agency. Through an interlocal agreement with Clark County, Vancouver and Clark County could jointly establish a TBD within the Vancouver urban growth boundary to develop and operate the HCT alternative, and, subject to voter approval within the TBD, if required, use the funding authorities of the TBD to fund the HCT project.

Currently Available TriMet Revenues

The Tri-County Metropolitan Transportation District of Oregon (TriMet) operates the transit system within the project area in Oregon. TriMet is a municipal corporation providing fixed-route and demand-responsive paratransit service within the urban areas of Clackamas, Multnomah, and Washington Counties, Oregon. TriMet currently operates about 44 miles of light rail service, and is completing an 8-mile light rail extension and a 15-mile commuter rail line. TriMet is governed by a seven-member Board of Directors, appointed by the Governor of Oregon. Board members represent, and must live in, certain geographical districts.

TriMet currently receives about $360 million in continuing annual revenues.

TriMet currently levies a 0.6618 percent tax ($6.618 per $1000) on the gross payrolls of private businesses and municipalities within its district. The payroll tax is dedicated to TriMet and is TriMet's largest source of operating revenue, accounting for 52 percent ($187.5 million) of its operating revenues in FY 2007. TriMet projects a long-term growth rate for the payroll tax of 6.2 percent per year. TriMet also adopted an ordinance that calls for increasing the payroll tax rate annually by one-hundredth of one percent, reaching a final tax rate of 0.7218 percent in FY 2014. TriMet also levies a 0.6618 percent tax on the gross profits earned within its district by self-employed individuals. The self-employment tax rate is scheduled to increase at the same rate as the payroll tax. State of Oregon government offices located within TriMet's district boundaries are not subject to the payroll tax. Instead, the State makes in-lieu of tax payments to TriMet based on 0.6218 percent of their gross payrolls. Passenger revenues are TriMet's second largest revenue source. In FY 2007, passenger revenues totaled $75.9 million, 21 percent of operating revenue. Grants, interest income, and other operating revenues comprise the remainder of TriMet's existing revenue sources. The federal grants currently available to TriMet are described in Section 4.3.1.

Over the next two years, TriMet must absorb increased operations costs caused by the completion of the South Corridor MAX line and the Commuter Rail line, reducing TriMet's near-term ability to assume additional financial obligations with existing resources. In addition, TriMet is currently engaged in project development activities for a future Milwaukie MAX line, which will place additional financial pressures on TriMet. However, TriMet's payroll tax has consistently exhibited continued real growth, which improves its capacity to make existing revenues available for a CRC project. Analyses of the simultaneous implementation of the Milwaukie MAX Project and CRC Project found that TriMet had the financial capacity to operate both projects.

Additional Revenue Options available to TriMet

If needed, TriMet could seek additional revenues from such sources as:

- A multi-year allocation of Surface Transportation Program (STP) or Congestion Management Air Quality (CMAQ) funds through Metro's Metropolitan Transportation Improvement Program (MTIP) process and GARVEE bonds to advance funding into the construction period;

- An allocation of state lottery funds through the Oregon legislature; or
- A contribution from private entities benefiting from the project in the Hayden Island area.

4.4 Capital Finance Plan Scenarios

In this section the project costs and revenues discussed above are assembled into a range of preliminary capital finance plan scenarios. For each alternative there are a range of terminus options, capital costs, and amounts available from each revenue source, as well as a toll and non-tolled scenario. Thus, a number of financial plan scenarios are possible. The finance plan scenarios shown below will be refined during the FEIS stage. These preliminary scenarios illustrate basic financial trade-offs and issues associated with the alternatives.

The preliminary capital funding scenarios shown in Exhibits 4.4-1 through 4.4-4 employ eight categories of revenues to meet the capital cost requirements of each alternative. Additional analyses are required to select the combination of individual funding sources within each category. These individual sources will be addressed in the funding plan incorporated in the FEIS. The eight categories of revenue sources used in the preliminary capital funding scenarios include:

- **Existing State Revenues:** which include only the $20 million currently committed to the project by WSDOT through the Transportation Partnership Account.
- **State Administered Funds**: which includes all of the potential state funding options for Oregon and Washington discussed in Section 4.3.2 and the all of the formula federal funds administered by both states described in Section 4.3.1. The amounts shown in Exhibits 4.4-1 through 4.4-4 for State Administered Revenues represent the aggregate amounts contributed by WSDOT and ODOT. The current WSDOT-ODOT agreement on the CRC project only addresses pre-construction activities and provides for an equal sharing of pre-construction expenses. The cost responsibility between the DOTs for construction will be addressed during preparation of the FEIS. Thus the funding scenarios shown in Exhibits 4.4-1 through 4.4-4 show the cumulative total of the WSDOT and ODOT contributions.
- **Federal Discretionary Highway Funds**: which include all of the potential highway discretionary programs described in Section 4.3.1. The amounts shown in Exhibits 4.4-1 through 4.4-4 for Federal Discretionary Highway Funds represent the aggregate amounts contributed by these programs during the design and construction stages of the project.
- **Federal Discretionary Transit Funds**: which includes Section 5309 New Starts funds, Section 5309 Bus funds, and the other transit-eligible discretionary grant programs described in Section 4.3.1. While it is anticipated that the New Starts program will be the primary source of these revenues, other discretionary grant programs may be sought for specific project elements such as park-and-rides and bus purchases.

- **Toll Bond Proceeds**: which are discussed in Section 4.3.3.
- **C-TRAN Revenues**: which include the federal formula funds administered by C-TRAN discussed in Section 4.3.1, and the currently available and additional funding options for C-TRAN described in Section 4.3.4. To size the amounts required from C-TRAN and TriMet, this analysis assumes two alternative cost sharing formulae that proportion the local match required from each transit district based on the relative length of the transit extension associated with the district: (i) using the Jantzen Beach station as the dividing point, and (ii) using the state line as the dividing point. While C-TRAN's share may be funded with a combination of revenue sources, the base assumption is that a C-TRAN district-wide sales and use tax would be used to provide local match. The capital funding scenarios show the sales and use tax rates need to provide the local capital match under this base assumption. The amounts needed for operating and maintaining the transit alternatives are addressed in Section 4.5.
- **TriMet Revenues**: which include the federal formula funds administered by TriMet discussed in Section 4.3.1, and the currently available and additional funding options for TriMet described in Section 4.3.4. The amounts required for TriMet are based on the alternative cost sharing formulae described above.
- **Toll Credits**: as discussed in Section 4.3.2 are used to meet local match requirements where applicable.

Exhibit 4.4-1
Capital Finance Plan Scenarios by Alternative and Full-Length Transit Terminus: With Tolls

	Alternative 2				Alternative 3				Alternative 4				Alternative 5			
Terminus	**Kiggins Bowl terminus**		**Lincoln terminus**		**Kiggins Bowl terminus**		**Lincoln terminus**		**Kiggins Bowl terminus**		**Lincoln terminus**		**Kiggins Bowl terminus**		**Lincoln terminus**	
Cost Estimate[a]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Highway Cost	$2,846	$2,997	$2,866	$3,011	$2,857	$2,983	$2,869	$3,043	$2,658	$2,799	$2,670	$2,809	$2,665	$2,802	$2,675	$2,813
Transit Cost	$863	$918	$669	$725	$1,045	$1,108	$850	$881	$939	$981	$744	$778	$1,102	$1,148	$906	$946
Total Cost	$3,709	$3,915	$3,535	$3,736	$3,902	$4,091	$3,719	$3,924	$3,597	$3,781	$3,414	$3,587	$3,767	$3,950	$3,581	$3,758
Sources																
Existing State Revenue[b]	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Federal Discretionary Highway Funds	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600
Toll Bond Proceeds[c]	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160
State Administered Revenues[d]	$876-$1,356	$1,027-$1,507	$896-$1,376	$1,041-$1,521	$887-$1,367	$1,012-$1,492	$899-$1,379	$1,073-$1,553	$878-$1,328	$1,019-$1,469	$890-$1,340	$1,029-$1,479	$885-$1,335	$1,022-$1,472	$895-$1,345	$1,033-$1,483
Federal Discretionary Transit Funds	$750	$750	$669	$725	$750	$750	$750	$750	$750	$750	$744	$750	$750	$750	$750	$750
C-TRAN Funds[e]	$86-$102	$129-$151	$0	$0	$226-$265	$274-$321	$71-$88	$93-$115	$145-$170	$177-$207	$0	$20-$25	$269-$316	$304-$357	$111-$137	$140-$172
TriMet Funds[e]	$12-$27	$17-$40	$0	$0	$30-$69	$37-$84	$13-$29	$16-$38	$19-$44	$24-$54	$0	$4-$8	$36-$83	$41-$94	$20-$45	$25-$56
Total Revenues	$3,709	$3,915	$3,535	$3,736	$3,902	$4,091	$3,719	$3,924	$3,597	$3,781	$3,414	$3,587	$3,767	$3,950	$3,581	$3,758
Toll Credits[f]	$60	$16	$134	$145	$0	$0	$70	$45	$0	$0	$149	$127	$0	$0	$25	$0
C-TRAN Sales and Use Tax Rate[g]	0.10%-0.12%	0.15%-0.18%	0.00%	0.00%	0.27%-0.32%	0.33%-0.39%	0.10%-0.11%	0.13%-0.14%	0.17%-0.20%	0.21%-0.25%	0.00%	0.03%	0.32%-0.38%	0.37%-0.43%	0.16%	0.20%-0.21%

a Low cost estimate is 60% confidence estimate from cost risk assessment, High cost estimate is 90% confidence estimate from risk assessment.

b From WSDOT's Transportation Partnership Account.

c See Exhibit 4.3-1.

d Low end of state and regional sources assumes high federal discretionary funds and toll bond proceeds; High end of state and regional sources assumes low federal discretionary funds and bond proceeds.

e Low end of C-TRAN share and High end of TriMet share assumes state line as cost dividing point; High end of C-TRAN share and Low end of TriMet share assumes Hayden Is. station as dividing point.

f Toll credits do not directly contribute funds to construct the project; they are only used to offset statutory match requirements.

g Assumes C-TRAN district wide tax base; if sub-district approach is selected, the tax rate within the sub-district must be proportionately higher.

Note: Costs and revenues are in millions of year of expenditure dollars and rounded to nearest million.

Exhibit 4.4-2

Capital Finance Plan Scenarios by Alternative and Full-Length Transit Terminus: Without Tolls

	Alternative 2				Alternative 3				Alternative 4				Alternative 5			
Terminus	Kiggins Bowl terminus		Lincoln terminus		Kiggins Bowl terminus		Lincoln terminus		Kiggins Bowl terminus		Lincoln terminus		Kiggins Bowl terminus		Lincoln terminus	
Cost Estimate[a]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Highway Costs	$2,846	$2,997	$2,866	$3,011	$2,857	$2,983	$2,869	$3,043	$2,658	$2,799	$2,670	$2,809	$2,665	$2,802	$2,675	$2,813
Transit Costs	$863	$918	$669	$725	$1,045	$1,108	$850	$881	$939	$981	$744	$778	$1,102	$1,148	$906	$946
Total Costs	$3,709	$3,915	$3,535	$3,736	$3,902	$4,091	$3,719	$3,924	$3,597	$3,781	$3,414	$3,587	$3,767	$3,950	$3,581	$3,758
Sources																
Existing State Revenues[b]	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Federal Discretionary Highway Funds	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600	$400- $600
Toll Bond[c]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
State Administered Revenues[d]	$2,226- $2,426	$2,377- $2,577	$2,246- $2,446	$2,391- $2,591	$2,237- $2,437	$2,362- $2,562	$2,249- $2,449	$2,423- $2,623	$2,038- $2,238	$2,179- $2,379	$2,050- $2,250	$2,189- $2,389	$2,045- $2,245	$2,182- $2,382	$2,055- $2,255	$2,193- $2,393
Federal Discretionary Transit Funds	$750	$750	$669	$725	$750	$750	$750	$750	$750	$750	$744	$750	$750	$750	$750	$750
C-TRAN Funds[e]	$86- $102	$129- $151	$0	$0	$226- $265	$274- $321	$71- $88	$93- $115	$145- $170	$177- $207	$0	$20- $25	$269- $316	$304- $357	$111- $137	$140- $172
TriMet Funds[e]	$12- $27	$17- $40	$0	$0	$30- $69	$37- $84	$13- $29	$16- $38	$19- $44	$24- $54	$0	$4-$8	$36- $83	$41- $94	$20- $45	$25- $56
Total Revenues	$3,709	$3,915	$3,535	$3,736	$3,902	$4,091	$3,719	$3,924	$3,597	$3,781	$3,414	$3,587	$3,767	$3,950	$3,581	$3,758
Toll Credits[f]	$60	$16	$134	$145	$0	$0	$70	$45	$0	$0	$149	$127	$0	$0	$25	$0
C-TRAN Sales and Use Tax Rate[g]	0.10- 0.12%	0.15- 0.18%	0.00%	0.00%	0.27- 0.32%	0.33- 0.39%	0.10- 0.11%	0.13- 0.14%	0.17- 0.20%	0.21- 0.25%	0.00%	0.03%	0.32- 0.38%	0.37- 0.43%	0.16%	0.20- 0.21%

a Low cost estimate is 60% confidence estimate from cost risk assessment, High cost estimate is 90% confidence estimate from risk assessment.

b From WSDOT's Transportation Partnership Account.

c See Exhibit 4.3-1.

d Low end of state and regional sources assumes high federal discretionary funds and toll bond proceeds; High end of state and regional sources assumes low federal discretionary funds and bond proceeds.

e Low end of C-TRAN share and High end of TriMet share assumes state line as cost dividing point; High end of C-TRAN share and Low end of TriMet share assumes Hayden Is. station as dividing point.

f Toll credits do not directly contribute funds to construct the project; they are only used to offset statutory match requirements.

g Assumes C-TRAN district wide tax base; if sub-district approach is selected, the tax rate within the sub-district must be proportionately higher.

Note: Costs and revenues are in millions of year of expenditure dollars and rounded to nearest million.

Exhibit 4.4-3

Capital Finance Plan Scenarios by Alternative and Minimum Operable Segment: With Tolls

	Alternative 2				Alternative 3				Alternative 4				Alternative 5			
Terminus	Mill Plain		Clark College		Mill Plain		Clark College		Mill Plain		Clark College		Mill Plain		Clark College	
Cost Estimate[a]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Highway Costs	$2,741	$2,911	$2,763	$2,905	$2,772	$2,920	$2,773	$2,920	$2,560	$2,719	$2,575	$2,711	$2,586	$2,743	$2,586	$2,699
Transit Costs	$519	$559	$555	$594	$596	$628	$654	$689	$565	$597	$617	$637	$629	$704	$697	$787
Total Costs	$3,260	$3,470	$3,318	$3,499	$3,368	$3,548	$3,427	$3,609	$3,125	$3,316	$3,192	$3,348	$3,214	$3,447	$3,283	$3,486
Sources																
Existing State Revenue[b]	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Federal Discretionary Highway Funds	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600
Toll Bond Proceeds[c]	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$1,070-$1,350	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160	$910-$1,160
State Administered Revenues[d]	$771-$1,251	$941-$1,421	$793-$1,273	$935-$1,415	$802-$1,282	$950-$1,430	$803-$1,283	$950-$1,430	$780 - $1,230	$939-$1,389	$795-$1,245	$931-$1,381	$806-$1,256	$963-$1,413	$806-$1,256	$919-$1,369
Federal Discretionary Transit Funds	$519	$559	$555	$594	$596	$628	$654	$689	$565	$597	$617	$637	$629	$704	$697	$750
C-TRAN Funds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$26-$32
TriMet Funds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5-$11
Total Revenues	$3,260	$3,470	$3,318	$3,499	$3,368	$3,548	$3,427	$3,609	$3,125	$3,316	$3,192	$3,348	$3,214	$3,394	$3,283	$3,439
Toll Credits[e]	$104	$112	$111	$119	$119	$126	$131	$138	$113	$119	$123	$127	$126	$141	$139	$148
C-TRAN Sales and Use Tax Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05-0.06%

[a] Low cost estimate is 60% confidence estimate from cost risk assessment, High cost estimate is 90% confidence estimate from risk assessment.

[b] From WSDOT's Transportation Partnership Account.

[c] See Exhibit 4.3-1.

[d] Low end of state and regional sources assumes high federal discretionary funds and toll bond proceeds; High end of state and regional sources assumes low federal discretionary funds and bond proceeds.

[e] Toll credits do not directly contribute funds to construct the project; they are only used to offset statutory match requirements.

Note: Costs and revenues are in millions of year of expenditure dollars and rounded to nearest million.

Exhibit 4.4-4
Capital Finance Plan Scenarios by Alternative and Minimum Operable Segment: Without Tolls

	Alternative 2				Alternative 3				Alternative 4				Alternative 5			
Terminus	Mill Plain		Clark College		Mill Plain		Clark College		Mill Plain		Clark College		Mill Plain		Clark College	
Cost Estimate[a]	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Highway Costs	$2,741	$2,911	$2,763	$2,905	$2,772	$2,920	$2,773	$2,920	$2,560	$2,719	$2,575	$2,711	$2,586	$2,744	$2,586	$2,699
Transit Costs	$519	$559	$555	$594	$596	$628	$654	$689	$565	$597	$617	$637	$629	$704	$697	$787
Total Costs	$3,260	$3,470	$3,318	$3,499	$3,368	$3,548	$3,427	$3,609	$3,125	$3,316	$3,192	$3,348	$3,214	$3,447	$3,283	$3,486
Sources																
Existing State Revenue[b]	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Federal Discretionary Highway Funds	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600	$400-$600
Toll Bond Proceeds[c]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
State Administered Revenues[d]	$2,121-$2,321	$2,291-$2,491	$2,143-$2,343	$2,285-$2,485	$2,152-$2,352	$2,300-$2,500	$2,153-$2,353	$2,300-$2,500	$1,940-$2,140	$2,099-$2,299	$1,955-$2,155	$2,091-$2,291	$1,966-$2,166	$2,124-$2,324	$1,966-$2,166	$2,079-$2,279
FTA New Starts Grant	$519	$559	$555	$594	$596	$628	$654	$689	$565	$597	$617	$637	$629	$704	$697	$750
C-TRAN Funds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$26-$32
TriMet Funds	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5-$11
Total Revenues	$3,260	$3,470	$3,318	$3,499	$3,368	$3,548	$3,427	$3,609	$3,125	$3,316	$3,192	$3,348	$3,214	$3,394	$3,283	$3,439
Toll Credits[e]	$104	$112	$111	$119	$119	$126	$131	$138	$113	$119	$123	$127	$126	$130	$139	$148
C-TRAN Sales and Use Tax Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.05-0.06%

[a] Low cost estimate is 60% confidence estimate from cost risk assessment, High cost estimate is 90% confidence estimate from risk assessment.

[b] From WSDOT's Transportation Partnership Account.

[c] No-toll scenario.

[d] Low end of state and regional sources assumes high federal discretionary funds and toll bond proceeds; High end of state and regional sources assumes low federal discretionary funds and bond proceeds.

[e] Toll credits do not directly contribute funds to construct the project; they are only used to offset statutory match requirements.

Note: Costs and revenues are in millions of year of expenditure dollars and rounded to nearest million.

With tolling (Exhibit 4.4-1) $876 million to $1.521 billion in State Administered Revenues would be required to fund Alternative 2 with the full-length transit terminus options. Without tolling (Exhibit 4.4-2) $2.226 to $2.591 billion in State Administered Revenues would be required. With the Kiggins Bowl terminus, Alternative 2 would require $86 to $151 million in C-TRAN Funds and $12 to $40 million in TriMet Funds. If funded through a district-wide tax, the C-TRAN contribution would require a 0.10 percent to 0.18 percent increase in the sales and use tax rate. With the Lincoln terminus or the Mill Plain or Clark College MOS (Exhibits 4.4-3 and 4.4-4), toll credits could be used to meet local match requirements for Alternative 2.

With tolling (Exhibit 4.4-1) $887 million to $1.492 billion in State Administered Revenues would be required to fund Alternative 3 with the full-length transit terminus options. Without tolling (Exhibit 4.4-2) $2.237 to $2.623 billion in State Administered Revenues would be required. With the Kiggins Bowl terminus, Alternative 3 would require $226 to $321 million in C-TRAN Funds and $30 to $84 million in TriMet Funds. If funded through a district-wide tax, the C-TRAN contribution would require a 0.27 percent to 0.3 percent increase in the sales and use tax rate. With the Lincoln terminus, Alternative 3 would require $0 to $115 million in C-TRAN Funds and $0 to $38 million in TriMet Funds. If funded through a district-wide tax, the C-TRAN contribution would require up to a 0.14 percent increase in the sales and use tax rate. With the Mill Plain or Clark College MOS (Exhibits 4.4-3 and 4.4-4), toll credits could be used to meet local match requirements for Alternative 3.

With tolling (Exhibit 4.4-1) $878 million to $1.469 billion in State Administered Revenues would be required to fund Alternative 4 with the full-length transit terminus options. Without tolling (Exhibit 4.4-2) $2.038 to $2.389 billion in State Administered Revenues would be required. With the Kiggins Bowl terminus, Alternative 4 would require $145 to $207 million in C-TRAN Funds and $19 to $54 million in TriMet Funds. If funded through a district-wide tax, the C-TRAN contribution would require a 0.17 percent to 0.25 percent increase in the sales and use tax rate. With the Lincoln terminus the C-TRAN contribution would require, at most, a very minor increase in the sales and use tax rate. With the Mill Plain or Clark College MOS (Exhibits 4.4-3 and 4.4-4), toll credits could be used to meet local match requirements for Alternative 4.

With tolling (Exhibit 4.4-1) $885 million to $1.472 billion in State Administered Revenues would be required to fund Alternative 5 with the full-length transit terminus options. Without tolling (Exhibit 4.4-2) $2.045 to $2.393 billion in State Administered Revenues would be required. With the Kiggins Bowl terminus, Alternative 5 would require $269 to $357 million in C-TRAN Funds and $36 to $94 million in TriMet Funds. If funded through a district-wide tax, the C-TRAN contribution would require a 0.32 percent to 0.40 percent increase in the sales and use tax rate. With the Lincoln terminus, Alternative 5 would require $111 to $172 million in C-TRAN Funds and $20 to $56 million in TriMet Funds. If funded through a district-wide tax, the C-TRAN contribution would require a 0.16 percent to 0.21 percent increase in the sales and use tax rate. With the Mill Plain or Clark College MOS

(Exhibits 4.4-3 and 4.4-4), toll credits could be used to meet local match requirements for Alternative 5.

4.5 CRC Operations and Maintenance Costs and Finance Scenarios

In this section the operating and maintenance (O&M) costs and revenues for the CRC alternatives are discussed and assembled into a range of preliminary finance plan scenarios. While these preliminary scenarios will be refined during the FEIS stage, they illustrate the basic O&M financial trade-offs and issues associated with the CRC alternatives and transit terminus options.

The responsibility for funding the O&M costs of the CRC alternatives will be defined in an agreement between WSDOT, ODOT, C-TRAN, and TriMet that will be prepared during the FEIS. It is currently assumed that all transit-related O&M costs will be shared between C-TRAN and TriMet and all highway-related O&M costs, including those related to tolling, will be shared by ODOT and WSDOT. Where overlapping O&M costs exist, such as those relating to a joint highway/transit bridge, a cost sharing formula will be developed that allocates costs based on the relative burdens placed by the highway and transit uses.

4.5.1 Highway Operations and Maintenance

Highway O&M Costs

A preliminary analysis was undertaken to identify the operations, maintenance, and major rehabilitation costs associated with the highway component of the CRC alternatives.[20] These costs will be refined in future project development stages. The preliminary estimates of the highway O&M costs of the CRC alternatives include:

- *Facility O&M Costs*, including such expenses as landscaping, sign repair and replacement, guardrail repair, painting, pavement marking, snow removal, lift span operation, incident response, lighting, etc. These costs address both the bridge and the roadway costs in the project area. Routine bridge maintenance costs were extrapolated from actual cost experience on the I-5 crossing. Routine roadway maintenance costs were based on a per-mile cost assumption. The annual Facility O&M Costs for Alternatives 2 and 3, which assume the replacement crossing, were estimated to be about $0.7 million in current dollars. Annual Facility O&M Costs for Alternatives 4 and 5, which assume the supplemental crossing, were estimated at $1.4 million; the difference resulting from the costs of the lift span operation on the existing bridges. The Annual Facility O&M costs for the Stacked Transit/Highway Bridge will be developed during the FEIS stage.
- *Periodic Major Maintenance, Renovation and Rehabilitation* expenditures, including deck overlays, asphalting, and painting the trusses. The existing bridges are estimated to require $107 million

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[20] CRC, Operations, Maintenance, and Major Rehabilitation Assumptions including Toll Collection Costs, 2007

(current dollars) in rehabilitation and renovation costs over the 40-year planning period.

- *Toll Collection O&M Costs*, including fixed and variable costs. Fixed toll collection costs were estimated to be $1.5 million per year in current dollars, based on factors derived for WSDOT's SR 520 project and independent analyses undertaken for the CRC Project. Variable toll O&M costs include those costs associated with toll collection, customer service, and enforcement activities that vary directly with marginal changes in traffic. These costs were estimated on a cost per transaction basis. The cost in current dollars of processing each electronic payment is estimated to be $0.25 per transaction and the additional cost of processing a pay-by-plate transaction is estimated to be $1.00. Credit card fees were assumed to be two percent of total gross revenues.

Highway O&M Finance Scenario

If the crossing were not tolled, the highway O&M costs associated with the CRC alternatives would be divided between the states and funded through their respective highway trust funds, as is the current practice. If the crossing is tolled, the highway and bridge maintenance and operations costs of the CRC alternatives would be paid with toll revenues throughout the duration of the tolls. The net toll revenues used to estimate the toll bond capacity in Section 4.3 deducted the highway O&M costs from the gross toll revenues in advance of any debt service payments. When the tolls are terminated, the highway O&M costs would be divided between the states and funded through the respective highway trust funds.

Since the states currently fund the O&M costs on the existing bridge and freeway and the highway O&M costs associated with the CRC alternatives are either similar to (for Alternatives 4 and 5) or less than (for Alternatives 2 and 3) the O&M costs on the existing facilities, no problems are anticipated in meeting highway O&M costs of the CRC alternatives.

4.5.2 Transit Operations and Maintenance Costs

Assumptions Underlying Transit O&M Costs

The transit components of the CRC alternatives require operation of a high-capacity transit line that crosses state and transit district boundaries, causing certain unique operations-related issues to be addressed. The O&M costs are based on the policy assumptions summarized below.

The bi-state governance of transit operations and maintenance would be handled through intergovernmental/interlocal agreements between C-TRAN and TriMet. TriMet and C-TRAN have the authority to enter into such agreements with each other. While the terms of the agreements will be addressed during preparation of the FEIS, an intergovernmental/ Interlocal agreement would typically leave existing governing structures in place; establish specific roles, responsibilities, and authorities for both parties; and require approval of significant operations and maintenance issues by the Boards of both districts. A bi-state compact, which typically refers to the creation of a legislatively and Congressionally approved quasi-independent entity for operations and maintenance of the bi-state system, is an alternative governance structure that was considered, but is currently not assumed because it may add administrative complexity without providing a commensurate benefit.

Transit riders from each district would be allowed to seamlessly and freely transfer to transit services in the other district. Each transit district would accept valid fare instruments from the other district. An agreement would be established describing how bi-state farebox revenues are shared between the districts to ensure an equitable allocation of these revenues.

While each transit agency would have certain approval authorities regarding operations, one agency would have primary responsibility to operate and maintain the HCT line. If BRT is implemented, it is assumed that C-TRAN would operate and maintain the BRT vehicles and guideway. The BRT riders would transfer to/from the Interstate MAX light rail line at the Expo Center station and TriMet would operate and maintain the Interstate MAX line. If light rail is implemented, it is assumed that TriMet would operate and maintain the light rail vehicles, guideway, and systems. The actual details of such arrangements, such as which agency would operate/maintain specific park-and-rides and stations, will be resolved during the FEIS stage.

Since the transit networks incorporated in each CRC alternative operate within and serve the C-TRAN and TriMet districts, a transit operations cost sharing agreement would be established between the districts. This analysis assumes that (i) the local bus service provided by both districts would remain the sole responsibility of the transit district providing the service; (ii) the base cost of operating the Interstate MAX line between downtown and Expo Center would remain TriMet's obligation; and (iii) a cost sharing formula would be established between to the two transit districts to pay for the marginal cost[21] of extending high-capacity transit between the Expo Center and the northern transit terminus.

Regarding the sharing of high-capacity transit O&M costs, this analysis assumes two alternative cost sharing formulae that proportion the local match required from each transit district based on the relative length of the alignment associated with the district: (i) using the Jantzen Beach station as the dividing point, and (ii) using the state line as the dividing point. During the preparation of the FEIS, C-TRAN and TriMet will negotiate a cost allocation formula, which will be incorporated in an intergovernmental/interlocal agreement and approved by the governing boards of both districts.

Transit O&M Costs

Given the policy framework described above, year 2030 transit O&M costs associated with the terminus options were estimated based on the detailed networks and cost estimating methodology described in the CRC Transit Technical Report.[22] Operations and maintenance costs are based on the service scenarios assumed for this analysis.

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[21] Marginal cost is the added cost of the build alternatives compared to the No-Build alternative.

[22] CRC Transit Technical Report, 2007.

As shown in Exhibit 4.5-1, the transit O&M costs (year 2030) associated with the full-length transit terminus options for Alternatives 2 and 3, are $3.51 to $5.31 million (2007 dollars) higher than for the No-Build Alternative. The transit O&M costs for Alternative 3 are $0.90 to $1.80 million (2007 dollars) less than those for Alternative 2. The transit O&M costs associated with the full-length transit terminus options with Alternatives 4 and 5 are substantially higher than those associated with Alternatives 2 and 3 due to the enhanced C-TRAN network incorporated in Alternatives 4 and 5.

Exhibit 4.5-1
Year 2030 Transit O&M Costs by Alternative and Full-Length Transit Terminus[a]

	No-Build	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Terminus	N/A	Kiggins Bowl	Lincoln	Kiggins Bowl	Lincoln	Kiggins Bowl	Lincoln	Kiggins Bowl	Lincoln
Corridor LRT[b]	$7.30	$7.30	$7.30	$11.08	$10.87	(f)	$7.30	(f)	$11.05
Corridor BRT	$0.00	$4.24	$4.29	$0.00	$0.00	(f)	$6.58	(f)	$0.00
Total Corridor HCT	$7.30	$11.54	$11.59	$11.08	$10.87	(f)	$13.88	(f)	$11.05
TriMet Corridor Bus[c]	$33.22	$33.08	$33.08	$33.08	$33.08	(f)	$42.85	(f)	$41.95
C-TRAN Corridor Bus[d]	$29.25	$30.30	$30.41	$29.86	$29.33	(f)	$57.65	(f)	$52.45
Total Corridor Bus	$62.47	$63.38	$63.48	$62.94	$62.41	(f)	$100.50	(f)	$94.41
Marginal Total HCT O&M cost[e]	N/A	$4.24	$4.29	$3.78	$3.57	(f)	$6.58	(f)	$3.75
Marginal Total Corridor Bus O&M cost[f]	N/A	$0.91	$1.01	$0.47	-$0.06	(f)	$38.03	(f)	$31.94
Total Marginal O&M Cost[e]	N/A	$5.15	$5.31	$4.25	$3.51	(f)	$44.61	(f)	$35.69

Source: CRC Transit Technical Report, 2007.

[a] Costs are annual 2030 transit O&M costs and are stated in millions of 2007 dollars rounded to nearest ten thousand.

[b] Corridor O&M costs include light rail operations on the existing Interstate MAX line between downtown Portland and the Expo Center, plus any applicable extension.

[c] TriMet Corridor bus O&M costs are based on operations within a north/northeast Portland sub-district serving the Interstate MAX line.

[d] C-TRAN Corridor bus O&M costs include all fixed route bus service and express service in the C-TRAN system, excluding any HCT O&M costs.

[e] Added costs compared to the No Build alternative.

[f] O&M costs for Alternatives 4 and 5 paired with the Kiggins Bowl transit terminus were not modeled; these O&M costs would not be materially higher than those shown for the Lincoln terminus option.

Exhibit 4.5-2 shows the 2030 transit O&M costs associated with the MOS terminus options. For the MOS terminus options, the transit O&M cost associated with Alternative 3 is $2.2 to $2.3 million (2007 dollars) less than those associated with Alternative 2. The transit O&M cost associated with the Mill Plain District MOS terminus option is slightly lower than those associated with the Clark College MOS option.

Exhibit 4.5-2

Year 2030 Transit O&M Costs by Alternative and Minimum Operable Segment Terminus Options[a]

	No Build	Alternative 2		Alternative 3	
Terminus	**N/A**	**Mill Plain**	**Clark College**	**Mill Plain**	**Clark College**
Corridor LRT[b]	$7.30	$7.30	$7.30	$9.60	$10.34
Corridor BRT	$0.00	$4.41	$4.42	$0.00	$0.00
Total Corridor HCT	$7.30	$11.71	$11.72	$9.60	$10.34
TriMet Corridor Bus[c]	$33.22	$33.08	$33.08	$33.08	$33.08
C-TRAN Corridor Bus[d]	$29.25	$30.09	$30.13	$29.92	$29.39
Total Corridor Bus	$62.47	$63.16	$63.20	$62.99	$62.39
Total Marginal HCT O&M Cost[e]	N/A	$4.41	$4.42	$2.30	$3.04
Total Marginal Corridor Bus O&M Cost[e]	N/A	$0.69	$0.73	$0.52	-$0.08
Total Marginal O&M Cost[e]	N/A	$5.10	$5.15	$2.82	$2.96

Source: CRC Transit Technical Report.

a Costs are annual 2030 O&M costs and are stated in millions of 2007 dollars rounded to nearest ten thousand.

b Corridor O&M costs include light rail operations on the existing Interstate MAX line between downtown Portland and the Expo Center, plus any applicable extension.

c TriMet Corridor bus O&M costs are based on operations within a north/northeast Portland sub-district serving the Interstate MAX line.

d C-TRAN Corridor bus O&M costs include all fixed route bus service and express service in the C-TRAN system, excluding any HCT O&M costs.

e Marginal costs compared to the No Build Alternative.

Transit Operations and Maintenance Finance Plan Scenarios

While C-TRAN's share of CRC-related O&M costs may be funded with a combination of revenue sources, the base assumptions is that a C-TRAN district-wide sales and use tax that would be used to provide the revenue needed to cover O&M shortfalls.

The transit O&M finance scenarios presented in the following section address the additional costs of the build alternatives compared to the No-Build alternative. C-TRAN is developing a 20-year improvement plan for its district that may require supplemental revenues independent of the CRC project. Future efforts would integrate the CRC project financing requirements with those of the 20-year plan, once the 20-year plan is settled. The current TriMet 20-year plan incorporates CRC O&M costs.

Exhibit 4.5-3 shows the transit O&M finance plan scenarios resulting from the policy assumptions described above for each alternative and full-length transit terminus.

Exhibit 4.5-3
Transit O&M Finance Plan Scenarios by Alternative and Full-Length Transit Terminus[a]

	Alternative 2		Alternative 3		Alternative 4		Alternative 5	
Terminus	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**	**Kiggins Bowl**	**Lincoln**
C-TRAN								
C-TRAN share of annual marginal HCT O&M costs[b]	$3.2-$3.8	$3.1-$3.8	$2.9-$3.4	$2.5-$3.1	(d)	$4.7-$5.8	(d)	$2.7-$3.3
C-TRAN annual marginal bus O&M cost	$1.1	$1.2	$0.6	$0.1	(d)	$28.4	(d)	$23.2
Total C-TRAN O&M Cost	$4.3-$4.9	$4.3-$5.0	$3.5-$4.0	$2.6-$3.2	(d)	$33.1-$34.2	(d)	$25.9-$26.5
Required C-TRAN Sales and Use Tax Rate	0.08%-0.09%	0.08%-0.09%	0.06%-0.07%	0.05%-0.06%	(d)	0.61%-0.63%	(d)	0.48%-0.49%
TriMet								
TriMet share of annual marginal HCT O&M costs[b]	$0.4-$1.0	$0.5-$1.2	$0.4-$0.9	$0.4-$1.0	(d)	$0.8-$1.9	(d)	$0.5-$1.1
TriMet annual marginal bus O&M cost	-$0.1	-$0.1	-$0.1	-$0.1	(d)	$9.6	(d)	$8.7
Total TriMet O&M Cost	$0.3-$0.9	$0.4-$1.1	$0.3-$0.8	$0.3-$0.9	(d)	$10.4-$11.5	(d)	$9.3-$9.8

a Costs are for 2030 O&M costs and are stated in millions of 2007 dollars rounded to nearest hundred thousand.

b Marginal O&M costs represent the difference between the O&M cost for the applicable alternative and the No Build. The range shown reflects the alternative cost sharing formula between C-TRAN and TriMet.

c Assumes that C-TRAN's total marginal cost would be paid by increase to district-wide sales and use tax. If sub-district tax undertaken, the required tax rate increase would be proportionately higher.

d O&M costs for Alternatives 4 and 5 paired with the Kiggins Bowl transit terminus were not modeled; the C-TRAN and TriMet shares of O&M Cost would not be materially higher than those shown for the Lincoln terminus option.

As shown, the year 2030 transit O&M costs (in 2007 dollars) for Alternative 2 allocable to C-TRAN range between $4.3 and $5.0 million. These costs could be met by increasing the district wide sales and use tax rate by less than 1/10th of 1 percent. The year 2030 marginal transit O&M costs of Alternative 3 allocable to C-TRAN are slightly lower than for Alternative 2. For Alternatives 2 and 3, the year 2030 transit O&M costs allocable to TriMet range between $0.3 and $1.1 million, which TriMet can meet with existing resources. The year 2030 O&M costs of Alternatives 4 and 5 allocable to C-TRAN range between $25.9 and $34.2 million. This would necessitate a sales and use tax rate increase of 0.48 percent to 0.63 percent. Additional O&M funding would also be required by TriMet.

Exhibit 4.5-4 shows the transit O&M finance plan scenarios for the transit MOS terminus options. The 2030 transit O&M costs allocable to C-TRAN and the associated sales and use tax rate are slightly lower for the MOS options than those shown for Alternatives 2 and 3 in Exhibit 4.5-3. While the 2030 transit O&M costs allocable to TriMet are higher than those shown for Alternatives 2 and 3, they remain within TriMet's ability to meet with existing revenues.

Exhibit 4.5-4
Transit O&M Finance Plan Scenarios by Alternative and MOS Terminus Options [a]

	Alternative 2		Alternative 3	
Terminus	**Mill Plain**	**Clark College**	**Mill Plain**	**Clark College**
C-TRAN				
C-TRAN share of annual marginal HCT O&M cost[b]	$2.3-$3.5	$2.9-$3.7	$1.2-$1.8	$2.0-$2.6
C-TRAN annual marginal bus O&M cost	$0.8	$0.9	$0.7	$0.1
Total C-TRAN O&M Cost	$3.1-$4.3	$3.8-$4.6	$1.9-$2.5	$2.1-$2.7
Required C-TRAN Sales and Use Tax Rate[c]	0.06%-0.06%	0.07%-0.09%	0.03%-0.05%	0.04%-0.05%
TriMet				
TriMet share of annual marginal HCT O&M cost[b]	$0.9-$2.1	$0.7-$1.5	$0.5-$1.1	$0.5-$1.1
TriMet annul marginal bus O&M cost	-$0.1	-$0.1	-$0.1	-$0.1
Total TriMet O&M Cost	$0.8-$2.0	$0.6-$1.4	$0.4-$1.0	$0.4-$1.0

[a] Costs are for 2030 O&M costs and are stated in millions of 2007 dollars rounded to nearest hundred thousand.

[b] Marginal O&M costs represent the difference between the O&M cost for the applicable alternative and the No-Build. The range shown reflects the alternative cost sharing formula between C-TRAN and TriMet. Low end of C-TRAN share and High end of TriMet share assumes state line as cost dividing point; High end of C-TRAN share and Low end of TriMet share assumes Hayden Is. station as dividing point.

[c] Assumes that C-TRAN's total marginal cost would be paid by increase to district-wide sales and use tax. If sub-district tax undertaken, the required tax rate increase would be proportionately higher.

4.6 Implementation Issues

Implementation of the CRC project, including its financial plan, would require a wide range of public and governmental activities, agreements, and approvals. These include the following:

- Following publication of the DEIS, the governing bodies of the participating governments must approve a locally preferred alternative to advance to the Final Environmental Impact Statement (FEIS) stage.
- An initial New Starts rating package (including a preliminary finance plan and cost effectiveness evaluation of the locally preferred alternative) and an application to enter Preliminary Engineering must be submitted to and approved by FTA.
- WSDOT, ODOT, C-TRAN, TriMet, and possibly the Cities of Vancouver and Portland, must prepare agreements on roles and responsibilities for project development, construction, and capital funding that address such issues as project management and decision-making, capital cost sharing, how potential cost-overruns are managed, and contracting procedures.

- Agreements between C-TRAN and TriMet must be prepared that addresses roles and responsibilities for operation and maintenance of the high-capacity transit extension and related bus service, including such issues as fare reciprocity, service and transfer policy, and cost and revenue sharing.
- If new state funding sources are required in Washington and/or Oregon, legislative approval of a funding bill would be required by the applicable legislature(s).
- If federal discretionary highway funds are included in the final finance plan, the funds would either have to be incorporated in one or more bills approved by Congress; and/or a discretionary grant, or combination of grants, must be approved administratively by FHWA and/or FTA.
- If required, C-TRAN must prepare and secure voter approval of an HCT system and finance plan required under Washington's HCT Act, including any associated revenue sources required by the transit capital plan and operations and maintenance finance plan.
- To secure the Oregon transit contribution, the TriMet Board must approve the project.
- If Transportation Benefit District funds are employed in the final plan, the City of Vancouver and, possibly, Clark County must establish the district, and, if necessary, seek voter approval of the associated funding.
- WSDOT must formally allocate the needed amount of toll credits to the project.
- WSDOT, ODOT, C-TRAN, TriMet, and potentially other entities, must enter into binding commitments to provide their respective funding shares to the project.
- A final environmental impact statement (FEIS) must be prepared and record of decision (ROD) issued.
- The proposed action must be incorporated into the fiscally constrained regional transportation plans for Metro and RTC, and air quality conformity will have to be demonstrated.
- Subsequent to the FEIS, an updated New Starts rating package must be submitted and FTA rating obtained, and a Final Design application submitted to and approved by FTA.
- If tolling is included in the locally preferred alternative, a toll agreement between ODOT, WSDOT, and FHWA must be prepared, and the toll rates must be set by the transportation commission of each state.
- A finance plan must be submitted to FHWA in compliance with its requirements for Major Projects.
- To obtain the federal discretionary New Starts grant, the project must receive a sufficient New Starts rating; FTA must approve and, after Congressional review, execute a full funding grant agreement.

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CHAPTER 5
Draft Section 4(f) Evaluation

Columbia River CROSSING

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CHAPTER 5

Draft Section 4(f) Evaluation

This chapter provides analysis and information to comply with Section 4(f) of the Department of Transportation Act (49 USC 303).

CHAPTER CONTENTS

5.1 Introduction

The Section 4(f) statute and related U.S. Department of Transportation policy require the U.S. DOT to avoid any *use* of Section 4(f) property (which includes any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance as determined by the federal, state, or local officials having jurisdiction, or any land from an historic site of national, state, or local significance as determined by such officials) unless there is no feasible and prudent alternative to using the land, or unless the impact will be *de minimis* (described on the following page).

A Section 4(f) "*use*" is defined and addressed in the FHWA/FTA Regulations at 23 CFR 774.17. A "*use*" of 4(f) property occurs when:

- Land is **permanently incorporated** into a transportation facility,
- There is a **temporary occupancy** of land that is adverse in terms of the Section 4(f) statute's preservationist purposes (23 CFR 774.13(d)), or
- There is a **constructive use** of land as determined by criteria in 23 CFR 774.15.

Land will be considered permanently incorporated into a transportation project when it has been purchased as right-of-way or when sufficient property interests have been otherwise acquired for the purpose of project implementation. For example, a "permanent easement" that is required for the purpose of project construction or that grants a future right of access onto 4(f) property, such as for the purpose of routine maintenance by the transportation agency, would be considered a permanent incorporation of land into a transportation facility.

The impact of *use* of a Section 4(f) resource may be influenced by multiple factors including, but not limited to:

- The size of the *use* relative to the overall size of the resource; for example, acres of a park or linear feet of a recreational trail.
- The attributes and character of the portion of the resource that is impacted; for example, using an edge of a property rather than dividing it, or impacting non-contributing elements of a historic property versus displacing key features that contribute to its historic significance.
- The effect of removing a structure compared to altering the context surrounding a structure.

A *de minimis* impact on a parkland is defined as an impact that will not adversely affect the features, attributes or activities qualifying the property for protection under Section 4(f). A *de minimis* impact on a historic resource is defined as a determination of either "no adverse effect" or "no historic properties affected" (no effect) in compliance with Section 106 of the National Historic Preservation Act (23 CFR 774.17, *De minimis impact*).

The potential that the CRC alternatives could have a "constructive *use*" of 4(f) resources is also considered in this evaluation. The evaluation of potential constructive *use* analyzes how non-physical effects such as noise, visual impacts, or access restrictions could potentially diminish a resource, as defined in 23 CFR 774.15.

When there are no prudent and feasible alternatives that can avoid all Section 4(f) resources, which is the case for the I-5 CRC project, then the 4(f) analysis must determine which alternative results in the least overall harm to 4(f) resources. Assessing least harm must consider the relative significance of the impacts on the 4(f) resources, mitigation incorporated into the proposed project, and impacts on other important resources that would occur from avoiding or minimizing the impact to a 4(f) resource.

This Section 4(f) Evaluation describes the 4(f) resources, the *uses* of those resources by CRC alternatives, potential avoidance alternatives, potential measures to minimize harm, the net impacts of measures to minimize harm, a preliminary conclusion, and on-going coordination efforts to protect 4(f) resources.

5.1.1 CRC Project Background and Purpose and Need

The CRC project is a bridge, transit and highway improvement project for I-5 between Vancouver, Washington, and Portland, Oregon. It is co-sponsored by ODOT, WSDOT, TriMet, Metro, C-TRAN and RTC and is intended to address the congestion, mobility, and safety problems on I-5 between State Route (SR) 500 in Vancouver and Columbia Boulevard in Portland. The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) are the lead federal agencies, on behalf of USDOT, responsible for processing the project in accordance with federal laws, regulations, policies and guidelines. FTA and FHWA are jointly issuing this DEIS for the project in accordance with the National Environmental Policy Act (NEPA).

Chapter 1 of this DEIS describes the CRC project's background, purpose, and need. Chapter 2 describes the No-Build and build alternatives being considered for the CRC project. The build alternatives include a range of river crossings, highway improvements, and transit terminus and alignment options, as well as transportation system and demand management measures, tolling, and transit operations options. These are all described in Chapter 2 of this DEIS.

5.2 Description of Section 4(f) Resources

This section provides an overview of the 4(f) resources that could be *used* by the CRC project. These resources include parks and recreation facilities and historic properties (including known archaeological sites). Wildlife or waterfowl refuges are 4(f) resources, but there are no such refuges in the project area. The CRC Parks and Recreation and Historic Built Environment Technical Reports discuss additional recreational and historic resources in the CRC project study area that are not Section 4(f) properties. The CRC Archaeology Technical Report provides additional information regarding potential and known archaeological sites in the project area. These reports also provide detailed descriptions of the recreational resources, historic aboveground resources, and archaeological resources that are summarized in this 4(f) section.

5.2.1 Park and Recreation Resources

Exhibit 5.2-1 lists summary data for the 4(f) resources potentially affected by this project; all of these potentially affected park and recreation 4(f) resources are located in Washington. Exhibit 5.2-2 identifies the location of existing park and recreation resources within the project area that could potentially have a Section 4(f) *use*. Individual resources that would have an impact constituting a 4(f) *use* by CRC alternatives are described in Section 5.3.

5.2.2 Historic Resources

The Washington State Department of Archaeology and Historic Preservation (DAHP) and Oregon State Historic Preservation Office (SHPO) have concurred on the determinations of eligibility for potentially affected resources that are not already on the National Register of Historic Places (NRHP). They have reviewed the eligibility of all potentially affected historic resources (those that were considered eligible as well as those that were considered not eligible) and provided concurrence on eligibility. Concurrence from the DAHP and SHPO on the preliminary findings of effect is expected by late spring of 2008. It is possible that DAHP's and SHPO's concurrence could change the preliminary determination of effect, which would likely change the 4(f) determination. The preliminary determinations of effect are relatively conservative, and any changes resulting from final concurrence would be likely to result in reducing the number of resources that would be adversely affected.

The locations, photographs and preliminary determinations of 4(f) use for each historic resource are shown in Exhibits 5.2-5 through 5.2-8. Section 5.3 provides more detailed discussions of the impacts and 4(f) determinations.

Exhibit 5.2-3 identifies the location of eligible or listed historic properties that may be *used* by the CRC alternatives. Exhibit 5.2-4 lists summary data for these properties. See the Parks and Recreation Resources and the Historic and Archaeological Resources sections of Chapter 3 for maps of all Park and Historic resources in the project area.

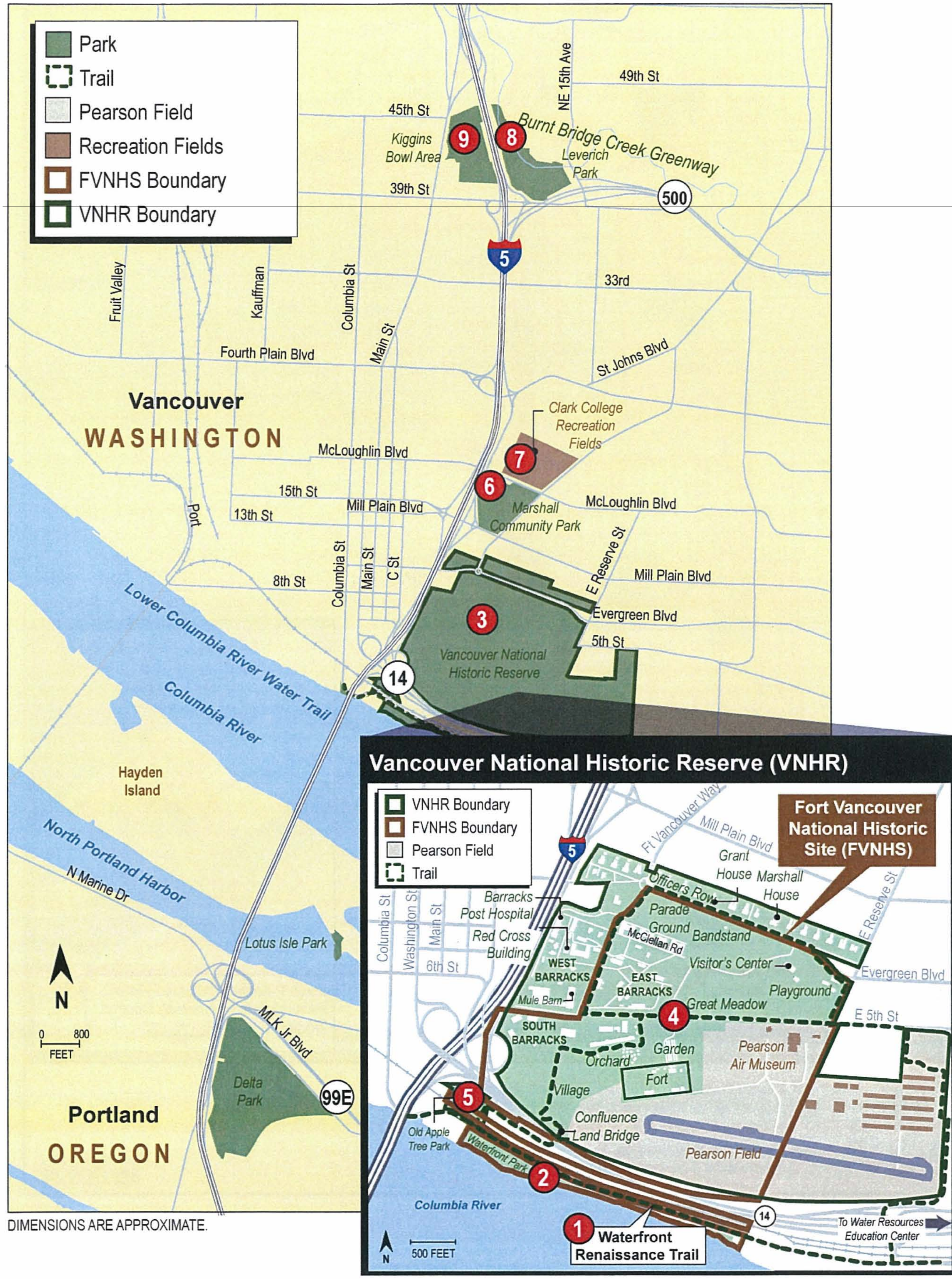
An area of potential effect (APE) for the CRC project has been delineated for regulatory purposes to help focus the investigation and data analysis for historic and archaeological resources. Within the APE for historic resources, approximately 218 historic resources have been identified that are either listed on the NRHP or have been determined to be NRHP-eligible. DAHP and SHPO have concurred with the determinations of eligibility for those resources that would be impacted by the project alternatives. All eligible and listed historic properties are subject to Section 4(f) provisions. DAHP and SHPO are in the process of reviewing the preliminary findings of effect, with concurrence expected by late spring of 2008.

Note that because this analysis is based on conceptual designs of the CRC alternatives, the precise impacts are likely to change as the design process advances. The Final Section 4(f) Evaluation will be updated to reflect any refinements to design and impacts.

Exhibit 5.2-1
Summary Information About 4(f) Park and Recreation Resources Potentially Used by the Project

	Name	Facility Type	Location	Ownership and Management	Site Features and Characteristics
1	Waterfront Renaissance Trail	Multi-Use Trail	115 Columbia Way Vancouver, WA	City of Vancouver/ National Park Service	4-mile long, multi-use trail along Vancouver waterfront; connects to Ft. Vancouver and Old Apple Tree Park via the Confluence Land Bridge
2	Waterfront Park	Regional Park	115 Columbia Way Vancouver, WA	National Park Service	5 acres; passive recreation and viewing, including Captain Vancouver Monument and Ilchee Statue, and starting point of the Waterfront Renaissance Trail
3	Vancouver National Historic Reserve (VNHR)	Historic Reserve including recreational facilities	612 E Reserve Vancouver, WA	National Park Service, Vancouver Historic Reserve Trust, US Army, City of Vancouver	366 acres; historic interpretive sites and replica structures, multi-use trails, picnic tables, event and recreation fields, reservable picnic shelter, Pearson Field, and Water Resources Education Center
4	Fort Vancouver National Historic Site (FVNHS)	National Historic Site	612 E Reserve Vancouver, WA	National Park Service	209 acres (included largely within the Vancouver National Historic Reserve); historic interpretive sites and replica structures, multi-use trails, picnic tables, event and recreation fields and reservable picnic shelter
5	Old Apple Tree Park	Community Park	112 Columbia Way Vancouver, WA	City of Vancouver	1.3 acres; passive recreation and viewing, and site of possibly the oldest apple tree in the Northwest (Heritage Apple Tree)
6	Marshall Community Park	Community Center and Public Swimming Pool	1015 E McLoughlin Vancouver, WA	City of Vancouver	22 acres; community center, play equipment, community gardens, loop trail, picnic tables, horseshoes, and ball fields
7	Clark College Recreation Fields	Community Park	1500 E Mill Plain Vancouver, WA	Clark College	14 acres; sports fields/courts, benches, and parking
8	Leverich Park	Regional Park	39th and M Sts. Vancouver, WA	City of Vancouver	30 acres; softball field, picnic tables, paved walkways, reservable picnic shelter, restroom, BBQ stands, and horseshoes pits
9	Kiggins Bowl	Sports Venue	800 E 40th St. Vancouver, WA	Vancouver School District	3 acres; natural area, and sports fields including Kiggins Field (artificial turf soccer/football field)

Exhibit 5.2-2
Map of 4(f) Parks and Recreation Resources Potentially Used by Build Alternatives



DIMENSIONS ARE APPROXIMATE.

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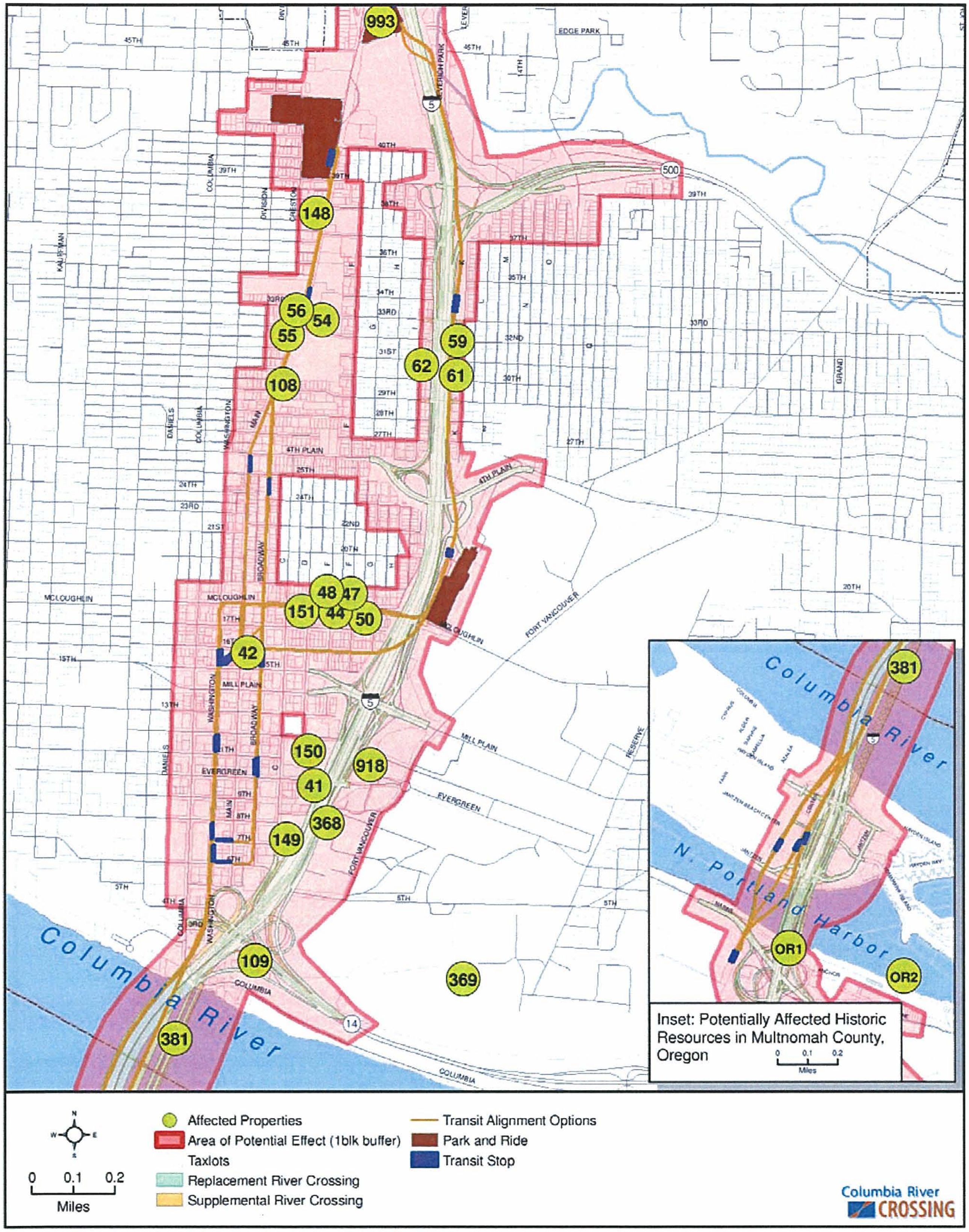
Exhibit 5.2-3
Map of 4(f) Historic Resources Potentially Used by Build Alternatives



Analysis by J. Koloszar; Analysis Date: 2-1-08; Plot Date 3-19-08; File Name: DAHP_Exhibits_RK130.mxd

Note: The numbers on this map are historic ID numbers and correspond to those used in Exhibit 5.2.4.

Exhibit 5.2-4
Summary of 4(f) Historic Resources Potentially Used by the Build Alternatives

Historic ID#	Tax Lot	Address	Building Name/Use	Construction Date	Eligible Historic Designation[a]
OR1	2N1E34C-02000	OR	Pier 99 Marina	1960	Eligible: NR
381	N/A	OR/WA	I-5 Bridge	1917/1958	NR
OR2	N/A	OR	Oregon Slough Levee	1916-60	Eligible: NR
993	12454005	Vancouver, 98663	Kiggins Bowl Park	dedicated 1933	Eligible: NR,
149	38820000	318 E 7th St	Normandy Apartments	c. 1930	Eligible: NR,
41	39214000	411 E Evergreen St	Kiggins House	1907	NR
150	39220000	400 E Evergreen St	Providence Academy	1873	NR
42	40250000	1511 Main	Carnegie Library (Historical Museum)	1909	NR
151	41240000	401 E McLoughlin	Residence/office	c. 1916	Eligible: NR
44	41290000	501 E McLoughlin	Residence	c. 1927	Eligible: NR
50	41341000	611 E McLoughlin	Residence	c. 1910	Eligible: NR
48	41630000	502 E McLoughlin	Residence	c. 1900	Eligible: NR
47	41640000	510 E McLoughlin	Residence	c. 1910	Eligible: NR
62	13670000	903 E 31st St	Residence	c. 1910	Eligible: NR
61	13725000	3000 K St	Residence	c. 1915	Eligible: NR
59	13460000	3110 K St	Residence	c. 1910	Eligible: NR
108	11265000	2901 Main	Residence	c. 1915	Eligible: NR
54	11295000	401 E 33rd St	First United Methodist	1948	Eligible: NR
55	7590000	3200 Main	Office	c. 1956	Eligible: NR
56	8810000	3212 Main	Office	c. 1960	Eligible: NR
148	10390000	300 E 37th St	Office	c. 1950	Eligible: NR
The following resources are within the Vancouver National Historic Reserve					
109	38279935A	Vancouver, 98661	Heritage Apple Tree	1827	NR, Ft. Vancouver
369	38279914	1115 E 5th St	Pearson Airfield	1904-45	NR, Ft. Vancouver
368	38279906A	Building 614	Barracks Hospital	1903	NR, Ft. Vancouver
918	38279942	Officers Row Historic District	Parking Lot next to 600-654 E. Evergreen	1849-1907	NR, Ft. Vancouver

[a] DAHP and SHPO have concurred with the determination of eligibility for the Eligible properties.

Note: The historic ID #s for resources in Washington are assigned by the WA DAHP database. The #s for Oregon resources were assigned by the CRC project.

Note: NR = National Register.

Exhibit 5.2-5
Map of Potentially Used 4(f) Historic Resources: Oregon

[a] DAHP and SHPO have concurred with the determination of eligibility for the Eligible properties. Note: The historic ID numbers for resources in Washington are assigned by the WA DAHP database. The numbers for Oregon resources were assigned by the CRC project.

Exhibit 5.2-6

Map of Potentially Used 4(f) Historic Resources: South Vancouver

[a] DAHP and SHPO have concurred with the determination of eligibility for the Eligible properties. Note: The historic ID numbers for resources in Washington are assigned by the WA DAHP database. The numbers for Oregon resources were assigned by the CRC project.

Exhibit 5.2-7

Map of Potentially Used 4(f) Historic Resources: McLoughlin Blvd

[a] DAHP and SHPO have concurred with the determination of eligibility for the Eligible properties. Note: The historic ID numbers for resources in Washington are assigned by the WA DAHP database. The numbers for Oregon resources were assigned by the CRC project.

Exhibit 5.2-8
Map of Potentially Used 4(f) Historic Resources: North Vancouver

[a] DAHP and SHPO have concurred with the determination of eligibility for the Eligible properties. Note: The historic ID numbers for resources in Washington are assigned by the WA DAHP database. The numbers for Oregon resources were assigned by the CRC project.

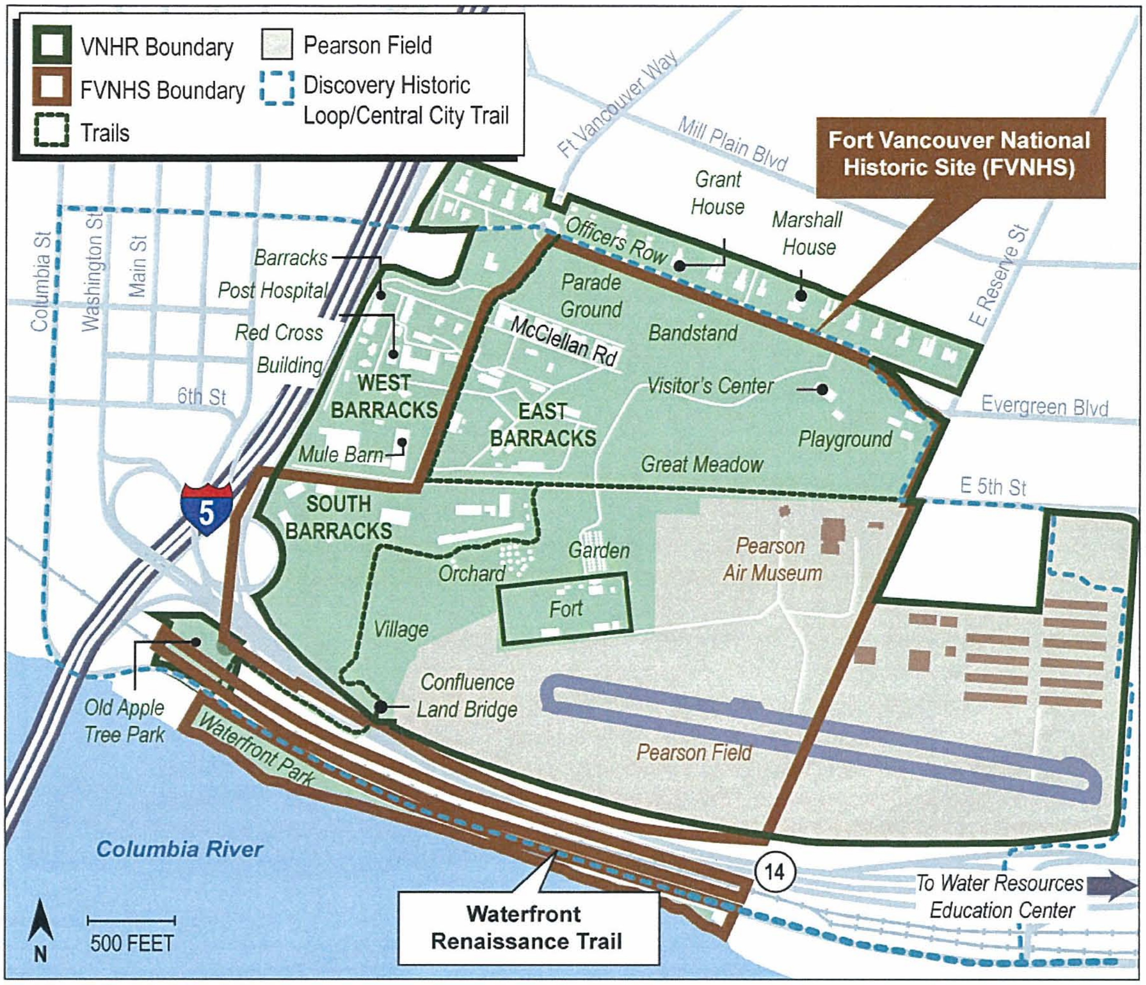
5.2.3 The Vancouver National Historic Reserve

The Vancouver National Historic Reserve (VNHR, or Reserve) is a nationally important public resource established to preserve and interpret historically significant and exceptionally complex overlapping areas associated with Native American, Hudson's Bay Company, U.S. military, and U.S. National Park Service (NPS) uses of the land that have occurred over time. Several of the individual historic resources and public recreation resources listed in Exhibit 5.2-4 are located within the boundaries of the VNHR.

The VNHR is a Section 4(f) resource encompassing 366 acres. It includes the Fort Vancouver National Historic Site (approximately 209 acres), Vancouver Barracks and Officers Row, Pearson Field, the Water Resources Education Center, a section of the Discovery Trail, and portions of the Columbia River waterfront. Approximately 252 acres in the westernmost portion of the VNHR lie within the VNHR Historic District. The VNHR is cooperatively managed by the NPS, the City of Vancouver, the U.S. Army, and the Vancouver National Historic Reserve Trust. Exhibit 5.2-9 shows the land ownership within the Reserve. Exhibits 5.2-10 and 5.2-11 show the area within and around the Reserve, including some of the buildings in the Reserve as well as the National Historic Site that is contained within the Reserve.

Exhibit 5.2-9
Vancouver National Historic Reserve (VNHR)
Land Ownership/Management

Exhibit 5.2-10
Fort Vancouver National Historic Reserve and National Historic Site



DIMENSIONS ARE APPROXIMATE.

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Exhibit 5.2-11
Vancouver National Historic Reserve (VNHR) Historic District

DIMENSIONS ARE APPROXIMATE.
Source: National Park Service, National Register Nomination.

The following recreational and historic built environment resources or facilities are associated with the VNHR in part or in whole, and are near to the proposed CRC project improvements:

- Fort Vancouver National Historic Site, including the Fort Vancouver Village ("Kanaka Village")
- Discovery Loop Trail
- Pearson Airfield
- Barracks Post Hospital
- NCO Duplexes south of Barracks Post Hospital
- West end of Officers Row
- Old Apple Tree Park (although not an historic resource, Old Apple Tree Park is a 4(f) public park, and contains the Heritage Apple Tree, which itself is a historic resource).

Archaeological Resources

Several archaeological sites, or archaeological contributing elements to the VNHR Historic District, are located in the archaeological Area of Potential Effect (APE). Several sites were likely impacted by previous construction of I-5 and SR 14. The archaeological APE also includes locations where a historic "military cemetery" may have been located. While graves were exhumed and re-interred at another cemetery during the late 1800s, previous archaeological research has indicated that not all of the graves were relocated. Unmarked graves were apparently excavated during construction of I-5, and other potential grave shafts have been identified in the general vicinity of the historic cemetery. The exact location of the cemetery is withheld from this report because of the sensitive nature of the resource. The portion of the CRC project that overlaps the historic site of the cemetery, based on historic mapping, has been extensively altered by past excavations and construction.

Only archaeological sites that are on or eligible for inclusion on the National Register and that warrant preservation in place are subject to Section 4(f) requirements. Extensive archaeological investigations have been conducted in the project area, particularly within the VNHR. Currently, no archaeological resources have been identified that can conclusively be determined to be significant for reasons other than the information they contain (which would require that they be preserved in place). The archaeological resources in the CRC project area are being further investigated within the context of the National Historic Preservation Act (NHPA), Section 4(f), and other related laws, regulations, and guidelines. The Final EIS and Final Section 4(f) Evaluation will update the relevant status of these resources.

Historic Resources

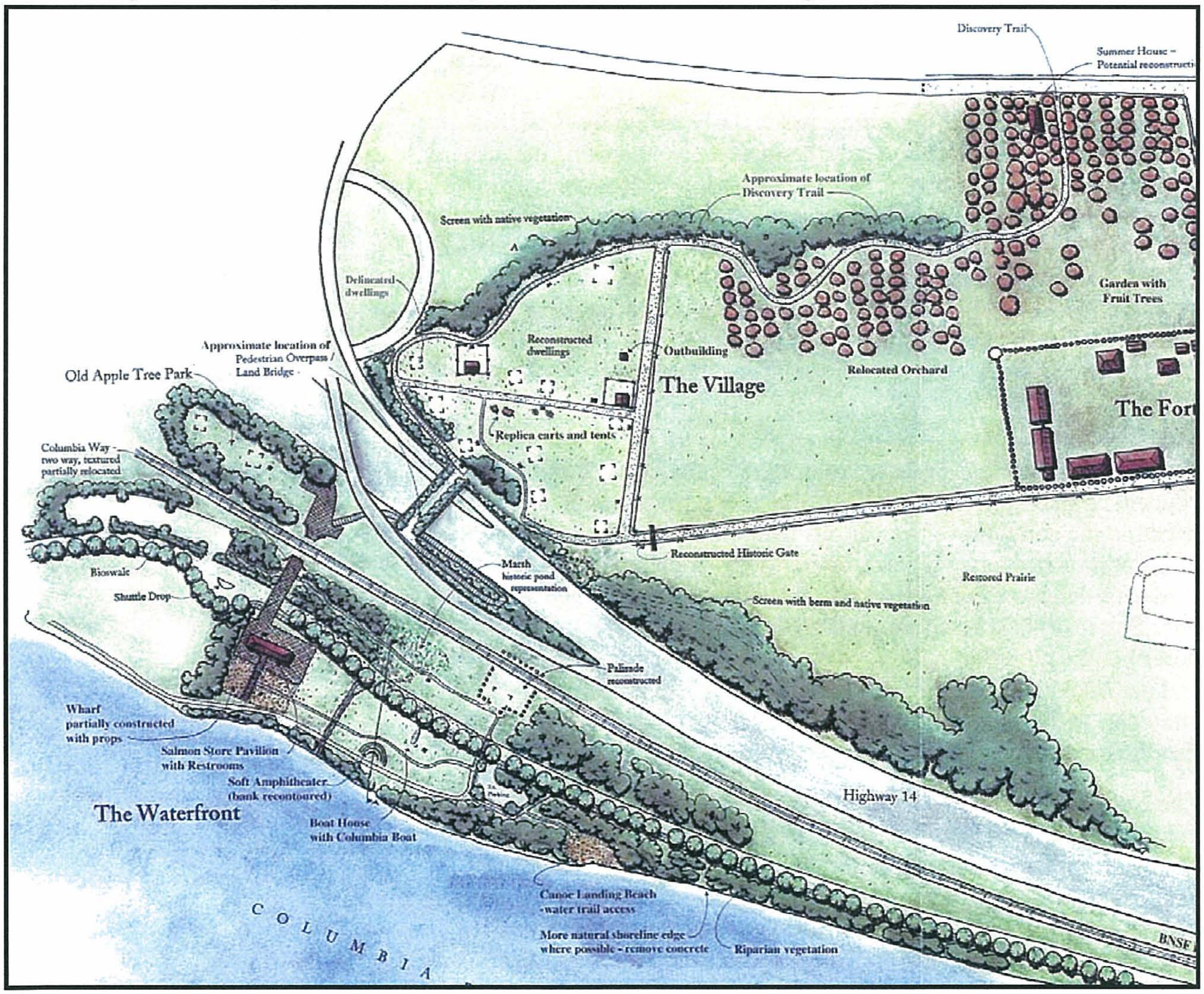
The VNHR Historic District listing promotes the District within the concept of a complex historic landscape that reflects continuous layers of construction and removal by various inhabitants of the area over time, and that provides a rich tapestry of buildings, structures, vegetation, and land uses that have overlapped and become interwoven. The National Park Service (NPS) has developed a Cultural Landscape Report that describes the contributing resources within the historic cultural landscape and provides planning guidelines for the area. The guidelines include strategies that recognize, protect, and celebrate the diverse influences that have created the cultural and recreational landscape.

The National Park Service's overall management objectives are to enhance visitors' experience and understanding of the District. Key treatment strategies that recognize and celebrate historic context in accordance with these objectives include rehabilitating existing buildings or landscape features and/or reconstructing buildings and features in association with preserving the landscape between features. The *Landscape Report*, the *VNHR Long-Range Plan* (NPS 2006), and the *Long-Range Interpretive Plan, VNHR with Special Emphasis on FVNHS and Vancouver Barracks* (NPS 2004) recommend reconstructing some buildings, historic roadway alignments, and interpretive features, and recommend leaving the Fort Vancouver Village ("Kanaka" Village) area in the southwest portion of the Reserve as open space, except for the proposed reconstruction of a limited number of Village buildings. The

CRC project team has reviewed these documents and coordinated with NPS staff to identify how the CRC alternatives could conflict with, or be compatible with, the VNHR's plans and priorities, as summarized below and in the following section on VNHR Plans.

Within the Fort Vancouver Village area, the NPS is currently reconstructing a Village dwelling in the western portion of the NPS property, near the U.S. Army Reserve property, and plans to construct additional Village buildings or building silhouettes to better enable the public to interpret the historic landscape (see Exhibit 5.2-12). Expansion plans include extensions to the existing trail system that would be tied to the historic Village and the new "land bridge" pedestrian overpass in the southwestern portion of the Reserve, near the I-5/SR 14 interchange.

Exhibit 5.2-12
NPS Development Concept Plan: Waterfront, Fort, and Fort Vancouver Village Site



Source: NPS 2003.

The Confluence Land Bridge was opened in December 2007, spanning SR 14 and connecting existing Fort facilities through extensions to the existing trail system. On the south side of SR 14, the Land Bridge connects to City of Vancouver property near Old Apple Tree Park, and to the park via a new trail from the bridge landing.

VNHR Plans

Some elements of the 10-Year Capital Project Priorities list in the VNHR's *Vancouver National Historic Reserve Long Range Plan* provide information relevant to the impacts of CRC on the VNHR. For example, Alternatives 2 and 3 would require acquisition of land near the Barracks Hospital, removal of a section of Anderson Road between the Hospital and I-5, and potentially, installation of a sound barrier between I-5 and Hospital. Implementing these changes would satisfy these priorities on the VNHR priority list, but would also reduce the width of open space buffer between the Reserve and I-5. One element in the VNHR's long range plan involves "Completion of landscaping including eliminating Anderson Street…" (2006:21). With Alternatives 2 or 3, this street would be removed by the CRC project.

Generally consistent with the long-range plan, the "Treatment" chapter of the VNHR's *Cultural Landscape Report* references measures that would "[s]electively remove non-historic roads in the West Barracks" and "[s]creen the interstate highway's visual and noise impacts on the West Barracks with a sound barrier wall and vegetative buffer…Native conifers such as Douglas-fir or incense cedar trees could provide a living screen between the structures and the barrier wall" (Jones & Jones 2005). Some of these measures could be carried out with the CRC build alternatives. Some may not be possible given the right-of-way acquisition that would occur in this location, narrowing the existing buffer between I-5 and the buildings located near the VNHR's western border.

The NPS has plans to build a new Visitor Center that would provide information on the entire Reserve, reconstruct buildings within the Fort and Fort Vancouver Village area directly to the west, reconstruct historic uses along the Columbia River Waterfront, and develop interpretive facilities. The NPS hopes to provide additional interpretive signage throughout the Reserve, landscaping improvements, and new parking facilities and circulation. In this same time frame, the City of Vancouver hopes to initiate West Barracks redevelopment, focusing on the rehabilitation and use of the Barracks Hospital and other buildings.

In a slightly longer time frame, the City of Vancouver, in partnership with the NPS, has plans to relocate the Vancouver Police Administration (currently located north of the Barracks Hospital) and restore that area for use by the Reserve. The City would also like to construct a Seventh Street pedestrian connection between downtown Vancouver and the Reserve that crosses over I-5. The NPS hopes to attain (through trade or other means) the Mule Barn located on Federal Highways land, and begin the rehabilitation and use of the East and South Barracks following the vacating of that land by the U.S. Army. The CRC project is not expected to preclude the NPS or the City from advancing any of these plans or priorities, and coordination will work to ensure that this remains the case. On-going coordination with NPS and City of Vancouver staff has included identifying potential opportunities for the CRC project to help the City and NPS realize some elements of these plans.

5.2.4 Traditional Cultural Properties

Traditional Cultural Properties (TCPs) can also be 4(f) resources. No TCPs have been previously identified in the project APE, and none have been identified through nearly two years of CRC-related consultations with tribes. However, on-going tribal consultation, including gathering oral histories, will further address the potential for TCPs in the project APE.

5.3 Potential Use of Section 4(f) Resources

5.3.1 How is this section organized?

This section describes the potential impacts from the CRC project, and how those impacts could constitute a *use* of Section 4(f) resources. The discussion addresses the 4(f) resources, based on analyses reported in the Parks and Recreation and the Historic Built Environment Technical Reports. It provides a brief evaluation of the No-Build Alternative, and then addresses potential *uses* of Section 4(f) resources from each of the build alternatives. Exhibits 5.3-1 and 5.3-2 provide comparative, synthesized summaries of the impacts associated with each CRC build alternative on 4(f) park and recreation resources, and 4(f) historic resources, respectively. Potential *de minimis* impacts and potential constructive *uses* are discussed at the end of this chapter.

Exhibit 5.3-1

Potential Use of Park and Recreation Section 4(f) Resources

		Alternatives 2 and 3 (A,B,C and D) (Effects from Highway)	Alternatives 4 and 5 (A, B, C and D) (Effects from Highway)	Alternatives 2, 3, 4 and 5 (Effects from Transit)			
Use Location	**Resources Affected**	**Replacement Crossing**	**Supplemental Crossing**	**Alignment A (Kiggins Bowl Terminus)**	**Alignment B (Lincoln Terminus)**	**Alignment C (Clark College MOS)**	**Alignment D (Mill Plain MOS)**
Waterfront Renaissance Trail[a]	Paved multimodal public path.	Crosses over 180 linear feet of multimodal path and likely requires relocation of path. Possible *de minimis* impact.	Crosses over 93 linear feet of multimodal path; path relocation unlikely to be required. Possible *de minimis* impact.	N/A	N/A	N/A	N/A
Waterfront Park[a]	Recreational park shoreline and public plaza/view areas.	Bridge spans about 0.23 acre of park shoreline and waterfront plaza/views. Potential bridge piers in park. Possible *de minimis* impact.	Bridge spans about 0.17 acre of park shoreline and waterfront plaza/views; potential bridge piers in park. Possible *de minimis* impact.	N/A	N/A	N/A	N/A
Vancouver National Historic Reserve	Cultural and recreational park landscape near I-5/ SR 14, strip adjacent to I-5 between E 5th St. and McClellan St, including portion of park, hospital and barracks buildings.	Acquires 1.76 to 2.70 acres of park land; possible impacts to Federal Lands Building and a storage garage owned by Army. No historic structures would be displaced. Potential for *use* to 0.54 acre of temporary construction easements.	0.31 acre of park land and buffer between VNHR and I-5. No building displacements. No historic structures would be displaced. Potential for up to 0.13 acre of temporary construction easements.	N/A	N/A	N/A	N/A
Fort Vancouver National Historic Site	Cultural and recreational park landscape near I-5/ SR 14, strip adjacent to I-5 between E 5th St. and McClellan St., including portion of park, hospital and barracks buildings.	1.50 acres of park land near I-5/SR 14 with the dual-loop design, and 0.80 acre with the left-loop design. Land is vacant but contains archaeological resources. Potential for up to 0.23 acre of temporary construction easements.	0.004 acre of park land near the I-5/SR 14 interchange. Land is vacant but contains archaeological resources.	N/A	N/A	N/A	N/A

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		Alternatives 2 and 3 (A,B,C and D) (Effects from Highway)	Alternatives 4 and 5 (A, B, C and D) (Effects from Highway)	Alternatives 2, 3, 4 and 5 (Effects from Transit)			
Use Location	**Resources Affected**	**Replacement Crossing**	**Supplemental Crossing**	**Alignment A (Kiggins Bowl Terminus)**	**Alignment B (Lincoln Terminus)**	**Alignment C (Clark College MOS)**	**Alignment D (Mill Plain MOS)**
Old Apple Tree Park	Portion of cultural and recreational viewing courtyard and passive recreation space.	0.27 acre of viewing courtyard and passive recreation space w/ dual-loop SR 14 interchange design; 0.027 acre w/ left-loop.	N/A	N/A	N/A	N/A	N/A
Marshall Community Park	Strip of landscaped passive recreation area adjacent to park ball field.	1.2-acre strip of landscaped passive recreation area adjacent to parking and fields. Could displace up to 3 horseshoe courts.	1.2-acre strip of landscaped passive recreation area adjacent to parking and fields. Could displace up to 3 horseshoe courts.	N/A	N/A	N/A	N/A
Clark College Recreation Fields	Strips of ball field, batting cage, park path, grass field.	0.07-acre strip of landscaped area adjacent to Clark College recreation fields.	N/A	1.24-acre strip with portions of ball field, batting cage, park path, grass field.	1.24-acre strip with portions of ball field, batting cage, park path, grass field.	1.24-acre strip with portions of ball field, batting cage, park path, grass field.	1.24-acre strip with portions of ball field, batting cage, park path, grass field.
Leverich Park	Passive recreational park border berms and landscaping. Park entrance road and parking area.	0.33 acre of park border, berms and landscaping. Airspace over park entrance road. Possible *de minimis* impact.	0.24 acre of park border, berms and landscaping. Airspace over park entrance road. Possible *de minimis* impact.	0.01 acre of park border and landscaping. Possible *de minimis* impact.	N/A	N/A	N/A
Kiggins Bowl	Recreational trail; landscaped area adjacent to sports venue.	N/A	N/A	Relocate 50 linear ft of trail; up to 0.35 acre landscaped area. Possible *de minimis* impact.	Relocate 50 linear ft of trails; impact to landscaping. Possible *de minimis* impact	Relocate 50 linear ft of trails; impact to landscaping. Possible *de minimis* impact.	Relocate 50 linear ft of trails; impact to landscaping. Possible *de minimis* impact.

[a] Waterfront Park and Waterfront Renaissance Trail would be impacted by the river crossing, which includes highway, transit, and bike/ped facilities.

Exhibit 5.3-2

Potential Use of Historic Section 4(f) Resources[a, b]

	Alternatives 2 and 3 (A, B, C and D) (Effects from Highway)	Alternatives 4 and 5 (A, B, C and D) (Effects from Highway)	Alternatives 2, 3, 4 and 5 (Effects from Transit)			
Resource Name/*Location*	**Replacement Crossing**	**Supplemental Crossing**	**Alignment A (Kiggins Bowl Terminus)**	**Alignment B (Lincoln Terminus)**	**Alignment C (Clark College MOS)**	**Alignment D (Mill Plain MOS)**
Pier 99, *OR*	Adverse (*Use*) (full displacement)	Adverse (*Use*) (full displacement)	N/A	N/A	N/A	N/A
1917 I-5 Bridge, *OR/WA*[c]	Adverse (*Use*) (full displacement)	Adverse (*Use*)	N/A	N/A	N/A	N/A
Oregon Slough Levee, *OR*	No Adverse Effect (*de minimis* impact)	No Adverse Effect (*de minimis* impact)	N/A	N/A	N/A	N/A
Heritage Apple Tree, *Vancouver, 98661*	Adverse (*Use*)	No Adverse Effect (No 4(f) *Use*)	N/A	N/A	N/A	N/A
Kiggins Bowl Park, *Vancouver*, *98663*	N/A	N/A	No Adverse Effect (*de minimis* impact)	No Adverse Effect (*de minimis* impact)	N/A	N/A
Potential Downtown Vancouver NRHP Historic District	Potential Proximity Effect (No 4(f) *Use*)	N/A	N/A	N/A	N/A	N/A
Normandy Apartments, *318 E 7th St*	No Adverse Effect (possible *de minimis*) + Potential Proximity Effect (No 4(f) *Use*)	N/A	N/A	N/A	N/A	N/A
Fort Apartments, *500 E 13th St*	Potential Proximity Effect (No 4(f) *Use*)	N/A	N/A	N/A	N/A	N/A
Kiggins House, *411 E Evergreen St*	Adverse (*Use*)[d]	N/A	N/A	N/A	N/A	N/A
Providence Academy, *400 E Evergreen St*	Adverse (*Use*) (0.27 acre)	N/A	N/A	N/A	N/A	N/A
Carnegie Library, *1511 Main St*	N/A	N/A	No Adverse Effect Potential Proximity Effect (No 4(f) *Use*)	N/A	No Adverse Effect Potential Proximity Effect (No 4(f) *Use*	N/A

	Alternatives 2 and 3 (A, B, C and D) (Effects from Highway)	Alternatives 4 and 5 (A, B, C and D) (Effects from Highway)	Alternatives 2, 3, 4 and 5 (Effects from Transit)			
Resource Name/*Location*	**Replacement Crossing**	**Supplemental Crossing**	**Alignment A (Kiggins Bowl Terminus)**	**Alignment B (Lincoln Terminus)**	**Alignment C (Clark College MOS)**	**Alignment D (Mill Plain MOS)**
Residence/office, *401 E McLoughlin*	N/A	N/A	Adverse (*Use*) (acquires 0.009 acre)	N/A	Adverse (*Use*) (acquires 0.009 acre)	N/A
Residence, *501 E McLoughlin*	N/A	N/A	No Adverse Effect (*de minimis* impact)	N/A	No Adverse Effect (*de minimis* impact)	N/A
Residence, *611 E McLoughlin*	N/A	N/A	Adverse (*Use*) (acquires 0.003 acre)	N/A	Adverse (*Use*) (acquires 0.003 acre)	N/A
Residence, *502 E McLoughlin*	N/A	N/A	No Adverse Effect (*de minimis* impact)	N/A	No Adverse Effect (*de minimis* impact)	N/A
Residence, *510 E McLoughlin*	N/A	N/A	No Adverse Effect (*de minimis* impact)	N/A	No Adverse Effect (*de minimis* impact)	N/A
Residence, *903 E 31st St*	N/A	N/A	Adverse (*Use*) (acquires 0.125 acre)	N/A	Adverse (*Use*) (acquires 0.125 acre)	N/A
Residence, *3000 K St*	No Adverse Effect (*de minimis* impact) (acquires 0.012 acre)	Adverse (*Use*) (acquires 0.034 acre)	N/A	N/A	N/A	N/A
Residence, *3110 K St*	N/A	Adverse (*Use*) (acquires 0.019 acre)	N/A	N/A	N/A	N/A
Residence/Office, *2901 Main St*	N/A	N/A	N/A	Adverse (*Use*) (acquires 0.010 acre)	N/A	N/A
First United Methodist, *401 E 33rd St*	N/A	N/A	N/A	No Adverse Effect (*de minimis* impact)	N/A	N/A
Office, *3200 Main St*	N/A	N/A	N/A	No Adverse Effect (*de minimis* impact)	N/A	N/A

	Alternatives 2 and 3 (A, B, C and D) (Effects from Highway)	Alternatives 4 and 5 (A, B, C and D) (Effects from Highway)	Alternatives 2, 3, 4 and 5 (Effects from Transit)			
Resource Name/*Location*	**Replacement Crossing**	**Supplemental Crossing**	**Alignment A (Kiggins Bowl Terminus)**	**Alignment B (Lincoln Terminus)**	**Alignment C (Clark College MOS)**	**Alignment D (Mill Plain MOS)**
Office, *3212 Main St*	N/A	N/A	N/A	Adverse (*Use*) (acquires 0.043 acre)	N/A	Adverse (*Use*) (acquires 0.043 acre)
Office, *300 E 37th St*	N/A	N/A	N/A	Adverse (*Use*) (acquires 0.095 acre)	N/A	N/A
VNHR NRHP District/Cultural Landscape *Vancouver*	Adverse (4(f) *Use)*[e]	Adverse (4(f) *Use)*[e]	N/A	N/A	N/A	N/A
Pearson Airfield, *1115 E 5th St*	Adverse (4(f) *Use)*[e]	Adverse (4(f) *Use)*[e]	N/A	N/A	N/A	N/A
Barracks Hospital, *Building 614*	Adverse (*Use*) (acquires 0.098 acre)[e]	Adverse (*Use*) (acquires 0.031 acre)[e]	N/A	N/A	N/A	N/A
Officers Row, *Parking Lot next to 600-654 E. Evergreen*	Adverse (4(f) *Use)*[e]	Adverse (4(f) *Use)*[e]	N/A	N/A	N/A	N/A

[a] The preliminary Section 106 findings of effect (Adverse (for Adverse Effect), No Adverse Effect, or Potential Proximity Effect) are shown in this table. The 4(f) use determination (Use, Constructive Use, No 4(f) Use, or de minimis impact) is shown in parentheses.

[b] The area of land that would be acquired, if any, from each resource, is indicated in the relevant cells. If the acquisition would fully displace the building, then "full displacement" is in that cell.

[c] Impacts to the 1917 bridge would be due to the work associated with the river crossing. The river crossing includes highway, transit and bike/ped facilities. However, all impacts to the bridge are shown in the Effects from Highway columns.

[d] The adverse effect determination and the Use, per 4(f) are based on the current location of the Kiggins House. However, as noted later in the text, the Kiggins House is scheduled to be moved from its current location by the Riverwest Development, a project that is completely independent of CRC.

[e] The impact to the individual contributing resources within the VNHR District (such as Pearson Airfield, Barracks Hospital and Officers Row) may be small or indirect, but because these resources are included within the VNHR District, they are part of that 4(f) resource. The overall effect on the VNHR is considered a 4(f) use, and therefore the 4(f) use determination also applies to any contributing resources that would be affected within the VNHR, regardless of the magnitude of the impact on that resource.

5.3.2 Potential 4(f) Uses by the No-Build Alternative

With the No-Build Alternative, there would be no CRC-related *uses* of park, recreational or historic resources subject to Section 4(f) provisions. Under the No-Build Alternative, the historic I-5 bridge would be retained but there would be no seismic retrofits to the structure. As such, the No-Build Alternative would likely have no direct effect on the historic bridge. However, the indirect effect of the No-Build alternative on the historic bridge would be that the bridge would remain vulnerable to severe damage or collapse in the event of a major seismic event.[1]

5.3.3 Potential 4(f) Uses by the Build Alternatives

This section is organized geographically from south to north in the project area, and discusses potential *uses* of Section 4(f) resources located in these four subareas:

- Resources in Portland
- The 1917 Interstate bridge
- Resources in Vancouver, south of the I-5/Mill Plain interchange
- Resources in Vancouver, north of the I-5/Mill Plain interchange

The following describes each resource, provides an aerial photo, and describes the potential 4(f) *use*. Note that the aerial photos are at different scales, as noted on each exhibit.

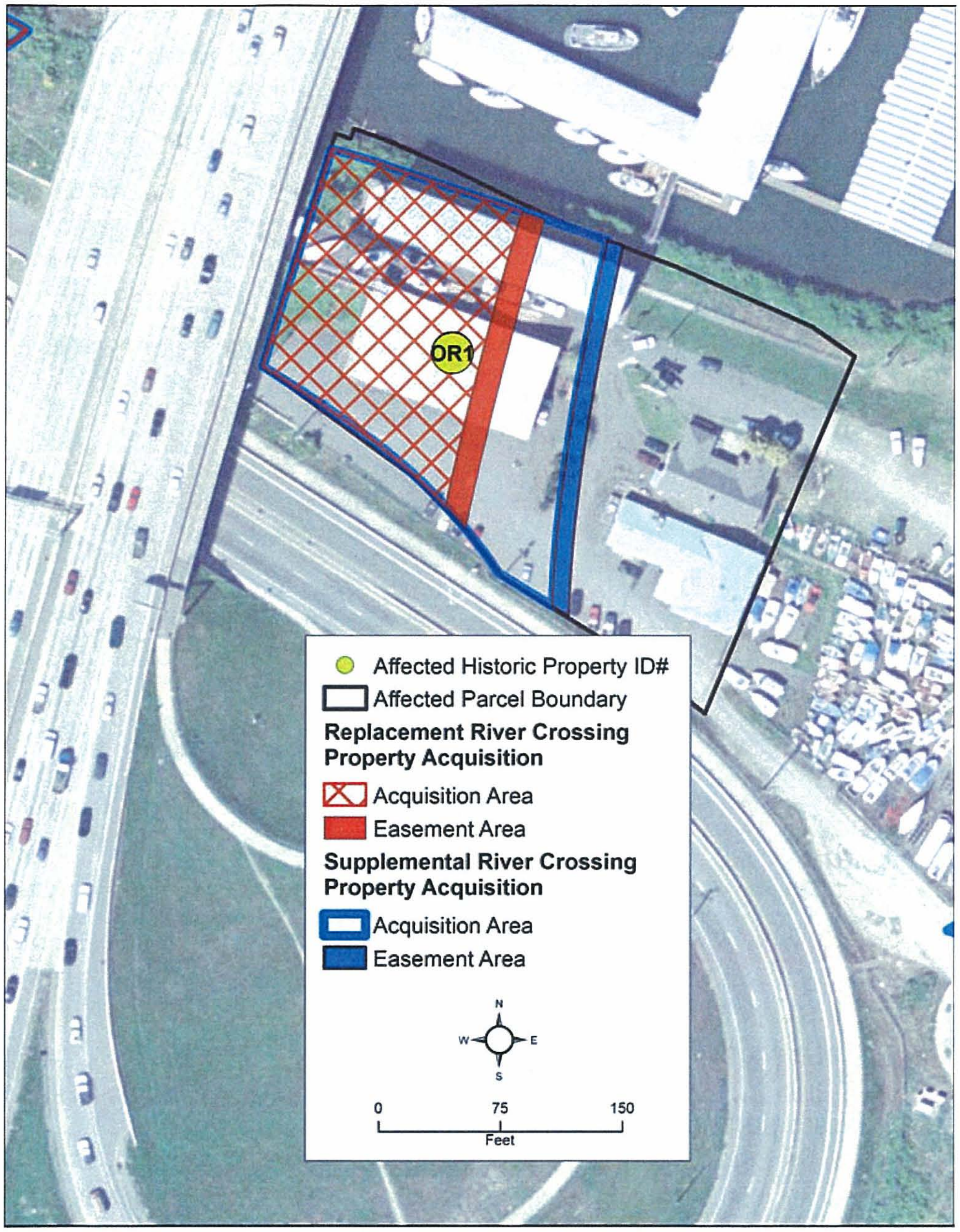
Impacts to Resources in Portland

There is one potential *use* of 4(f) resources located in Portland, south of the Columbia River.

Pier 99 – As illustrated in Exhibit 5.3-3, highway construction associated with all build alternatives would require the acquisition of the western half of the parcel that houses Pier 99, a boat store and marina. This acquisition would displace this mid-century, NRHP-eligible resource, which would constitute a Section 4(f) *use*. CRC construction would also require the acquisition of a non-contributing garage.

[1] Seismic Panel, 2006.

Exhibit 5.3-3
Pier 99



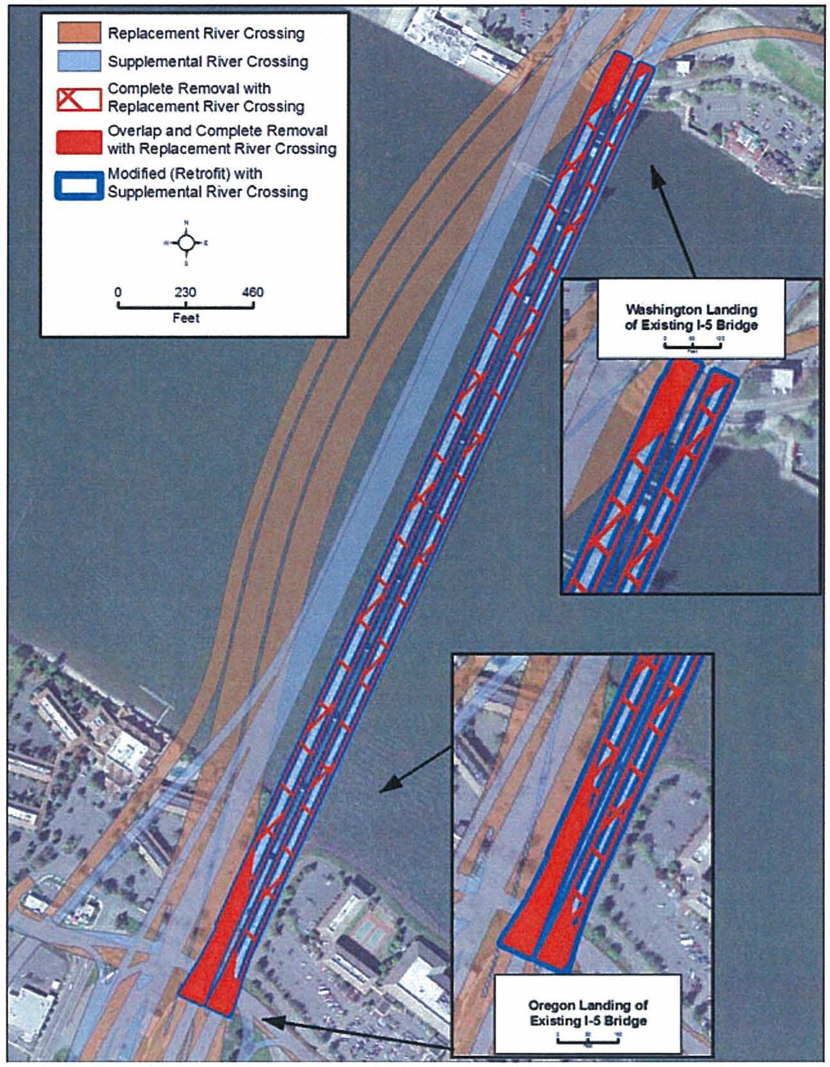
DIMENSIONS ARE APPROXIMATE.

Impacts to the 1917 Northbound I-5 Bridge

Impacts to the 1917 Interstate bridge are shown in Exhibit 5.3-4. With Alternatives 2 and 3 (the replacement crossing), the bridge would be removed, which would constitute a Section 4(f) *use*.

With Alternatives 4 and 5 (the supplemental crossing), the 1917 and parallel 1958 bridges would be retrofitted, and a modern bridge would be built just west of and parallel to these bridges. These retrofits to the 1917 bridge include modifications to both the substructure and superstructure and would be a 4(f) use.

Exhibit 5.3-4
4(f) Impacts – Northbound I-5 Bridge



DIMENSIONS ARE APPROXIMATE.

SUBSTRUCTURE MODIFICATIONS WITH ALTERNATIVES 4 AND 5

With Alternatives 4 and 5, the pier system would be retrofitted by constructing, for each intermediate bent pier, a supplemental pile group of six large (8-12 foot) diameter shafts, topped by a new pile cap at or slightly above water level. The existing piers would be connected to the new shafts and pile cap, providing additional seismic stability. Welded hoops would be placed at 6-inch intervals along the entire face of the existing pier; this would require drilling through the in-fill walls between the columns and running the hoops through the holes. The existing pier would be encased in a jacket of 6- to 12-inch thick concrete, or a steel plate sheathing.

The bridge decking would be modified. A bicycle/pedestrian pathway would be cantilevered from the existing 1917 bridge, extending from its east side.

SUPERSTRUCTURE MODIFICATIONS WITH ALTERNATIVES 4 AND 5

To an unspecified extent, the chords and bracing members would be replaced or retrofitted (which might include adding additional members) in each of the steel truss spans. While methods are available that could complement the webbing and lacing visible on the historic bridge, no riveting would be *used* in replacement or retrofitted members.

The existing vertical steel lift towers would be either replaced or substantially retrofitted in a manner similar to the changes described above for the truss spans. The height would remain approximately the same.

These retrofits would substantially alter the integrity of the bridge's design, material, and workmanship within the context of its significance primarily under National Register Criterion C. Criterion C relates to a resource that embodies the distinctive characteristics of a type, period or method of construction, or represents the work of a master.

Alternatives 4 and 5 would also result in a higher, wider, modern bridge next to the existing I-5 bridges, and the existing visual context would be substantially changed. The bridge type for the new bridge has not yet been determined. However, height restrictions associated with Pearson Airfield would not allow the new bridge to be a through truss design like the existing I-5 bridges.

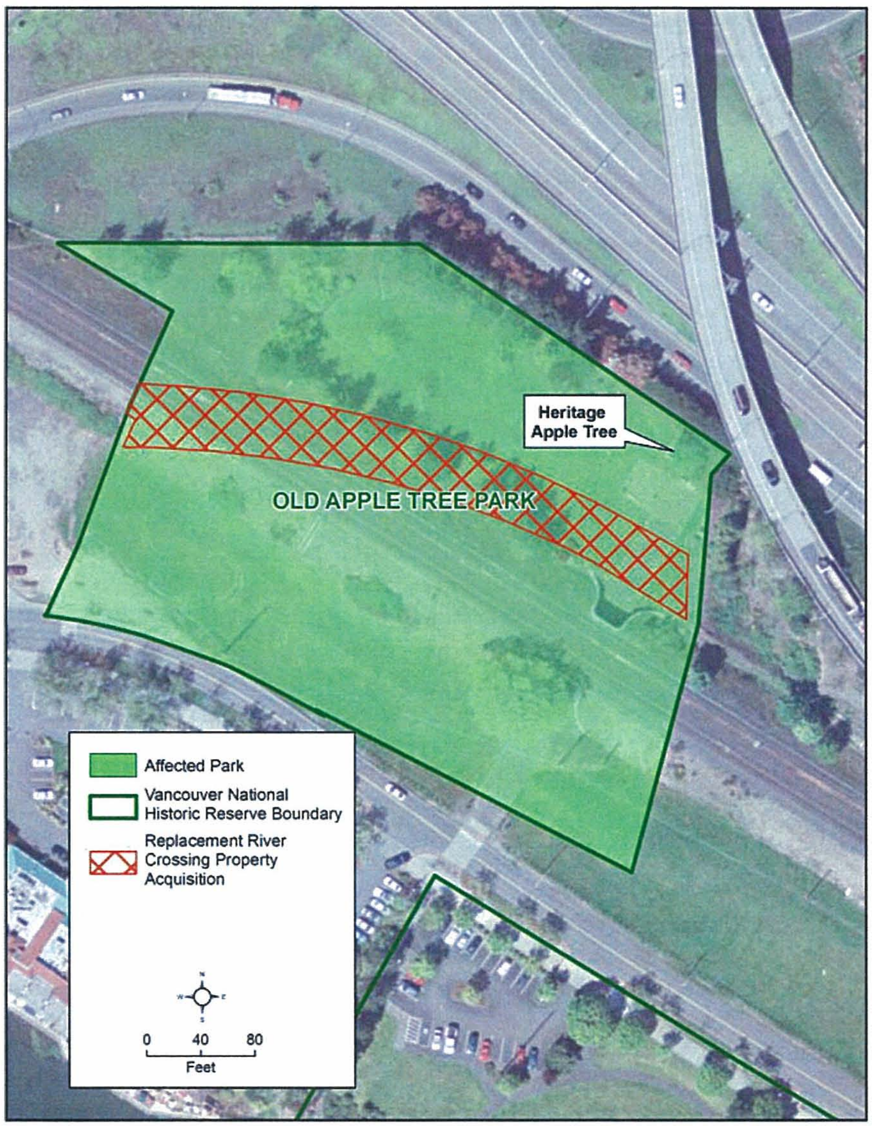
These changes would constitute a Section 4(f) *use*.

Impacts to Resources in Vancouver, South of the I-5/Mill Plain Interchange

This section describes potential *uses* of 4(f) resources located in Vancouver, south of the I-5/Mill Plain Boulevard interchange. This subarea includes the Vancouver National Historic Reserve.

Old Apple Tree Park and *Heritage Apple Tree* – the Heritage Apple Tree (a historic resource) is located within Old Apple Tree Park (a public park). Constructing Alternative 2 or 3 (the replacement crossing) with the dual-loop I-5/SR 14 interchange configuration would impact the park. The elevated ramps would cross over approximately 0.27 acre of the Old Apple Tree Park. The left-loop interchange configuration would not impact the park. These impacts are illustrated in Exhibit 5.3-5. The extent of actual displacement of Section 4(f) land would depend on whether or not ramp piers would be placed within the park. The dual-loop configuration, which would cross over portions of the park's viewing courtyard and passive recreation space on the south side of the resource, has the potential to require pier placement in the park. The ramps associated with the dual loop interchange would also cause increased shading on the Heritage Apple Tree. The dual-loop interchange configuration would constitute a Section 4(f) *use* of Old Apple Tree Park.

Exhibit 5.3-5
Old Apple Tree Park



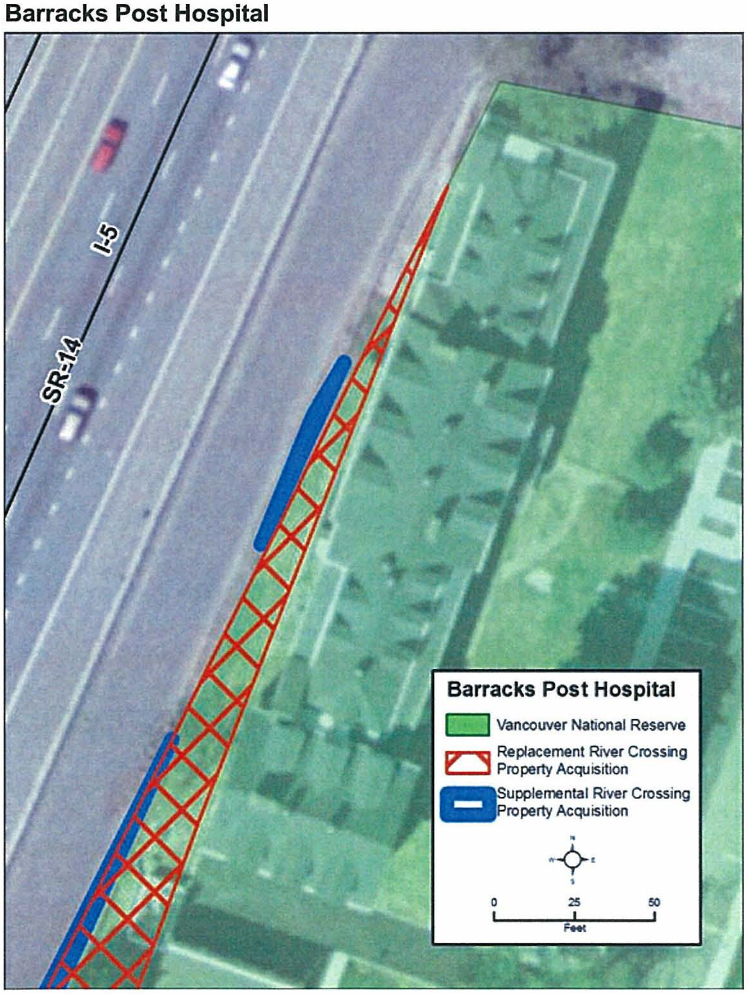
DIMENSIONS ARE APPROXIMATE.

Barracks Post Hospital – As illustrated in Exhibit 5.3-6, none of the alternatives would directly impact the Barracks Post Hospital building. However, the replacement crossing (Alternatives 2 and 3) would require acquisition of about 0.098 acre of VNHR land between I-5 and the hospital, largely displacing Anderson Road, and encroaching to within 14 to 16 feet of the hospital building.

The supplemental crossing (Alternatives 4 and 5) would require acquisition of less than 0.031 acre of VNHR land between I-5 and the hospital, largely displacing Anderson Road, and encroaching to within 14 to 30 feet of the hospital building.

As mentioned in Section 5.2.3, NPS has plans to remove Anderson Road and replace it with landscaping that would better reflect the historic context of the hospital, and/or to place sound barriers to reduce noise levels from I-5 traffic. This acquisition would be consistent with these plans, but would reduce the amount of area that could be *used* for landscaping. Although this property acquisition would not directly affect the Barracks Hospital or any other historic buildings, it would constitute a 4(f) *use* because the land that would be acquired is part of the VNHR and the VNHR NRHP District.

Exhibit 5.3-6
Barracks Post Hospital



DIMENSIONS ARE APPROXIMATE.

Fort Vancouver National Historic Site – With Alternatives 2 and 3, the dual-loop and left-loop SR 14 interchange options would require acquisition of approximately 1.50 acres and 0.80 acre, respectively, of land within the Fort Vancouver Village ("Kanaka Village") and South Barracks areas, including the Army property located north of the SR 14 interchange, adjoining I-5. While the dual-loop design would acquire more property, the left-loop design would be higher in the air and more visually intrusive on views from the VNHR. The area that would be acquired by either interchange option is currently vacant. The U.S. Army Reserve and NPS have made progress in the planned transfer of the military property to the NPS. Given the historical significance of these impacted areas, the NPS has developed plans that include incorporating the southern portion of the impacted areas into the Fort Vancouver Village interpretive trails, reconstruction, and park perimeter buffering. See Section 5.2.3 for more information regarding these plans. Up to 0.23 acre of temporary construction easements could also be required from the Site for these alternatives.

Alternatives 4 and 5 would require acquisition of approximately 0.004 acres in this area.

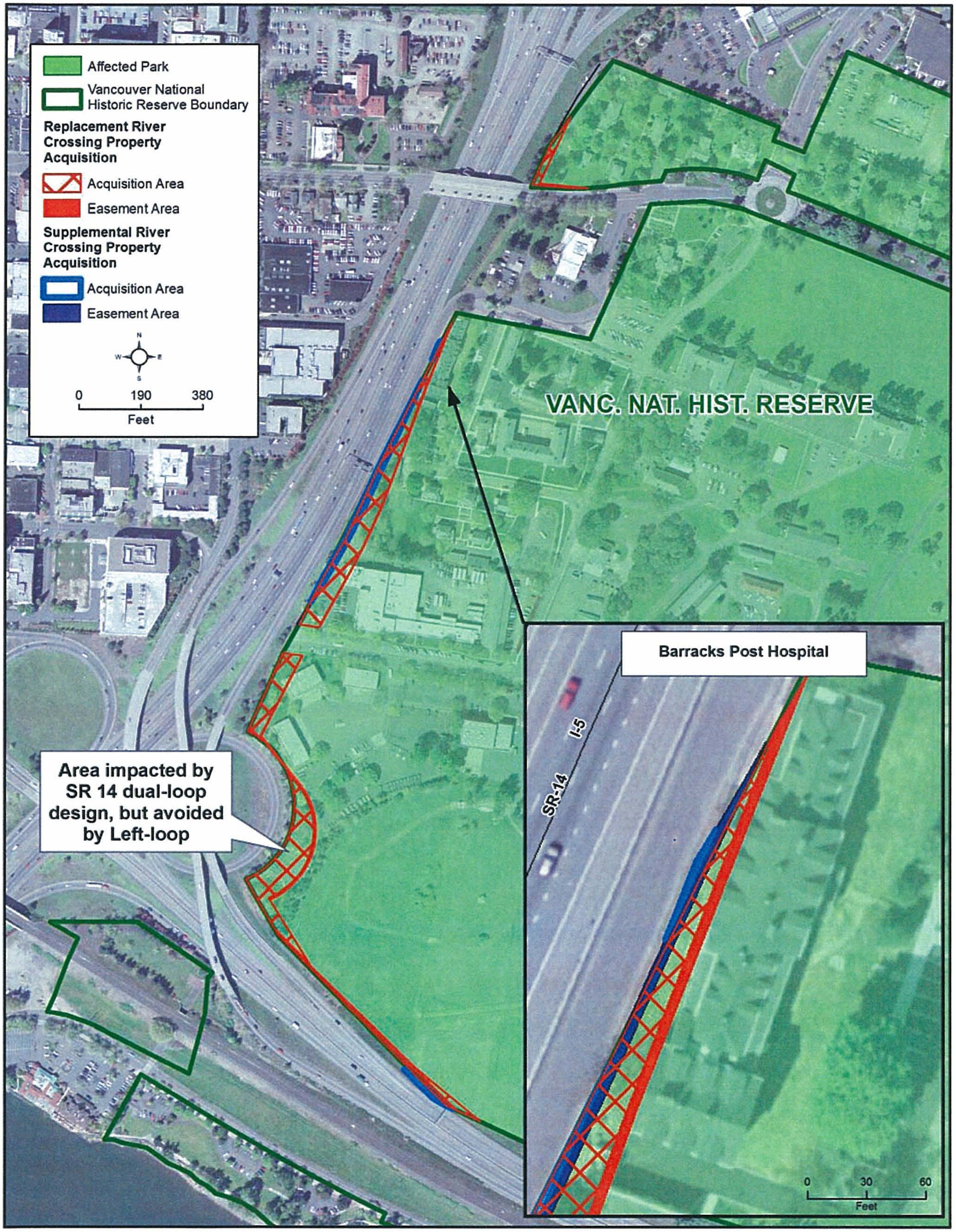
Vancouver National Historic Reserve – As illustrated in Exhibit 5.3-7, Alternatives 2 and 3 (the replacement crossing) would require acquisition of a total of 2.7 acres of land within the Reserve with the dual-loop SR 14 interchange design, and approximately 1.76 acres with the left-loop design. This includes impacts to the Fort Vancouver National Historic Site, discussed above, the parking lot at the west end of Officers Row (see Exhibit 5.3-8), and land owned by the City of Vancouver, U.S. Army, WSDOT, and the FHWA. These alternatives could require up to 0.54 acre of the Reserve as temporary easements for the construction of the SR 14 interchange and a retaining wall along I-5.

All alternatives would also have a minor incursion into Pearson Field's protected air space.

Alternatives 4 and 5 (the supplemental crossing) would require acquisition of approximately 0.31 acre of the Reserve, with up to 0.13 acre of temporary easement.

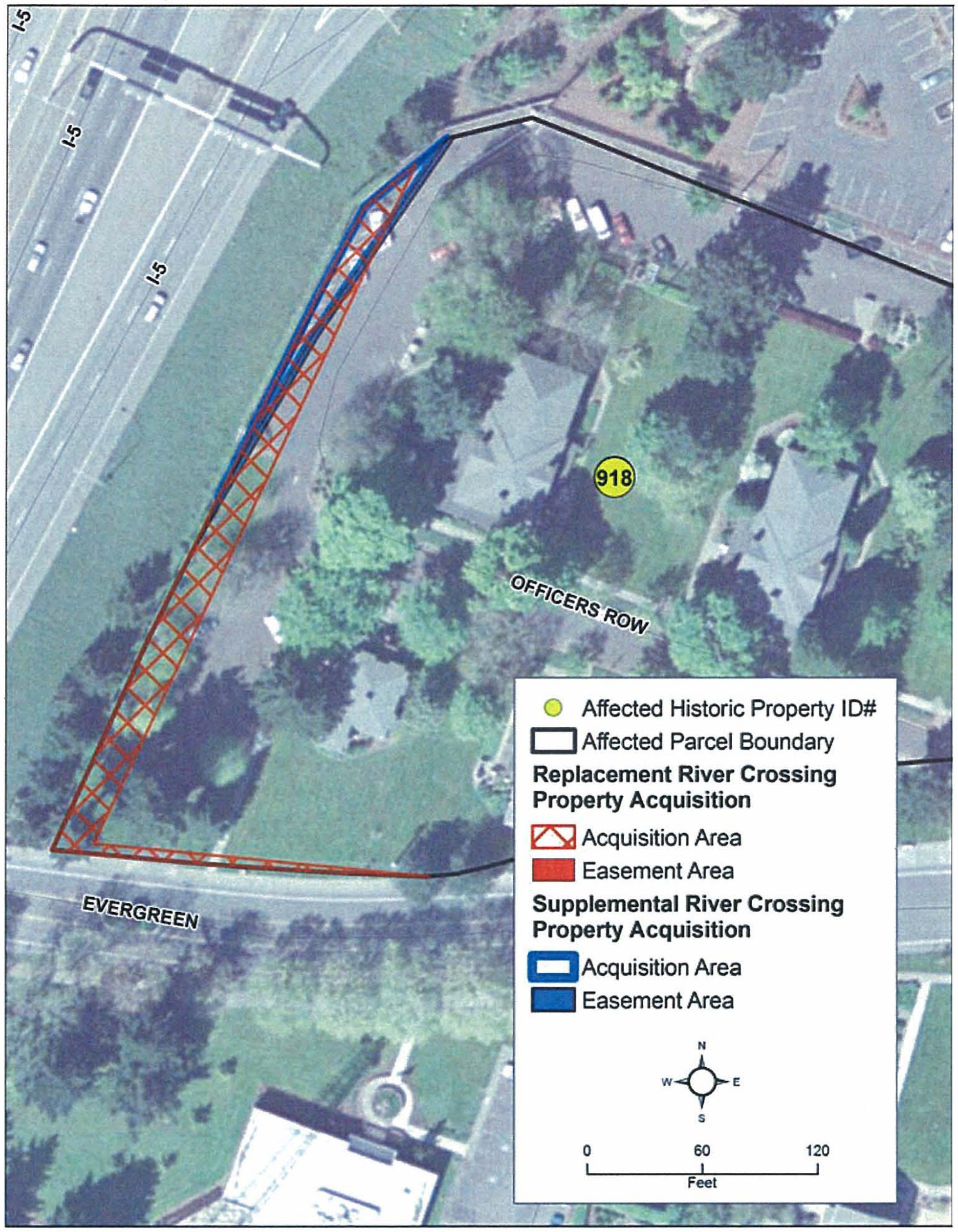
Although these alternatives would require acquisition of land near the planned reconstruction of the Fort Vancouver Village ("Kanaka Village") and redevelopment of the West Barracks, they are not expected to substantially interfere with NPS and City of Vancouver plans for Fort Vancouver Village reconstruction or West Barracks redevelopment (see discussion of the relevant plans in Section 5.2.3). It is likely that impacts will be limited to existing and planned landscaping along SR 14, the I-5/ SR 14 interchange, and between the West Barracks and I-5.

Exhibit 5.3-7
Vancouver National Historic Reserve



DIMENSIONS ARE APPROXIMATE.

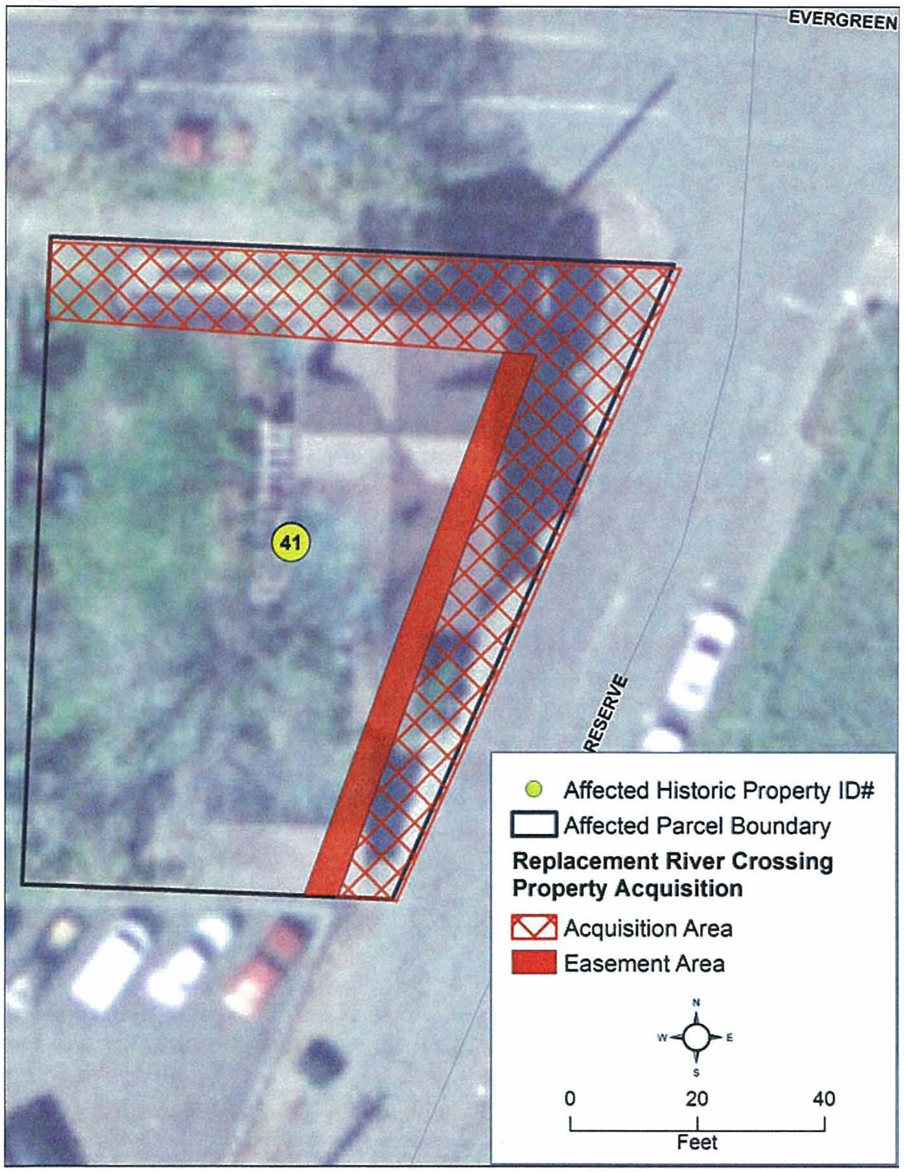
Exhibit 5.3-8
Officers Row (part of the Vancouver National Historic Reserve)



DIMENSIONS ARE APPROXIMATE.

Kiggins House, 411 E Evergreen Street – With Alternatives 2 and 3 (the replacement crossing), widening the highway could require acquisition of a portion of the property currently occupied by this NRHP-listed house (see Exhibit 5.3-9). However, the City of Vancouver plans to move the Kiggins house for the Riverwest development, which is not associated with the CRC project. This is expected to occur in May 2008, before CRC would be constructed. The City has designated an area of about 3.75 acres, including the land where the Kiggins House is located, as the Riverwest Revenue Development Area. Construction of that mixed use project is scheduled to begin in late 2008 and continue through 2011. The Riverwest development is being designed to allow CRC to use a portion of that property, if needed. Given that the Riverwest development is occurring irrespective of the CRC project, its moving of the Kiggins House would not be a 4(f) use.

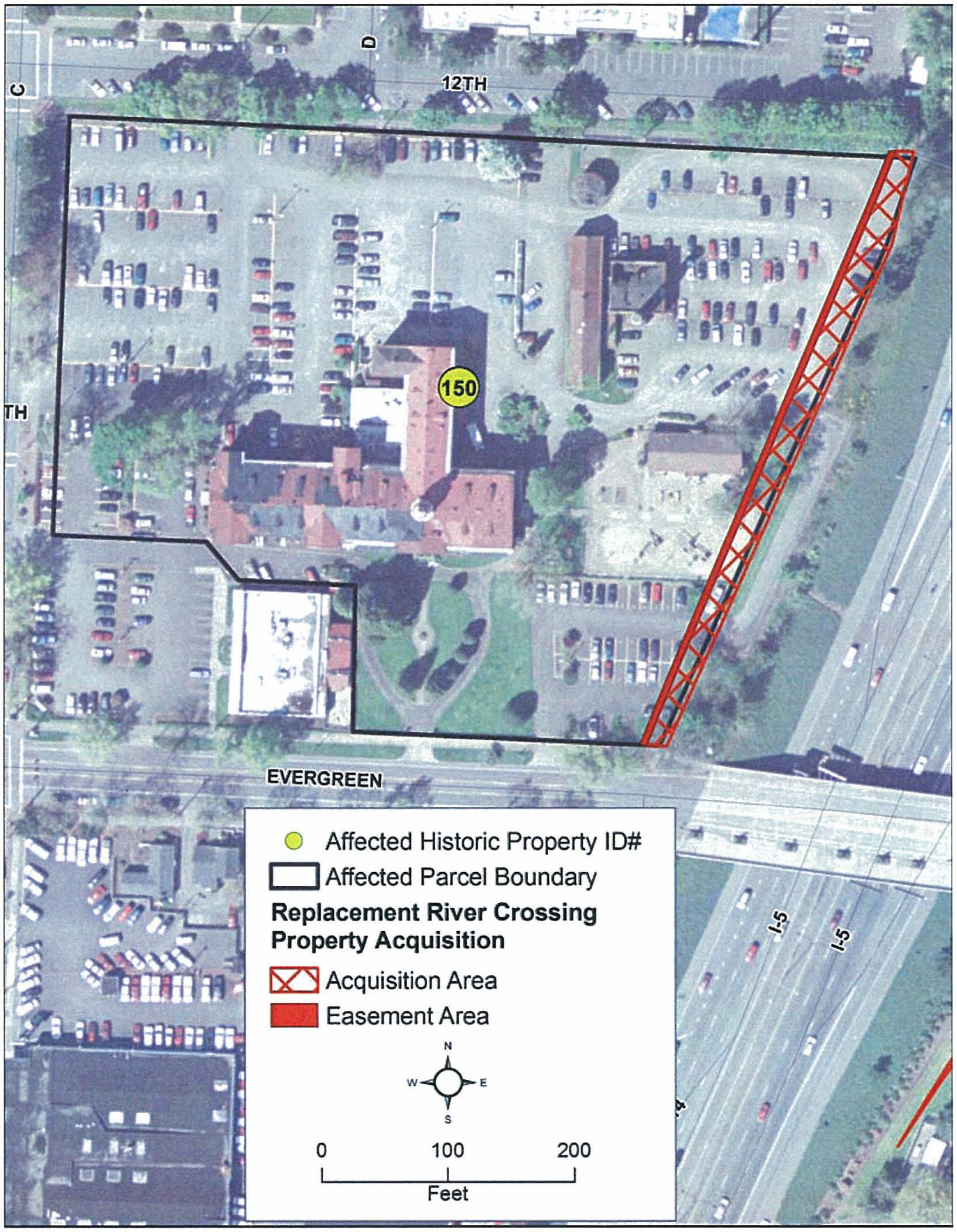
Exhibit 5.3-9
Kiggins House



DIMENSIONS ARE APPROXIMATE.

Providence Academy, 400 E Evergreen Street – Alternatives 2 and 3 (the replacement crossing) would require acquisition of 0.27 acre of the eastern edge of the parcel containing this eligible historic resource, as illustrated in Exhibit 5.3-10. The land that would be acquired is adjacent to I-5 and contains parking spaces and landscaping. Highway construction would not remove any historic or non-historic buildings from the site.

Exhibit 5.3-10
Providence Academy



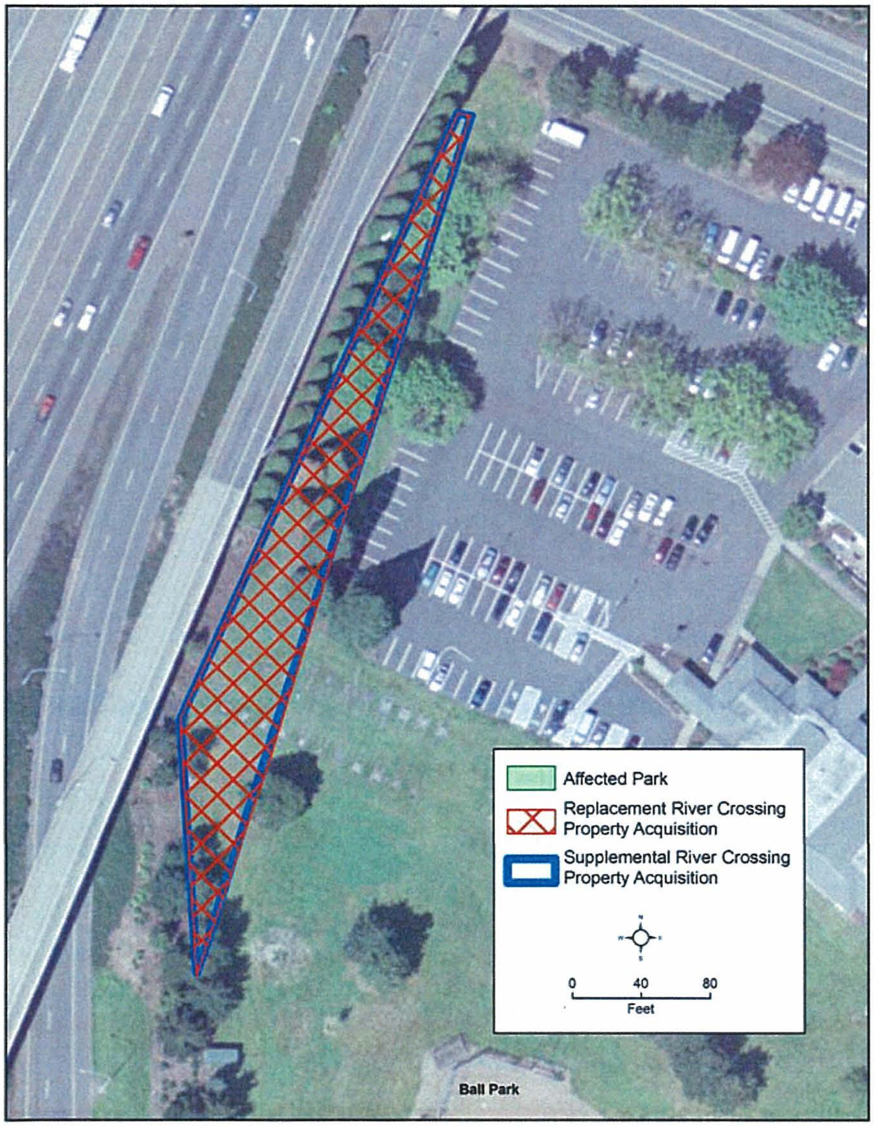
DIMENSIONS ARE APPROXIMATE.

Impacts to Resources in Vancouver, North of the I-5/Mill Plain Boulevard Interchange

This section describes potential *uses* of Section 4(f) resources located in Vancouver, north of the I-5/Mill Plain Boulevard interchange. This sub-area includes resources that would be impacted by highway or transit improvements along I-5, as well as by potential transit improvements at the Lincoln terminus.

Marshall Community Park – All of the build alternatives, regardless of transit terminus or alignments option, would require acquisition of an approximately 1.2-acre strip of land along the western boundary of this park (Exhibit 5.3-11). The northern portion of this land is used for buffering landscaping, and the southern portion for passive recreation space. The acquisition could also displace up to three horseshoe courts. The conversion of this land to transportation functions would constitute a Section 4(f) *use*.

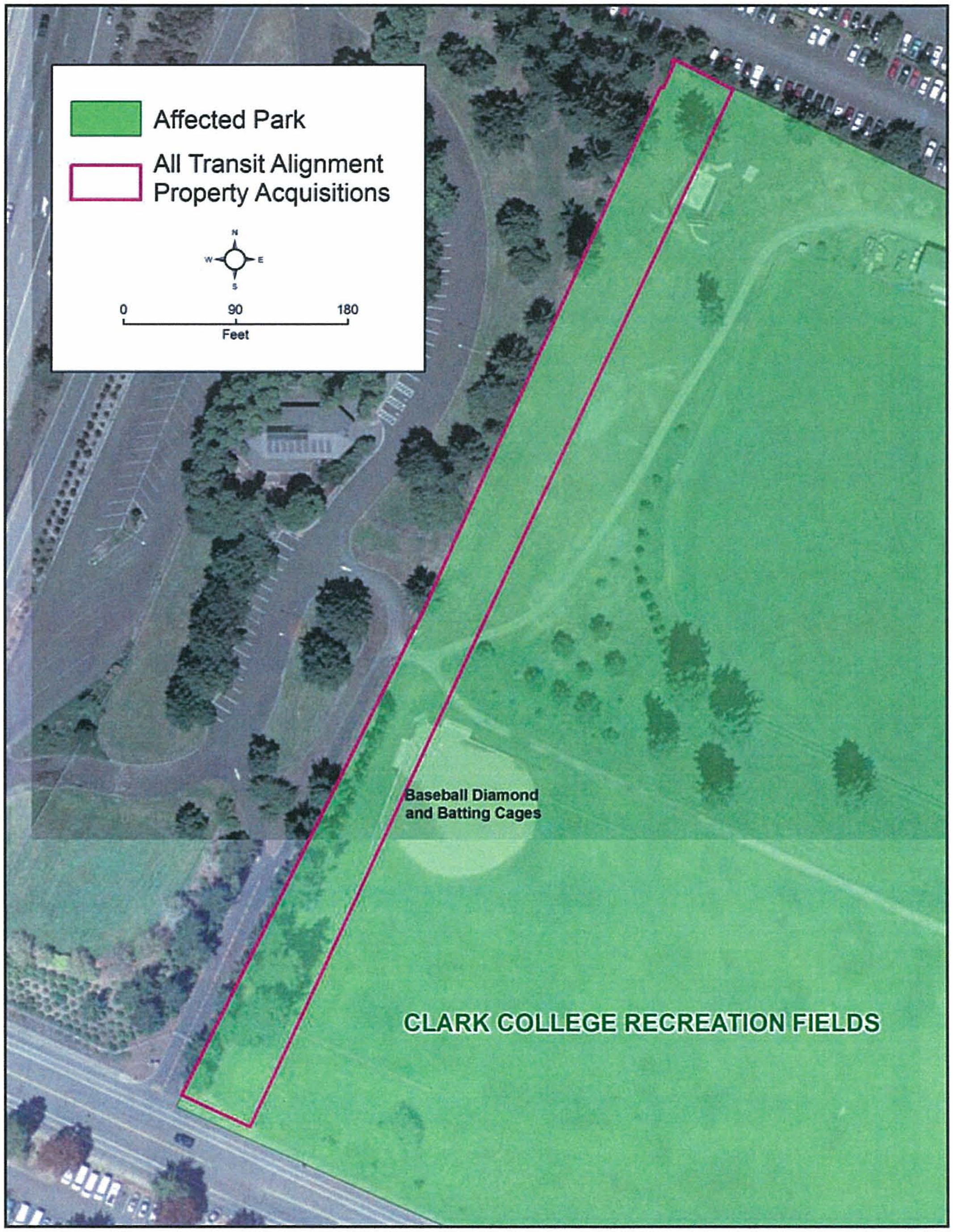
Exhibit 5.3-11
Marshall Community Park



DIMENSIONS ARE APPROXIMATE.

Clark College Recreation Fields – The proposed Clark College Park and Ride associated with all of the alternatives, with any transit terminus option, would require acquisition of a 1.24-acre narrow strip of the Clark College recreational fields, which are open to the public. This acquisition could displace a batting cage and a portion of a ball field, as illustrated in Exhibit 5.3-12. Converting this recreational resource to transportation use would constitute a Section 4(f) *use*.

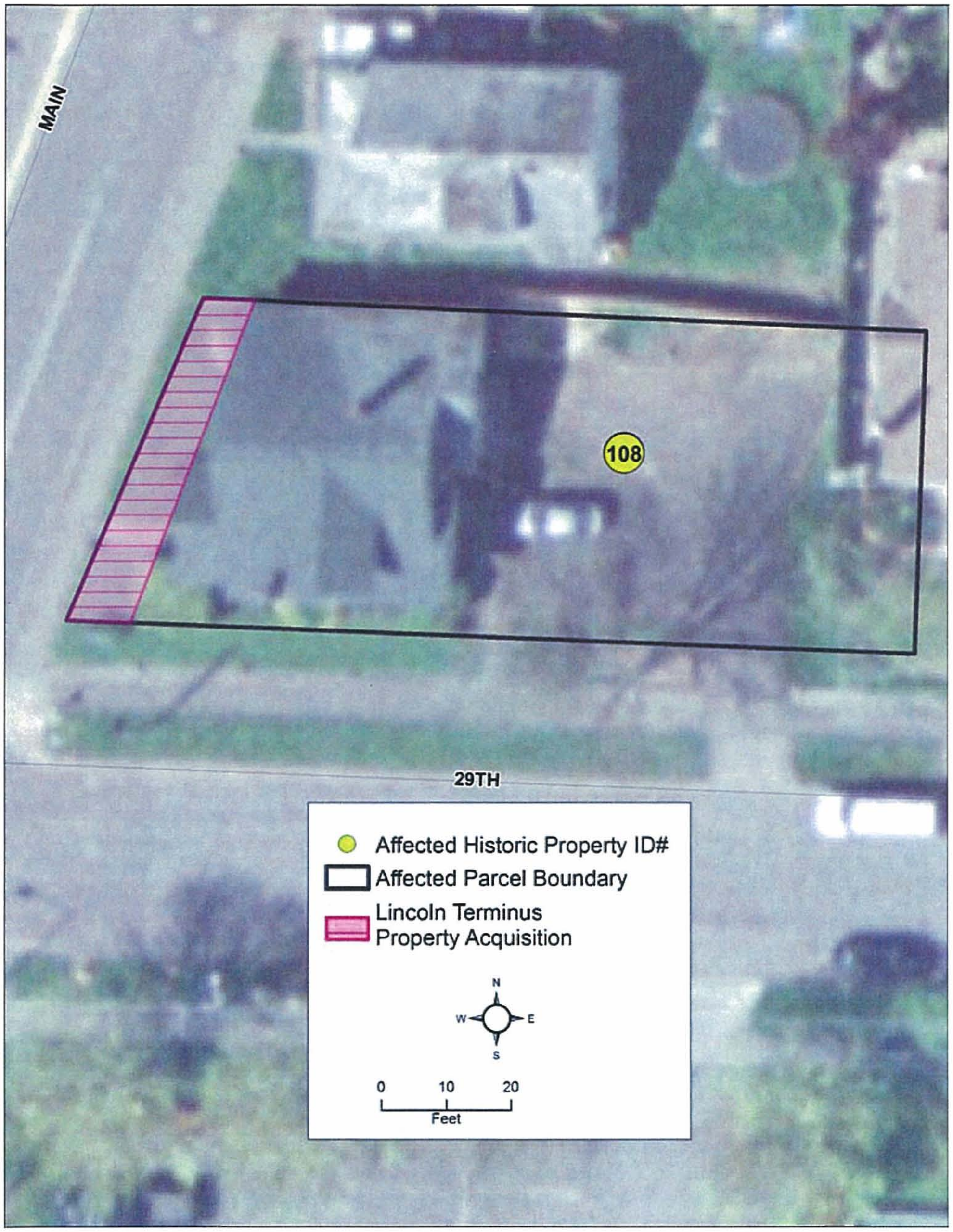
Exhibit 5.3-12
Clark College Recreation Fields



DIMENSIONS ARE APPROXIMATE.

Residence/Office, 2901 Main Street – The Broadway-Main couplet and Two-way Broadway alignment options (part of the Lincoln terminus) would require displacement of this NRHP-eligible building currently being used for offices, which would constitute a 4(f) *use* (Exhibit 5.3-13).

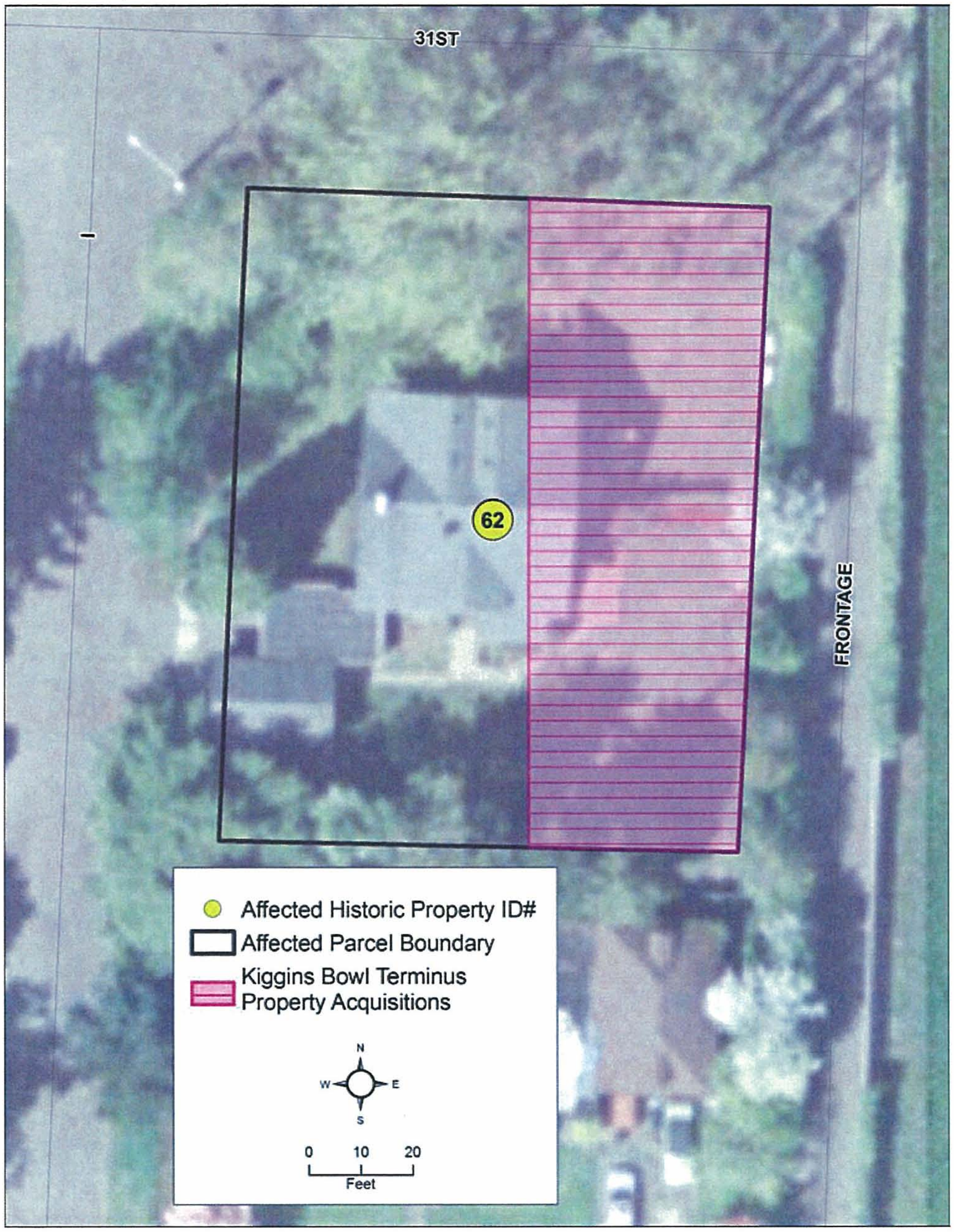
Exhibit 5.3-13
Residence/Office, 2901 Main Street



DIMENSIONS ARE APPROXIMATE.

Residence, 903 E 31 Street – The McLoughlin and 16th Street alignment options (Kiggins Bowl and Clark College MOS terminus options) would require acquisition of the eastern half of the parcel that houses this NRHP-eligible residential building. This acquisition would result in a displacement of the building, which would constitute a Section 4(f) *use* (see Exhibit 5.3-14).

Exhibit 5.3-14
Residence, 903 E 31st Street

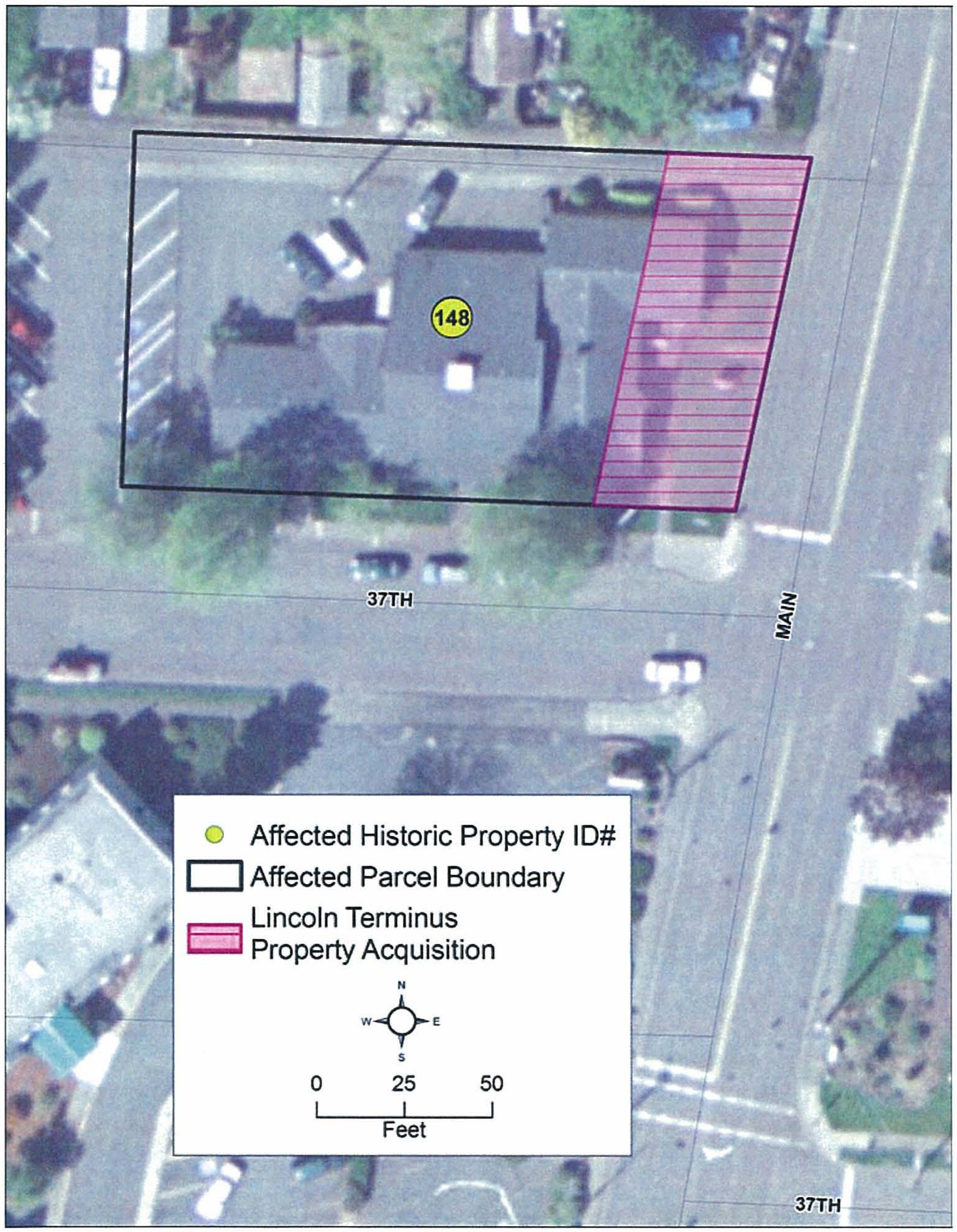


DIMENSIONS ARE APPROXIMATE.

Residence, 3000 K Street – Alternatives 4 and 5 would require acquisition of 0.034 acre of the western edge of this parcel, eliminate back access, and require the demolition of the garage. This would be considered a 4(f) *use*. Alternatives 2 and 3 would have substantially less impact on this property, as discussed under De Minimis Impact Findings later in this section. The impacts of all alternatives on this resource are illustrated in Exhibit 5.3-25, also in the De Minimis section.

Office, 300 E 37th Street – The Broadway-Main couplet and Two-way Broadway alignment options (part of the Lincoln terminus) would require displacement of this NRHP-eligible building currently being used for offices, which would constitute a 4(f) *use* (Exhibit 5.3-15).

Exhibit 5.3-15
Office, 300 E 37th Street

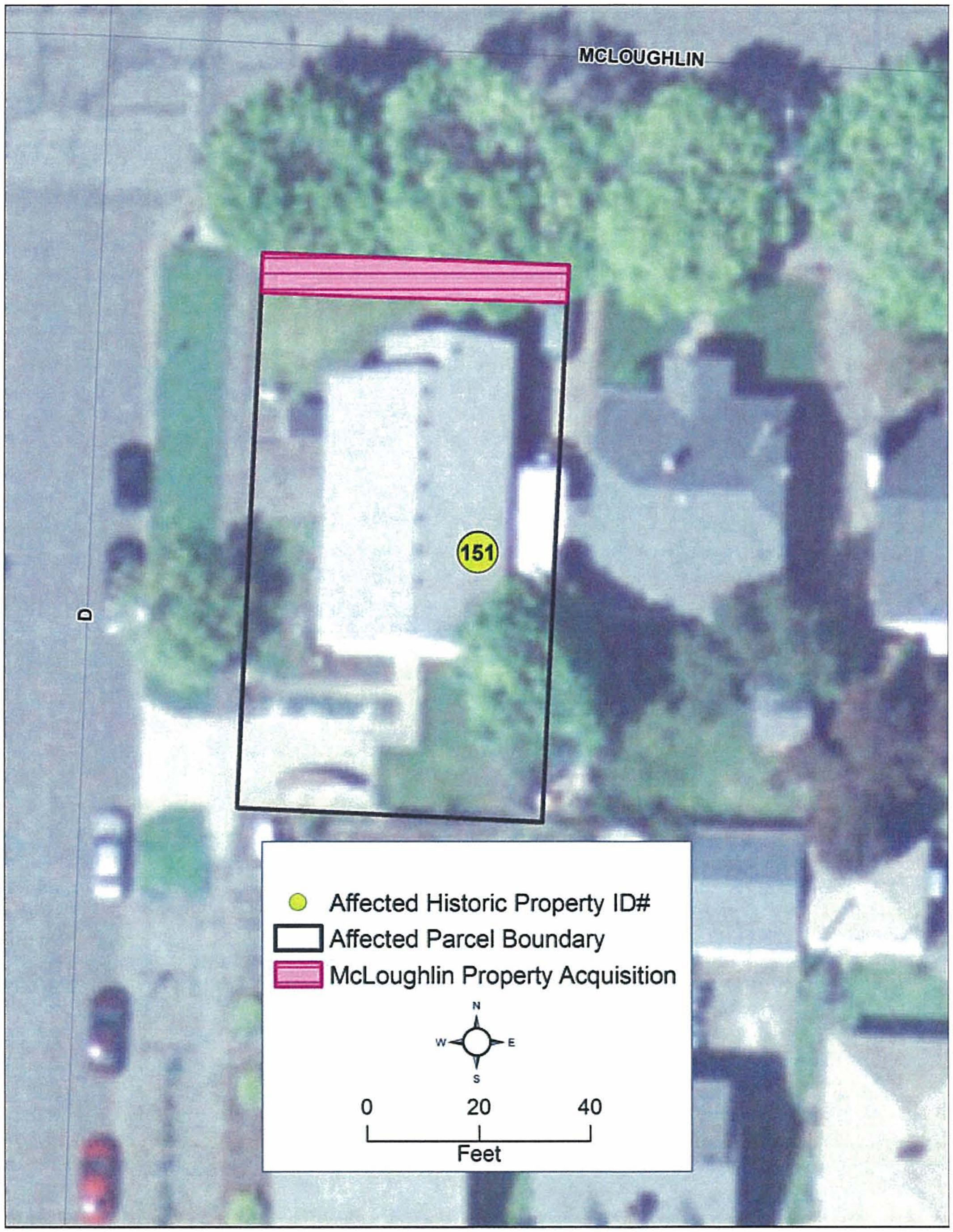


DIMENSIONS ARE APPROXIMATE.

10651

Residence/Office, 401 E McLoughlin – The McLoughlin alignment option (Kiggins Bowl or Clark College MOS terminus option) would require acquisition of 0.009 acre of this parcel, as illustrated in Exhibit 5.3-16, but would not require displacement of the use. This would change the building's setting by removing trees associated with the house and relocating the road nearer to the house. Pending DAHP's concurrence on the preliminary findings of effect, this is currently assumed to be an adverse effect, and is therefore assumed to be a 4(f) *use*.

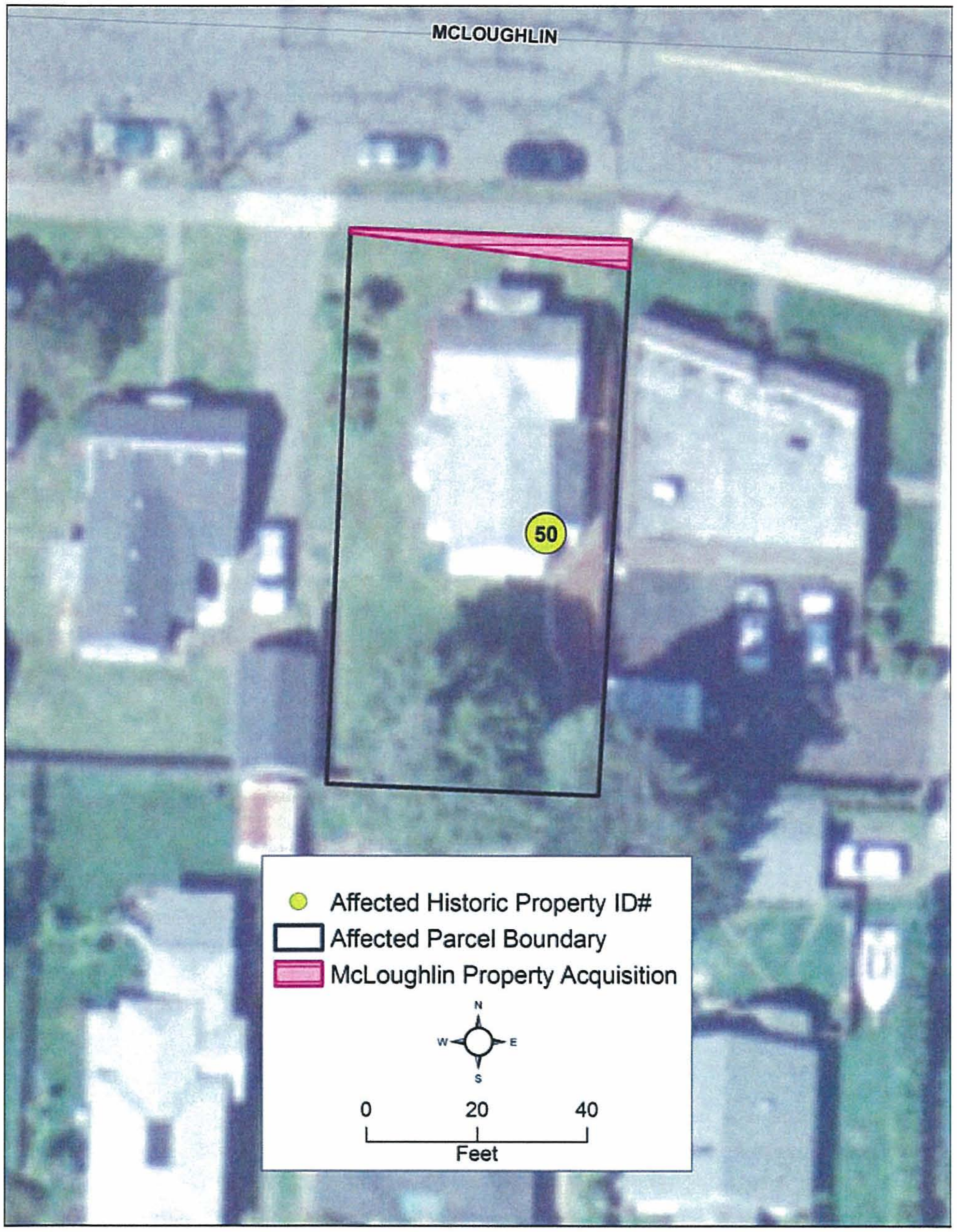
Exhibit 5.3-16
Residence/Office, 401 E. McLoughlin



DIMENSIONS ARE APPROXIMATE.

Residence, 611 E McLoughlin – The McLoughlin alignment option (Kiggins Bowl or Clark College MOS terminus options) would require acquisition of 0.003 acre of this parcel, as illustrated in Exhibit 5.3-17, but would not require displacement of the use. This would change the building's setting by relocating the road nearer to the house and removing a portion of the front lawn. Pending DAHP's concurrence on the preliminary findings of effect, this is currently assumed to be an adverse effect, and is therefore assumed to be a 4(f) *use*.

Exhibit 5.3-17
Residence, 611 E McLoughlin



DIMENSIONS ARE APPROXIMATE.

Residence 3110 K Street – Alternatives 4 and 5 would require acquisition of 0.02 acre of this parcel, as illustrated in Exhibit 5.3-18. The acquisition is from the back of the property (western edge of the parcel) and no buildings would be displaced, but access to the back of the parcel would be eliminated. This would be considered a 4(f) *use*.

Exhibit 5.3-18
Residence, 3110 K Street

DIMENSIONS ARE APPROXIMATE.

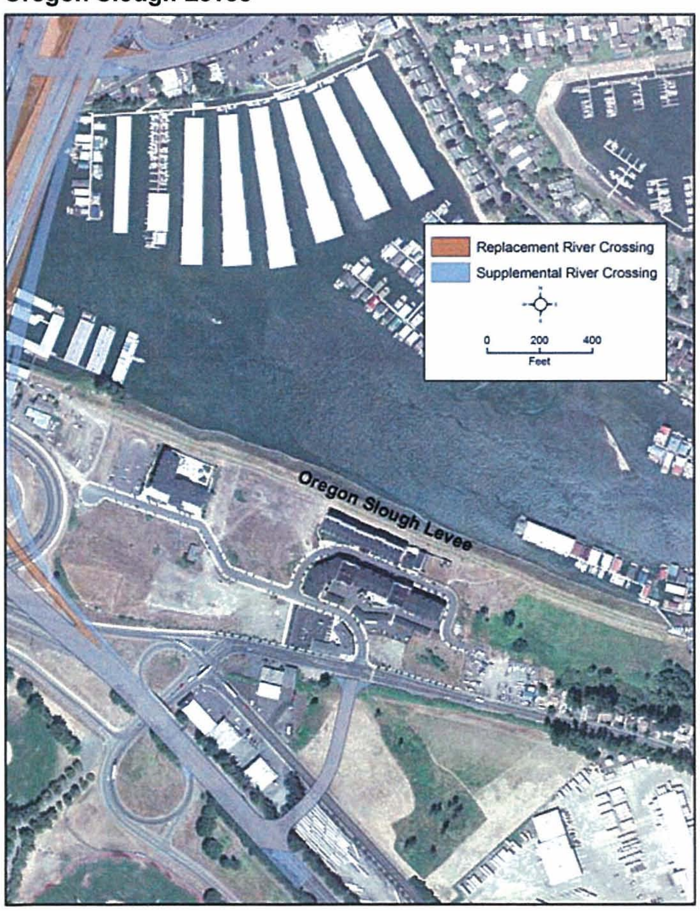
De Minimis Impact Findings Being Pursued

A *de minimis* impact on a parkland is defined as an impact that does not adversely affect the activities, features or attributes of the 4(f) resource. A *de minimis* impact on a historic resource is defined as a finding of either "no adverse effect" or "no historic properties affected" (no effect) in compliance with Section 106 of the National Historic Preservation Act. *De minimis* impact findings must be made in compliance with Section 6009(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and subsequent amendments to Section 138 of Title 23 and Section 303 of Title 49, United States Code. There will be an opportunity for the public to review and comment on any de minimis impact findings for parks.

FHWA and/or FTA intend to pursue making *de minimis* impact findings on the following parks and historic properties for which the project would have a "no adverse effect". These "no adverse effect" findings are pending concurrence from the Washington Department of Archaeology and Historic Preservation (DAHP) or Oregon SHPO.

Oregon Slough Levee, Oregon – With all alternatives, highway ramps would be elevated over the levee located on the southern shore of the North Portland Harbor, as illustrated in Exhibit 5.3-19. No piers would be placed in the levee.

Exhibit 5.3-19
Oregon Slough Levee



DIMENSIONS ARE APPROXIMATE.

Residence, 501 E McLoughlin – The McLoughlin alignment option (Kiggins Bowl or Clark College MOS terminus options) would require acquisition of 0.001 acre from the front of the parcel, which may shorten the front access pathway. This impact is illustrated in Exhibit 5.3-20.

Residence, 502 E McLoughlin – The McLoughlin alignment option (Kiggins Bowl or Clark College MOS terminus options) would require acquisition of 0.01 acre from the front of the parcel, which may shorten the front access pathway. This impact is illustrated in Exhibit 5.3-21.

Residence, 510 E McLoughlin – The McLoughlin alignment option (Kiggins Bowl or Clark College MOS terminus option) would require acquisition of 0.008 acre from the front of the parcel, which may shorten the front access pathway. This impact is illustrated in Exhibit 5.3-22.

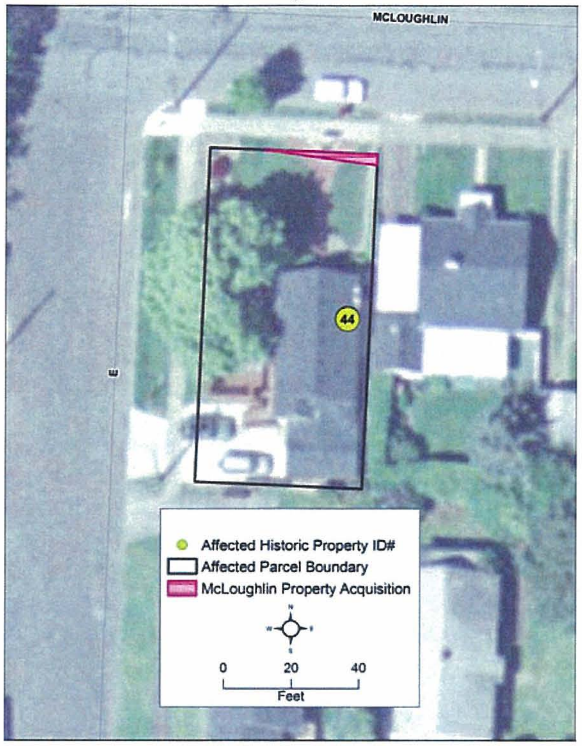
Office, 3200 Main Street – The Lincoln terminus would require acquisition of 0.015 acre from the front of the parcel, which may require the front strip of the drive way and possibly one to two parking spaces. This impact is illustrated in Exhibit 5.3-23.

First United Methodist Church, 401 E 33rd Street – The Lincoln terminus would require acquisition of 0.08 acre of lawn in front of the church. This impact is illustrated in Exhibit 5.3-24.

Residence, 3000 K Street –Alternatives 2 and 3 would require acquisition of 0.012 acre of land from the parcel, but would not require displacement of the garage or eliminate access to it. This impact is illustrated in Exhibit 5.3-25. The FTA and FHWA anticipate pursuing *de minimis* findings for this use.

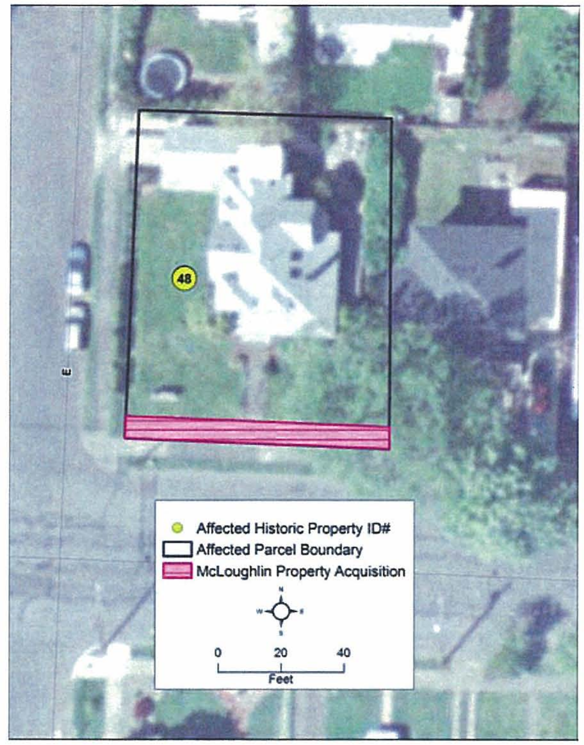
Normandy Apartments, 318 E Seventh Street – Alternatives 2 and 3 (replacement crossing) would require highway ramp widening next to the parcel containing this eligible historic resource. As illustrated in Exhibit 5.3-26, construction would temporarily *use* about 0.013 acre of the eastern edge of this parcel, which is currently used for landscaping. A temporary occupancy does not necessarily constitute a *use* of a 4(f) resource (23 CFR 771.135(p)(7)). Any permanent acquisition would be less than 0.013 acre. The building would not be displaced, nor would any contributing features. This could be a *de minimis* impact, unless the Washington DAHP determines that, in accordance with Section 106 of the National Historic Preservation Act (16 USC 470f), this would constitute an adverse effect.

Exhibit 5.3-20
Residence, 501 E McLoughlin



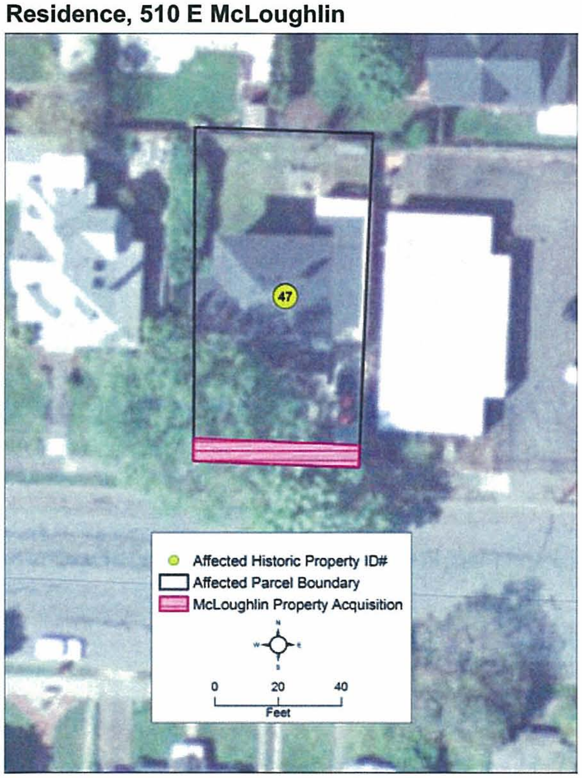
DIMENSIONS ARE APPROXIMATE.

Exhibit 5.3-21
Residence, 502 E McLoughlin



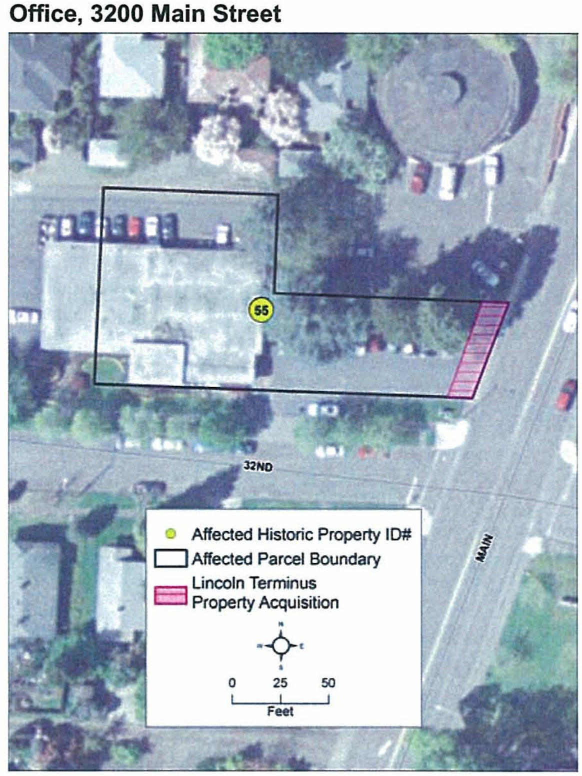
DIMENSIONS ARE APPROXIMATE.

Exhibit 5.3-22
Residence, 510 E McLoughlin



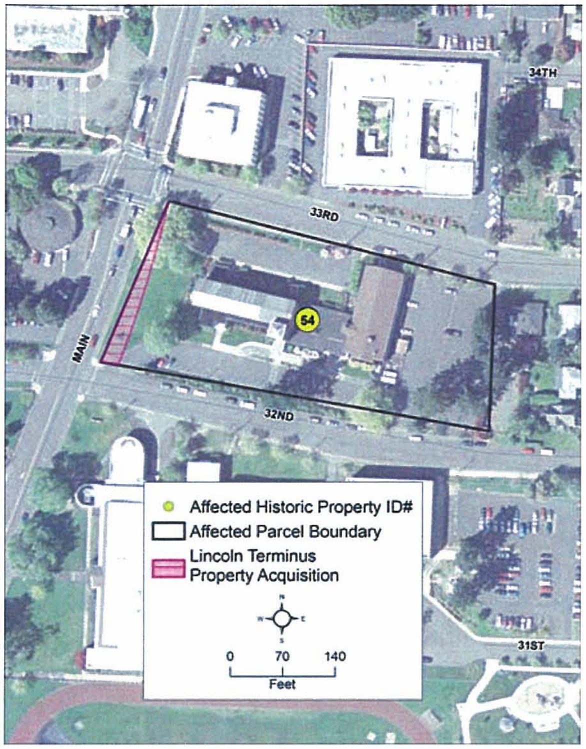
DIMENSIONS ARE APPROXIMATE.

Exhibit 5.3-23
Office, 3200 Main Street



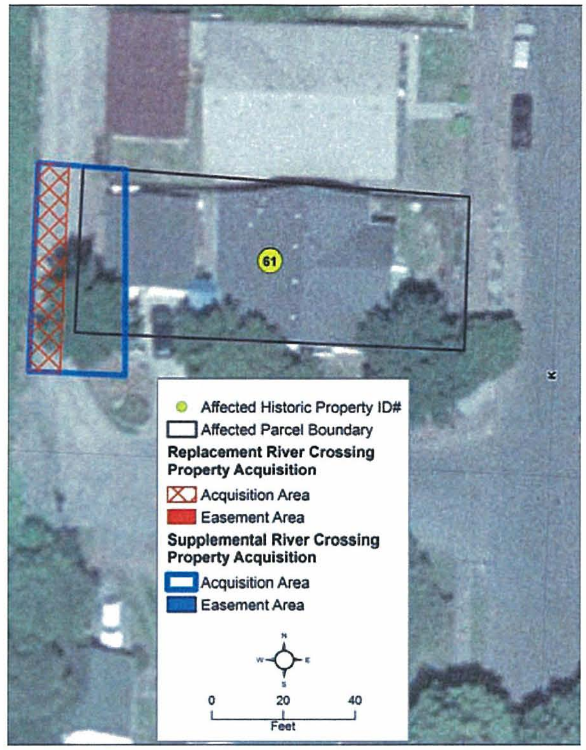
DIMENSIONS ARE APPROXIMATE.

Exhibit 5.3-24
First United Methodist Church, 401 E 33rd Street



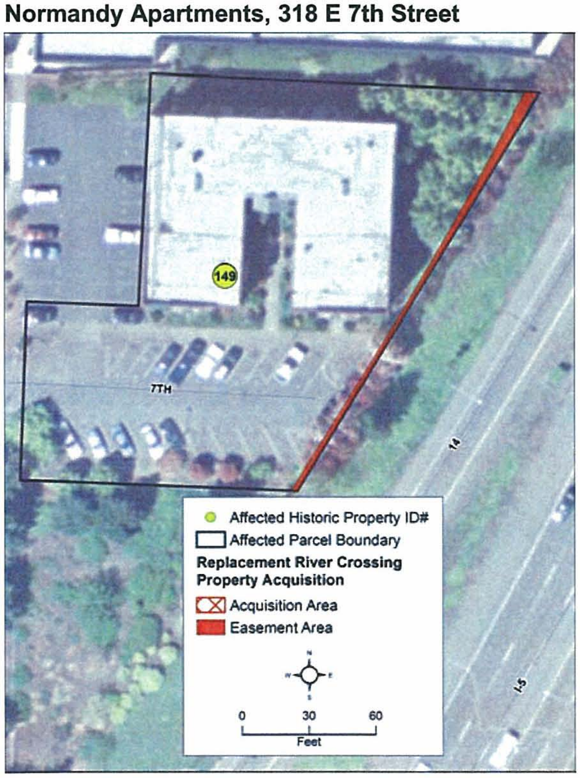
DIMENSIONS ARE APPROXIMATE.

Exhibit 5.3-25
Residence, 3000 K Street



DIMENSIONS ARE APPROXIMATE.

Exhibit 5.3-26
Normandy Apartments, 318 E 7th Street



DIMENSIONS ARE APPROXIMATE.

A finding of *de minimis* impact for historic resources requires that the project have no adverse effect on that site, or no historic properties affected (no effect), in accordance with Section 106 of the National Historic Preservation Act (16 USC 470f). The Section 106 finding needs to be developed in consultation with Section 106 consulting parties, and requires written concurrence from the Washington or Oregon State Historic Preservation Office (SHPO) (and from the Advisory Council on Historic Preservation, when the Council is participating in the consultation process). Written concurrence on the Section 106 findings of effect is expected prior to publication of the Final EIS and 4(f) Evaluation. The relevant SHPO would be notified that the Section 106 finding of effect determination will be used for a Section 4(f) *de minimis* finding. However, the *de minimis* impact finding does not require SHPO concurrence.

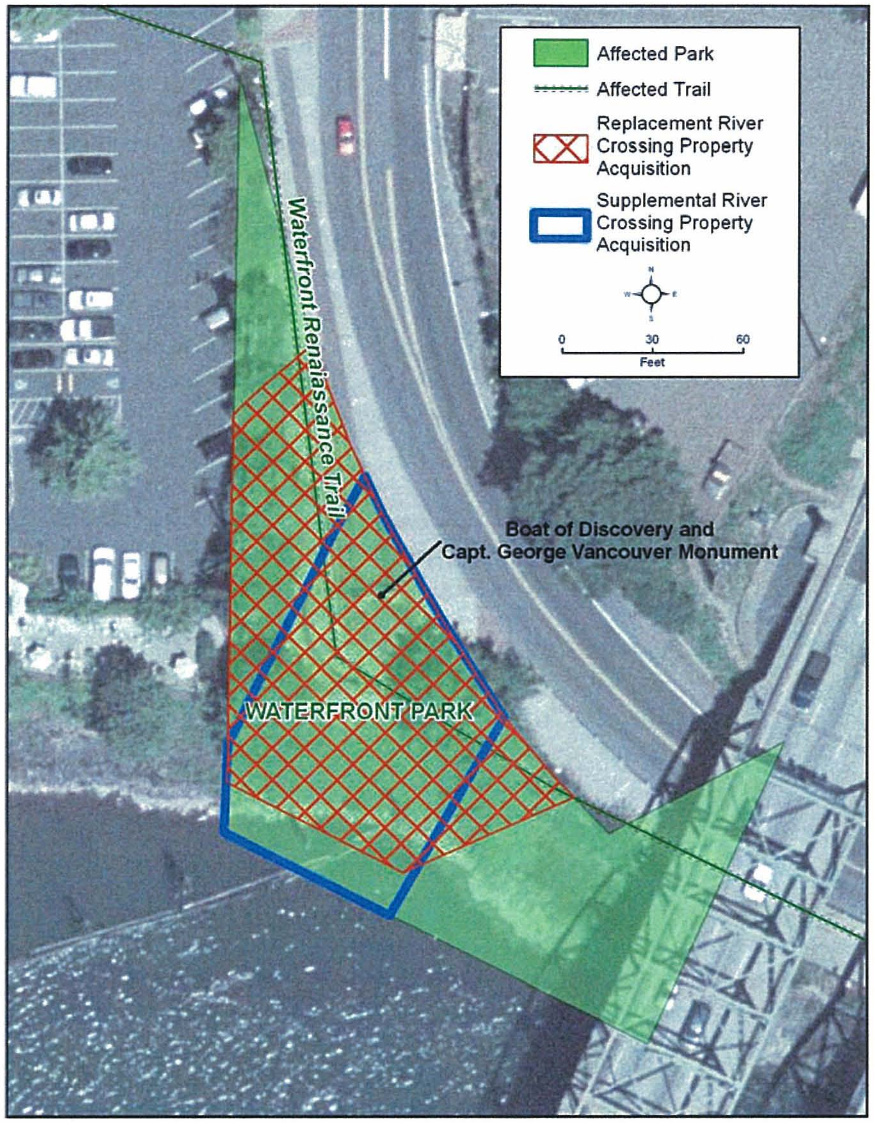
FTA and FHWA will pursue making *de minimis* impact findings on the following park lands.

The finding of *de minimis* impact for the parks and recreation areas will be reviewed and commented on by the public during the Draft EIS comment period. The public will have the opportunity to comment at a public hearing and open houses, and to submit written comments. It must be demonstrated that the project will not adversely affect the activities, features, or attributes of the park or recreation area. This finding will need concurrence from the officials with jurisdiction over the park or recreation area. This concurrence, and the *de minimis* findings, will be documented in the Final 4(f) Evaluation.

Waterfront Renaissance Trail (part of the Discovery Loop Trail) – The Waterfront Renaissance trail is located in Waterfront Park, along Columbia Way on the Vancouver riverfront. With Alternatives 2 and 3 (the replacement crossing), the piers of the new bridges, and other improvements underlying the northern elevated approach to the new bridge, could require relocating up to 180 feet of this trail, which could constitute a Section 4(f) *use* of the resource. This portion of the trail is located west of the existing bridges, and acts as the starting point of the trail for many downtown residents (Exhibit 5.3-27).

Alternatives 4 and 5 could require the relocation of up to 93 feet of trail. Additional coordination is required before making final conclusions, however, based on communication with the City of Vancouver, relocating this trail would likely be acceptable to the City. The FTA and FHWA anticipate pursuing *de minimis* findings for this *use* and will continue coordination with the official having jurisdiction to substantiate the finding.

Exhibit 5.3-27
Waterfront Trail and Waterfront Park



DIMENSIONS ARE APPROXIMATE.

Waterfront Park – With Alternatives 2 and 3 (the replacement crossing), the new bridges would be built in the air space over about 0.23 acre of Waterfront Park, located on the Vancouver shoreline. These alternatives would also require removal of the existing I-5 bridges located adjacent to the parkland.

Alternatives 4 and 5 would span about 0.17 acre of Waterfront Park. These areas of the park are occupied by landscaping, riprap shoreline and some public art installations. None of the alternatives would require displacement of the art installations at this site (i.e., the Boat of Discovery or the Capitan George Vancouver Monument). See Exhibit 5.3-27.

Occupying the air space over a park is typically not considered a 4(f) *use*. However, placing any bridge piers in the park (locations yet to be determined) would be a 4(f) *use*. The FTA and FHWA anticipate pursuing *de minimis* findings for this *use* and will continue coordination with the official having jurisdiction to substantiate the finding.

Leverich Park – This resource is impacted by all alternatives, but in slightly different ways.

Alternatives 2B, 2C, 2D, 3B, 3C, and 3D (replacement crossing with the Lincoln Terminus, Clark College MOS or Mill Plain MOS) would require displacement of approximately 0.33 acre of narrow park perimeter landscaping and berms, and would include elevated highway ramps over the park entrance road (see Exhibit 5.3-28). These impacts would be due to highway improvements and would occur adjacent to I-5 and SR 500.

Alternatives 4B, 4C, 4D, 5B, 5C, and 5D (supplemental crossing with the Lincoln Terminus, Clark College MOS or Mill Plain MOS) would require acquisition of approximately 0.24 acre of narrow park perimeter landscaping and berms and would include elevated highway ramps over the park entrance road (see Exhibit 5.3-28). These impacts would be due to highway improvements and would occur adjacent to I-5 and SR 500.

The Kiggins Bowl terminus would require acquisition of an additional 0.01 acre along the western edge of Leverich Park, adjacent to I-5. This would increase the Leverich Park acquisition to approximately 0.34 acre for Alternatives 2A and 3A, and to 0.25 acre for Alternatives 4A and 5A.

These acquisitions would comprise approximately one percent of Leverich Park. The FTA and FHWA anticipate pursuing *de minimis* findings for this potential *use* of Leverich Park, and will continue coordination with the official having jurisdiction to substantiate the finding.

Exhibit 5.3-28
Leverich Park

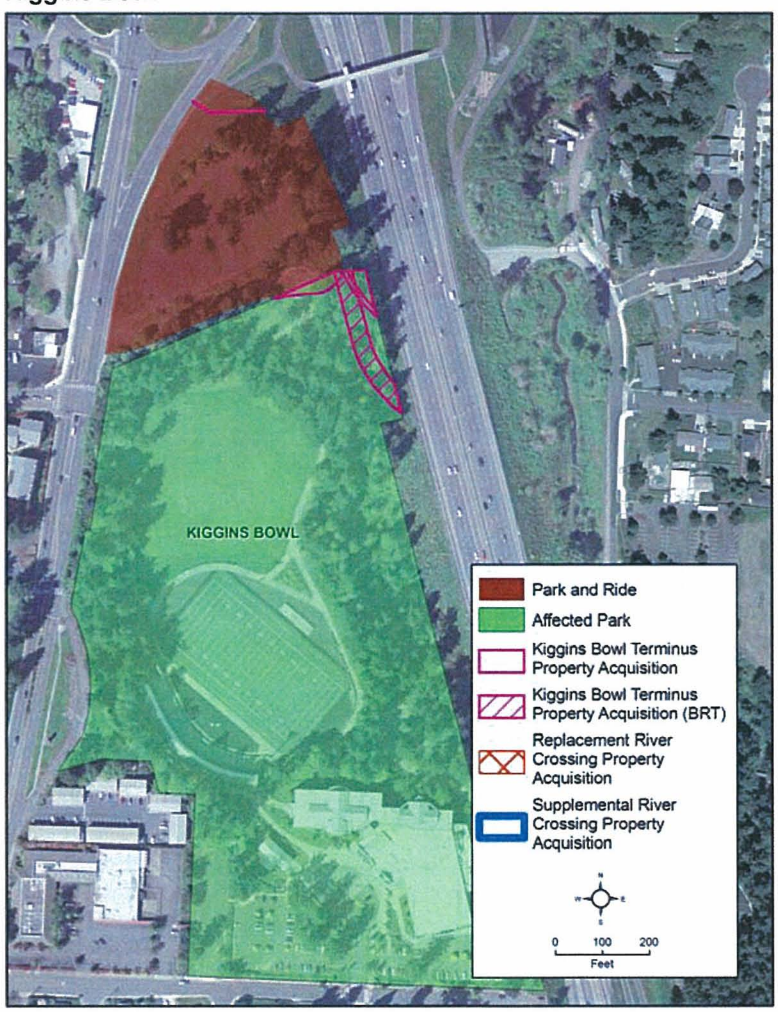
DIMENSIONS ARE APPROXIMATE.

Kiggins Bowl – With all of the build alternatives, approximately 0.14 acre of Kiggins Bowl would be acquired and 50 linear feet of the trail connecting Main Street to the Burnt Bridge Creek Greenway Trail would be relocated. The Kiggins Park and Ride would be located on WSDOT property that is adjacent to but not part of the Kiggins Bowl property.

With Alternatives 2A and 4A (bus rapid transit and Kiggins Bowl terminus) there would be an additional *use* of about 0.35 acre of land within the Kiggins Bowl parcel. As illustrated in Exhibit 5.3-29, the affected land is currently forested, and the impact would not affect the use of the sports fields or venues of Kiggins Bowl.

This resource not only serves as a park and recreation facility, but is also an eligible historic resource. Considering the relatively minor impact to the 4(f) resource, combined with the enhanced transit access to the nearby parks and existing and planned Burnt Bridge Creek trail system, and potential mitigation (trail relocation), overall impacts to the recreational resource would be minimal. The FTA and FHWA anticipate pursuing *de minimis* findings for this *use* and will continue coordination with the official having jurisdiction to substantiate the finding.

Exhibit 5.3-29
Kiggins Bowl



DIMENSIONS ARE APPROXIMATE.

The finding of *de minimis* impact for the parks and recreation areas will be reviewed and commented on by the public during the Draft EIS comment period. The public will have the opportunity to comment at a public hearing and open houses, and to submit written comments. It must be demonstrated that the project will not adversely affect the activities, features, or attributes of the park or recreation area. This finding will need concurrence from the officials with jurisdiction over the park or recreation area. This concurrence, and the *de minimis* findings, will be documented in the Final 4(f) Evaluation.

5.3.4 Potential Constructive Uses

The project team evaluated the potential for "constructive uses" to 4(f) resources, consistent with 23 CFR 774.15. This included historic resources for which NHPA Section 106 preliminary "adverse effect" findings were identified based on proximity impacts, as well as park and recreation resources where land would not be incorporated into the CRC project but where proximity impacts (noise, visual, access, vibration) would or could occur. The analysis revealed that such impacts would not substantially impair the protected activities, features or attributes of any 4(f) properties, and therefore there would be no constructive use of 4(f) resources.

5.4 Avoidance Alternatives

As outlined in 23 CFR 774.3, the USDOT may not approve the use of Section 4(f) property unless they first determine that there is no prudent and feasible alternative to the use of land from the property, or that any use of 4(f) property would be a de minimis impact. An alternative is not prudent, according to 23 CFR 774.17(3)), if it compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated purpose and need. In other words, alternatives that do not adequately meet the project's Purpose and Need can be dropped from further consideration.

There are no alternatives that can simultaneously meet the project's Purpose and Need while also avoiding all Section 4(f) resources.

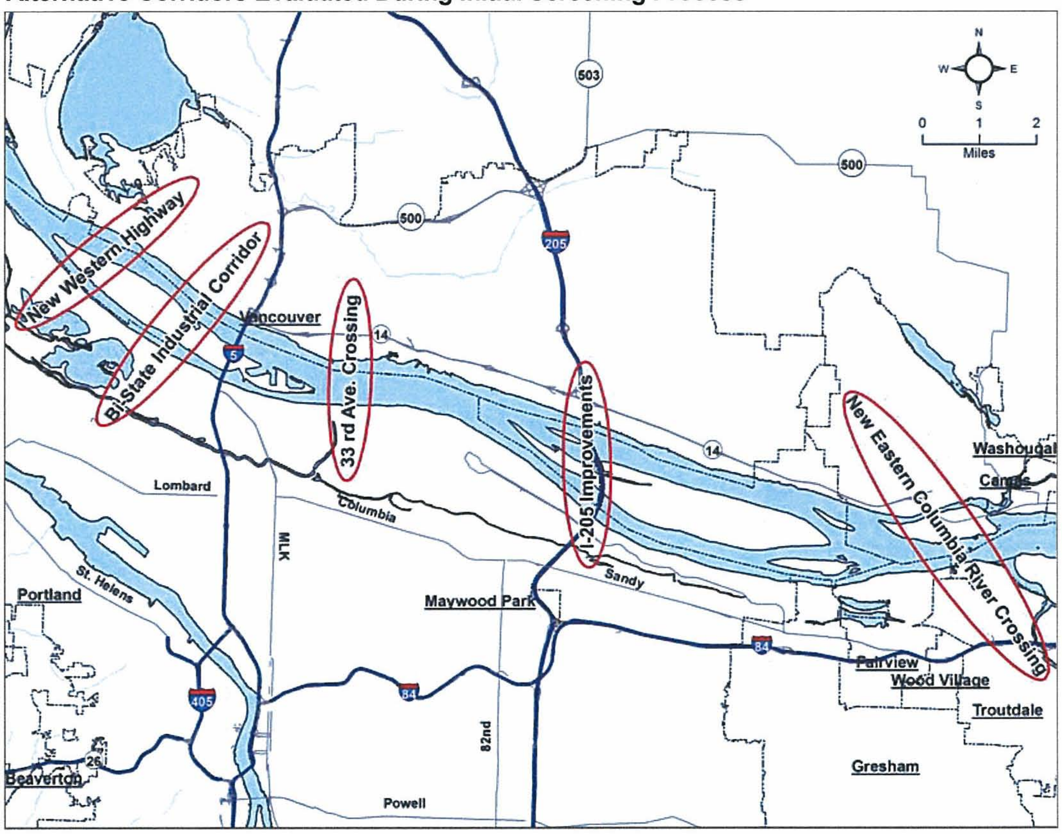
In earlier phases of alternative development, the project team evaluated a wide range of potential alternatives, as summarized in Section 2.5 of the DEIS. Potential avoidance alternatives evaluated during screening included a package of transportation demand management (TDM) and transportation system management (TSM) measures, and five alternate river crossing corridors outside the area immediately surrounding the I-5 crossing.

The TSM/TDM alternative included very limited capital construction and therefore did not directly result in impacts to Section 4(f) resources. However, the TSM/TDM alternative included very few physical improvements and did not meet the project's Purpose and Need.

Exhibit 5.4-1 illustrates the five alternate corridors evaluated during this screening process, located both west and east of the existing I-5 corridor:

- A Western Highway crossing two to three miles west of I-5 that would connect suburban Clark and Multnomah counties
- A Bi-State Industrial Corridor crossing near the BNSF railroad bridge, one mile west of I-5
- A new crossing at 33rd Avenue in Portland, two to three miles east of I-5
- Improvements to I-205 only
- An Eastern Columbia River crossing 10 to 12 miles east of I-5, that would connect Camas/East Clark County to Troutdale

Exhibit 5.4-1
Alternative Corridors Evaluated During Initial Screening Process



DIMENSIONS ARE APPROXIMATE.

The initial screening process was used to evaluate how well these corridors would meet the purpose and need of the project. While most of these alternatives could provide transportation benefits, they would do little to address the mobility, transit or safety problems in the I-5 corridor or to serve the proposed action's targeted travel markets. Therefore, these five corridor alternatives failed to meet most or all of the elements of the project's Purpose and Need.

The Bi-State Industrial Corridor had the potential for improving I-5-related freight mobility, as it connects the industrial areas in Vancouver to those in Portland. The initial traffic analysis indicated that this Industrial Corridor, as well as the Western Crossing, have potential for providing some congestion relief compared to 2030 No-Build conditions.

However, the potential highway transportation benefits of these two corridors would be limited and are outweighed by the fact that these, and the three other corridors, would fail to improve the stated needs related to transit performance, bicycle and pedestrian mobility, and highway safety. All alternative corridors evaluated would require substantial out-of-direction travel for transit passengers, bicyclists and pedestrians, and would do nothing to address the identified I-5 safety deficiencies, high crash rates, and seismic vulnerability.

These alternatives would have avoided affecting the Section 4(f) resources impacted by the alternatives evaluated in the DEIS, because they would be located in other corridors. However, given the density and distribution of historic and recreational resources within the north Portland and Vancouver areas, these corridors would very likely result in impacts to different Section 4(f) resources. Impacts to 4(f) resources from alternative corridors were not evaluated in detail because all of these alternatives, and the TSM/TDM alternative, failed to meet most or all of the proposed action's Purpose and Need.

Alternatives and options that could avoid one or more of the Section 4(f) properties, but could not *avoid Section 4(f) properties altogether* (23 CFR 774.17) are not considered avoidance alternatives. Alternatives and options that would have less impact on Section 4(f) resources or would impact fewer Section 4(f) properties, are considered Measures to Minimize Harm, and are described and evaluated in Section 5.5.

5.5 Measures to Minimize Net Harm

As discussed above, there are no prudent and feasible alternatives that would avoid all Section 4(f) resources. The next step then is to identify all reasonable measures to minimize harm or mitigate for adverse impacts and effects. 23 CFR 774.3(c) provides the following direction:

(c) *If the analysis ... concludes that there is no feasible and prudent avoidance alternative, then the Administration may approve only the alternative that:*

> *(1) Causes the least overall harm in light of the statute's preservation purpose. The least overall harm is determined by balancing the following factors:*
>
> > *i. The ability to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property);*
> >
> > *ii. The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that quality each Section 4(f) property for protection;*
> >
> > *iii. The relative significance of each Section 4(f) property;*

iv. *The views of the official(s) with jurisdiction over each Section 4(f) property;*

v. *The degree to which each alternative meets the purpose and need for the project;*

vi. *After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f); and*

vii. *Substantial differences in costs among the alternatives.*

This section describes how the CRC alternatives and options, and other potential minimization measures, could avoid one or more of the Section 4(f) resources, reduce the impacts to one or more Section 4(f) resources, or potentially mitigate impacts to Section 4(f) resources.

This section also evaluates whether these measures would be reasonable. As outlined in 23 CFR 774.17, *All possible planning*, in evaluating the reasonableness of measures to minimize harm, FHWA and FTA consider the preservation principles of the 4(f) statute, along with:

(i) *The views of the officials with jurisdiction over the Section 4(f) property,*

(ii) *Whether the cost of the measures is a reasonable public expenditure in light of the adverse impacts of the project on the Section 4(f) property and the benefits of the measure to the property, and*

(iii) *Any impacts or benefits of the measures to communities or environmental resources outside the Section 4(f).*

Based on this analysis, some of the CRC options and other measures that could minimize harm to 4(f) resources are not reasonable. However, because the CRC project is currently in the conceptual design phase, it is not possible to draw conclusions about the reasonableness of all potential measures to minimize harm. Therefore, this draft 4(f) Evaluation carries all reasonable and potentially reasonable measures forward for consideration. These measures will be further considered as the CRC project sponsors identify a locally preferred alternative and move into preliminary engineering and final design. In all cases, measures to minimize harm to 4(f) resources will be considered in coordination with the relevant consulting parties for historic resources, and with the City of Vancouver for city park resources.

This section is organized geographically from the south to the north end of the corridor, and discusses the options and measures in the context of the Section 4(f) resources located in each geographic area of the project. These areas include:

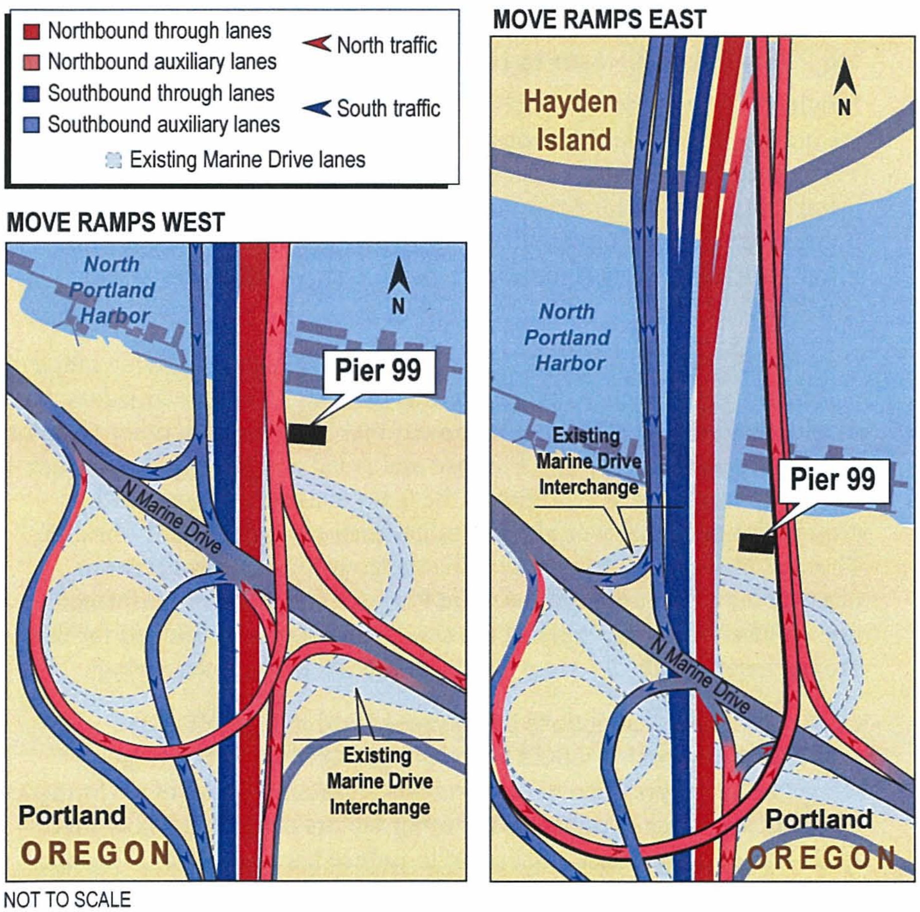
- Resources in Portland
- The Columbia River - 1917 Bridge
- Resources in Vancouver, south of the I-5/Mill Plain interchange
- Resources in Vancouver, north of the I-5/Mill Plain interchange.

Exhibit 5.6-1 lists the measures being considered to avoid or minimize harm, indicates which 4(f) resources could be benefited by each measure, and indicates which measures are considered reasonable, potentially reasonable, or unreasonable.

5.5.1 Minimizing Harm to the Resources in Portland

One potential Section 4(f) resource, the Pier 99 Marina (an eligible historic resource), would be impacted by the proposed Marine Drive interchange improvements. The proposed improvements would require displacement of the building and permanent acquisition of up to half of the parcel. Potential measures to minimize harm are described below. Exhibit 5.5-1 shows the Marine Drive interchange area, along with proposed refinements to this interchange to reduce impacts to Pier 99 (discussed below).

Exhibit 5.5-1
Potential Marine Drive Refinements to Reduce Impacts to Pier 99



Moving the Marine Drive/I-5 Interchange Ramps Farther East

Measure: Relocate, to the east end of the Pier 99 parcel, the proposed eastbound Marine Drive to northbound I-5 and westbound Martin Luther King Jr. Boulevard to northbound I-5 ramps. Relocating these ramps to the east would avoid the Pier 99 building but would result in a different set of impacts. It would displace several businesses, displace additional boat docks and floating homes on North Portland Harbor, and still acquire a portion of the Pier 99 parcel. It would also leave the Pier 99 building isolated between the I-5 mainline and the on-ramps, which would be highly undesirable. Given the additional impacts associated with this design refinement, and the remaining harm to the resource, this does not appear to be a reasonable measure.

Moving the Marine Drive/I-5 Interchange Ramps Farther West

Measure: Relocate, farther west, the proposed eastbound Marine Drive to northbound I-5 and westbound Martin Luther King Jr. Boulevard to northbound I-5 ramps. Relocating these ramps farther to the west, directly adjacent to the I-5 mainline, could potentially avoid displacing the Pier 99 building. This would require reducing the radius of the curves for the ramps from Marine Drive and Martin Luther King Jr. Boulevard to northbound I-5, and shifting both ramps farther west as they parallel the I-5 mainline. Additional design work will be required to determine if this design refinement is constructible and can completely avoid the Pier 99 building. This may be a reasonable measure for reducing harm to the Pier 99 building and will be further evaluated through on-going design efforts.

5.5.2 Minimizing Harm to the 1917 Interstate Bridge

Moving north, the next Section 4(f) resource that would be impacted is the northbound I-5 bridge, constructed in 1917 and listed on the NRHP. The adjacent 1958 bridge was exempted from review as a potential historic property under Sections 4(f) and 106, per the 2005 federal transportation reauthorization act, known as the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

Between 2005 and early 2007 the project team evaluated a wide range of potential river crossings, including new crossings in other corridors that would avoid the 1917 bridge. However, these crossings in other corridors could not meet the project's Purpose and Need and were dropped from further consideration. In addition, the team evaluated a range of I-5 crossing options that would reuse rather than remove the 1917 bridge. These crossing options were eliminated from further consideration because they either did not meet the Purpose and Need or performed poorly when measured against the screening criteria developed for the project (see Section 2.5 for a discussion of alternatives screening).

Of the river crossing options being considered in this DEIS, the supplemental crossing would have less harm on the 1917 bridge. However, the supplemental crossing has an accumulation of performance deficiencies, adverse impacts, and other factors described below that make this an unreasonable measure to reduce harm to the 1917 bridge.

Supplemental River Crossing (Alternatives 4 and 5)

The supplemental river crossing evaluated as part of Alternatives 4 and 5 was the only bridge reuse option that passed the screening process. This option would allow at least some of the I-5 traffic safety and mobility issues to be addressed while still keeping part of the interstate traffic on the existing bridges. However, continued analysis of this option has demonstrated that it cannot meet the project's Purpose and Need as well as the replacement crossing can, it would have higher adverse impacts on the community and environment, and it would have fewer benefits.

Given the collection of problems associated with the supplemental river crossing, it is not a reasonable measure for minimizing harm to the Interstate Bridge.

The problems with the supplemental river crossing (lower transportation benefits, higher adverse impacts, and lower community benefits) are listed below, followed by more detailed descriptions of each item in this list:

- Higher seismic vulnerability
- Greater impacts and degradation of river navigation safety, potentially to levels that are unacceptable to the United States Coast Guard
- Minimal benefits to traffic safety, mobility, congestion and travel time
- Higher adverse impacts on downtown Vancouver land use, circulation, and development
- Higher adverse impacts to neighborhoods and populations on Hayden Island
- Higher adverse impacts and fewer benefits to threatened and endangered species and the natural environment
- Higher maintenance and operation costs.

These problems are described in more detail below.

SEISMIC VULNERABILITY AND SEISMIC RETROFITS

Improving the seismic safety of the crossing is considered critical, and extensive seismic retrofits would be required. The existing bridges do not meet basic "no collapse" criteria for safety in the occurrence of a major seismic event. An expert panel, convened to assess this vulnerability, determined that it is technically feasible to upgrade the bridges' seismic stability to withstand a 500-year event, at a cost of between $125 million and $265 million.[2] These retrofits would change the visual character of the existing bridges due to added and strengthened piers, structural members and rebuilt towers. Seismic retrofits would include encasing the existing piers in a suitable material, adding 40 to 60 feet to the width of each of the foundations. This would extend the current foundation limits and reduce the horizontal clearance between piers, worsening the already restricted navigation route that many vessels must traverse between the existing bridges and a downstream railroad bridge. The supplemental crossing, with major seismic retrofits, would greatly improve the seismic stability of river crossing but would still be more vulnerable to seismic damage than a new bridge.

NAVIGATION SAFETY AND EFFICIENCY

The river navigation problems associated with the existing bridges would be greatly improved if they were replaced by a new crossing (Alternatives 2 and 3). Navigation problems would be exacerbated by reusing the existing bridges (Alternatives 4 and 5) and adding a

[2] Seismic Panel, 2006.

supplemental structure. The supplemental crossing would result in nearly three times as many pier sets across the Columbia River as the replacement crossing, and would result in narrowing the already tight navigation clearance between the existing piers. While this would further degrade navigational safety for the supplemental crossing, the U.S. Coast Guard has not yet provided an official opinion or determination on their ability to permit or not permit this option. Formal determinations by the Coast Guard are typically not issued prior to submitting permit applications, which occurs much later in the bridge design process. Stakeholders from the commercial river users community testified in a preliminary Coast Guard hearing that they would not support an alternative that worsened existing navigation hazards.

TRAFFIC SAFETY, CONGESTION, MOBILITY AND TRAVEL TIME

Because the supplemental crossing would keep northbound interstate traffic on the existing I-5 bridges, it would fail to eliminate all of the sub-standard safety features associated with these bridges. It would not fix the vertical curves that restrict sight distance, or eliminate the need for bridge lifts that are associated with higher accident rates. It would also not include standard width shoulders. Failing to eliminate bridge lifts also means that the congestion and delay associated with bridge lifts will continue. The supplemental crossing, with fewer auxiliary highway lanes, would also do less to address congestion and mobility than a replacement crossing. The supplemental crossing would result in over 11 hours of daily congestion, compared to 4.5 hours with the replacement crossing. This added congestion further contributes to higher accident rates.

The supplemental crossing would also provide poor access for Hayden Island residents to Vancouver destinations, especially during peak periods. This is because the northbound on-ramps at Hayden Island can only access the eastern most bridge, which will also be carrying all I-5 traffic that needs to exit at SR 14, City Center, Mill Plain or Fourth Plain. This is necessary because of the physical separation of the two existing bridges that would be reused with the supplemental crossing. Because of the high number of trips exiting and entering I-5 at these interchanges, modeling indicates substantial northbound congestion in these two traffic lanes during the peak period.

DOWNTOWN VANCOUVER LAND USE, CIRCULATION AND DEVELOPMENT

The supplemental crossing would cause a decrease in connectivity in downtown Vancouver and complicate the City's ability to meet parts of the City Center Vision, which includes providing new connections between downtown and the waterfront. Removing the existing bridges (part of alternatives 2 and 3) would allow Main Street to be extended to the waterfront, whereas keeping the existing bridge (part of alternatives 4 and 5) and adding a supplemental one would not. The City could still potentially extend other local streets to the waterfront, but these would require tunneling under the BNSF right-of-way and additional property acquisitions.

The supplemental crossing would also close Sixth Street, an important east-west connection to the City of Vancouver's Convention Center and City Center (including Esther Short Park).

HAYDEN ISLAND NEIGHBORHOOD AND ENVIRONMENTAL JUSTICE IMPACTS

The supplemental crossing would require displacement of the Safeway supermarket on Hayden Island. Community members have expressed concern over the potential loss of this use, since it is the only grocery store on the island. It's loss would require community residents, which include a relatively high number of mobility-impaired people, to travel much further for groceries. The replacement crossing design could be refined so that it does not impact Safeway. The supplemental crossing would also require displacement of more floating homes than the replacement crossing.

The supplemental crossing would provide much poorer highway egress off the island during peak periods (as described above under Traffic Safety, Congestion, Mobility and Travel Time). Substantially impaired egress off the island would adversely affect the residents' mobility, and would adversely affect emergency vehicle access and response time.

The replacement crossing would allow for a local east-west street connection under I-5 on Hayden Island; the supplemental crossing, similar to existing conditions, would not allow for this. Hayden Island residents and the City of Portland's Hayden Island Concept Plan have identified this east-west link as important to local circulation and to connecting the community on either side of I-5.

NATURAL ENVIRONMENT IMPACTS

The supplemental crossing would cause greater short-term and permanent impacts to the natural environment than the replacement crossing. It would require more in-water structures (16 sets of bridge piers, compared to 6 sets for the replacement crossing) across the river. The amount of fill would be similar, but the supplemental crossing would result in nearly three times as many large pier sets across the river and more piers in shallow water. Piers can create habitat for invasive fish species that prey on juvenile salmon. The supplemental crossing would also continue to discharge untreated stormwater runoff from a portion of the crossing directly into the Columbia River, which is critical habitat for threatened and endangered salmon species. The National Marine Fisheries Service has provided a written statement of their preference for the replacement crossing over the supplemental crossing.

COSTS

The cost to maintain and operate the existing bridges would be an order of magnitude higher than the costs for maintaining and operating a new, fixed span bridge. The costs for routine maintenance for the existing bridges would be approximately $750,000/year, compared to about $35,000/year for a new facility. However, the existing bridges also have projected major maintenance costs (e.g., for painting and deck replacement) that result in an annualized equivalent cost of about $3.9 million per year over 30 years. Preliminary estimates indicate capital costs for supplemental alternatives would be roughly 10 to 15 percent less than the replacement alternatives.

Other Measures to Minimize Harm to the 1917 I-5 Bridge

Other measures to minimize harm to this 4(f) resource would include mitigation that will be developed through a Memorandum of Agreement (MOA) with consulting parties, in compliance with Section 106 of the National Historic Preservation Act. Such measures could include documenting the bridge prior to deconstruction, relocating and adaptively reusing elements of the existing bridge, developing interpretive information, and other measures to be determined in coordination with the Section 106 consulting parties.

5.5.3 Minimizing Harm to 4(f) Resources in Vancouver, South of the I-5/Mill Plain Interchange

Section 4(f) resources are located adjacent to both sides of the I-5 right-of-way between the north shore of the Columbia River and the Mill Plain interchange. Any action that widens the right-of-way of I-5 or the I-5/SR 14 interchange could potentially impact the adjacent 4(f) properties, including:

- The Vancouver National Historic Reserve (VNHR)
- Old Apple Tree Park (parkland)
- Fort Vancouver Village ("Kanaka" Village; historic resource in the VNHR)
- Barracks Hospital (historic resource in the VNHR)
- The Providence Academy (historic resource)
- The Kiggins House (historic resource)
- The Waterfront Renaissance Trail (park and recreation resource)
- Waterfront Park (park and recreation resource)

These resources would be affected by the highway widening and I-5/SR 14 interchange improvements. The highway improvements associated with the replacement crossing generally would require more right-of-way than with the supplemental crossing. Potential ways to minimize harm include:

- Select the supplemental crossing option with its narrower footprint to reduce harm to the west edge of the VNHR, the Barracks Hospital, the Fort Vancouver Village area of the VNHR, Old Apple Tree Park, the Providence Academy, Waterfront Trail and Waterfront Park.
- Shift the replacement crossing alignment to the west to avoid the VNHR.
- Shift the replacement crossing slightly west (Intermediate Alignment) to reduce harm to the VNHR.
- Stack I-5 on-ramps from SR 14 vertically instead of aligning them side by side to reduce harm to the west edge of the VNHR.
- Reduce I-5 lane widths and/or shoulder widths below standards to reduce harm to the west edge of the VNHR and Barracks Hospital.

- Eliminate one or more proposed auxiliary lanes from I-5 between SR 14 and Mill Plain to reduce harm to the west edge of the VNHR, Barracks Hospital and the Academy.
- Select an SR 14 interchange design that reduces acquisition of VNHR property to reduce harm to the Fort Vancouver Village area of the VNHR, and Old Apple Tree Park.
- Select the SR 14 Left-Loop interchange design to reduce the direct impact to the Fort Vancouver Village area of the VNHR and Old Apple Tree Park.
- Refine the SR 14 Dual-Loop interchange design to reduce the direct impact to the Fort Vancouver Village area of the VNHR and Old Apple Tree Park.
- Reorient the I-5/SR 14 interchange to reduce direct impacts to the Fort Vancouver Village area of the VNHR and Old Apple Tree Park.

Select the Supplemental Crossing Option

The supplemental crossing (part of Alternatives 4 and 5) has a narrower cross-section than the replacement crossing (part of Alternatives 2 and 3), with one less lane in each direction north of SR 14. It would also make no improvements to the eastern portion of the SR 14 interchange that abuts parts of the VNHR. This option would result in less impact on the VNHR resources, Waterfront Trail and Waterfront Park and would avoid the Providence Academy and Barracks Hospital. However, the supplemental crossing has an accumulation of performance deficiencies, adverse impacts and other factors, described in Section 5.5.2, that demonstrate why this option is not a reasonable measure to reduce harm to 4(f) resources.

Shift the Replacement Crossing Alignment to the West to Avoid the VNHR

The CRC team has evaluated a potential refinement of the highway design for Alternatives 2 and 3 that would shift the I-5 alignment and proposed improvements to the west in order to fully avoid the VNHR (Exhibit 5.5-2). Shifting the alignment west would avoid the following impacts:

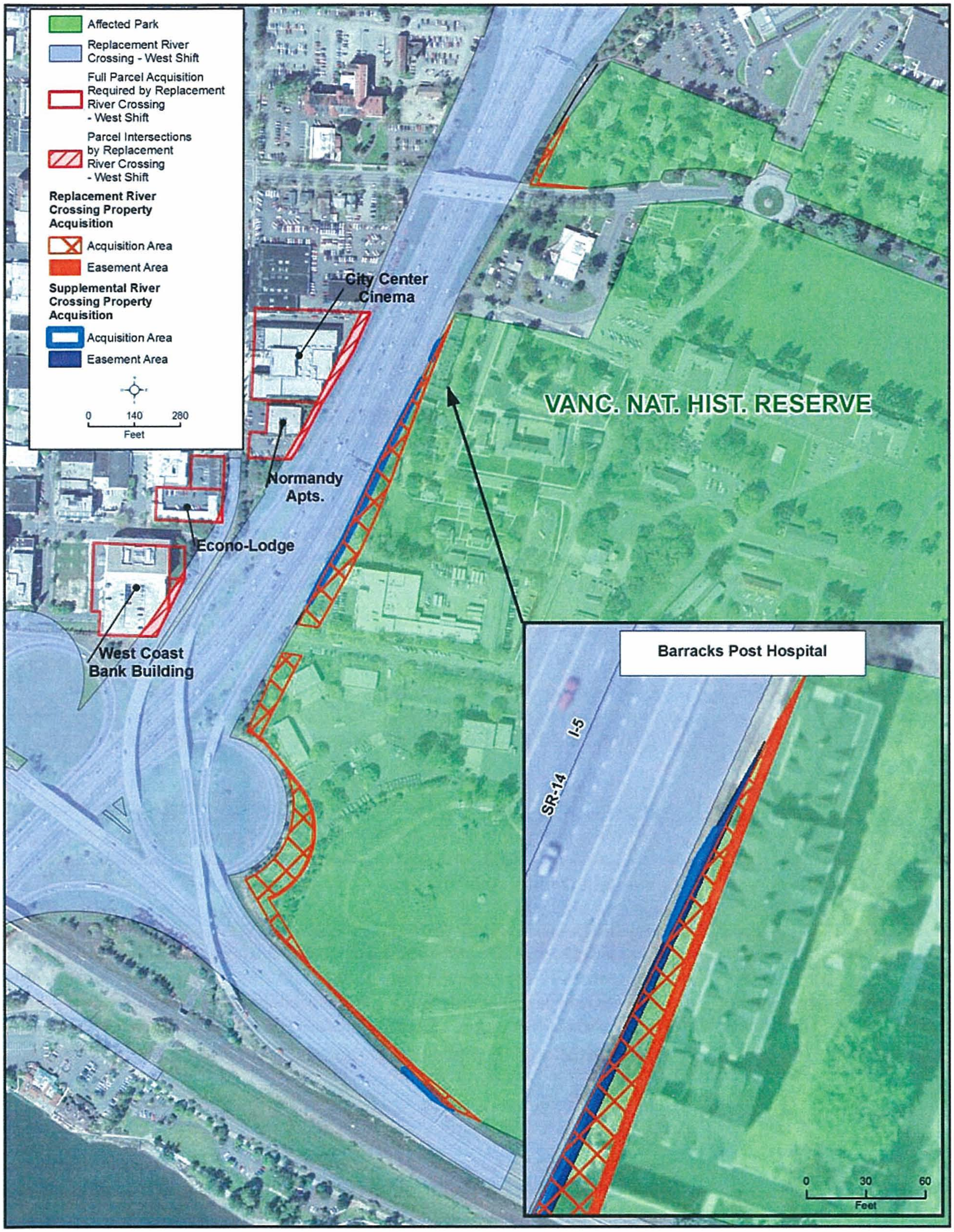
- Acquisition of 1.76 to 2.7 acres (0.4 to 0.6 percent) of the land within the VNHR, occupied largely by open space or road.
- Removal of a portion (about 2,000 square feet) of a single-story federal office building (not historic) and a garage (not historic) in the VNHR. The office building space would likely need to be replaced.

Because 4(f) resources are located on both sides of the I-5 right-of-way, it is not possible to make this shift without impacting the resources on the west side of I-5. There are also relatively large residential and commercial uses abutting the west side of I-5. Shifting the I-5 alignment west, in order to fully avoid acquiring any property from the VNHR, would result in:

- Demolishing at least a portion of the Normandy Apartments building (a historic resource that is eligible for the National Register of Historic Places).

- Displacing several and up to 40 households from the studio and one-bedroom apartments in the Normandy building. Based on US Census data some of these could be low income households. House-by-house surveys would be required to confirm the demographics of each household.
- Demolishing at least a portion of the parking garage associated with the West Coast Bank Building. This is a recently constructed project (70,000 square feet of commercial space and 21 condominium units) that is an important part of the downtown's revitalization and provides parking to residents and businesses in the vicinity.
- Demolishing at least a portion of the Econo-Lodge motel located just north of the West Coast Bank Building.
- Demolishing at least part of the City Center Cinema building (a 12-theatre complex – the largest in downtown Vancouver – that attracts people and activity to downtown, making it integral to the City's overall vision for an active and vibrant urban center).

Exhibit 5.5-2
Highway Alignment and Proposed Improvements Shifted West[a]



DIMENSIONS ARE APPROXIMATE.

[a] This shifted alignment of I-5 has three through lanes and four auxiliary lanes in each direction. All lanes and shoulders are standard width, but the barrier between the collector-distributor and through lanes has been narrowed by 8 feet. This results in a typical cross section that is 238 feet across.

This evaluation assumes that each of the buildings hit by this minimization measure would be only partially demolished, thus allowing some portion of the existing use of the buildings to continue. However, full demolition of one or more of the buildings may be required. Additional analysis would be conducted prior to finalizing the I-5 design and the ROD, to determine the feasibility and cost-effectiveness of fully demolishing versus partially demolishing and refacing each of these buildings.

The CRC project team has been meeting regularly with the NPS staff members who administer and manage the VNHR. The NPS has provided records from past archaeological investigations and historic research, as well as input regarding the relative importance of different elements of the VNHR and the potential impacts that the CRC alternatives would have on the VNHR. The NPS has provided a letter to WSDOT identifying various mitigation measures they would like the project to consider to address the effects on the VNHR associated with Alternatives 2 and 3. Some of these measures are among the potential mitigation listed in Section 3.8.5 of the DEIS. WSDOT and NPS are also preparing a Memorandum of Agreement that would allow the VNHR Partners to provide staff to assist in on-going archaeological investigations for the CRC project.

While Alternatives 2 and 3 would directly impact the VNHR, some of these impacts would be consistent with the NPS's VNHR Long-Range Plan and other VNHR management objectives described in Section 5.2.3. The NPS has plans to remove Anderson Road (located between I-5 and the Barracks Hospital) and replace it with landscaping that would better reflect the historic context of the hospital and/or to place sound barriers to reduce noise levels from I-5 traffic. Alternatives 2 and 3 would remove most of Anderson Road in this location, and would likely install a sound barrier and vegetation between I-5 and the hospital.

In addition, potential mitigation proposed by the administrator of the VNHR would further allow the NPS to implement important aspects of VNHR Long-Range Plan, Interpretive Plan, and other plans noted in Section 5.2.3. With mitigation, Alternatives 2 and 3 could have an overall benefit to the VNHR.

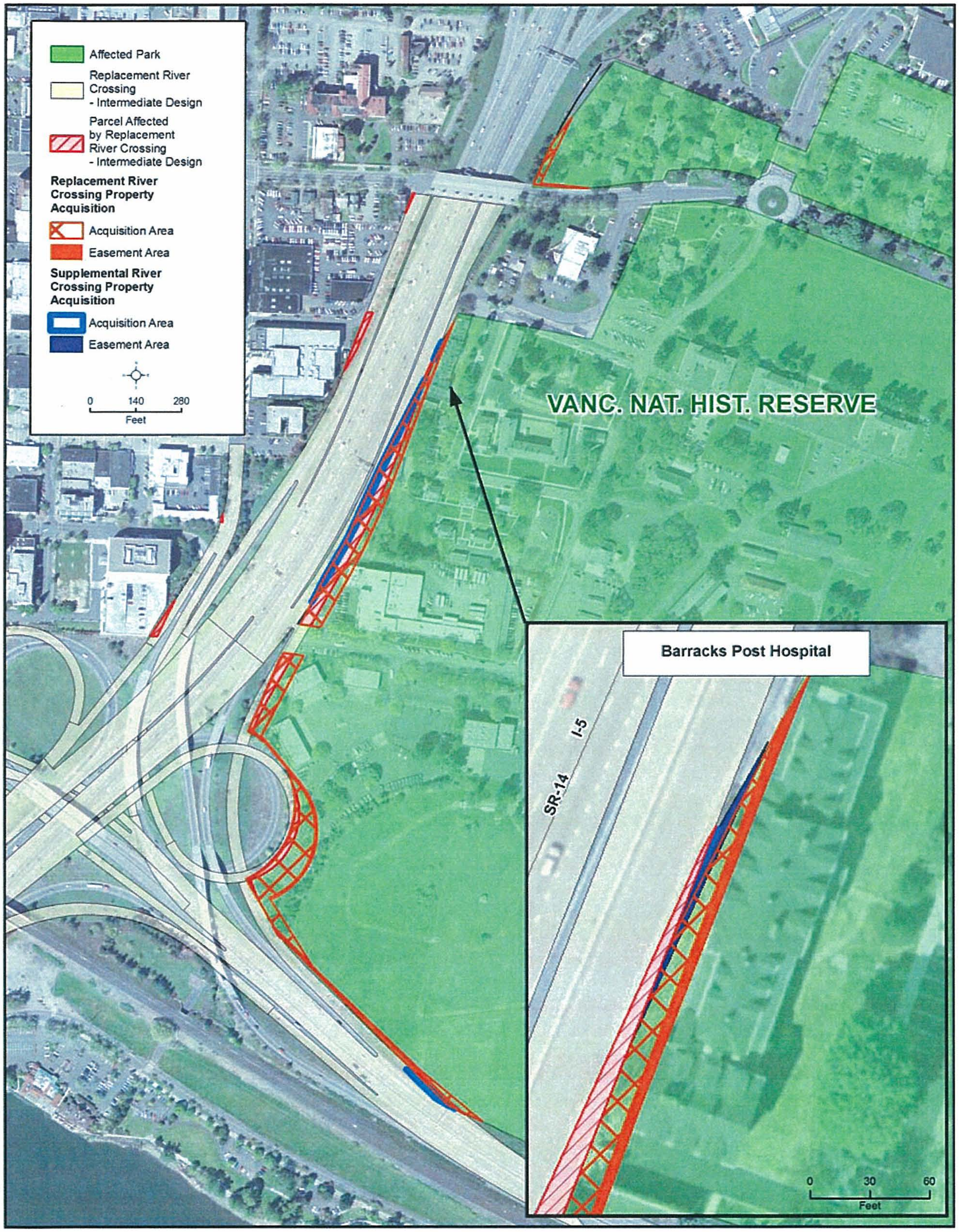
The impacts on buildings west of I-5 that would result from shifting I-5 to the west, and the lost opportunity for the VNHR to receive the mitigation-related benefits associated with direct impacts on VNHR land, may not be a reasonable trade-off for the VNHR impacts and mitigation that would be avoided with this minimization measure. A final determination will depend on on-going coordination with the NPS regarding impacts and mitigation, as well as analysis of the feasibility and cost-effectiveness of partially versus fully demolishing the buildings outside the VNHR on the west side of I-5.

Shift the Replacement Crossing to an Intermediate Alignment

The CRC team has evaluated a potential refinement of the highway design for Alternatives 2 and 3 that would shift the I-5 alignment and proposed improvements slightly west in order to reduce impacts on the VNHR (Exhibit 5.5-3), while also minimizing impacts to 4(f) and non-4(f) resources on the west side of I-5. Selecting this alignment would reduce land acquired from VNHR along the I-5 and SR 14 interchange to about 0.8 acre, rather than 2.7 acres. This would also avoid directly affecting the federal office building on the VNHR, and could avoid affecting the Normandy Apartments building, the City Center Cinema building, and the parking garage associated with the West Coast Bank building.

This potential design refinement calls for narrowing the overall cross-section of I-5 in this location. The design shown does not appear to require any highway design standard exceptions. However, at this early phase of design, it is prudent to generally note that as design information progresses, some design standard exceptions may be necessary in order to achieve this level of minimization. If design exceptions are not required, or are required and warranted, this minimization measure would be a reasonable approach to minimizing harm to 4(f) resources, while also reducing impacts to other properties and community resources.

Exhibit 5.5-3
Shift the Replacement Crossing to an Intermediate Alignment[a]



DIMENSIONS ARE APPROXIMATE.

[a] The Intermediate Alignment has three through lanes and four auxiliary lanes in each direction. All lanes and shoulders are standard width, resulting in a typical cross section that is 246 feet across.

Stack I-5 Ramps to Reduce Overall Right-of-Way Width

Stacking ramps vertically where I-5 is adjacent to the VNHR and Barracks Hospital would reduce the width of the proposed right-of-way. Selecting this measure (a modification of the highway improvements associated with Alternatives 2 and 3) could reduce but not avoid direct property acquisition from the west edge of the VNHR, but would locate a two-lane elevated structure approximately 25 feet above grade, adjacent to the VNHR from about SR 14 to north of Evergreen. The structure would be adjacent to the second story of the Barracks Hospital, a historic resource located on the VNHR. This would increase the visual and potential noise impacts to the Barracks Hospital, other parts of the VNHR, and other locations in downtown Vancouver. The National Park Service staff has indicated that this option is undesirable because of the substantially greater visual impacts to the Barracks Hospital and other parts of the VNHR. This measure would also eliminate the SR 14 to Mill Plain direct connection; current conditions include this direct connection, and keeping this connection is a high priority to the City of Vancouver. This is not considered to be a reasonable measure for minimizing harm to the VNHR, especially since there are other measures for reducing harm that would result in fewer adverse impacts.

Reduce I-5 Lane Widths and/or Shoulder Widths

Reducing the width of I-5 lanes and/or shoulders (associated with Alternatives 2 and 3) in this segment would reduce the right-of-way width and thus reduce the direct property acquisitions on one or both sides of I-5. This could reduce, although not likely completely avoid, the amount of property acquired from the west side of the VNHR or from the Providence Academy. The impacts to the VNHR at this location would be relatively limited, as currently proposed, and would not require displacement of any historic buildings or above-ground features. The disadvantage of this measure is that narrower lanes and shoulders reduce highway safety and increase crashes. Some narrowing of lanes and shoulders may be acceptable, but would require additional safety and design analysis, as well as coordination with the NPS, to determine if the trade-off is reasonable.

Eliminate One or More I-5 Auxiliary Lanes between SR 14 and Mill Plain Interchanges

Between SR 14 and Mill Plain Boulevard, the impact of Alternatives 2 and 3 on 4(f) resources (including the western edge of the VNHR, the Providence Academy, and the Normandy Apartments) could be reduced by eliminating one or two of the proposed auxiliary lanes in this section of I-5. This would reduce the basic I-5 lane configuration of Alternatives 2 and 3 to that of Alternatives 4 and 5 (the supplemental crossing) in this section of I-5. As currently designed, Alternatives 2 and 3 would not require displacing any buildings on the Providence Academy property or Normandy Apartments, or any historic buildings or features on the VNHR property. Therefore, reducing the auxiliary lanes in this section of I-5 would not preserve any historic buildings or historic features that would otherwise be displaced (see Section 6.3 for a description of the use of these properties). Eliminating auxiliary lanes would provide a meaningful but perhaps not substantial benefit to these 4(f) resources.

Such a benefit is likely not warranted given the degradation in highway safety, congestion and operations associated with this minimization measure.

Proposed auxiliary lanes in this area are used to extend the currently substandard weaving distance between the SR 14 and Mill Plain interchanges. Eliminating one or more of the proposed auxiliary lanes would violate highway design principles that were developed to help ensure safety and operational efficiency. Thus, this potential minimization measure is not reasonable.

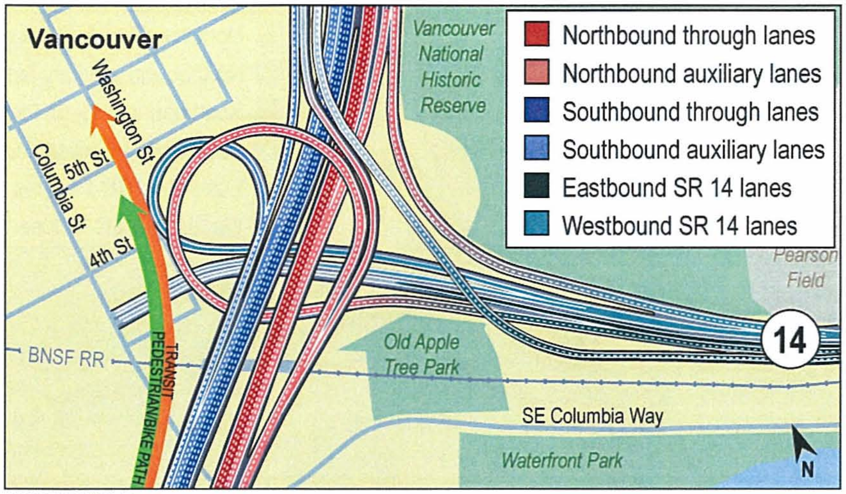
Select the SR 14 Left-Loop Interchange Design to Reduce the Direct Impact

With Alternatives 2 and 3, two basic interchange designs are being considered for I-5/SR 14. The dual-loop was designed to meet highway design standards to bring the exit ramps down to grade from the higher bridge structure, while still providing a tight connection to SR 14 and downtown Vancouver.

The left-loop design (Exhibit 5.5-4) could reduce the direct use of VNHR property near the Fort Vancouver Village ("Kanaka" Village) area. The affected VNHR property is currently vacant, but is a Section 4(f) resource and likely contains archaeological resources. The disadvantages of the left-loop design are that it would be higher in the air and more visually intrusive on views from the VNHR, would cost more, would have greater traffic safety risks, and would intrude farther into the Pearson Field air space. This design would likely require design exceptions from FHWA. This minimization measure will receive further safety and design analysis to determine if it is reasonable.

Several meetings have been held with Federal Aviation Administration (FAA) and Pearson Field Airport staff to discuss CRC alternatives, identify concerns, and review conceptual alternatives and options. The FAA reaffirmed its procedure in stating that once a proposal is submitted the FAA aeronautical review will issue a finding of "hazard to aviation" or "no hazard to aviation." They noted that it is ultimately up to the community to determine the preferable mode of transportation, and that service to Pearson may be affected if proposed improvements are not safe for aviation. Once a locally preferred alternative (LPA) is identified, FAA Form 7460 can be submitted to the FAA. Submitting this form will initiate the formal FAA aeronautical review process. FAA will review proposed construction and how it affects the Part 77 imaginary surface.

Exhibit 5.5-4
SR 14 Interchange Replacement Crossing Left-Loop Design



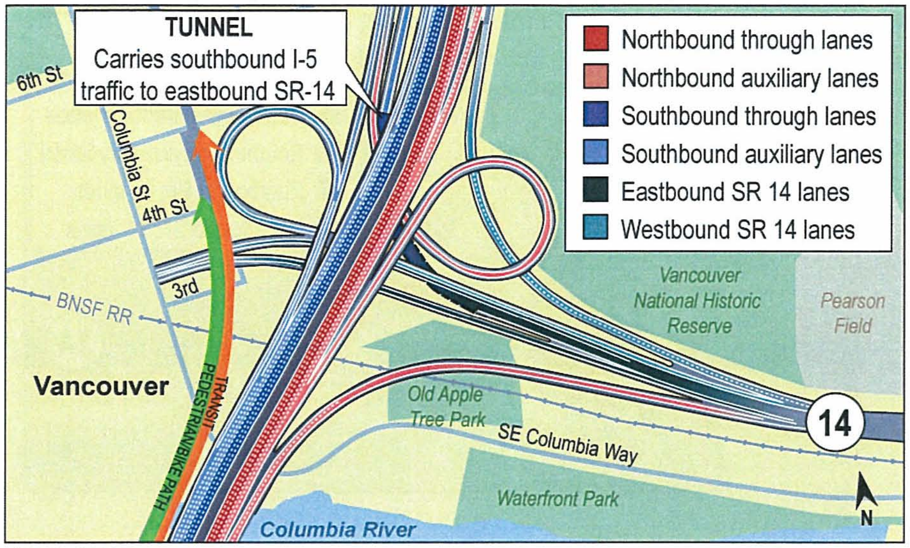
NOT TO SCALE

Refine the SR 14 Dual-Loop Interchange Design to Reduce the Direct Impact

Another potential measure for minimizing the impact of Alternatives 2 and 3 in this area would be to refine the design of the eastern loop of the SR 14 dual loop interchange (specifically, the I-5 northbound to City Center off-ramp and the SR 14 westbound to I-5 northbound ramp) so that neither of these would intrude into VNHR property (including the Fort Vancouver Village area) (Exhibit 5.5-5). This could be done by tightening the curve on the City Center off-ramp (to about a 20-15 mph design speed) and tightening the curve on the SR 14 to I-5 northbound ramp (to about a 35-30 mph design speed), as well as increasing ramp grades and decreasing spacing between off-ramps.

These changes would require design exceptions because they would not meet design safety standards for curve radius, ramp design speeds, grade, or spacing between ramps. Full avoidance of VNHR at this location may not be reasonable, given these impacts. However, it might be possible to make design revisions with acceptable safety standard exceptions that reduce, but do not avoid, the *use* of VNHR property. This is a potentially reasonable minimization measure and will be further evaluated for safety, design and other impacts.

Exhibit 5.5-5
SR 14 Interchange Replacement Crossing Dual-Loop Design

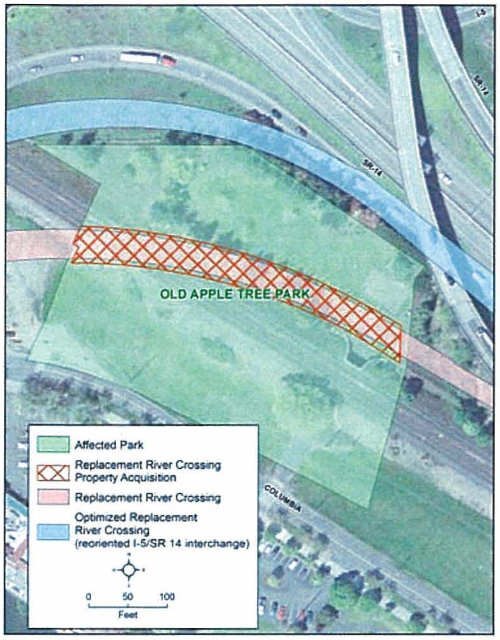


NOT TO SCALE

Reorient the I-5/SR 14 Dual-Loop Interchange Design to Reduce Direct Impacts

This refinement of the dual loop SR 14 interchange design (part of Alternatives 2 and 3) would reorient the I-5/SR 14 interchange, locating the I-5 northbound to SR 14 eastbound ramp farther north to avoid direct *use* of the Old Apple Tree Park, and shift the alignment of the I-5 mainline slightly west to enter the SR 14 interchange from a different angle. Exhibit 5.5-6 shows how the ramp that cuts across Old Apple Tree Park under the standard design for the replacement crossing would be relocated to avoid the Old Apple Tree Park with this reoriented design of the I-5/SR 14 interchange. This refinement would increase the impact on the hotel (Red Lion) property located on the west side of the SR 14 interchange. This hotel property would already be impacted by the CRC project even without this reorientation of the I-5/SR 14 interchange. The Red Lion property is not a 4(f) resource. This change would not compromise the design speeds of the loop ramps. This appears to be a reasonable minimization measure and will continue to be considered.

Exhibit 5.5-6
Two Ramp Alignment Options at Old Apple Tree Park



DIMENSIONS ARE APPROXIMATE.

Other Measures for Reducing Impacts to 4(f) Resources in This Segment

Use of the Waterfront Trail might be avoided by ensuring that bridge demolition and construction of new facilities and structures (1) would meet Section 4(f) temporary *use* criteria and (2) would involve replacement or relocation of the trail and its recreational qualities and functions in a manner approved by the official having jurisdiction. This is a reasonable measure to minimize harm to the trail.

A variety of other measures, such as sound walls and vegetative buffers where I-5 borders the VNHR, could help reduce harm to the VNHR.

5.5.4 Minimizing Harm to 4(f) Resources in Vancouver, North of the I-5/Mill Plain Interchange

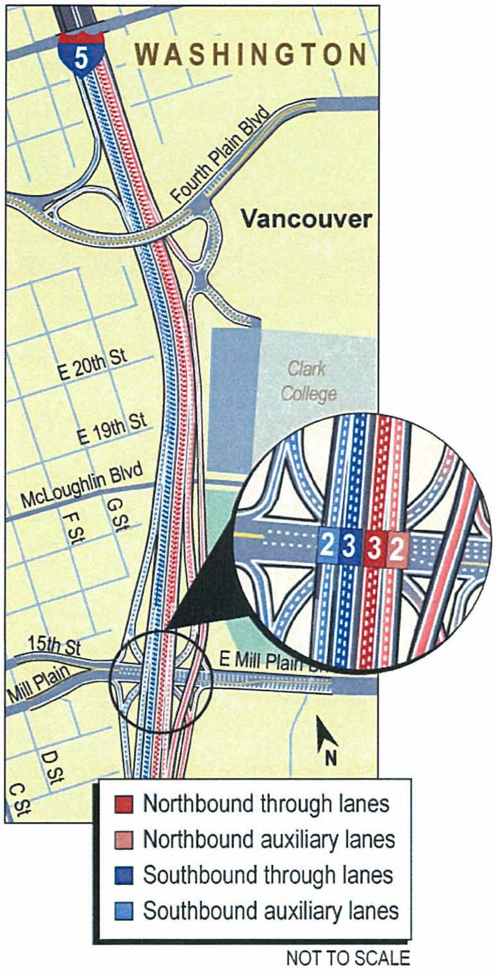
This subarea includes resources that would be impacted by potential highway or transit improvements along I-5, as well as by potential transit improvements on the Lincoln terminus. Section 4(f) resources potentially *used* by the CRC alternatives include:

- Marshall Community Park
- Clark College recreation fields
- Residence, 903 E 31 Street
- Office, 300 E 37th Street
- Office, 3212 Main Street
- Leverich Park
- Kiggins Bowl Area

- Residence/office, 401 E McLoughlin
- Residence, 611 E McLoughlin
- Residence, 3000 K Street
- Residence 3110 K Street

Potential measures for minimizing harm to these resources are described below.

Exhibit 5.5-7
Supplemental Crossing – Fourth Plain and Mill Plain Interchanges



Select the Supplemental Crossing and Highway Option

The supplemental crossing (part of Alternatives 4 and 5) would generally have lower impacts to 4(f) resources than the replacement crossing (part of Alternatives 2 and 3), including slightly lower impacts on the Clark College recreation fields and Leverich Park. However, it is not a reasonable option given its deficient performance, other impacts, and accumulation of unique problems. The discussion above outlines why the supplemental crossing and highway improvements are not a reasonable approach to minimizing harm to 4(f) resources, compared to the replacement crossing.

Select the Replacement Crossing and Highway Option

The replacement crossing (part of Alternatives 2 and 3) would have less impact on the potentially historic residence at 3000 K Street than the supplemental crossing. The replacement crossing would also completely avoid impacting the historic residence at 3110 K Street. However, although this crossing and highway option would minimize or avoid impacts to these two resources, they would result in greater impacts to other 4(f) resources. Additional measures, discussed below, could further reduce the impacts of the replacement crossing on 4(f) resources. Selecting this option is a reasonable measure.

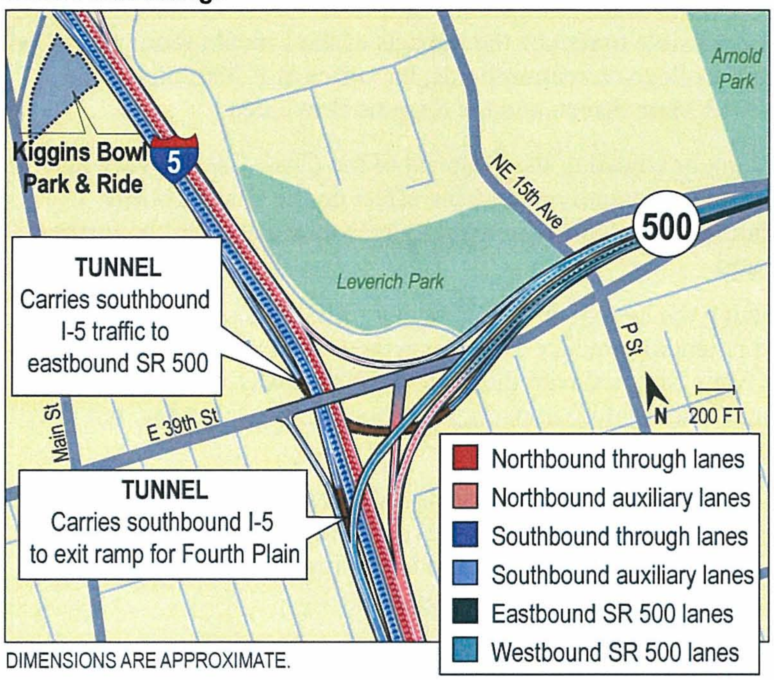
Revise the Replacement Crossing and Highway Options

Three potential revisions to the replacement crossing highway improvements (associated with Alternatives 2 and 3) are being considered in order to reduce harm to Marshall Community Park, Leverich Park, and potentially, the historic residence at 3000 K Street.

- Realigning or narrowing the Mill Plain to Fourth Plain ramps just north of the Mill Plain interchange along the east side of I-5 (Exhibit 5.5-7) could reduce the impacts on Marshall Community Park. This measure appears reasonable, but would require additional design to make a final determination.
- Under the proposed design in the DEIS, Leverich Park air space is impacted and there could be one or more piers on park property. Realigning the westbound SR 500 to northbound I-5 elevated ramp (Exhibit 5.5-8) and using a fill wall could reduce the impacts on Leverich Park. Realigning this ramp would require a shorter radius curve. Given the safety tradeoff associated with this measure, and given that the impact is likely *de minimis*, this is likely not a reasonable approach for minimizing harm to Leverich Park.

- Realigning I-5, narrowing lanes and shoulders, or modifying a retaining wall type could reduce impacts to the historic residence at 3000 K Street. However, the impact to this resource would not be a full acquisition, only a portion of the parcel. Reducing lane and shoulder widths to reduce highway safety and adjusting the alignment further west would likely result in additional full displacements on the west side of I-5. Therefore, this is not likely a reasonable measure for minimizing harm to 4(f) resources.

Exhibit 5.5-8
SR 500 Interchange



DIMENSIONS ARE APPROXIMATE.

Select the Lincoln or Mill Plain MOS Terminus Options

Selecting the Lincoln or Mill Plain MOS terminus option (under all alternatives) would likely be a reasonable measure for minimizing harm to 4(f) resources. It would avoid the adverse effects of the Kiggins Bowl or Clark College MOS terminus options, including the *use* of the residences at 401 E McLoughlin (partial property acquisition) and 611 E McLoughlin (partial property acquisition). It would also avoid the adverse effects unique to the Kiggins Bowl terminus, including the full displacement of the residence at 903 E 31st Street and the *use* of a portion of Leverich Park. It would, however, have greater impacts to residences and businesses and would require greater overall property acquisition.

Select the Kiggins Bowl Terminus

Selecting the Kiggins Bowl terminus (with all alternatives) would result in greater harm to 4(f) resources than selecting the Lincoln terminus. However, this would avoid using the one historic resource *used* by the Lincoln terminus, would displace fewer businesses and residences, and would acquire less property. Although it would cause greater harm to 4(f) resources, that would be offset by notably lesser direct impacts on other community resources. Therefore, this is likely a reasonable measure for minimizing harm.

Revise the Lincoln Terminus

It might be possible to reduce the impacts of the Lincoln terminus option to the Clark College recreation fields, the office at E 37th Street, the office at 3212 Main Street, and the Kiggins Bowl area.

- Reducing or adjusting the footprint of the Clark College Park and Ride could potentially reduce the effect on the Clark College recreation fields. This is potentially reasonable and will be further explored.
- Adjusting the alignment or narrowing traffic lanes or sidewalks could potentially reduce impacts on the offices at E 37th Street and 3212 Main Street. Given the narrow right-of-way in this location and the anticipated safety impacts, this may not be reasonable, but it will be further explored.
- Reducing or adjusting the footprint of the Kiggins Bowl Park and Ride could potentially reduce the effect on the recreational trail. The effect might be considered a *de minimis* impact. This is potentially reasonable and will be further explored.

Revise the Kiggins Bowl Terminus

It might be possible to reduce the impacts of the Kiggins Bowl terminus option to the Clark College recreation fields; the residences at 903 E 31st Street, and at 401 and 611 E. McLoughlin Boulevard; Leverich Park; and Kiggins Bowl.

- Reducing or adjusting the footprint of the Clark College Park and Ride could potentially reduce the effect on the Clark College recreation fields. This is potentially reasonable and will be further explored.
- Shifting the transit and/or highway alignment, narrowing travel lanes and shoulders, or modifying wall construction techniques could potentially reduce the *use* (full displacement) of the residence at 903 E 31st Street. However, reducing lane and shoulder widths would reduce highway safety, and adjusting the alignment would likely result in additional full displacements on the west side of I-5. Therefore, this is likely not a reasonable measure for minimizing harm to 4(f) resources but will continue to be explored.

- Shifting the alignment or narrowing traffic lanes and sidewalks could reduce the impact to the residences at 401 and 611 E McLoughlin Boulevard. This measure would reduce traffic and pedestrian safety, or would increase the impact on the opposite side of McLoughlin, which also contains eligible historic resources. This is likely not a reasonable measure for reducing harm to 4(f) resources, but it will be further explored.
- Adjusting the transit terminus alignment or modifying the retaining wall construction technique could potentially reduce the direct effect on Leverich Park. This might be reasonable, but would require further study if the Kiggins Bowl terminus option is selected. This impact might be considered a *de minimis* use.
- Reducing or adjusting the footprint of the Kiggins Bowl Park and Ride (with bus rapid transit) could potentially reduce the effect on the recreational trail and Kiggins Bowl. Revising the proposed bus rapid transit alignment between Kiggins Bowl and I-5 could reduce the *use* of the Kiggins Bowl parcel by the transit terminus. Both of these measures are potentially reasonable and will be further explored. The effect might be considered a *de minimis* use.

Select the Mill Plain Minimum Operable Segment

Terminating high-capacity transit at the Mill Plain terminus would avoid the 4(f) *uses* associated with the Kiggins Bowl terminus option, including the *use* of Leverich Park and the residences at 903 E 31st Street (full displacement), 401 E McLoughlin (partial property acquisition), and 611 E McLoughlin (partial property acquisition). It would also avoid the *use* (full displacement) of the office at 300 E 37th Street and the *use* (no displacement) of the office at 3200 Main Street. Selecting this MOS would reduce harm to 4(f) resources. However, it would not provide the same transit service benefits envisioned with either of the full-length transit terminus options.

Select the Clark College Minimum Operable Segment

Terminating high-capacity transit at the Clark College Park and Ride would avoid the Section 4(f) *uses* associated with the Kiggins Bowl terminus option north of Clark College, including the *use* of Leverich Park and the *use* of the residence at 903 E 31st Street (full displacement). It would also avoid the *use* (full displacement) of the office at 300 E 37th Street and the *use* (no displacement) of the office at 3212 Main Street. Selecting this MOS would reduce harm to 4(f) resources. However, it would not provide the same transit service benefits envisioned with either of the full-length transit terminus options.

5.6 Net Impact Analysis

As discussed above, there are no prudent and feasible alternatives that can avoid all Section 4(f) resources. Therefore, it is necessary to determine which alternative would result in the least overall harm to 4(f) resources, taking into account the net impacts to 4(f) resources after applying reasonable measures to minimize harm. Based on the analysis in Section 5.5, some of the measures that could minimize harm to 4(f) resources are not reasonable, when the potential benefit those measures would provide to some 4(f) resources is weighed against the additional impacts that would result to other 4(f) and non-4(f) resources. Such options and measures are not recommended and are therefore not analyzed in this section.

Because the CRC project is currently in the conceptual design phase, it is not possible to draw conclusions about the reasonableness of all potential measures to minimize harm. This draft 4(f) Evaluation carries all reasonable and potentially reasonable measures forward for consideration. These measures will be further evaluated as the CRC project sponsors identify a locally preferred alternative and refine the project design. In all cases, measures to minimize harm to 4(f) resources will be considered in coordination with the relevant consulting parties for historic resources, and with the officials with jurisdiction for park resources.

Exhibits 5.6-1 and 5.6-2 summarize the potential measures that have been considered to avoid or minimize harm, and indicate which 4(f) resources would be benefited by each measure. They also indicate whether each measure would be considered reasonable, potentially reasonable, or unreasonable, based on the analysis in this chapter.

The preliminary findings on least net harm are presented by geographic area, consistent with the organization of Section 5.5.

5.6.1 Net Section 4(f) Resource Impacts in Portland

Based on preliminary findings, the least net harm to 4(f) resources in Portland, using reasonable measures to minimize harm, would result with the replacement river crossing combined with the realignment of the proposed on-ramps to northbound I-5 at the Marine Drive interchange. This realignment, intended to avoid displacing the Pier 99 Marina (a 4(f) resource), will require further design evaluation to ensure that it is reasonable and feasible and that the design exceptions it would require are justified.

5.6.2 Net Section 4(f) Resource Impacts to the 1917 Interstate Bridge

There is no reasonable measure for avoiding a 4(f) *use* of the 1917 Interstate bridge. The supplemental river crossing would result in less harm to this bridge than the replacement crossing, but it is not a reasonable measure, for the reasons listed below and described in greater detail in Section 5.5.2. The supplemental crossing would have:

- Higher seismic vulnerability
- Greater impacts and degradation of river navigation safety, potentially to levels that are unacceptable to the United States Coast Guard

- Minimal benefits to traffic safety, mobility, congestion and travel time
- Higher adverse impacts on downtown Vancouver land use, circulation, and development
- Higher adverse impacts to neighborhoods and populations on Hayden Island
- Higher adverse impacts and fewer benefits to threatened and endangered species and the natural environment
- Higher maintenance and operation costs.

The least net harm to the 1917 bridge, using reasonable measures to minimize harm, would result from the replacement river crossing, combined with mitigation measures to be developed through a Memorandum of Agreement in compliance with Section 106 of the National Historic Preservation Act. Such measures could include documentation, relocation and adaptive reuse of elements of the existing bridge, developing interpretive information, and other measures to be determined in coordination with the Section 106 consulting parties.

Exhibit 5.6-1

Measures to Minimize Harm: Portland to Mill Plain Boulevard Interchange

Minimization Measure	Reasonable Measure?[a]	4(f) Resources that would be used by one or more CRC alternatives											
		Pier 99 Marina	1917 Interstate Bridge	VNHR/ FVNHS	Apple Tree Park	Heritage Apple Tree	Fort Vancouver Village	Barracks Hospital	Normandy Apts	The Providence Academy	The Kiggins House	Waterfront Renaissance Trail	Waterfront Park
Relocate Marine Drive/I-5 Interchange farther east	Likely not reasonable	Minimizes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Relocate Marine Drive/I-5 Interchange ramps farther west	Potentially reasonable	Minimizes; Potentially Avoids	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Select supplemental river crossing	Not reasonable	N/A	Minimizes	Minimizes	Avoids	Avoids	Avoids	Minimizes	Avoids	Minimizes	Avoids	Minimizes	Minimizes
Shift replacement crossing alignment west to avoid VNHR	Potentially reasonable	N/A	N/A	Avoids	N/A	N/A	Minimizes	Avoids	Higher impact	N/A	N/A	N/A	N/A
Shift replacement crossing west to intermediate alignment	Potentially reasonable	N/A	N/A	Minimizes	N/A	N/A	Minimizes	Minimizes	Avoids	N/A	N/A	N/A	N/A
Stack I-5 on-ramps from SR 14 vertically	Not reasonable	N/A	N/A	Minimizes	N/A	N/A	N/A	Minimizes	N/A	Minimizes	Minimizes	N/A	N/A
Reduce I-5 lane/shoulder widths	Potentially reasonable	N/A	N/A	Minimizes	Minimizes	N/A	Minimizes	Minimizes	N/A	Minimizes	Minimizes	N/A	N/A
Eliminate one or more I-5 aux. lanes between SR 14 and Mill Plain	Likely not reasonable	N/A	N/A	Minimizes	Minimizes	N/A	Minimizes	Minimizes	N/A	Minimizes	Minimizes	N/A	N/A
Select the SR 14 Left-loop design	Likely not reasonable	N/A	N/A	Minimizes	N/A	N/A	Minimizes	N/A	N/A	N/A	N/A	N/A	N/A
Refine SR 14 Dual-Loop design	Potentially reasonable	N/A	N/A	Minimizes	N/A	N/A	Minimizes	N/A	N/A	N/A	N/A	N/A	N/A
Reorient I-5/SR 14 interchange	Reasonable	N/A	N/A	Minimizes	Avoids	Avoids	Minimizes	N/A	N/A	N/A	N/A	N/A	N/A

[a] "Potentially reasonable" indicates that, based on the current level of design and information, this measure appears to be reasonable. "Likely unreasonable" indicates that based on the current level of design and information, this measure appears to be unreasonable. These measures will be further examined during the preparation of the FEIS prior to any final determination.

Exhibit 5.6-2
Measures to Minimize Harm: North of Mill Plain Boulevard Interchange

Minimization Measure	Reasonable Measure?[a]	4(f) Resources that would be used by one or more CRC alternatives											
		Marshall Community Park	Clark College Fields	Residence, 903 E 31st	Office, 300 E 37th St	Office, 3200 Main Street	Office, 3212 Main Street	Leverich Park	Kiggins Bowl Area	Residence/ office, 401 E McLoughlin	Residence, 611 E McLoughlin	Residence, 3000 K St	Residence, 3110 K St
Select Supplemental Crossing and Highway	Not reasonable	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	N/A	N/A	N/A	N/A	N/A
Select Replacement Crossing and Highway	Reasonable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	Avoids
Realign or narrow ramps north of Mill Plain	Potentially reasonable	Minimizes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Realign WB SR 500 to NB I-5 elevated ramp	Likely not reasonable	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	N/A	N/A	N/A	N/A	N/A
Realign I-5 north of Fourth Plain	Likely not reasonable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	Minimizes
Narrow lanes and shoulders of I-5	Potentially reasonable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	Minimizes
Modify retaining wall	Potentially reasonable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	Minimizes
Select Lincoln terminus option	Potentially reasonable	N/A	N/A	Avoids	N/A	N/A	N/A	N/A	N/A	Avoids	Avoids	N/A	N/A
Select Kiggins Bowl terminus option	Potentially reasonable	N/A	N/A	N/A	Avoids	Avoids	Avoids	N/A	N/A	N/A	N/A	N/A	N/A
Reduce/adjust footprint of Clark College P & R	Potentially reasonable	N/A	Avoids or Minimizes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Adjust transit alignment, or narrow traffic lanes/sidewalks	Potentially reasonable	N/A	N/A	Minimizes	Minimizes	Minimizes	Minimizes	N/A	N/A	Minimizes	Minimizes	N/A	N/A
Reduce/adjust footprint of Kiggins Bowl P & R	Potentially reasonable	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	N/A	N/A	N/A	N/A

Minimization Measure	Reasonable Measure? [a]	4(f) Resources that would be used by one or more CRC alternatives											
		Marshall Community Park	Clark College Fields	Residence, 903 E 31st	Office, 300 E 37th St	Office, 3200 Main Street	Office, 3212 Main Street	Leverich Park	Kiggins Bowl Area	Residence/ office, 401 E McLoughlin	Residence, 611 E McLoughlin	Residence, 3000 K St	Residence, 3110 K St
Adjust Kiggins Bowl terminus or retaining wall construction method	Potentially reasonable	N/A	N/A	N/A	N/A	N/A	N/A	Minimizes	N/A	N/A	N/A	N/A	N/A
Select Mill Plain MOS	Potentially reasonable	N/A	N/A	Avoids	Avoids	Avoids	Avoids	Avoids transit-related use	N/A	Avoids	Avoids	N/A	N/A
Select Clark College MOS	Potentially reasonable	N/A	N/A	Avoids	Avoids	Avoids	Avoids	Avoids transit-related use	N/A	N/A	N/A	N/A	N/A

[a] "Potentially reasonable" indicates that, based on the current level of design and information, this measure appears to be reasonable. "Likely unreasonable" indicates that based on the current level of design and information, this measure appears to be unreasonable. These measures will be further examined during the preparation of the FEIS prior to any final determination.

5.6.3 Net Section 4(f) Resource Impacts in Vancouver, South of the I-5/Mill Plain Interchange

Based on preliminary findings, the least net harm to 4(f) resources in Vancouver south of the I-5/Mill Plain interchange, using reasonable measures to minimize harm, would result with the following:

1. The replacement river crossing.
2. Shift I-5 alignment west (or to an intermediate alignment if the full shift proves to be unreasonable) in order to avoid or reduce direct *use* of the VNHR, avoid impacts to Normandy Apartments, and reduce impacts on non-4(f) properties adjacent to I-5.
3. For the SR 14 interchange, either:
   a. The SR 14 left loop interchange, or
   b. A refined version of the dual loop interchange (to reduce direct *use* of the VNHR). This would include re-orienting the I-5/SR 14 interchange and relocating the I-5 northbound to SR 14 eastbound ramp, to avoid *use* of the Old Apple Tree Park and the Heritage Apple Tree and reduce direct *use* of the VNHR.
4. Mitigation for impacts to the VNHR. These would be developed through a Memorandum of Agreement (MOA) in compliance with Section 106 of the National Historic Preservation Act. Discussions of potential mitigation with the National Park Service have already begun. Mitigation could include reconstruction of historic buildings, development of curation and/or interpretive facilities, construction of an expanded overpass/cover-connection between Evergreen Boulevard and 5th Street, and/or other measures to be determined through the MOA. Mitigation for impacts to the VNHR will be determined in coordination with the Section 106 consulting parties.

Measures 2, 3a, and 3b above would require additional design analysis before a final decision could be made on the least net harm alternative in this corridor segment. On-going design analysis will be needed to ensure that exceptions to highway design standards required by these proposed design modifications would be justified. In addition to safety concerns, the visual impacts of the SR 14 left-loop interchange option (3a) on views from the VNHR could make this an unreasonable measure. Making a final determination on this measure will require additional design and impact analysis as well as coordination with consulting parties. This will occur prior to publication of the Final 4(f) Evaluation and Final EIS.

5.6.4 Net Section 4(f) Resource Impacts in Vancouver, North of the I-5/Mill Plain Interchange

The least net harm to 4(f) resources in Vancouver north of the I-5/Mill Plain interchange, using reasonable measures to minimize harm, would result with the following:

1. The replacement river crossing.
2. Realigning or narrowing the Mill Plain to Fourth Plain ramps, just north of the Mill Plain interchange, along the east side of I-5 (to reduce the impacts on Marshall Community Park).
3. Reducing lane and shoulder widths near 3000 K Street (to reduce the impacts to the historic residence at 3000 K Street).
4. For the transit terminus, either:
    a. The Kiggins Bowl terminus with revisions, as described in Section 5.5.4 (to reduce harm to the Clark College recreation fields; the residences at 903 E 31st Street, 401 E McLoughlin Boulevard, and 611 E McLoughlin Boulevard; and Leverich Park and Kiggins Bowl; or
    b. The Lincoln terminus with revisions, as described in Section 5.5.4 (to reduce harm to the Clark College recreation fields, the offices at E 37th Street and 3212 Main Street, and Kiggins Bowl.

Measures 2 and 3 require additional design analysis before a final conclusion can be made on the least net harm alternative in this corridor segment. On-going design analysis would be needed to determine whether exceptions to highway design standards required by these proposed design modifications would be justified.

The least net harm to 4(f) resources from the two full-length transit alignments cannot be determined at this time. The net harm to 4(f) resources from the Kiggins Bowl and Lincoln terminus options would be similar. Reaching a conclusion regarding least net harm will require additional analysis of the potential measures to minimize harm for each alignment. This will be part of the on-going design, impact analysis, and coordination that will be included in the Final EIS and 4(f) Evaluation.

5.7 Preliminary Conclusion

As discussed above, none of the alternatives that could avoid all Section 4(f) resources is prudent and feasible.

The range of alternatives includes components and options that can avoid one or more 4(f) resources, and a variety of measures have been evaluated that could further minimize harm to 4(f) resources. The net impact of the various measures and the reasonableness of the measures has been evaluated. Additional design work, mitigation development, and coordination will be required to make a final conclusion on which measures are reasonable, and what combination of reasonable measures will cause the least overall harm. However, based on the current conceptual designs and the analysis completed to-date, the least overall harm to 4(f) resources, using reasonable measures to minimize harm, would result with the following:

The Replacement River Crossing and Highway Improvements. The replacement crossing, with the following modifications, is the reasonable approach to achieving the least net harm to 4(f) resources:

- Realign the proposed on-ramps to northbound I-5 at the Marine Drive interchange to avoid displacing the Pier 99 Marina.
- Shift the I-5 alignment west (or to an intermediate alignment if the full shift west proves to be unreasonable) to avoid or reduce direct *use* of the VNHR, avoid impacts to Normandy Apartments, and reduce impacts to non-4(f) properties adjacent to I-5). These measures will need further design and analysis to determine whether they are reasonable and any design exceptions justified.
- Select either the SR 14 left loop interchange, or a refined version of the dual loop interchange (to reduce direct *use* of VNHR). Both of these options will need further design and analysis to determine whether they are reasonable and the design exceptions justified.
- Reorient I-5/SR 14 and relocate the I-5 northbound to SR 14 eastbound ramp, to avoid *use* of the Old Apple Tree Park and Heritage Apple Tree, and reduce direct *use* of the VNHR.
- Realign or narrow the Mill Plain to Fourth Plain ramps just north of the Mill Plain interchange along the east side of I-5, to reduce the impacts to Marshall Community Park. This measure will need further design and analysis to determine whether it is reasonable and the design exceptions justified.
- Reduce lane and shoulder widths near 3000 K Street to reduce the impacts to the historic residence at 3000 K Street. This measure will need further design and analysis to determine whether it is reasonable and the design exceptions justified.

Either Light Rail or Bus Rapid Transit. The transit mode makes no meaningful difference to the impacts on 4(f) resources, although light rail would result in lower noise levels at adjacent 4(f) resources than bus rapid transit. Transit noise levels would not cause a *use* of any 4(f) resources.

Either the Kiggins Bowl or Lincoln Terminus Options. The net harm to 4(f) resources from the Kiggins Bowl and Lincoln terminus options would be similar in magnitude. Measures to minimize harm to 4(f) resources have been evaluated for both of these terminus options. Reaching a final conclusion regarding least net harm will require additional design work and analysis of the potential of each measure to minimize harm. This will be part of the on-going design, impact analysis, and coordination that will be included in the Final EIS and 4(f) Evaluation. Choosing either the Clark College MOS or Mill Plain MOS would result in a substantially shorter transit alignment, and would avoid the *use* of several 4(f) resources thus resulting in less net harm to 4(f) resources than either of the longer terminus options to Kiggins Bowl or Lincoln. However, MOS options are generally considered to be the first phase of a multi-phased transit line. As such, an MOS could be constructed as an interim phase until additional funding could be acquired to extend the transit line further. The MOS options are therefore not considered to be least net harm alternatives.

Other Measures. A variety of mitigation measures for historic resources will be developed through a Memorandum of Agreement in compliance with Section 106 of the National Historic Preservation Act. Discussions of potential mitigation for impacts on the VNHR have begun with the National Park Service. Final mitigation for impacts to the VNHR will be determined in coordination with the Section 106 consulting parties.

The CRC project team will continue to evaluate ways to reduce impacts on 4(f) resources, so that the proposed action will include all possible planning to minimize harm to Section 4(f) properties. A final conclusion will be made as part of the Final Section 4(f) Evaluation that will accompany the Final Environmental Impact Statement.

5.8 Coordination

Project sponsors have coordinated with nine Tribes, the Washington Department of Archaeology and Historic Preservation, the Oregon State Historic Preservation Office, the National Park Service, the City of Vancouver, the City of Portland, and other interested parties in identifying 4(f) resources, evaluating the *use* of 4(f) resources, and considering potential measures for minimizing harm. This coordination will continue through selection of a locally preferred alternative, final design, and construction.

MAY 2008

Interstate 5
Columbia River Crossing Project

Draft Environmental Impact Statement and Draft Section 4(f) Evaluation

Volume 2 of 2
APPENDICES

Columbia River CROSSING

United States Department of Transportation
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL TRANSIT ADMINISTRATION

Oregon Department of Transportation

Washington State Department of Transportation

C-TRAN TRIMET RTC METRO

APPENDIX A

Agency and Tribal Coordination

Columbia River CROSSING

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Appendix A

Agency and Tribal Coordination

Agency Coordination

Agency coordination played a significant role throughout the CRC NEPA process, from Purpose and Need to development of the Draft Environmental Impact Statement. Because the project is located in two states, cities and counties it requires coordination and outreach with numerous federal, state, and local agencies. In addition, the project is composed of three major structural components: a bridge, transit and highway. Thus, various agencies have a wide range of expertise and jurisdictional authority.

For the purpose of this chapter, "regulatory agency" refers to those federal, state and local agencies from which a permit is anticipated or approval is needed for a build alternative. The CRC project team has, and continues, to communicate with regulatory agencies throughout the NEPA process and in doing so identified permits and approvals needed for construction.

The CRC project team works extensively with regulatory agencies and local jurisdictions, structured into three designated agency groups: the Interstate Collaborative Environmental Process group (InterCEP), Cooperating Agencies, and Participating Agencies. The InterCEP group is composed of federal and state regulatory agencies that will likely have permit or approval authority over certain components of this project. Cooperating Agencies are federal agencies invited to participate in the development of this Environmental Impact Statement (EIS) and may use this document to help their permit or approval decision making. The Participating Agency group, as defined in the transportation bill reauthorization, (Safe Accountable Flexible, Efficient Transportation Equity Act: A Legacy for Users or SAFETEA-LU), includes representatives from a variety of local and state agencies and tribal governments with an interest in the project.

Interstate Collaborative Environmental Process Group

In August 2005, the project team convened a workshop of federal, state and local resource agencies from Oregon and Washington. The goal of the workshop was to initiate early agency coordination, and to begin developing an agency coordination process for the project's NEPA review. The NEPA process for this project has been enriched due to the early agency participation in the preparation of NEPA analyses, including: identifying all applicable information early in the analytical process; applying technical expertise and additional staff support; increasing communication and reliability; avoiding duplication with other federal, state, tribal, and local procedures; and establishing a mechanism for addressing intergovernmental issues. Other benefits of enhanced agency participation include fostering intra- and intergovernmental trust (e.g., partnerships at the community level) and a common understanding and appreciation for various governmental roles in the NEPA process.

On January 25, 2006, the InterCEP Agreement was signed by WSDOT, ODOT, FHWA, FTA and 12 resource agencies from Oregon, Washington, and the federal government (see attachment). This agreement formally established the InterCEP group, defined obligations of the signatory agencies and the CRC team, and described the process for communication and collaboration within this group.

The following resource agencies signed the InterCEP Agreement:

- National Marine Fisheries Service
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- Washington State Department of Ecology
- Washington State Department of Fish and Wildlife
- Washington State Department of Archaeology and Historic Preservation
- Oregon Department of Fish and Wildlife
- Oregon Department of Land Conservation and Development
- Oregon Department of State Lands
- Oregon State Historic Preservation Office
- Oregon Department of Environmental Quality

The InterCEP Agreement integrated the procedures and requirements for many existing coordination agreements. WSDOT and ODOT, in conjunction with FHWA, have existing agreements and procedures in their respective states to aid in coordinating certain state and federal regulatory programs with the NEPA process on state and federal highway projects. These agreements are, in Oregon, the Collaborative Environmental and Transportation Agreement for Streamlining (CETAS), and, in Washington, the Signatory Agency Committee (SAC) Agreement. The SAC Agreement also integrates the Washington State Environmental Policy Act (SEPA) in the process.

The goal of InterCEP is to allow the CRC project to efficiently plan, design, and build a solution that successfully addresses the project's goals and meets state and federal environmental regulations. The purpose of InterCEP is to:

- Establish an integrated review process for all stages of the NEPA process;
- Establish a timeline that identifies key decision points and potential conflicts as early as possible;
- Establish an open dialogue for discussion at major turning points (i.e., comment and concurrence points); and
- Integrate the NEPA process and other environmental review and approvals as early as possible into the scoping and transportation planning processes.

The InterCEP Agreement designates project milestones at which signatory agencies provide the project team with formal concurrence or comment. Comment points represent specific points in the project process at which resource agencies are asked to provide written advisory comments.

Concurrence points represent milestones in the project at which resource agencies are asked to provide a written concurrence on that stage of the project. Concurrence means that the resource agency has determined that there is adequate information for the topic under consideration for this stage of the project development and that agency concerns were adequately addressed by the project team.

These milestones include:

InterCEP Milestone	
Project Purpose and Need Statement	Concurrence for the U.S. Army Corps of Engineers, and Comment for other resource agencies
Evaluation Criteria	Concurrence
Methodologies to be used for analyzing alternatives and impacts	Comment
Range of alternatives to be considered in the Draft EIS	Concurrence
Preliminary Draft EIS	Comment
Preferred Alternative and Conceptual Mitigation Plan	Concurrence
Preliminary Final EIS	Comment

Below is a timeline of meetings and milestones that have been met thus far in the process.

Year	Meetings	InterCEP Milestone	Topic of Discussion
2005	August		*2-day Kick-off Workshop*: Initial Coordination Discussion; brainstorming of Draft Agreement and Operating Procedures
	October		Draft InterCEP Agreement Review
	December		*Finalize InterCEP Agreement*; Review draft Purpose and Need and Evaluation Criteria
2006	January	***Comment Point*: Project Purpose and Need** (Concurrence point for Corps of Engineers only)	Coordinate signing of InterCEP Agreement; Reach agreement on Purpose and Need, Evaluation Criteria
	March		Preliminary Methods and Data Reports, Step A Screening
	April	***Concurrence Point:* Evaluation Criteria/ Framework**	*Finalize Evaluation Criteria* (Step A Screening)
	June	***Comment Point*: Methods for Analyzing Impacts**	Preliminary Methods and Data Reports for Built Environment, Cultural Environment, and Natural Environment
	July		*Finalize* Methods and Data Reports; Begin Alternative Packaging process
	August		Review Performance Measures
	September		Review Component Packaging Process
	October		Present Alternative Packages; preliminary screening results
	December		Alternative screening results; Proposed DEIS Alternatives
2007	February	***Concurrence Point:* Range of Alternatives**	Concurrence on DEIS Alternatives
	May		Field Trip of Project Alternatives
	June		Sub-group regarding Endangered Species and In-water work
	July		Technical Report Findings for Water Quality, Ecosystems, Wetlands, Hazardous Materials, Geology & Soils, Acquisitions, Land Use, Neighborhoods, Economics, Visual & Aesthetics, Public Services

Year	Meetings	InterCEP Milestone	Topic of Discussion
	August		Updated Technical Report Findings for Water Quality, Ecosystems, Wetlands, Hazardous Materials, Geology & Soils
	October		Focused Discussion on Mitigation for Endangered Species; Technical Report Findings for Acquisitions, Land Use, Neighborhoods, Economics, Visual & Aesthetics, Public Services
	November		Technical Report Findings on Environmental Justice, Air Quality, Noise & Vibration, Traffic and Transit
2008	March	***Comment Point:*** **Preliminary Draft EIS**	Distributed document for review
	April		Discuss Preliminary Draft EIS
	May	**Draft EIS**	Formal review

Cooperating Agencies

Cooperating Agencies have an elevated status in the NEPA process, which includes an opportunity to contribute expertise in the development in methodology and analysis of impacts associated with project alternatives. In accordance with NEPA regulations, and upon request of a lead federal agency, any other federal or state agency which has jurisdiction or a special expertise with respect to any environmental issue may become a Cooperating Agency.

The Cooperating Agencies are:

- U.S. Army Corps of Engineers
- U.S. Coast Guard
- U.S. General Services Administration
- Federal Aviation Administration
- Washington State Department of Archaeology and Historic Preservation
- National Park Service

Beginning in 2005, the project team met with each of the Cooperating Agencies on a one-on-one basis to gather information and seek advice on project development and potential build concepts. Each Cooperating Agency played a key role in developing the build alternatives.

Participating Agencies

On August 10, 2005, President George W. Bush signed the into federal law the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The Participating Agency was established in accordance with SAFETEA-LU to create specific coordination opportunities for a broader array of public agencies and tribal governments. Invitation letters were broadly distributed to a comprehensive list of local and state agencies and tribal governments with potential interest in the CRC project. The following agencies agreed to become Participating Agencies:

- City of Vancouver
- Clark County Community Development Department

- Clark Public Utilities
- Confederated Tribes of Grand Ronde
- Cowlitz Indian Tribe
- Portland Bureau of Development Services
- Portland Bureau of Environmental Services
- Portland Bureau of Water Works
- Portland Department of Transportation
- Portland Development Commission
- Portland Fire & Rescue
- Portland Office of Neighborhood Involvement
- Portland Parks and Recreation
- Portland Planning Bureau
- Portland Policy Bureau
- Vancouver Housing Authority
- Washington Department of Natural Resources

The project team met with Participating Agencies throughout the EIS process. Meetings serve to update members on the project's progress and solicit feedback on various documents and decision points.

Tribal Coordination

Below is a summary of the CRC tribal consultation plan. The Columbia River Crossing Government-to-Government Tribal Consultation Plan details how this project team is coordinating with tribal governments.

WSDOT, ODOT, FHWA, and FTA are committed to government-to-government consultation with tribes on projects that may affect tribal rights and resources. The CRC tribal consultation process is designed to encourage early and continued feedback from, and involvement by, tribes potentially affected by the CRC project, and to ensure that their input will be incorporated into the decision-making process. Although tribal coordination and government-to-government tribal consultation is being undertaken as a distinct outreach effort, tribal involvement is also occurring during agency coordination and public involvement.

Goals for Tribal Consultation

- To achieve a respectful engagement between the needs of the tribes and states as supported by numerous federal and state agreements and executive orders, including Presidential Executive Order 13175 Consultation and Coordination with Indian Tribal Governments, Washington State Centennial Accord, and WSDOT Executive Order 1025 Tribal Consultation, and Oregon Revised Statutes 182.162 Relationship of State Agencies with Indian Tribes.

- To achieve compliance with legally required steps under the National Environmental Policy Act, Section 106 of the National Historic Preservation Act and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and other applicable state and federal laws.
- To resolve effects this project may have on the rights of tribes which they reserved under treaties with the United States, as supported by the Constitution of the United States. Reach full and fair settlement on any tribal treaty-related issues associated with the Columbia River Crossing project in a manner that is compatible with the mutual interests of the tribes, ODOT, WSDOT, FTA, FHWA, and the objectives of the project.
- To achieve a richer and lasting understanding of the area and build durable relationships between WSDOT, ODOT, and the affected tribes who are or will be engaged in consultation for other projects.
- For the CRC project team and tribes to engage in an open exchange of information about the project, its potential impacts, and appropriate mitigation.

Consulting Tribes

During the environmental review stage of this project, the project team is consulting with both the natural and cultural resource offices of each affected tribe. CRC staff periodically meet with tribal councils and committees as appropriate.

The CRC project team initiated formal consultation with the following tribes:

- Confederated Tribes of Grand Ronde
- Confederated Tribes of Umatilla
- Confederated Tribes of Warm Springs
- Cowlitz Tribe
- Nez Perce Tribe
- Siletz Tribe
- Spokane Tribe
- Yakama Nation
- Chinook (non-federally recognized)

The following tribes have treaty rights to the Columbia River:

- Confederated Tribes of Umatilla
- Confederated Tribes of Warm Springs
- Nez Perce Tribe
- Yakama Nation

Tribal Consultation Approach

The CRC has a designated tribal liaison for this project. The statewide tribal liaisons for both WSDOT and ODOT are assisting in tribal coordination efforts, when necessary. Other DOT team members may participate in the ongoing government-to-government dialogue, but consultants will not. Consultants will assist in preparing for meetings with the tribes, but all contact will be through DOT staff on the project. All communication with tribes is coordinated through the CRC Tribal Liaison to ensure that information is managed internally and integrated into the government-to-government dialogue with the tribes. All tribal consultation and the results from these efforts are documented in the project's administrative record and are summarized under Tribal Consultation Activities on the following pages.

The general approach to government-to-government consultation for the CRC project is as follows:

- Meet with representatives of affected tribes to review broad issues. CRC staff met with interested tribes early in the environmental review process in order to establish the following information:
    - An understanding of the aspects of the CRC project that are likely to interest the tribes.
    - Preliminary information about the potential for the project to affect tribal land, historical or cultural resources, fishing and other aquatic resources, or any other issues of tribal concern.
    - An initial agreement regarding the process for the government-to-government consultations.
- Engage in both formal and technical consultation with tribal staff. At the request of the tribes, project staff will formally meet with cultural and natural resource committees, and will involve technical staff in working group meetings concerning applicable issues (e.g., identification of fish and wildlife habitat).
    - At the request of interested tribes, the project team will meet with the Tribal Council and appropriate committees at major project milestones.
    - Technical staff will be invited to all working group meetings that the tribe may have an interest or expertise in.
    - The consultation process will integrate both formal and informal contact with the Tribal Council and tribal staff, respectively.
- Seek to resolve issues in parallel with project planning and permitting activities. CRC staff will keep the interested tribes fully informed throughout the project planning, permitting, and development process. In acknowledgement that CRC must afford the interested tribes with more than the opportunity to participate as members of the general public in the planning and permitting process, CRC has initiated the following actions to ensure effective government-to-government consultation:
    - Seek tribal input regarding alternatives and opportunities to avoid, reduce, or otherwise mitigate the effects of the CRC project on tribal interests.

- Seek tribal comment throughout the project's environmental review, permitting, and regulatory review processes.

Tribal Consultation Activities

The following summarizes the tribal consultation the CRC project has engaged in through February, 2008.

The Columbia River Crossing project team has conducted extensive consultation with interested tribes since December 2005. The project's Environmental Manager led the consultation effort until they arranged to have a Tribal Liaison dedicated to the project in January 2007. This report summarizes the following:

- Who we are consulting with and why
- Summary of consultation activities to date
- Current/upcoming consultation efforts
- Key tribal concerns
- Tribal meeting record
- Upcoming tribal meetings

Who are we consulting with and why?

To determine which tribes to consult with, the CRC project team met with WSDOT and ODOT Tribal Liaisons. They also submitted a formal letter to the Oregon Commission on Indian Services requesting their input as required by Oregon law. Eight federally recognized tribes and one non-federally recognized tribe were identified through those efforts.

The National Park Service has a list of approximately 35 tribes and tribal organizations that have members buried within Fort Vancouver. The CRC project team sent a letter to each of these tribes to determine if they were interested in consulting on this project. Only the Spokane Tribe responded and requested to be a consulting party. These tribes (except Spokane) are not being consulted on this project. However, if human remains are found on federal property within Fort Vancouver, the National Park Service is the lead for complying with the Archaeological Resources Protection Act (ARPA) and Native American Graves Protection and Repatriation Act (NAGPRA). If the remains are determined to be post-contact Native Americans, the park service will notify all 35 tribes and tribal organizations of the find.

The following is a list of the nine tribes we are actively consulting with on this project. Each tribe received a formal letter initiating consultation in December 2005. Four of the nine tribes have treaty fishing rights on the Columbia River.

Federally Recognized Tribes:

- Cowlitz
- Grand Ronde
- Nez Perce (Treaty tribe)

- Siletz
- Spokane
- Umatilla (Treaty tribe)
- Warm Springs (Treaty Tribe)
- Yakama (Treaty Tribe)

Non Federally Recognized Tribes

- Chinook

The project team is consulting with both the natural and cultural resource offices of each affected tribe. We periodically present/meet with tribal councils and committees when requested.

Consultation Activities to Date

- Initiated consultation with the tribes in December 2005
- Conducted face-to-face meetings with each tribe (see meeting record below).
- Sent invitations to be participating agencies under SAFETEA-LU to all the tribes in March 2006. The Grand Ronde and Cowlitz Tribes accepted.
- Held several meetings to solicit input on methods for analyzing impacts to resources in the DEIS, which the Cowlitz and Grand Ronde both attended.
    - Consulted with tribes on the following products:
    - Purpose and Need statement
    - Method and data reports
    - The range of alternatives
    - Area of Potential Effects for Section 106
    - Tribal consultation plan
    - Over water geotechnical boring Plan
    - Inadvertent Discovery Plan
    - Jurisdictional wetlands and waters technical report
    - Geology and Soils technical report
    - Water quality and soils technical report
    - Hazardous materials technical report
    - Ecosystems technical report
    - Acquisitions and Relations technical report
    - Historic Resources technical report
    - Archaeological technical report
    - Draft research design for archaeological discovery field investigations
- The CRC project hosted a History Seminar on March 20, 2007. The purpose of the seminar was to educate the project team about the significant history of the area. Each

tribe sent a speaker to tell their history/experience in the area. There were also 4 non-tribal historians that presented on the non-tribal and environmental history of the project area.

- Coordinated with the Grand Ronde (as requested) to participate in the pedestrian archeology survey in July 2007 and observe cultural resources monitoring for geotechnical borings in February 2008.
- Consulted with tribes and agencies (including FHWA, FTA, NPS, Oregon and Washington SHPOs, WSDOT and ODOT archaeologists) on an Inadvertent Discovery Plan (IDP) for any ground disturbing activity on the project. Held two intertribal/ interagency meeting to review the plan. Consulted on 4 drafts of the plan before it was "finalized" in October 2007. The plan to ready to apply to ground disturbing activities such as testing. This is a living document that we will amend in the future as needed. It will likely be revised before construction.
- Held multi-tribal/agency meetings to discuss preliminary findings for the natural and cultural resource discipline reports.
- Held pre-DEIS meetings with individual tribes between November and January.

Current/Upcoming Consultation Activities

- Consult on the DEIS
- Host an intertribal meeting with presentations by the National Park Service and CRC. The purpose of the meeting is to look at detailed archaeological information in relation to the detailed CRC design maps.
- Host a leadership meeting, modeled after one hosted by the Alaskan Way Viaduct and Seawall Replacement project. The meeting will include the leaders of tribes, FHWA, FTA, WSDOT, ODOT, City of Portland, City of Vancouver, National Parks Service, Washington and Oregon Governor's Offices and others. This meeting is scheduled for April 1, 2008.
- Develop contracts with tribes to conduct oral history studies for the project area. (Six tribes have expressed an interest. Four tribes have submitted submit scopes of work. Three tribes have declined).
- Develop service contracts with interested tribes to conduct cultural resource monitoring during ground disturbing activities on the project.
- Consult on the on-land geotechnical borings plan and associated cultural resources monitoring plan.

Key Tribal Concerns and Positions Expressed to Project Team

- The high probability of disturbing human remains through project testing and construction.
- The high probability of disturbing cultural resources and sacred sites through project testing and construction.

- Impacts to fish and other marine life through project construction. Significant impacts to aquatic life could affect treaty fishing rights upstream.
- During the pre-DEIS meetings tribes are asked if they were willing to enter into agreements to address disinterment and reburial of remains if they found in parts of the project that would be impossible to avoid/design around. The tribes were not willing to enter into advanced decision making agreements. The context of the find will greatly affect the tribes support or opposition to disinterment (such as how many burials, how old etc). The tribes have talked about general principals such as the first priority is to rebury in place, the second is to rebury nearby in a protected located.

Tribal Meeting Record

Unless otherwise noted, these meetings took place at the tribal offices.

Date	Tribe (and Staff Level)	Agency Staff	Purpose
11/9/05	Cowlitz natural and cultural resources staff	Co-Directors, Deputy Director, Environmental Manager	To introduce the project to the tribe and hear initial concerns about cultural and natural resources in the project area
12/9/05	Grand Ronde natural and cultural resources staff	Co-Directors, Deputy Director, Environmental Manager	To introduce the project to the tribe and hear initial concerns about cultural and natural resources in the project area
2/21/06	Umatilla Cultural Resources Sub-Committee	Environmental Manager	To present initial baseline cultural resource information to the sub-committee and introduce the project
3/3/06	Grand Ronde Tribal Council	FHWA Division Administrators, Project Co-Directors, Deputy Director, Environmental Manger	To discuss the project and Tribal Council involvement
3/7/06	Nez Perce Natural Resource Sub-Committee	Co-Director, Deputy Director, Environmental Manager	To present initial baseline natural resource information to the sub-committee and introduce the project
3/14/06	Umatilla Natural Resources Sub-Committee	Environmental Manager	To present initial baseline natural resource information to the sub-committee and introduce the project
5/17/06	Spokane THPO	Environmental Manager	To present initial baseline cultural resource information and introduce the project
9/28/06	Yakama, Grand Ronde, Cowlitz and Siletz staff (Portland)	Environmental Team, WSDOT and ODOT Tribal Liaisons and Archeologists	To discuss preliminary screening findings for natural and cultural resources
11/3/06	Yakama, Grand Ronde, Spokane, Nez Perce, Cowlitz and Siletz staff (Portland)	WSDOT Tribal Liaison	The tribes wanted a chance to discuss how they will coordinate amongst themselves
12/05/06	Nez Perce	Co-Director, Deputy Director, Environmental Manager	Project update; Recommendations for the range of alternatives to be studied for the project; An inadvertent discovery plan; Discuss the preliminary cultural resources findings from the screening analysis conducted
1/4/07	Grand Ronde Deputy Director, Cultural Resources Staff	Deputy Director, Environmental Manager, CRC Tribal Liaison	Project update; Recommendations for the range of alternatives to be studied for the project; An inadvertent discovery plan; Discuss the preliminary cultural resources findings from the screening analysis conducted

Date	Tribe (and Staff Level)	Agency Staff	Purpose
1/8/07	Cowlitz Council member, cultural resources staff	Deputy Director, Environmental Manager, CRC Tribal Liaison	Project update; Recommendations for the range of alternatives to be studied for the project; An inadvertent discovery plan; Discuss the preliminary cultural resources findings from the screening analysis conducted
1/24/07	Umatilla Tribe Natural and Cultural Resource staff	Environmental Manager, CRC Tribal Liaison	Project update; Recommendations for the range of alternatives to be studied for the project; An inadvertent discovery plan; Discuss the preliminary cultural resources findings from the screening analysis conducted
1/25/07	Warm Springs Tribe cultural and natural resources staff	Environmental Manager, CRC Tribal Liaison	Project update; Recommendations for the range of alternatives to be studied for the project; An inadvertent discovery plan; Discuss the preliminary cultural resources findings from the screening analysis conducted
2/5/07	Yakama Nation natural and cultural resources staff	Environmental Manager, CRC Tribal Liaison, WSDOT SWR Tribal Liaison	Project update; Recommendations for the range of alternatives to be studied for the project; An inadvertent discovery plan; Discuss the preliminary cultural resources findings from the screening analysis conducted
2/27/07	Intertribal/Interagency cultural resources meeting (Portland)	Cultural resources managers from Grand Ronde, Cowlitz, Spokane and Yakama tribes. CRC Environmental Manager, CRC Tribal Liaison, FHWA, FTA, NPS, Oregon and Washington SHPOs, WSDOT and ODOT archaeologists, CRC cultural resources consultants Parametrix and Heritage Resource associates.	The purpose of the meeting was to discuss: Inadvertent discovery plan Scope of work for archaeology survey Introduce the cultural resources consultant (Parametrix) and archaeological consultant (Heritage Research Associates (HRA)) to the tribes
3/1/07	Siletz Tribe cultural resources staff	Environmental Manager, CRC Tribal Liaison,	Project update; Recommendations for the range of alternatives to be studied for the project; An inadvertent discovery plan; Discuss the preliminary cultural resources findings from the screening analysis conducted
3/20/07	Chinook, Cowlitz, Grand Ronde, Nez Perce, Siletz, Spokane, Umatilla, Warm Springs, Yakama (Vancouver)	Representatives from project team, federal agencies, and other project partners.	History Seminar. Give the project team and its partners an opportunity to learn about the significant and diverse history of the project area.
6/5/07	Cowlitz, Umatilla cultural resources staff. (All tribes invited). (Vancouver)	CRC Tribal liaison	Discuss human remains examination protocols with tribes.
7/24/07	Grand Ronde ceded lands coordinator (all tribes invited). (Portland)	Project team	Interagency meeting to discuss the natural resources discipline reports.
8/6/07	Umatilla (all tribes invited). Grand Ronde tried to call in, but there was difficulty with phones. (Portland)	Project team	Interagency meeting to discuss the cultural resources discipline reports.
9/10/07	Cowlitz (all tribes invited). (Vancouver)	Project team	Interagency meeting to discuss the cultural resources discipline reports
9/27/07	Cowlitz and Grand Ronde natural resources staff (all tribes invited). (Vancouver)	Project team	Interagency meeting to discuss the natural resources technical reports
10/15/07	Grand Ronde natural resources staff	Project environmental manager and CRC tribal liaison	Discuss the possibility of contracting with Grand Ronde to conduct an oral history study.

Date	Tribe (and Staff Level)	Agency Staff	Purpose
11/19/07	Cowlitz Tribe: natural and cultural resources staff	Deputy director, Environmental manager, CRC tribal liaison	Provide a project update, discuss the DEIS, technical report findings
11/20/07	Grand Ronde Tribe: natural and cultural resources staff, tribal manager. Some tribal council members may sit in	Project director, deputy project director, environmental manager, CRC tribal liaison	Provide a project update, discuss the DEIS, technical report findings
12/4/07	Umatilla Tribe: natural and cultural resources staff, cultural committee	Project deputy director, environmental manager, CRC tribal liaison	Provide a project update, discuss the DEIS, technical report findings
12/5/07	Warm Springs Tribe: Cultural resources staff, policy support staff	Project deputy director, environmental manager, CRC tribal liaison	
12/17/07	Spokane Tribe: tribal historic preservation office and interested members of the cultural committee	Assistant project deputy director, environmental manager, CRC tribal liaison	Provide a project update, discuss the DEIS, technical report findings
12/18/07	Nez Perce Tribe: natural and cultural resources staff and natural resource committee	Assistant project deputy director, environmental manager, CRC tribal liaison	Provide a project update, discuss the DEIS, technical report findings
1/8/08	Chinook Tribe: cultural resource committee	Project director, deputy director, CRC tribal liaison, technical staff	Project introduction; Discuss the DEIS, technical report findings
3/15/08	Cultural resources offices from 9 tribes invited	NPS, CRC, FHWA, FTA, DAHP, OR SHPO, WSDOT, ODOT	Examine and discuss archaeological sites on Ft Vancouver in relation to detailed CRC design maps.

Upcoming Tribal Meetings

FHWA, FTA and DAHP have been notified of these meetings in accordance with the WSDOT Section 106 programmatic agreement.

Date	Tribe (and staff level)	Agency Staff	Purpose
4/1/08	Tribal leadership and technical staff invited	Leadership from project leads and resources agencies	Build relationships at the leadership level.
TBD (rescheduled from 12/11/07 & 1/23/08)	Yakama Nation: Cultural resources staff, natural resources staff	Deputy project director, environmental manager, CRC tribal liaison	Provide a project update, discuss the DEIS, technical report findings
TBD (rescheduled from 1/8/08)	Siletz Tribe: cultural resource manager (who is also tribal council and chair of the natural resources committee).	Project deputy director, environmental manager, CRC tribal liaison	Provide a project update, discuss the DEIS, technical report findings

Permits and Approvals

Federal, state, and local permits and approvals for the project will be needed, including but not limited to the following:

Water Quality, Wetlands and Shoreline
Clean Water Act (CWA) Section 404 Permit
Oregon Removal and Fill Permit
Washington Hydraulic Project Approval
CWA Section 401 Water Quality Certification
CWA NPDES Permit
Rivers and Harbors Act Section 9 Bridge Permit
Rivers and Harbors Act Section 10 Waterway Structures Permit
Sole Source Aquifer protection review
Washington Shoreline Management Act Substantial Development Permit
Floodplain Construction Permit
Portland Environmental Zone Review
Fish and Wildlife
Endangered Species Act Section 7 Consultation
Marine Mammal Protection Act
Magnuson-Stevens Fishery Conservation Management Act
Migratory Bird Treaty Act
Oregon Endangered Species Act
Washington Aquatic Lands Act
Air Quality
Air Quality Conformity Determination
Indirect Source Permits
Hazardous Waste
Voluntary Cleanup Program Approval
Archaeological and Historic Resources
Section 106 Memorandum of Agreement
Oregon Archaeological Excavation Permit
Section 4(f)
Section 4(f) Evaluation
Public Utilities
Use and occupancy agreements (if relocated)
Federal Land Acquisitions
Federal Land Transfer

ATTACHMENT

InterCEP Agreement

Columbia River
CROSSING

700 WASHINGTON STREET
SUITE 300
VANCOUVER, WA 98660
360-737-2726 | 503-256-2726

INTERSTATE 5
COLUMBIA RIVER CROSSING

INTERSTATE COLLABORATIVE ENVIRONMENTAL PROCESS AGREEMENT

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Acronyms

CETAS........................Collaborative Environmental and Transportation Agreement for Streamlining

CRC............................Columbia River Crossing

EIS..............................Environmental Impact Statement

FHWA........................Federal Highway Administration

FTA............................Federal Transit Administration

InterCEP.....................Interstate Collaborative Environmental Process

NEPA.........................National Environmental Policy Act

ODOT........................Oregon Department of Transportation

ROD...........................Record of Decision

SAC............................Signatory Agency Committee

SEPA..........................State Environmental Policy Act

WSDOT.....................Washington State Department of Transportation

Terms and Definitions

Unless the context requires otherwise, the following terms in this agreement shall have these meanings:

Agency Representative, means the individual designated as a Signatory Agency's primary point of contact for this agreement. This individual is responsible for coordinating his/her agency's involvement in the coordination process.

Bridge Influence Area, refers to the area approximately between Columbia Boulevard in Portland and State Route 500 in Vancouver as identified by the Final Strategic Plan for the I-5 Transportation and Trade Partnership.

Comment Point, refers to a specific point or topic in the NEPA process at which the Resource Agencies in the agreement will be asked to provide advisory comments. See Section VI.B. of the agreement.

Concurrence, when used in reference to a Resource Agency's response to a concurrence point, means that in the Resource Agency's opinion the project topic is appropriate and will not interfere with the agency's ability to ultimately approve or permit the project. Concurrence on a concurrence point represents that each of the following criteria are met: 1) the Resource Agency has determined that there is adequate information for the topic under consideration for this stage of the project development; 2) the concurrence is consistent with the agency's applicable statutes and regulations; and 3) concerns were adequately addressed by NEPA Leads and Project Sponsors following a non-concurrence (if applicable).

Concurrence Point, refers to a specific work product or milestone in the NEPA process at which the Resource Agencies in the agreement will be asked to give a response of concurrence, non-concurrence or waiver. See Section VI.D. of the agreement.

Interstate Collaborative Environmental Process Agreement, refers to this agreement.

Interstate Collaborative Environmental Process Group, refers to all the Signatory Agencies to this agreement.

Methods Reports (aka Methods and Data Reports), when used in reference to a comment point, is the document that describes the methods that will be used to collect data, evaluate impacts and identify mitigation for the CRC project alternatives.

NEPA Leads, refers to those Federal agencies that have assumed lead agency status under 40 CFR 1501.5 for the project's NEPA process. For the CRC project the NEPA Leads are FHWA and FTA.

Non-Concurrence, when used in reference to a Resource Agency's response to a concurrence point, means that in the Resource Agency's opinion one or more of the criteria allowing concurrence is not being met and that the project, if it proceeded under the current concurrence point element, would likely not be able to receive final approval or permits from that agency.

Preferred Alternative and Conceptual Mitigation Plan, when used in reference to a concurrence point, means the project proponents' preferred alternative and proposed mitigation measures associated with that alternative, as defined by 40 CFR 1502.14(e) and (f).

Preliminary Draft EIS, when used in reference to a comment point, means an initial version of the document required by 40 CFR 1502.9(a).

Preliminary Final EIS, when used in reference to a comment point, means an initial version of the document required by 40 CFR 1502.9(b).

Project Sponsors, refers to the Oregon and Washington State Departments of Transportation, who are sharing the primary responsibility of managing the CRC project within the scope of this agreement process. For the purposes of this agreement ODOT and WSDOT are representing other project proponents (including C-TRAN, RTC, Metro, Tri-Met, City of Portland and City of Vancouver).

Purpose and Need, when used in reference to a comment or concurrence point, means an initial version of the statement required by 40 CFR §1502.13 describing the underlying purpose and need to which the agency is responding in proposing the alternatives.

Resource Agencies, refers to those federal and state agencies from which it is anticipated a future build alternative would need a permit or other approval. See section IV.A.3 for a list of Resource Agencies. For the purposes of this agreement Resource Agencies includes only the Signatory Agencies.

Signatory Agencies refers to those agencies that have signed this agreement in section IX.

Topic, refers to the subject of a particular comment or concurrence point (i.e. Purpose and Need).

Waive, when used in reference to a Resource Agency's response to a concurrence point, means that in the Resource Agency's opinion its participation in the concurrence point is not necessary at this point in the project or that the concurrence point topic is outside its jurisdictional scope or expertise.

Interstate 5 Columbia River Crossing Bi-State Agreement

I. INTRODUCTION

The Interstate 5 Columbia River Crossing (CRC) project will be addressing transportation needs in the I-5 Columbia River Crossing Bridge Influence Area, located in the Portland, Oregon and Vancouver, Washington metropolitan area.

The I-5 CRC alternatives will lie within the jurisdictions of both states, thus this project will benefit from an approach that coordinates the federal, state and local regulatory requirements and programs applicable in each state. The Washington State Department of Transportation (WSDOT) and Oregon Department of Transportation (ODOT), each in conjunction with the Federal Highway Administration (FHWA), have existing agreements and procedures in their respective states to aid in coordinating certain state and federal regulatory programs with the National Environmental Policy Act (NEPA) process on state and federal highway projects. These agreements are, in Oregon, the Collaborative Environmental and Transportation Agreement for Streamlining (CETAS), and, in Washington, the Signatory Agency Committee (SAC) Agreement. The SAC agreement also integrates the Washington State Environmental Policy Act (SEPA) in the process. Because the I-5 Columbia River crossing project will evaluate both highway and transit alternatives, the Federal Transit Administration (FTA) and the FHWA will be co-lead agencies for NEPA compliance. Therefore, the coordination process also needs to integrate the procedures and requirements of FHWA and FTA.

In August 2005, project proponents convened a workshop of federal, state and local agencies from Oregon and Washington. The goal of the workshop was to initiate early agency coordination, and to begin developing an agency coordination process for the project's NEPA review. This agreement was initiated through the workshop and finalized through subsequent collaboration.

II. GOALS

The Signatory Agencies are committed to implementing this agreement in a manner that accomplishes the following principles for the process and project:

<u>Agreement Process</u>

- Build on the successes of the CETAS and SAC agreements and other regional collaboration efforts.
- Implement a coordination process in compliance with NEPA requirements.
- Integrate the NEPA/SEPA process with subsequent permitting requirements, including section 404(b)(1) of the Clean Water Act.
- Use frequent and early communication.
- Use sound information, good science and agency and community input to make intelligent decisions.
- Implement a collaboration process that is efficient and cost effective and that integrates transportation, environmental and land use planning objectives.

- Develop a process and alternatives that reflect all participating agencies' missions and input.
- Accommodate broad advisory input from each agency but limit agreement-related authority to each agency's respective legal authority.
- Develop and meet efficient and realistic timelines.

<u>CRC Project Outcome</u>

- Develop alternatives that have strong community support and are able to serve the region's future growth and quality of life.
- Use collaboration to develop alternatives that accommodate multimodal transportation needs and resource protection in innovative and effective ways.
- Develop a project that will be "permittable" by the agencies with permitting/approval authority.
- Effectively implement the policy of avoidance, minimization and mitigation of impacts to affected resources.
- Strive to achieve the project's vision and values.

III. APPLICABILITY

A. Agreement Limited to I-5 Columbia River Crossing Project

This agreement is limited to agency coordination efforts related to the Interstate 5 Columbia River Crossing project.

B. Scope of Coordination

This agreement establishes a process for coordination of the NEPA and SEPA process and the various federal, state and local regulatory programs administered by the Signatory Agencies. This agreement will coordinate the Signatory Agencies' involvement in the NEPA/SEPA planning process, including the ultimate development of an Environmental Impact Statement (EIS) and Record of Decision (ROD). The purpose of this agreement is to coordinate between the NEPA Leads/Project Sponsors and the Resource Agencies and is not intended as a forum for resolving issues amongst the NEPA Leads and Project Sponsors. NEPA Leads and Project Sponsors will use other forums for developing the NEPA work products used in this agreement's collaboration process and will use other forums for coordinating with participating agencies that are not signatories to this agreement. The process outlined by this agreement effectively ends when a final EIS and ROD have been issued for the project. However, the Signatory Agencies may continue to use the collaborative framework of this agreement through project permitting, construction and ongoing monitoring as agreed to by the parties.

C. Limitation on Affect of Agreement

This agreement is intended to facilitate the coordination of the environmental review process and does not create rules or regulations, the violation of which, would create a cause of action or proof of violation of existing Federal or state statutes or regulations by any signatory party or third party. Evidence of a signatory party's failure to follow this agreement or the obligations under it including any actions taken or presented under the agreement's issue resolution process, shall not be evidence under the administrative record or otherwise of a party's failure to meet its obligations under any Federal, state or local law or regulation.

IV. SIGNATORY AGENCIES AND TENETS OF PARTICIPATION

A. Signatory Agencies

The parties to this agreement and the members of the **Interstate Collaborative Environmental Process (InterCEP)** group include the NEPA Leads, Project Sponsors and Resource Agencies.[1]

1. NEPA Leads

The NEPA Leads are the federal agencies that have the ultimate responsibility for the project's NEPA compliance. They share management responsibilities with the Project Sponsors. NEPA Leads are the:

Federal Highway Administration (FHWA);

Federal Transit Administration (FTA);

2. Project Sponsors

The Project Sponsors are the state transportation departments who are the proponents of the project. They share management responsibilities with the NEPA Leads. Project Sponsors are the:

Oregon Department of Transportation (ODOT);

Washington State Department of Transportation (WSDOT);

3. Resource Agencies

The Resource Agencies are the federal and state agencies from which it is anticipated a future build alternative would need a permit or other approval. These agencies will be asked to provide early coordination, comment and/or concurrence on the project through the process described in this agreement. Resource Agencies are the:

National Marine Fisheries Service;

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[1] NEPA Leads and Project Sponsors are coordinating with tribal authorities through a separate, parallel process.

U.S. Army Corps of Engineers;

U.S. Environmental Protection Agency;

U.S. Fish and Wildlife Service;

Oregon Department of Environmental Quality;

Oregon Department of Fish and Wildlife;

Oregon Department of Land Conservation and Development;

Oregon Department of State Lands;

Oregon State Historic Preservation Office;

Washington State Department of Archaeology and Historic Preservation;

Washington State Department of Ecology; and

Washington State Department of Fish and Wildlife.

B. Tenets of Participation

All Signatory Agencies agree to follow the processes described in this agreement including consistent meeting attendance and timely participation in the decision making process. As part of participation all Signatory Agencies are responsible for providing sufficient and appropriate staff with the needed expertise and authority to proceed with the timely resolution of the agreement process. Specific roles and responsibilities of NEPA Leads, Project Sponsors and Resource Agencies are further defined below in Section V and VI.

Participation in this agreement does not imply endorsement of the project. Nothing in this agreement or its appendices is intended to diminish, modify, or otherwise affect the statutory or regulatory authorities of the agencies involved.

All participating federal Resource Agencies with offices in both the states of Oregon and Washington agree to make efforts to coordinate their participation in this agreement, such as appointing one office to represent the agency on the CRC project, so as to minimize jurisdictional overlap and to provide a single person as the agency's primary point of contact.

Each Signatory Agency shall identify a single person as that agency's primary point of contact for the agreement process who will be responsible for representing the agency in the process. Other staff may be used in a technical or supporting role as needed. See *Appendix A: Contacts* for a list of agency representatives. Agency representatives should have sufficient authority to represent the agency during meetings and participate in decision making. Representatives need not have signatory authority to formally respond to concurrence point requests, but it is the representative's responsibility to see that concurrence requests are reviewed by appropriate agency authorities within the process timeline.

V. IMPLEMENTATION PROCEDURES

A. Agreement Management

Project Sponsors have the overall responsibility of coordinating and facilitating the process described in this agreement.

1. Implementation Coordinator

   Project Sponsors will provide an Implementation Coordinator. It is the responsibility of this coordinator to be a central point of contact for all Signatory Agencies and insure that all meeting notices and other necessary information are disseminated to participating agencies in a timely manner. This person will also be ODOT's and WSDOT's primary representative at meetings and during the decision making process.

2. Facilitator

   Project Sponsors may provide for a facilitator at meetings and other points in the process as needed. The facilitator may be an agency staff person, contractor or other designee but will not be an agency's sole representative at the relevant meeting or process point and will not be an advocate for any agency while acting as facilitator but will strive to (1) ensure meetings are efficient, focused and productive, and (2) achieve consensus among participating agencies to the extent possible. The facilitator will work closely with the implementation coordinator to ensure appropriate collection and dissemination of information for the facilitated meeting or process point.

3. Decision Documentation

   Project Sponsors are responsible for completely and accurately documenting all decisions that are made during the agreement process. This includes providing for note-taking during all meetings. All meeting summaries will be distributed to all Signatory Agencies with any substantive decisions and assignments conspicuously marked. All Signatory Agencies shall have an opportunity to comment, within a specified timeframe, on the accuracy of any summaries disseminated.

   Project Sponsors are responsible for the collection and dissemination of all requests for concurrence, comments received from Resource Agencies and responses to comments.

   All notes and appropriate documents will be transmitted to the NEPA Leads by the Project Sponsors for the administrative record.

4. Electronic Information System

   Project Sponsors are responsible for establishing and maintaining a web-based information repository that shall be the primary means of disseminating information to Signatory Agencies. All documents necessary to implement the agreement process shall be located on this system and available to all Signatory Agencies. E-mail or other appropriate means shall be used to notify agency representatives when new information is added to the system.

B. Meetings

1. Timing of Meetings

A meeting of the InterCEP group shall be held approximately on a monthly basis, depending on need, for the purpose of information sharing, monitoring of the process and addressing other project issues. The frequency of meetings may be adjusted over time. A scheduled meeting may be cancelled by the Project Sponsors up to one week before the meeting date.

At the request of any Project Sponsor, NEPA Lead or two or more Resource Agencies, additional meetings may be convened.

2. Meeting Agenda

Project Sponsors shall distribute a preliminary agenda approximately one month before a meeting or at the time of scheduling whichever is later. Agendas shall clearly outline items for discussion or resolution or actions requested of agency representatives at the next meeting. Agendas shall also indicate which Resource Agencies, if any, may not need to attend based on the planned topics of discussion. Excused Resource Agencies should communicate with the Implementation Coordinator to verify their attendance is not needed. Resource Agencies, however, may attend any meeting regardless of whether designated as excused or not. Agendas shall also clearly indicate if discussion topics are expected to be of such a technical matter that agency representatives may want to bring additional staff and if a specific decision will need to be made at the meeting. Agency representatives shall also review the meeting agenda topic descriptions to determine if additional agency staff/managers should attend.

Resource Agencies may request additions to the agenda of any scheduled meeting by submitting a "Request for Discussion" form (*Appendix C*) to the Implementation Coordinator at least 14 calendar days before a scheduled meeting. See section IV.D. Issue Resolution and *Appendix B* for more on this process.

3. Meeting Attendance

It is the responsibility of agency representatives to attend scheduled meetings unless it was indicated on that meeting's agenda that their presence is not warranted. Decisions will not be revisited because an agency, absent during the relevant meeting, objects to the outcome. If an agency representative knows they will not be able to attend a meeting they shall inform the Implementation Coordinator prior to the meeting. Although not preferred, representatives that cannot attend in person may be able to connect to the meeting via conference call, with adequate notice.

If an agency representative cannot attend a meeting during which a concurrence point presentation is scheduled, a makeup presentation may be scheduled with that representative at the discretion of the Project Sponsors.

4. Proxy

If an agency representative is unable to attend a scheduled meeting he/she may send a proxy representative from his/her agency or coordinate with a separate Signatory Agency to represent them. Proxy representatives should have sufficient authority and knowledge in order to fully represent the agency in the process and any decision making. Agencies sending proxy representatives should consider, as needed, sending written instructions or opinion on scheduled discussion or decision topics.

C. Workgroups and Off-line Meetings

Workgroups may be formed by the Project Sponsors to address any issue they believe needs more focused or technical attention than is available within the scheduled InterCEP meetings. Any Signatory Agency(ies) may recommend the formation of a workgroup or single offline meeting and make recommendations regarding the composition of the workgroup. Workgroups shall be composed of all Signatory Agencies relevant to the topic available to attend and can be staffed with the existing agency representatives or other staff as needed. Generally it is expected that workgroups will report back to the primary committee on meeting results and any action that may be needed as a result of the workgroup's effort. Workgroups will make regular progress reports during scheduled InterCEP meetings.

D. Issue Resolution

The purpose of this issue resolution process is to provide a means to resolve disagreements between Signatory Agencies. The intention is to expeditiously resolve issues at the lowest level of the organizations through collaboration and consensus. Alternative issue resolution forums (e.g., facilitation or mediation) can be used in this process.

1. Triggers

The issue resolution process may be initiated by any Signatory Agency for the following reasons: there is a disagreement on the interpretation of this agreement; a Resource Agency gives a response of non-concurrence to a request for concurrence; or any other dispute in the process that cannot be resolved by a consensus of agency representatives.

2. Process

   The issue resolution process involves first an informed discussion amongst agency representatives and then, if a resolution can not be reached, the sequential elevation of the issue to higher levels of authority within the agencies until a resolution is achieved. See *Appendix B: Issue Resolution Process* for details on the elevation sequence, process and timeline.

VI. COMMENT AND CONCURRENCE PROCESS

A. Comment and Concurrence Points

Comment and concurrence points are specific milestones or decisions in the project process at which the NEPA Leads and Project Sponsors will request Resource Agencies to provide specific comments or concurrence on the project at that stage.

B. Comment Points

Comment points represent specific points in the project process at which Resource Agencies will be asked to provide written, advisory comments to NEPA Leads and Project Sponsors. Participation in comment points by resource agencies does not represent an endorsement of the project. Comments received by NEPA Leads and Project Sponsors at these points are advisory only and treatment of advisory comments does not trigger the issue resolution process. The comment points for this agreement are:

i. Purpose and Need (For all Resource Agencies except the Corps of Engineers)

ii. Methods and Data Reports

iii. Preliminary Draft EIS

iv. Preliminary Final EIS

In order to support the collaborative process, Resource Agencies should comment on, amongst others, the following issues if appropriate:

- The appropriateness of the specific comment point topic;
- How the comment point topic will impact further development and ultimate completion and approval of the EIS and ROD by the project NEPA Leads;
- How the comment point topic would be consistent or inconsistent with the agency's ability to ultimately approve or permit the project;
- How the specific comment point topic will support the best possible project and environmental outcome.

Resource Agencies should focus comments on the element's interaction with resources under that agency's legal jurisdiction or expertise and on how that element may impact the agency's ultimate approval or permitting of the project.

C. Comment Point Process

The purpose of the comment point process is to provide Resource Agencies with several opportunities to provide early input on the comment point topic and allow the NEPA Leads and Project Sponsors to refine the topic if needed.

1. Initial Comment Opportunity

The NEPA Leads and Project Sponsors shall submit an initial comment package at least 20 calendar days prior to a scheduled meeting at which the comment point topic will be discussed. The initial comment package should provide agencies with sufficient information regarding the comment point to allow substantive comments before or during the meeting presentation.

Resource Agencies are expected to review the initial comment package and may provide NEPA Leads and Project Sponsors with comments on the information in an initial comment package up to seven (7) calendar days before the scheduled meeting presentation.

2. Comment Point Meeting and Discussion

NEPA Leads and Project Sponsors shall make a comment point presentation at a scheduled InterCEP meeting of the signatory agencies. The presentation shall describe the comment point topic and how it relates to the overall project. The presentation shall indicate any changes to the comment point topic since the distribution of the initial comment package. NEPA Leads and Project Sponsors shall allow for Resource Agencies to comment on and discuss the presentation and initial comment package at the meeting.

3. Final Comment Opportunity

After the comment point meeting, NEPA Leads and Project Sponsors shall submit a final comment package to each Resource Agency for written comments.

The information in the final comment package should represent the current version of the relevant topic based on previous Resource Agency input during the initial comment opportunity and meeting and indicate any changes to the comment point topic since the distribution of the initial package.

4. Response to Final Comment Package

   Within 20 calendar days of receiving a final comment package, a Resource Agency may provide in writing on a form provided by the Project Sponsors, any further advisory comments on the comment point topic.

   NEPA Leads and Project Sponsors shall provide a response to any advisory comments within 45 calendar days of receipt. Advisory comments and responses to them do not trigger the issue resolution process as they are only advisory in nature and do not constitute conditional approval.

D. Concurrence Points

Concurrence points represent specific points in the project process at which Resource Agencies will be asked to provide a written concurrence on that stage of the project to NEPA Leads and Project Sponsors. Concurrence on a Concurrence Point means that the information submitted for a particular concurrence point meets the definition of "Concurrence" in this Agreement. The Concurrence Points for this agreement are:

i. Purpose and Need (For Corps of Engineers only)[2]

ii. Evaluation Criteria

iii. Range of Alternatives to be considered in the Draft EIS

iv. Preferred Alternative and Conceptual Mitigation Plan

Concurrence Points shall follow the process established in the remainder of Section VI.

E. Pre-Concurrence Coordination

The purpose of pre-concurrence coordination before the submittal of a formal concurrence point is to allow early identification of issues that may prevent a Resource Agency from being able to concur on the point in question.

1. Pre- Concurrence Package

   A pre-concurrence package is an important element of the process because it provides Resource Agencies an opportunity to assist the NEPA Leads and Project Sponsors to provide as complete a concurrence package as possible. NEPA Leads and Project Sponsors will submit a pre-concurrence package to Resource Agencies at least 20 calendar days prior to a scheduled meeting at which the concurrence presentation will be made. The pre-concurrence package should provide agencies with sufficient

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[2] The U.S. Army Corps of Engineers was given concurrence authority on the Purpose and Need Statement due to permit authority under Section 404 of the Clean Water Act and interactions between NEPA and Section 404(b)(1) guidelines.

information regarding the concurrence point to allow substantive comments before or during the concurrence presentation.

Resource Agencies are expected to review the pre-concurrence package and may provide NEPA Leads and Project Sponsors with comments on the information in a pre-concurrence package up to seven (7) calendar days before the scheduled concurrence presentation.

2. Concurrence Point Meeting and Discussion

NEPA Leads and Project Sponsors shall make a concurrence point presentation at a scheduled InterCEP meeting. The presentation shall describe the concurrence point topic and how it relates to the overall project. The presentation shall indicate any changes to the concurrence point topic since the distribution of the pre-concurrence package. NEPA Leads and Project Sponsors shall allow for Resource Agencies to comment on and discuss the presentation and pre-concurrence package at the meeting. The intent of the meeting is to increase all participants' understanding of the proposed concurrence point and any concerns, in order to reach a collaborative decision. Following the presentation and discussion, the Resource Agencies at the meeting will be polled to determine whether (a) each agency is ready to receive a formal concurrence request, or (b) any agency needs additional dialogue with the group before making a concurrence decision. At the request of any Resource Agency, a second meeting on the concurrence point will be scheduled. Any Resource Agency(ies) requesting the additional meeting will specify, in their request, their concerns to be addressed at the meeting.

F. Formal Concurrence Request

After the concurrence point meeting(s), NEPA Leads and Project Sponsors shall submit a formal concurrence request to each Resource Agency for written concurrence on the particular project stage.

The information in the concurrence request should represent the current version of the relevant project element based on previous Resource Agency input during the pre-concurrence coordination and the outcome of any prior decisions or concurrence and comment points under this agreement.

G. Response to Concurrence Request

1. Response Process

Within 20 calendar days of receiving a formal concurrence request a Resource Agency shall provide in writing on a form provided by Project Sponsors, one of the following responses:

i. Concurrence

ii. Non-Concurrence

iii. Waive

If the Project Sponsors make significant substantive changes to the concurrence topic after the concurrence request has been delivered, then the 20-day review period will start again once the changes have been provided in writing to the Resource Agencies.

If there has been only one concurrence presentation meeting prior to the formal concurrence request, a Resource Agency may request in writing a ten (10) calendar day extension.

If a Resource Agency's response is non-concurrence, it shall be accompanied by a detailed explanation of the reasons for non-concurrence and the specific authority (i.e., law, statute, administrative rule, etc.) upon which the non-concurrence decision has been based.

A non-concurrence response shall commence the issue resolution process of Section V.D. of this agreement.

If any Resource Agency has not provided a written response before the 20 day deadline (30 days if an extension was granted), Project Sponsors shall issue that agency a written notice, accompanied by a telephone call to the agency representative, that it has not responded to a concurrence request and if it does not provide a response within ten (10) calendar days the agency will waive its participation on that concurrence point. If the NEPA Leads and Project Sponsors do not receive a written response of Concurrence, Non-concurrence or Waiver within 30 calendar days (40 if an extension was granted) of the resource agencies receiving the concurrence request, the Project Sponsors shall inform the Resource Agency in writing that they have been deemed to have waived participation in this concurrence point.

2. Effect of Concurrence

Concurrence on a concurrence point means that each of the following criteria are met: 1) the Resource Agency has determined that there is adequate information regarding the topic under consideration for this stage of the project development; 2) the concurrence is consistent with the agency's applicable statutes and regulations; and 3) concerns were adequately addressed by NEPA Leads and Project Sponsors following a non-concurrence (if applicable).

Once a Resource Agency has provided concurrence on a given point it agrees not to revisit that project topic unless there is substantial new information or substantial changes have occurred to the project, the environment or relevant laws and regulations.

Concurrence is not legal approval and does not preclude a Resource Agency from denying later project approval or permitting. Concurrence does, however, preclude an agency from later revisiting the project decisions made at the particular concurrence point. Concurrence does not diminish, modify, or otherwise affect the statutory or regulatory authorities of the agencies involved.

3. Effect of Non-Concurrence

   Non-concurrence on a concurrence point is appropriate if a Resource Agency has determined that one or more of the criteria allowing concurrence is not being met and that the project, if it proceeded under the current concurrence point element, would likely not be able to receive final approval or permits from that agency.

   The grounds for a Resource Agency's non-concurrence shall be limited to the agency's legal authority. A Resource Agency should only provide a non-concurrence if it believes it would be unable to provide final approval to the project.

   Non-concurrence by any Resource Agency prevents the project from continuing to the next concurrence point request under this agreement until the issue is resolved. Non-concurrence does not prevent NEPA Leads and Project Sponsors from continuing to advance the project development process.

4. Waiver

   A Resource Agency may choose to waive a concurrence point. Waiver may be appropriate if an Agency believes that its participation in the concurrence point is not necessary at this point in the project or that the concurrence point topic is outside its jurisdictional scope or expertise.

   A waiver has the same procedural effect as a concurrence in that it allows NEPA Leads and Project Sponsors to proceed to the next comment or concurrence point (assuming all resource agencies have concurred or waived). By responding with a waiver the Resource Agency agrees not to revisit that project topic unless there is substantial new information or substantial changes have occurred to the project, the environment or laws and regulations.

5. Advisory Comments

   Advisory comments may be provided with any response to a concurrence request. Such comments are submitted for informational purposes only and do not represent a conditional response. Advisory comments are appropriate if the Resource Agency has comments that are:

i. About the concurrence point that were not severe enough to warrant non-concurrence;

ii. Outside the agency's regulatory authority;

iii. Beyond existing minimum standards for resource protection; or

iv. The Resource Agency wishes to provide early substantive input and recommendations for a subsequent stage of the process.

NEPA Leads and Project Sponsors shall provide a response to any advisory comments within 45 calendar days of receipt. NEPA Leads and Project Sponsors' treatment of advisory comments does not trigger the issue resolution process.

VII. MONITORING, REPORTING AND ADAPTIVE MANAGEMENT

A. Monitoring and Evaluation

The signatory agencies will monitor the success of the agreement process and modify it as necessary to improve it. A workgroup shall be formed to monitor and evaluate the success of this agreement. The monitoring and evaluation workgroup will give annual progress reports at a scheduled InterCEP group meeting. The subgroup shall consider topics including, but not limited to: minor editorial correction to the agreement; more substantive proposals for improvement in the agreement process; how to monitor and measure the success of the agreement process; changes to the agreement process to reflect monitoring results; and continuation of monitoring and evaluation.

B. Annual Report

Project Sponsors shall prepare an annual report and distribute it to all Signatory Agencies. The report shall include the progress of the project to date and how the process established by this agreement has impacted the project. The report shall also address the goals developed for this agreement. The reporting time period will be from January 1 to December 31 of each year.

VIII. EFFECTIVE DATE, AGREEMENT MODIFICATION AND TERMINATION

A. Effective Date of Agreement

This agreement becomes effective upon the signature of the NEPA Leads, Project Sponsors and at least four Resource Agencies. The agreement is only effective for those agencies that have signed the agreement. The agreement becomes effective for any other listed Signatory Agency on the date of their respective signatures.

B. Agreement Modification

This agreement may be modified upon approval of all Signatory Agencies. Revisions may be proposed by any Signatory Agency. Proposals for modifications will be circulated to all Signatory Agencies for a 30-day period of review. Approval of such proposals will be indicated in writing. This provision does not prevent agencies from entering into supplemental agreements to address issues of limited concern affecting only a portion of the Signatory Agencies.

C. Agreement Termination

Any Signatory Agency may choose to withdraw from this agreement upon 30-days written notice to the other parties of this agreement. Withdrawal of any Signatory Agency does not affect the continued use of the agreement by the remaining signatory agencies.

IX. SIGNATURES

Daniel M. Mathis	02/07/06
Federal Highway Administration, Washington	Date
	Feb 7, 2006
Federal Highway Administration, Oregon	Date
	2/17/06
Federal Transit Administration	Date
Oregon Department of Transportation	Date
Washington State Department of Transportation	Date
Michael R. Crouse	2/28/06
National Marine Fisheries Service	Date
	6 MAR '06
U.S. Army Corps of Engineers	Date
	2/2/06
U.S. Environmental Protection Agency	Date
	04/04/06
U.S. Fish and Wildlife Service	Date
	2/14/06
Oregon Department of Environmental Quality	Date

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______________________	3/13/06
Oregon Department of Fish and Wildlife	Date
______________________	Jan. 25, 2006
Oregon Department of Land Conservation and Development	Date
Ann Hanus	1/31/06
Oregon Department of State Lands	Date
James M. Hamrick	3 Mar 06
Oregon State Historic Preservation Office	Date
______________________	1/25/06
Washington State Department of Archaeology and Historic Preservation	Date
______________________	2/26/06
Washington State Department of Ecology	Date
______________________	1/25/06
Washington State Department of Fish and Wildlife	Date

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APPENDIX A: SIGNATORY AGENCY CONTACTS

Agency	Name	Email	Role	Phone #
CRC Team	Heather Gundersen	gundersenh@columbiarivercrossing.org	Agreement Coordinator	360-737-2726
		Federal		
FHWA - OR	Jeff Graham	jeffrey.graham@fhwa.dot.gov	Primary - OR	503-587-4727
FHWA - OR	Michelle Eraut	michelle.eraut@fhwa.dot.gov	Alternate - OR	503-587-4716
FHWA - WA	Gary Hughes	gary.hughes@fhwa.dot.gov	Primary - WA	
FHWA - WA	Sharon Love	sharon.love@fhwa.dot.gov		
FHWA - WA	Steve Saxton	steve.saxton@fhwa.dot.gov	Alternate - WA	
FTA	Linda Gehrke	linda.gehrke@fta.dot.gov	Primary	
FTA	Thomas Radmilovich	thomas.radmilovich@fta.dot.gov	Alternate	
EPA	Patty Betts	pbet461@ecy.wa.gov	Alternate	360-407-6925
EPA	Yvonne Vallette	vallette.yvonne@epa.gov	Primary	503-326-2716
NOAA	Michael Grady	michael.grady@noaa.gov	Alternate	206-526-4645
NOAA	Neil Rickard	neil.rickard@noaa.gov	Primary	360-753-9090
USFWS	David Leal	david_leal@fws.gov	Primary	503-231-6179
USACE	Susan Sturges	susan.m.sturges@usace.army.mil	Primary	503-808-4381
		Oregon State		
DLCD	Bob Cortright	bob.cortright@state.or.us	Alternate	503-373-0050 ext. 241
DLCD	Matt Crall	matthew.crall@state.or.us	Primary	503-373-0050 ext. 272
ODFW	Tom Murtagh	tom.murtagh@state.or.us	Primary	503-657-2000 ext. 241
ODOT	Joyce Cohen	cohen.joyce@deq.state.or.us	Primary	503-229-6916
ODOT	Susan Haupt	susan.haupt@odot.state.or.us	Alternate	
ODSL	Mike McCabe	mike.mccabe@state.or.us	Primary	503-378-3805 ext. 255
OR DEQ	Ann Levine	levine.ann@deq.state.or.us	Alternate - Land	
OR DEQ	Dick Pedersen	pedersen.dick@deq.state.or.us	Primary	
OR DEQ	Marianne Fitzgerald	fitzgerald.marianne@deq.state.or.us	Alternate - Air	503-229-5946
OR DEQ	Tom Melville	melville.tom@deq.state.or.us	Alternate - Water	503-229-5845
OR SHPO	Kirk Ranzetta	kirk.ranzetta@state.or.us	Primary	503-986-0678
OR SHPO	Lucie Tisdale	lucie.tisdale@state.or.us	Alternate	503-986-0683
		Washington State		
Ecology	Iloba Odum	iodu461@ecy.wa.gov	Alternate	360-690-7170
Ecology	Terry Swanson	tswa461@ecy.wa.gov	Primary	360-407-6789
WA DAHP	Matthew Sterner	matthew.sterner@dahp.wa.gov	Alternate	
WA DAHP	Russell Holter	russell.holter@dahp.wa.gov	Primary	360-583-3533
WDFW	Sam Kolb	kolbssk@dfw.wa.gov	Alternate	360-906-6729
WDFW	Teresa Eturaspe	eturatae@dfw.wa.gov	Primary	360-902-2575
WSDOT	Phil Kauzloric	kauzlop@wsdot.wa.gov	Primary	

APPENDIX B: ISSUE RESOLUTION PROCESS

I. INTRODUCTION

The purpose of this issue resolution process is to provide a means to resolve disagreements within the scope of the Interstate Collaborative Environmental Process (InterCEP) Agreement between Signatory Agencies. The intent is to expeditiously and systematically resolve issues at the lowest level of the involved agencies through a consensus building process before triggering an elevation to higher levels. Alternative issue resolution processes (e.g., facilitation or mediation) can be used.

II. ISSUE RESOLUTION PROCESS TRIGGERS

A. Written non-concurrence at any of the concurrence points (Resource Agency needs to provide detailed reason(s) for its non-concurrence). See Section III.B of this appendix for the process.

B. A disagreement on the interpretation of the agreement. See Section III.A of this appendix for the process.

C. Any other dispute in the process that cannot be resolved by a consensus of agency representatives. See Section III.A for process.

III. ISSUE RESOLUTION PROCESSES AND TIMELINES

A. Initial Issue Discussion for Issues Not Involving Non-Concurrence

The intent of the initial issue discussion process is to focus discussions amongst agency representatives in order to resolve issues and avoid unneeded issue elevations. When any Signatory Agency believes that there is an unresolved or emerging issue under their agency's purview that needs attention, the agency representative may request discussion of that issue during the next scheduled InterCEP meeting or through a forum agreed upon with the Project Sponsors.

1. To initiate the request, the initiating agency will fill out the "Request for Discussion" form (Appendix C) and submit it to the Implementation Coordinator at least 14 calendar days prior to the next scheduled InterCEP meeting to allow time to adjust the meeting agenda to accommodate time for discussion (if the initiating agency requests that the issue be presented through the InterCEP group).

2. The purpose of the "Request for Discussion" form is to save time by having a clear statement of the issue to be addressed, to identify which agencies or project specific interests need to be involved in the resolution discussion, to establish a timeframe for resolution, and to track the progress in resolving the issue.

3. Other Signatory Agencies will receive a copy of the "Request for Discussion" form in their meeting agenda submitted at least seven (7)

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calendar days prior to the scheduled InterCEP meeting (or an alternative forum agreed to by the initiating agency and the Project Sponsors). Signatory Agencies may add to the articulation of the problem and submit a revised "Request for Discussion" form to the Implementation Coordinator at least five (5) calendar days before the scheduled InterCEP meeting (or alternative forum).

4. Sufficient time will be made available on the scheduled InterCEP meeting agenda to adequately present the issue and allow the discussion to work towards resolution with the Signatory Agencies. The issue will be presented by the agency representative requesting discussion.

5. If the issue is resolved during the InterCEP meeting, this will be noted on the "Request for Discussion" form, including a statement of the decision and the rationale for that decision. This will also be documented in the meeting minutes. Additional time for discussion of the issue may be scheduled during subsequent InterCEP meetings (or alternative forums) if there is consensus from the participants that additional discussion is necessary to resolve the issue before seeking elevation.

6. If the issue is not presented or discussed through a InterCEP meeting, but through some alternative forum (conference call, site visit, etc.) then the outcome will be noted on the "Request for Discussion" form, including a decision for resolution or not of the issue, and key discussion points raised. Copies of the "Request for Discussion" form will be provided to the other Signatory Agencies.

7. If the issue is not resolved to the satisfaction of the initiating agency, the agency representative shall inform the Implementation Coordinator that the agency is initiating the issue elevation process (see Section III.C. of this appendix).

B. Initial Non-concurrence Discussion

1. Within ten (10) calendar days of receiving a written non-concurrence, the Project Sponsors and Implementation Coordinator will consult with the non-concurring agency's representative and any other Signatory Agencies' representatives needed to resolve the issue. If the issue(s) cannot be resolved, the agencies involved will proceed to the issue elevation process (see Section III.C).

2. If the issue(s) causing the non-concurrence can be resolved, the Project Sponsors and non-concurring agency will each provide the other Signatory Agencies written documentation that outlines the issues and their resolution. If the project changes are substantial, the NEPA Leads and Project Sponsors will submit a revised concurrence point package to the Resource Agencies immediately. If the project changes appear minimal and non-substantive, the NEPA Leads and Project Sponsors must verify

this determination with all Resource Agencies. Within 15 calendar days of receipt of the determination request, each Signatory Agency will decide if the changes to the project, needed to achieve issue resolution, are significant enough to warrant revisiting the concurrence point.

NEPA Leads, Project Sponsors and nonconcurring Resource Agencies are strongly encouraged to consult with other agencies during the discussion process to pursue the resolution of non-concurrence issues without creating new issues of concern for other Resource Agencies.

C. Issue Elevation Process

1. Step 1: The Implementation Coordinator begins the issue elevation process by informing all other Signatory Agencies that the issue elevation process is being initiated and describe in detail the reasons for initiation. The notice must also indicate which signatory agencies need to consult, either to resolve the issue or to determine how concerns can be best addressed.

2. Step 2: Within ten (10) calendar days of Step 1, the initiating agency, NEPA Leads, Project Sponsors and/or other Resource Agencies involved will develop and exchange questions or comments to be addressed in white papers and identify the change that is needed for issue resolution.

3. Step 3: Within 30 calendar days of Step 2, white papers will be developed and exchanged addressing each question or comment submitted and detailing concerns, and a meeting will be held with the next level of supervisors. The Implementation Coordinator will manage the issue resolution meeting unless any involved agency requests a mediator. The mediator may be a specialist from one of the Signatory Agencies or a contractor (contingent upon a project's budget).

   Depending on the Signatory Agencies involved in the issue resolution process, the following individuals or their designees will participate at this step:

   Emily Lawton – Federal Highways Administration

   X – Federal Transit Administration

   X – Oregon Department of Transportation

   X – Washington Department of Transportation

   X - National Marine Fisheries Service;

   Donald Borda – U.S. Army Corps of Engineers;

   X - U.S. Environmental Protection Agency;

   X - U.S. Fish and Wildlife Service;

   X - Oregon Department of Environmental Quality;

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X - Oregon Department of Fish and Wildlife;

Bob Cortright - Oregon Department of Land Conservation and Development;

Eric Metz – Oregon Department of State Lands;

X - Oregon State Historic Preservation Office;

Russell Holter – Washington State Department of Archaeology and Historic Preservation;

X - Washington State Department of Ecology; and

Gayle Kreitman – Washington State Department of Fish and Wildlife.

If the issues cannot be resolved by project and agency staff at Step 3, the involved agencies will proceed to Step 4.

If the issue(s) can be resolved, and involved a non-concurrence, the Project Sponsors and nonconcurring agency will each provide the other Signatory Agencies written documentation that outlines the issues and their resolution. If the project changes are substantial, the NEPA Leads and Project Sponsors will submit a revised concurrence point package to the Resource Agencies immediately. If the project changes appear minimal and non-substantive, the NEPA Leads and Project Sponsors must verify this determination with all Resource Agencies. Within 15 calendar days of receipt of the determination request, each Signatory Agency will decide if the changes to the project, needed to achieve issue resolution, are significant enough to warrant revisiting the concurrence point.

NEPA Leads, Project Sponsors and nonconcurring agencies are strongly encouraged to consult with other agencies during the issue resolution process to pursue the resolution of non-concurrence issues without creating new issues of concern for other Resource Agencies.

4. Step 4: If resolution cannot be achieved at Step 3, a meeting will be held with the signatories of the agreement or their designees. This meeting will occur within 45 calendar days of the exchange of white papers (Step 3). (It is presumed that the signatories will reach an agreement on how to resolve the disputed issues).

   If the issue(s) can be resolved, and involved a non-concurrence, the Project Sponsors and nonconcurring agency will each provide the other Signatory Agencies written documentation that outlines the issues and their resolution. If the project changes are substantial, the NEPA Leads and Project Sponsors will submit a revised concurrence point package to the Resource Agencies immediately. If the project changes appear minimal and non-substantive, the NEPA Leads and Project Sponsors must verify this determination with all Resource Agencies. Within 15 calendar days of receipt of the determination request, each Signatory Agency will decide if the changes to the project, needed to achieve issue resolution, are significant enough to warrant revisiting the concurrence point.

NEPA Leads, Project Sponsors and nonconcurring agencies are strongly encouraged to consult with other agencies during the issue resolution process to pursue the resolution of non-concurrence issues without creating new issues of concern for other Resource Agencies.

Depending on the signatory agencies involved in the issue resolution process, the following people or their designees will participate at this step:

David Cox – Federal Highways Administration

X – Federal Transit Administration

X – Oregon Department of Transportation

X – Washington Department of Transportation

X - National Marine Fisheries Service;

Colonel Thomas E. O'Donovan – U.S. Army Corps of Engineers;

X - U.S. Environmental Protection Agency;

X - U.S. Fish and Wildlife Service;

X - Oregon Department of Environmental Quality;

X - Oregon Department of Fish and Wildlife;

Lane Shetterly - Oregon Department of Land Conservation and Development;

John Lilly – Oregon Department of State Lands;

X - Oregon State Historic Preservation Office;

Allyson Brooks – Washington State Department of Archaeology and Historic Preservation;

X - Washington State Department of Ecology; and

Don Haring – Washington State Department of Fish and Wildlife.

If resolution is not reached at Step 4 the Project Sponsors may choose to proceed ahead with the project.

APPENDIX C: REQUEST FOR DISCUSSION FORM

Requestor's Name/Agency:
Issue(s) that require discussion- Specific Statement of each issue that needs to be resolved or decided: (No more than one short paragraph per issue)
Statement of need or concern of requestor's agency, related to the issue(s):
Solution proposed by requestor's agency (if known) and statement of why this solution is important to that agency:
Other potentially interested or affected agencies:

Proposed Discussion Forum: Next Scheduled InterCEP meeting ☐ Date _____ Alternative Proposed Forum (please describe):
The information below will be filled out following the discussion forum. The completed form will then be sent out to all the participants, and a copy will be sent to all of the signatory agencies.
Outcome: _____ Issue was resolved: Decision: Rationale for the decision: ______ Issue was not resolved: Additional discussion require (based on consensus of InterCEP members): Next scheduled discussion date: _______Issue to be elevated: Level to which issue will be elevated: Notification date of elevation: Means of notification of elevation to the next appropriate level:
COMMENTS:

APPENDIX B
Public Involvement

Columbia River
CROSSING

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Appendix B

Public Involvement

This appendix describes the public involvement program for the Columbia River Crossing (CRC) project. While public involvement on this project began much earlier, the NEPA public involvement program was formally initiated with publication of a Notice of Intent to prepare an Environmental Impact Statement (EIS) in the Federal Register on September 27, 2005, and will continue through the public comment period for this Draft Environmental Impact Statement (DEIS) and selection of the Locally Preferred Alternative (LPA) in 2008. Over the course of the project, this program is used to educate and involve interested parties and stakeholders in order for them to become active participants in shaping the CRC project.

To date, through the public involvement program, CRC staff participated in nearly 350 public events, giving over 10,000 people a face-to-face opportunity to learn about the project and provide meaningful input. A list of all public involvement events held to date is included at the end of this appendix. The program also enabled significant involvement for those who are unable to attend public events. Extensive outreach has been conducted through dissemination of written information in hard copy and electronic form, including dissemination of comment forms, the creation of an interactive project web site, and outreach to local and regional media. The project's database, used to encourage participation in public events and involve the broader community, has grown to nearly 3,000 e-mail addresses and over 10,000 postal mailing addresses.

Through implementation of the public involvement program, over 3,000 public comments have been received so far on a range of topics, including the purpose of and need for the project as well as comments on specific transit, river crossing and highway components, and alternatives. The comments have significantly contributed to the development of the CRC project, including the creation of the project's purpose and need statement, the addition of new transit and river crossing ideas, and the development of additional full alternatives to be studied in the DEIS process, and will contribute to the development of a recommended LPA.

Education and involvement activities will continue to take place during the formal public comment period for the DEIS, and will include at least one public event in Washington and one in Oregon prior to the selection of the LPA by project sponsors. These additional activities will encourage the community to learn about, and comment on, the DEIS. Education and involvement activities will take place after the DEIS formal comment periods are closed, and will be tailored to meet the needs of the public.

This appendix includes the program's goals for public involvement, a description of the public stakeholders targeted for involvement, and the outreach tools being used to communicate with these stakeholders.

Goals for Public Involvement

The goals for public involvement and measures for assessing progress toward these goals are as follows:

- Goal: Provide opportunities for meaningful public engagement in project development.
  - Objective: Keep the interested and affected people, groups, and agencies informed of project developments on an ongoing basis through presentations, attendance at community-based events, open houses, print and electronic communications, and the media.
  - Objective: Encourage public feedback though public outreach activities and tools.
  - Objective: Compile and summarize public feedback on an ongoing basis. Distribute public feedback to project staff on an as-needed basis.
  - Objective: Evaluate and consider all public comments.
- Goal: Fully comply with Executive Orders 12898 and 12948 on Environmental Justice.
  - Objective: Hold regular Community and Environmental Justice Group (CEJG) meetings that provide opportunity for feedback on key project decisions.
  - Objective: Specifically target minority, low-income, and limited English-speaking populations within the project area for stakeholder outreach and feedback.
  - Objective: Translate project documents into Spanish, Russian, and Vietnamese and provide interpreter services when needed.

Stakeholders

The first major public involvement task was to identify who would be interested in, affected by, utilize, or otherwise have a stake in the CRC project; in other words, identifying the public stakeholders. The following people and organizations have been identified as public stakeholders and are the primary focus of outreach:

- The people of Clark County and Portland
- People who live adjacent to I-5
- People who drive on I-5
- The business and freight community
- Transit users
- Elected officials
- Project sponsors and staff
- Media
- People identified in the 2005 demographic analysis for the bridge influence area: low-income residents, minorities, and people speaking limited English (specifically those speaking Spanish, Russian, and Vietnamese)
- Neighborhood associations

Public Involvement Approach

The main focus of CRC participation in public events is at the grass-roots community level. The guiding philosophy is to take information and solicit feedback where people are already gathered, rather than expecting them to seek out project information and look for ways to provide input. To that end, CRC staff continue to reach out to neighborhood associations on both sides of the river and seek to connect with other community groups, service clubs, business organizations, and large employers.

In Vancouver, targeted outreach is focused on the Esther Short, Arnada, Hudson's Bay, Shumway, Lincoln, Central Park, and Rosemere/Rose Village neighborhoods. In Portland, targeted outreach is primarily focused on the Hayden Island, Bridgeton, Kenton, and East Columbia neighborhoods, with close coordination through the North Portland Neighborhood Coalition office. These neighborhoods receive frequent visits and face-to-face outreach about issues the neighborhoods may face as a result of being immediately adjacent to I-5 in the Bridge Influence Area (BIA), providing the CRC project team with localized community input. Monthly e-mail updates are sent to these groups through the City of Vancouver Neighborhoods office, the North Portland Neighborhood Coalition office, and the Neighborhood Association Coalition of Clark County. The project team also works with other associations to provide information and project updates, but not with the same frequency.

CRC staff have also reached out to individual businesses and business associations. Project staff have met with groups such as the Uptown Village Association and Vancouver's Downtown Association. In addition, staff are engaged in an ongoing door-to-door outreach campaign to businesses near the proposed high-capacity transit alignments in Vancouver. These efforts have helped identify business-specific concerns and preferences.

The CRC project is complying with NEPA requirements for public involvement, including fully complying with Executive Orders 12898 and 12948, which require each federal agency to make achieving environmental justice part of its mission "by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The project team has identified minority, low-income, and limited English-speaking populations within the project area for stakeholder engagement and through the formation of the CEJG.

Public Involvement Tools

Listed below is a summary of the public involvement tools and methods being utilized by the CRC project.

Broadcast/Podcast Meetings and Interviews

In an effort to reach new populations and provide a new and convenient way for the public to stay updated about the project, the project team created and posted podcasts onto the project web site.

Communications Tracking

The public can provide the project team with comments through a variety of media, including e-mail, the project web site, voicemail, and public meetings. Comments and questions received through all media are stored in a comment tracking database and are shared individually, or as summarized reports, with project team members and the CRC Task Force (see discussion of the CRC Task Force under Advisory and Working Groups below), as appropriate. When appropriate, the project team provides timely responses to public questions or comments.

Communications Working Group

The communications team periodically convenes communications staff from the partner agencies to update them on project progress, introduce and review communications strategies and messages, and track the distribution of project materials. Meetings are typically held around major project milestones, or as needed.

Fairs, Festivals, and Community Events

The project team focuses on reaching people where they are in order to connect with a broader range of people. These efforts include participation in major community events such as Fort Vancouver Days and the Rose Festival, concerts and events on the Portland waterfront, farmers' markets, and events targeted to reach people who speak Russian, Vietnamese, and Spanish languages. These outreach opportunities provide the general public with an informal opportunity to engage in dialogue with the project team, view project information, and learn about upcoming project milestones and public involvement opportunities. This type of outreach provides the public with increased knowledge of the project, broad-based understanding of project goals and schedules, and a convenient means of providing feedback directly to project staff. Project team participation at community events typically involves the staffing of informational tables.

Mailing List

A project mailing list for electronic and postal mail is maintained in a database to enable printing of mailing labels for newsletters, meeting reminders, web site update notices, and electronic mailings.

Media Support

A media plan has been developed to reach a broad audience with accurate and timely information, to increase awareness of the project by the general public, and to encourage attendance at public events. It includes strategies for gaining media coverage at project milestones as well as methods to keep the project visible between milestones. The following activities are employed to ensure that the media are appropriately involved throughout the project:

- Reporter Briefings and Materials: Members of the media receive project briefings at key milestones. At this time, they also receive press kits which include project descriptions, graphics, timelines, and key decision dates. The press kits serve as a tool for transmittal of new project information and details.

- Editorial Board Briefings: Editorial board meetings are scheduled with a variety of publications within Clark and Multnomah Counties in an effort to inform the editorial boards and their reporters of the project.
- Opinion/Editorial Articles: Project staff solicit opinion/editorial articles from regional transportation leaders such as governors, legislators, local elected officials, the Secretary (Washington) and Director (Oregon) of Transportation, members of the State Transportation Commissions, business leaders, and others interested in transportation issues.
- Minority and Small Press: Minority and neighborhood-based media are included in the distribution of press materials. The project team provides translated versions of press releases, as needed.
- Media Distribution List: The project updated pre-existing media lists and distribution system(s) to ensure that materials are distributed to all relevant and interested news outlets. Neighborhood publications are included on this list, and coordination is planned to ensure that smaller publications receive information in a manner that recognizes their less frequent publication dates.
- Community Calendars: Dates, times, and locations of community open houses and other public events are submitted to a wide variety of publications (both inside and outside the project corridor) via "Community Calendar" sections in order to reach a broad regional audience.
- Media Tracking: All print media stories are collected for reference and archiving and are distributed via e-mail to the project team on a weekly basis.
- E-mail Messages: The project communications team keeps the media informed with monthly e-mails about the project.

Monthly E-mail Updates

Monthly e-mails are used to provide regular updates on the project status to all those on the project mailing list.

Outreach to Limited-English, Low-Income, and Minority Populations

An important component of the public involvement strategy for this project is two-way communication with limited-English, low-income, and minority populations. To this end, the public involvement team coordinates with local communities, the established CEJG, and community-based organizations (CBOs) to develop appropriate strategies for outreach to these communities.

Selected project documents are translated into Spanish, Russian, and Vietnamese, are posted on the project web site, and are distributed in hard copy form at strategic locations in the community. Spanish, Russian, Vietnamese, and sign language interpreters are made available at project open houses, upon request.

Printed and Display Materials

Hard copy materials provide information about the project to a broad range of audiences. One of the main components of the communications effort includes having a range of written materials that are easily identifiable as CRC materials and that can be accessed either in print form or electronically. Individuals requiring reasonable accommodations can request written material in alternative formats or sign language interpreters by contacting the project team.

The following are all elements of the written materials that have been produced for the project:

- Newsletters: Project newsletters are produced to describe project plans and timelines, opportunities for public input, options and alternatives under consideration, and project progress. They also serve as part of the notification system for public meetings and other milestones. Newsletters are also posted on the project web site.
- Project Folio: A general background document was created that describes project need, process, timelines, and benefits; and is used for briefings and meetings and is updated as needed.
- Fact Sheets: Fact sheets have been developed that can be used individually or in packets for specialized audiences, and focus on topics such as safety, transit, funding, and other topics of interest during project development.
- Display Boards: Display boards are created for open houses, booths at fairs and festivals, and miscellaneous presentations.
- Postcards: Postcards are mailed to all addresses in the CRC project database approximately three weeks before public meetings. These postcards notify neighbors and other interested parties of upcoming opportunities to review the project team's work and provide input.
- Presentation Materials: Presentation materials are prepared to support open houses, briefings with neighborhoods, business groups, and community organizations, as well as meetings with media and elected officials. Materials are tailored to each group and may consist of a combination of PowerPoint slides, graphic images, display boards, and presentation handouts.

Public Open Houses and Design Workshops

Public open houses and design workshops are held for the general public and special interest groups in coordination with key project milestones. Individuals requiring reasonable accommodations can request written material in alternative formats or sign language interpreters by contacting the project team. For the convenience of the public, these events are held in both Vancouver and Portland.

- In the fall of 2005, three public open houses were held to provide staff with public input to help define the primary problems in the project area. This information was relevant to the development of the purpose and need statement for the project.
- In the spring of 2006, two open houses were held to discuss and receive public feedback on 23 initial river crossing ideas and 14 initial public transportation ideas.

- In the fall of 2006, four open houses were held to discuss and receive public feedback on the project's draft staff recommendation for alternatives to move forward for further evaluation into the DEIS.
- In the fall of 2007, two open houses were held to share detailed information with neighborhood and business groups about potential high-capacity transit alignments and streetscape design tradeoffs, and to receive feedback.

Traveling Displays

Traveling displays provide information on project context and highlight the range of feasible alternatives being considered; these display locations rotate as needed.

Web Site

A CRC project web site has been created and is regularly updated. The web site provides project information, schedules, and public events, and serves as a venue for the public to provide the project team with feedback. At key project milestones, web-based surveys are also available through this web site.

Comments

Public and agency comments gathered over the course of the project are shared with project staff as relevant to their work, depending on the phase of the project and the issue the comment is related to. By attending outreach events, project staff (including technical staff) also receive comments directly from members of the public. Project comment summaries are also created as a tool for sharing information with the CRC Task Force and lead staff.

Advisory and Working Groups

The CRC Task Force was created to advise the Washington State Department of Transportation and Oregon Department of Transportation on general project-related issues and concerns. In addition, several advisory and working groups were formed to address specific project issues as they arise. These advisory and working groups include specialists from agency and consultant staff as well as from other organizations. These working groups address public involvement, environmental justice, and freight, bicycle, pedestrian, and urban design issues.

CRC Task Force

The 39-member CRC Task Force is composed of leaders from a broad cross section of Washington and Oregon communities. Public agencies, businesses, civic organizations, neighborhoods and freight, commuter, and environmental groups are represented on the CRC Task Force. This group meets regularly to advise the CRC project team and provide guidance and recommendations at key decision points.

<u>Task Force Co-Chairs</u>

Hal Dengerink, Chancellor, Washington State University, Vancouver
Henry Hewitt, Past Chair, Oregon Transportation Commission

Public Agencies

Commissioner Sam Adams, City of Portland
Mike Bennett, City of Gresham
Councilor Rex Burkholder, Metro
Serena Cruz Walsh, Multnomah County
Jeff Hamm, C-TRAN
Fred Hansen, TriMet
Dennis Osborn, City of Battle Ground
Dean Lookingbill, Southwest Regional Transportation Council
Larry Paulson, Port of Vancouver
Mayor Royce Pollard, City of Vancouver
Commissioner Steve Stuart, Clark County
Tom Imeson, Port of Portland

Environmental Organizations

Lora Caine, Friends of Clark County, Southwest Washington
Jill Fuglister, Coalition for a Livable Future, Oregon

Neighborhood Associations

Dave Frei, Arnada Neighborhood Association, Southwest Washington
Brad Halverson, Overlook Neighborhood Association, Portland
Dick Malin, Central Park Neighborhood Association, Southwest Washington
Walter Valenta, Bridgeton Neighborhood Association, Portland

Trucking Industry Organizations

Bob Russel, Oregon Trucking Association
Larry Pursley, Washington Trucking Association

Chambers of Commerce and Portland Business-Based Organizations

Rich Brown, Bank of America, Portland
Ed Lynch, Greater Vancouver Chamber of Commerce
Grant Armbruster, Portland Business Alliance
Scot Walstra, NW Natural Gas, Vancouver (appt. by Greater Vancouver Chamber)

Local Economic Organizations

Bob Byrd, Identity Clark County
Monica Isbell, Starboard Alliance Company, LLC, Portland
Bart Phillips, Columbia River Economic Development Council, Vancouver
Jonathan Schleuter, Westside Economic Alliance, Portland

Community Organizations

Dave Tischer, Columbia Pacific Building Trades
Elson Strahan, Vancouver National Historic Reserve Trust
Jeri Sundvall-Williams, Environmental Justice Action Group
Bob Knight, Clark College

Statewide Commuter/Travel Organizations

Elliott Eki, Oregon/Idaho AAA
Janet Ray, Washington AAA

Statewide Freight Organizations

Jerry Grossnickle, Columbia River Towboat Association
Karen Schmidt, Washington Freight Mobility Strategic Investment Board
Tom Zelenka, Oregon Freight Advisory Committee

Community and Environmental Justice Group

To achieve the goal of meaningful public engagement throughout the project development process, the CRC project team formed the CEJG. The members of the CEJG come from neighborhoods in the project area and include environmental justice communities (low-income, African American, Latino), one liaison from the CRC Task Force, and five at-large members. They represent the diverse interests and perspectives of the Vancouver, Portland, and Hayden Island neighborhoods potentially affected by the project.

CEJG Members

Diana Avalos, Vancouver Public Schools, Clark County
John Benson, Piedmont Neighborhood Association
Jonath Colon-Montesi, Hispanic Metropolitan Chamber, NE Neighborhood Coalition, Portland
Dave Frei, Columbia River Crossing Task Force, Arnada Neighborhood, Vancouver
Ed Garren, Manufactured Homes Association, Hayden Island
Kris Long, Vancouver resident; former North Portland resident
Anne McEnerny-Ogle, Shumway Neighborhood Association, Vancouver
Connie Sherrard, Vancouver Housing Authority, Vancouver
Dave Skagen, Rose Village, Vancouver
Michelle Tworoger, Jantzen Beach Moorage Association, Hayden Island
Marcia Ward, Clark County resident
Matt Whitney, Bridgeton Neighborhood Association
Nikki Willams, Boise Neighborhood, Economic Justice Action Group (EJAG) member, Insulators and Asbestos Workers Union, Local 36, Portland

Freight Working Group

The Freight Working Group (FWG) meets every other month to advise and inform the CRC project team about freight issues. Specifically, the group provides insight, observation, and recommendations about the needs for truck access and mobility within the corridor; characterizes the horizontal and vertical clearances, acceleration/deceleration, and stopping performance needs of trucks that must be accommodated; provides meaningful comments on the effect of geometric, regulatory, and capacity changes on truck movements in the corridor; and provides testimony and objective information about the effects of congestion on freight-related businesses and the businesses they serve.

FWG Members

Grant Armbruster, Columbia Sportswear
Steve Bates, Redmond Heavy Hauling
Bryan Bergman, Georgia Pacific
Mark Cash, G&M Trucking
Corky Collier, Columbia Corridor Association
Ken Emmons, United Road Service
Jerry Gaukroger, Boise Building Supply
Lee Johnson, Jet Delivery Systems
John Leber, Swanson Bark
Tracy Whelan, ESCO Corporation

Pedestrian and Bicycle Advisory Committee

The Pedestrian and Bicycle Advisory Committee (PBAC) was established to guide the development of improvements for people who walk or ride bicycles in or through the project area. The committee brings together community members and agency representatives to develop recommendations to enhance facilities and connections for pedestrian and bicycle circulation.

PBAC Members

April Bertelsen, City of Portland
Todd Boulanger, City of Vancouver
Kyle Brown, Steps to a Healthier Clark County
Elicia Cardenas, Portland Bicycle Advisory Committee
Basil Christopher, Oregon Department of Transportation
Seanette Corkill, Bike Gallery, Arnada Neighborhood Association
Debbie Elven-Snyder, C-TRAN
Carley Francis, Washington State Department of Transportation
Jill Fuglister, Coalition for a Livable Future
Emily Gardner, Bicycle Transportation Alliance
Roger Geller, City of Portland
Lisa Goorjian, City of Vancouver
Joe Greulich, Clark County Bicycle Advisory Committee
Mark Harrington, Southwest Washington Regional Transportation Council
Rod Merrick, Portland Pedestrian Advisory Committee
Shayna Rehberg, Portland Bicycle Advisory Committee
Walter Valenta, Bridgeton Neighborhood Association, Columbia River Crossing Task Force

Urban Design Advisory Group

The Urban Design Advisory Group (UDAG) advises the CRC project on the appearance and design of bridge, transit, and highway improvements. This bi-state group is led by Vancouver Mayor Royce Pollard and Portland Commissioner Sam Adams. The 14 members from Washington and Oregon contribute diverse professional and community perspectives on a variety of topics including architecture, aesthetic design, cultural and historic resources, community connections, and sustainability.

UDAG Members

Vancouver Mayor Royce Pollard, Co-Chair
Portland Commissioner Sam Adams, Co-Chair
Rob Barrentine, Vancouver Design Review Commission, Architects Barrentine Bates Lee
Ed Carpenter, Artist
Jeanne Caswell, Vancouver Parks Commission
Jane Hansen, Lango Hansen Landscape Architects, P.C.
Mark Masciarotte, Aviation Advisory Committee
Dick Pokornowski, Downtown Redevelopment Authority
Carrie Schilling, Works Partnership Architecture
Jeff Stuhr, HOLST Architecture, Portland Design Commission
Dave Smith, Vancouver Planning Commission and Design Review Committee
Michelle Tworoger, Jantzen Beach Moorage Association, Inc.
Walter Valenta, Bridgeton Neighborhood Association
Marcia Ward, Salmon Creek neighborhood

Public Involvement Events: February 2005 through February 2008

Public involvement is essential for effective decision making. Below is a list of public outreach events conducted by Columbia River Crossing (CRC) project staff. From February 2005 to February 2008, staff have engaged over 11,000 community members in conversation about the project at nearly 439 events. Below is a chronological list.

Note: Completed individual event summaries are available upon request. Some events, usually jurisdictional briefings, list "n/a" under number of public participants because those groups have been counted before or because there were no members of the general public attending.

Date	Activity/Organization	Location	State	Number of Public Participants
2/3/2005	CRC Task Force meeting	ODOT Region 1	OR	n/a
5/4/2005	CRC Task Force meeting	Clark County Public Service Center	WA	n/a
9/12/2005	CRC Task Force meeting	OAME – Oregon Association of Minority Entrepreneurs	OR	n/a
9/30 – 11/20 2005	Columbia River Crossing Web-based Survey	www.columbiarivercrossing.org. Hard copies were at CRC public open houses and were mailed, when requested	OR/WA	620 surveys completed
10/12/2005	CRC Task Force meeting	WSDOT – SW Region Headquarter, Vancouver	WA	n/a
10/22/2005	CRC Open House	Jantzen Beach SuperCenter	OR	58
10/25/2005	CRC Open House	Clark College, Vancouver	WA	61
10/27/2005	CRC Open House	OAME – Oregon Association of Minority Entrepreneurs	OR	38
11/30/2005	CRC Task Force meeting	OAME – Oregon Association of Minority Entrepreneurs	OR	n/a
1/4/2006	CRC Task Force meeting	WSDOT – SW Region Headquarter, Vancouver	WA	n/a
2/1/2006	CRC Task Force meeting	OAME – Oregon Association of Minority Entrepreneurs	OR	n/a
3/2006	Rotary Club, Camas	Camas	WA	40
3/2006	Portland Business Alliance Transportation Committee	Portland	OR	15
3/2006	Multnomah County Commission	Portland	OR	17
3/13/2006	Neighborhood Associations Council of Clark County (NACCC)	4700 NE 78th, Vancouver, Clark County Public Works	WA	20
3/21/2006	Columbia Corridor Association	Tabled at CCA's open house	OR	25
3/22/2006	CRC Task Force meeting	WSDOT – SW Region Headquarter, Vancouver	WA	n/a
4/3/2006	North Portland Neighborhood Services	2209 N. Schofield St.	OR	15
4/11/2006	Portland Business Alliance Transportation Committee	200 SW Market St., Portland	OR	12

Date	Activity/Organization	Location	State	Number of Public Participants
4/12/2006	CRC Open House, Vancouver	Hudson's Bay High School	WA	103
4/13/2006	CRC Open House, Portland	Red Lion Hotel at Jantzen Beach, 909 N Hayden Island Dr, Portland	OR	100
4/18/2006	Overlook Neighborhood Association	Kaiser Town Hall, 3704 N Interstate Ave	OR	25
4/26/2006	CRC Task Force meeting	OAME – Oregon Association of Minority Entrepreneurs	OR	n/a
5/4/2006	Shumway Neighborhood Association	3101 Main St., Vancouver School of Arts and Academics,	WA	22
5/5/2006	Laurelhurst Elementary School, 3rd grade class	Laurelhurst Elementary, Portland	OR	25
5/10/2006	Kenton Neighborhood Association	Kenton Firehouse, 8105 N. Brandon St, Portland	OR	20
5/11/2006	WSDOT open house on I-205 Mill Plain Blvd. Southbound Off Ramp	WSDOT SW Region, Vancouver	WA	5
5/11/2006	Say Hey! Partners in Diversity networking event	Wieden & Kennedy, 224 NW 13th Ave, Portland	OR	10
5/11/2006	Hayden Island Neighborhood Association (HINooN)	12050 N. Jantzen Ave.	OR	12
5/11/2006	Arnada Neighborhood Association	Vancouver Housing Authority, 2500 Main St.	WA	12
5/16/2006	Esther Short Neighborhood Association	Smith Tower, 515 Washington St.	WA	30
5/16/2006	Portland Pedestrian Advisory Committee	Portland City Hall, Lovejoy Room	OR	14
5/16/2006	PROPER Community Forum (Kenton neighborhood)	Fridays Espresso Café, 4131 N. Denver Ave	OR	21
5/17/2006	CRC Task Force meeting	WSDOT SW Region, Vancouver	WA	n/a
5/23/2006	Rose Village Neighborhood Association	Washington Elementary, 2908 S. St., gymnasium	WA	13
6/1/2006	Lloyd District Transportation Management Association	700 NE Multnomah	OR	25
6/1/2006	Shumway Neighborhood Association	3101 Main St., Vancouver School of Arts and Academics, Media Center	WA	14
6/2/2006	Rose Festival	Tom McCall Waterfront Park	OR	99
6/2/2006	St. Johns Business Boosters	7325 N. Alta Portland	OR	8
6/2/2006	Association of General Contractors	Salem	OR	16
6/6/2006	Central Eastside Industrial Council	Goodwill Industries, SE 7th Ave, Portland	OR	24
6/8/2006	Hudson's Bay Neighborhood Association	McLoughlin Hts. Church of God, E 9th and Winchell	WA	10
6/8/2006	Portland Community College	Student Service Bld. Room 209	OR	2
6/8/2006	Association of Building Owners and Managers (BOMA)	1211 Southwest Fifth Suite L17	OR	25

Date	Activity/Organization	Location	State	Number of Public Participants
6/9/2006	Kenton Neighborhood Association	Kenton Lodge (not Firehouse), 8130 N. Denver Ave.	OR	50
6/10/2006	Vancouver Farmers Market	Esther Short Park	WA	46
6/14/2006	CRC Task Force meeting	OAME – Oregon Association of Minority Entrepreneurs	OR	n/a
6/15/2006	Associated Oregon Industries	1149 Court. NE, Salem	OR	4
6/17/06 to 6/18/06	Juneteenth Celebration	Peninsula Park, Portland	OR	60
6/19/2006	North Clackamas Chamber of Commerce	Portland	OR	19
6/19/2006	Kenton Business Association	Firehouse	OR	15
6/20/2006	Meadow Homes Neighborhood Association	Jim Parsley Center, Community Room, Vancouver	WA	12
6/20/2006	Rosemere	International Air Academy, 2901 E Mill Plain Blvd.	WA	18
6/21/2006	Uptown Village Association	Vancouver Housing Authority, 2500 Main St.	WA	11
6/21/2006	Association of Oregon Counties	Salem, Oregon	OR	6
6/21/2006	Bridgeton Neighborhood Association	Columbia School, 716 NE Marine Dr.	OR	39
6/25/2006	Good in the 'Hood	King School Park 4815 NE 7th Ave. Portland	OR	5
6/27/2006	Vancouver Planning Commission	City Council Chambers, 210 East 13th Street	WA	8
6/29/2006	Yost Grube Hall (architecture firm)	Portland	OR	48
7/6/2006	Hayden Island forum	12050 N. Jantzen Ave,	OR	40
7/6/2006	Metro	Metro, 600 NE Grand Ave, Portland	OR	2
7/7/2006	Columbia Bi-State Bicycle Ride	Esther Short Park	WA	15
7/8/2006	Vancouver Farmers Market	Esther Short Park	WA	52
7/10/2006	Albina Community Bank	Albina Community Bank, Portland	OR	1
7/11/2006	Gresham Brownbag -- elected officials and transportation managers	Gresham City Hall	OR	12
7/12/2006	CRC Task Force meeting	WSDOT SW Region, Vancouver	WA	n/a
7/12/2006	Hazel Dell/Salmon Creek Business Association	Felida Fire Station 11600 NW Lakeshore Avenue Vancouver	WA	30
7/12/2006	Swan Island Business Association and TMA	Freightliner Headquarters, Portland	OR	18
7/15 - 7/16/2006	Battle Ground Harvest Days	Battleground Fair Grounds	WA	90
7/18/2006	Oakbrook Neighborhood Association	Oakbrook Park, Vancouver	WA	36
7/18/2006	Hough Neighborhood Association	Hough Elementary School, 1900 Daniels St. Vancouver	WA	29

Date	Activity/Organization	Location	State	Number of Public Participants
7/19/2006	West Hazel Dell Neighborhood Association	Clearwater Springs Assisted Living Center, 201 NW 78th Street, Vancouver 98665	WA	3
7/19/2006	Noon Concert Series in the Park	Esther Short Park	WA	17
7/20/2006	African-American Alliance Community Unity Breakfast	Irvington Village, 420 NE Mason St, Portland	OR	50
7/20/2006	Heart District	904 Main St. Divine Consign	WA	7
7/20/2006	Carter Park Neighborhood Association	Vancouver Housing Authority, 2500 Main St.	WA	14
7/22/2006	Transportation Open House (City of Vancouver and Clark County)	Vancouver Mall	WA	5
7/25/2006	Columbia Pacific Building Trades	Kirkland Union Manor, Portland	OR	27
7/26/2006	Noon Concert Series in the Park	Esther Short Park	WA	20
7/26/2006	Beaverton Chamber of Commerce	Kingstad Center, 15450 SW Millikan Way, Beaverton	OR	28
7/27/2006	C-TRAN Citizens' Advisory Committee	C-TRAN, 2425 NE 65th Avenue, Vancouver	WA	15
7/28/2006	Oregon Association of Minority Entrepreneurs (OAME) Coffee and Issues Forum	OAME, 4134 N Vancouver Ave., Portland	OR	10
7/29/2006	Hawaiian Festival	Ester Short Park	WA	132
7/31/2006	At Home At School Elementary School Event	Silver Star Elementary, Vancouver	WA	26
8/2/2006	Noon Concert Series in the Park	Esther Short Park	WA	10
8/3/2006	Lloyd District Community Association	Oregon Square	OR	27
8/7/2006	North/Northeast Business Association	Albina Community Bank, Portland	OR	19
8/8/2006	Rotary Club, North Portland	Columbia Edgewater Club	OR	9
8/8/2006	Pacific Northwest International Trade Association	Port of Portland Terminal 6, conference room	OR	27
8/8/2006	Women's Transportation Seminar (WTS), Downtown Vancouver Tour	CRC Office, 700 Washington St., Vancouver	WA	20
8/8/2006	Waterfront Organizations of Oregon	Tyee Yatch Club, 2929 Marine Drive, Portland	OR	11
8/9/2006	Identity Clark County, board	Murdoch Building, 6th floor, Vancouver	WA	24
8/9/2006	Noon Concert Series in the Park	Esther Short Park	WA	11
8/10/2006	Say Hey, Northwest! Partners in Diversity networking event	Oregon Convention Center	OR	50
8/10/2006	Design Concepts Workshop, Vancouver -- Columbia River Crossing	Fort Vancouver Historic Reserve, 605 Barnes St., Vancouver	WA	18
8/13/2006	Vancouver Farmers Market	Esther Short Park	WA	24
8/15/2006	Humboldt Neighborhood Association	PCC Cascade PSEB, 705 N. Killingsworth, Portland	OR	16

Date	Activity/Organization	Location	State	Number of Public Participants
8/16/2006	CRC Task Force meeting	WSDOT SW Region, Vancouver	WA	n/a
8/17/2006	Kiwanis Club of Cascade Park	IHOP, 164th Ave, SR14	WA	8
8/17/2006	Lake Oswego Chamber of Commerce	242 B Avenue, Lake Oswego	OR	18
8/17/2006	Arbor Lodge Community Fair	Peace Lutheran Church 2201 N Portland Blvd.	OR	37
8/18/2006	Lions Club, Vancouver	Washington State School for the Deaf611 Grand Blvd.,	WA	18
8/17/06-8/20/06	Taste of Vancouver	Esther Short Park	WA	93
8/19/06-8/20/06	Uptown Village Street Festival	Uptown Village, Vancouver, WA Main & 13th	WA	187
8/21/2006	Vancouver City Council	210 E. 13th St., Vancouver, City Council Chambers	WA	7
9/7/2006	Hayden Island Neighborhood Network (HINooN) (board of directors)	12050 N. Jantzen Ave, next to Zupan's, in big room downstairs	OR	11
9/7/2006	Fern Prairie Grange	Vancouver	WA	8
9/9/2006	PROPER Festival, North Portland	Kenton Park, North Portland	OR	32
9/9/2006	Friends of Clark County	Ridgefield	WA	35
9/10/2006	SeptemberFest – Holy Cross Catholic Church	5227 N. Bowdoin St.	OR	35
9/11/2006	NW Regional Right of Way Conference	Vancouver Hilton,	WA	180
9/14/2006	Hayden Island Neighborhood Network (HINooN)	12050 N. Jantzen Dr	OR	60
9/16/2006	Alberta Co-Op Farmers Market and Alberta Street Fair	NE 15th Ave and NE Alberta St. Portland	OR	13
9/19/2006	Jantzen Beach Moorage, Inc.	Holiday Inn Express, Hayden Island Dr. Portland	OR	20
9/21/2006	US Coast Guard Open House and Public Meeting	Red Lion Hotel at Jantzen Beach, Timberline Room 909 N Hayden Island Dr, Portland	OR	60
9/23/2006	6th Annual Open House at Public Safety Complex at Fairgrounds	505 NW 179th Street, Ridgefield	WA	20
9/25/2006	Design Concepts Workshop, Portland -- Columbia River Crossing	Oregon Association of Minority Entrepreneurs, 4134 N. Vancouver Ave, Portland	OR	28
9/26/2006	Vancouver National Historic Reserve Trust	Pearson Airpark	WA	20
9/27/2006	CRC Task Force meeting	WSDOT SW Region	WA	17
9/27/2006	Piedmont Neighborhood Association	Holy Redeemer School, 127 N. Portland Blvd, Small Hall.	OR	20
9/28/2006	Vancouver Heights Neighborhood Association	105 Lieser Rd. between St. Helens and Mill Plain, Vancouver	WA	15
9/28/2006	Fairway/164th Neighborhood Association	Fairway Village Ballroom, Vancouver	WA	13

Date	Activity/Organization	Location	State	Number of Public Participants
9/30/2006	Environmental Justice Training with Running Grass	Fort Vancouver Historic Reserve, E.B. Hamilton Hall, 605 Barnes St., Vancouver	WA	13
10/3/2006	Metro Council	Metro, 600 NE Grand Ave, Portland	OR	7
10/5/2006	Shumway Neighborhood Association	Vancouver School of Arts and Academics Media Center, 3101 Main Street, enter from F St and 31st.	WA	41
10/10/2006	Slavic Coalition	IRCO, 10301 NE Glisan, Portland	OR	9
10/17/2006	The Oregon Chapter of the Air & Waste Management Association	World Trade Center, Portland	OR	27
10/17/2006	Meadow Homes Neighborhood Association	Jim Parsley Center, Community Room, next to pool, 2901 Falk Road, Van.	WA	13
10/18/2006	The Economic Roundtable	University Club, SW 6th Ave and Jefferson St., Portland	OR	20
10/18/2006	Washington Grange	7701 NE Ward Rd. Vancouver	WA	8
10/19/2006	Senior Studies Institute	Capital Center 185th and Walker Rd. Beaverton	OR	8
10/19/2006	City Center Redevelopment Authority	Vancouver City Hall, Council Chambers	WA	8
10/24/2006	Kiwanis Club, Boulevard chapter	Elmer's Restaurant 40th St. and Andresen	WA	22
10/25/2006	CRC Task Force meeting	OAME, 4134 N Vancouver Ave, Portland	OR	5
10/25/2006	Piedmont Neigh. Association	Holy Redeemer School, 127 N. Portland Blvd, Clare Hall.	OR	10
10/30/2006	Opus Northwest	1500 SW 1st Ave, Portland	OR	11
10/31/2006	Agencies in SW Washington, Design Workshop	Vancouvercenter, 2nd floor, 700 Washington St.	WA	13
11/1/2006	Harney Heights Neighborhood Association	King Elementary, 4801 Idaho St., Vancouver	WA	18
11/2/2006	Portland Freight Committee	Portland City Hall, Lovejoy Room	OR	26
11/2/2006	Hayden Island Mobile Home Owners and Renters Association	12221 North SouthShore Drive, Portland OR 97217	OR	41
11/2/2006	Shumway Neighborhood Association	3101 Main St., Vancouver School of Arts and Academics,	WA	20
11/4/2006	Felida Neighborhood Park Dedication	Raspberry Fields Park	WA	16
11/8/2006	Identity Clark County, board	Riverview Community Bank, 900 Washington St., 9th floor board room, Vancouver	WA	15
11/9/2006	Say Hey! NW	Self-Enhancement Inc., 3920 N. Kerby Avenue Portland OR	OR	15
11/10/2006	Oregon Highway Users Alliance	Astoria, Oregon	OR	19

Date	Activity/Organization	Location	State	Number of Public Participants
11/14/2006	Wyeast Middle School eighth graders	Wyeast Middle School, Vancouver	WA	250
11/14/2006	East Columbia Neighborhood Association	East Columbia Bible Church, 420 NE Marine Drive	OR	25
11/14/2006	Bennington Neighborhood Association	Fire Station 89, conference room, 17408 SE 15th St.	WA	15
11/15/2006	Washington State Transportation Commission		WA	7
11/16/2006	Youth Town Hall, Clark County	1300 Franklin St., 6th floor, Vancouver	WA	9
11/16/2006	WSDOT open house on SR-14 widening	Camas Police Station	WA	41
11/16/2006	Arbor Lodge Neigh. Association	Chief Joseph School, Portland	OR	15
11/17/2006	Columbia Corridor Association	700 NE Multnomah, room 7H	OR	15
11/21/2006	Division/Clinton Business Association	Jane Fisher's Edward Jones office: 4111 SE Division Street	OR	13
11/21/2006	Rosemere neighborhood group	Washington Elementary School	WA	13
11/29/2006	CRC Task Force meeting	WSDOT SW Region	WA	7
11/30/2006	Kiwanis Club of Cascade Park	IHOP, 2900 SE 164th Ave, Vancouver	WA	22
12/5/2006	Metro Council (work session)	600 NE Grand Ave, Portland	OR	7
12/5/2006	SW Washington Regional Transportation Council (RTC) board	1300 Franklin St., 6th floor, Vancouver	WA	25
12/6/2006	Kiwanis, Downtown Portland	Benson Hotel, SW Broadway and Oak St., Portland	OR	25
12/12/2006	Portland Planning Commission	1900 SW Fourth Ave, #2500	OR	8
12/12/2006	Hayden Island Neigh. Network (HINooN)	12050 N. Jantzen Dr	OR	67
12/14/2006	Jantzen Beach SuperCenter employee meet and greet	Jantzen Beach SuperCenter	OR	25
12/14/2006	Portland Transport Blog	Wynne's Bar, 2002 SE Division St., Portland	OR	13
12/20/2006	RPACT (Regional Policy Advisory Committee on Transportation), Cowlitz-Wahkiakum Counties	County Admin. Bldg., Kelso, WA	WA	20
1/4/2007	Coalition for a Livable Future -- Forum on Columbia River Crossing	New Columbia	OR	65
1/2/2007	SW Washington Regional Transportation Council (RTC) board	1300 Franklin St., 6th floor, Vancouver	WA	n/a
1/4/2007	Shumway Neighborhood Association	3101 Main St., Vancouver School of Arts and Academics,	WA	25
1/8/2007	Neighborhood Associations Council of Clark County (NACCC)	4700 NE 78th, Vancouver, Clark County Public Works	WA	16
1/9/2007	Portland Planning Commission	1900 SW Fourth Ave, #2500	OR	n/a

Date	Activity/Organization	Location	State	Number of Public Participants
1/9/2007	East Columbia Neighborhood Association	East Columbia Bible Church, 420 NE Marine Drive	OR	8
1/11/2007	Jantzen Beach SuperCenter meet and greet	Jantzen Beach SuperCenter	OR	5
1/11/2007	Esther Short Neighborhood Association	indoor farmers market, 8th St. and Esther, corner of Esther Short Park	WA	47
1/11/2007	Arnada Neighborhood Association	Vancouver Housing Authority, 2500 Main St., Vancouver	WA	25
1/18/2007	City Center Redevelopment Authority	Vancouver City Hall, Council chamber	WA	n/a
1/18/2007	WSDOT Open House, Cowlitz County	Cowlitz PUD room	WA	7
1/20/2007	Open House, Columbia River Crossing	Lincoln Elementary 4200 NW Daniels St., Vancouver	WA	137
1/23/2007	CRC Task Force meeting	WSDOT SW Region	WA	9
1/23/2007	Rose Village Neighborhood Association	Memorial Lutheran Church, classroom, 2700 E. 28th St., Vancouver	WA	24
1/25/2007	African-American Alliance Community Unity Breakfast	Irvington Village ALF, 420 NE Mason St., Portland	OR	45
1/25/2007	Open House, Columbia River Crossing	Oregon Association of Minority Entrepreneurs, 4134 N. Vancouver Ave, Portland	OR	59
1/30/2007	Open House, Columbia River Crossing -- Hayden Island	12050 N. Jantzen Dr. Portland	OR	111
1/31/2007	Piedmont Neighborhood Association	Holy Redeemer School, 127 N. Portland Blvd, Small Hall.	OR	12
2/1/2007	Lions Club, Vancouver	Bill's Chicken Inn, St. Johns Blvd, Vancouver	WA	18
2/1/2007	Shumway Neighborhood Association	3101 Main St., Vancouver School of Arts and Academics,	WA	14
2/5/2007	Open House, Columbia River Crossing -- Vancouver/Clark County	WSDOT SW Region	WA	51
2/5/2007	Citizen Transportation Summit	12050 N Jantzen Dr	OR	n/a
2/6/2007	RTC (Southwest Washington Regional Transportation Council)	1300 Franklin St., 6th floor, Vancouver	WA	n/a
2/6/2007	City of Portland Community Fair on Budget Priorities, St. Johns Neighborhood	8427 N Central Street, St. Johns	OR	10
2/7/2007	Bridgeton Neighborhood Association	Columbia School, 716 NE Marine Dr. Portland	OR	35
2/8/2007	JPACT (Joint Policy Advisory Committee on Transportation), Metro	Metro Council Chamber, 600 NE Grand Ave, Portland	OR	n/a
2/8/2007	WSDOT 2007 Design/Construction training sessions	WSDOT SW Region	WA	n/a (but 105 attended)

Date	Activity/Organization	Location	State	Number of Public Participants
2/8/2007	Arnada Neighborhood Association	2500 Main St., Vancouver Housing Authority	WA	21
2/8/2007	Hayden Island Neigh. Network (HINooN) -- board of directors	12050 N. Jantzen Dr	OR	16
2/12/2007	City of Vancouver, Council work session	Marshall House, Vancouver	WA	n/a
2/12/2007	West Minnehaha Neighborhood Association	1500 NE 49th St, Vancouver	WA	7
2/12/2007	Neighborhood Associations Council of Clark County (NACCC)	4700 NE 78th, Vancouver, Clark County Public Works Maintenance Ctr.	WA	25
2/12/2007	Multnomah County Republican Party, Central Committee Meeting	NE 57th and Sandy Blvd.	OR	68
2/12/2007	Retired Carpenter's Union	JJ North Restaurant, NE 105th and Halsey St., Portland	OR	32
2/13/2007	Metro Council	600 NE Grand Ave, Portland	OR	n/a
2/13/2007	Washington State Senate Transportation Committee	Senate Hearing Room 1, J. A. Cherberg Building, Olympia, WA	WA	n/a
2/14/2007	Federal Highway Administration - Western Federal Lands Division	610 E. Fifth St., Vancouver	WA	63
2/14/2007	Rotary Club, Vancouver	Convention Ctr At the Inn at the Quay, Vancouver	WA	190
2/14/2007	Kenton Neighborhood Association	Kenton Firehouse, 2209 N. Schofield at Brandon, Portland	OR	10
2/15/2007	Retired Public Employees of Clark County	1009 E. McLoughlin, Luepke Senior Center, Vancouver	WA	19
2/15/2007	Oregon Senate ~ Business, Transportation, and Workforce Development Committee	Salem, Oregon	OR	n/a
2/16/2007	Joint Meeting of the Washington Senate Transportation Committee and the Oregon Senate Business, Transportation and Workforce Development Committee	Commission Board Room Port of Portland Building 121 NW Everett Street Portland, Oregon	OR	n/a
2/16/2007	Bus tour for Oregon and Washington legislators	Starts at Port of Portland, ends at ODOT	OR/WA	n/a
2/20/2007	Kiwanis Club, Boulevard chapter	Elmer's Restaurant, 40th St. and Andresen Vancouver	WA	16
2/20/2007	Multnomah County Commission	Multnomah Bldg., 501 SE Hawthorne Boulevard, Portland	OR	n/a
2/20/2007	Neighborhood Traffic Safety Alliance (NTSA)	Glenwood Place Senior Living, Plaza Building, 5320 NE 81st Avenue, Vancouver	WA	22
2/20/2007	Hough Neighborhood Association	Hough Elementary School, 1900 Daniels St (at McLoughlin)	WA	26
2/22/2007	Metro Council public hearing and action	600 NE Grand Ave, Portland	OR	n/a
2/22/2007	WSDOT SR 502 Open House	Battle Ground High School	WA	25

Date	Activity/Organization	Location	State	Number of Public Participants
2/22/2007	C-TRAN Citizens' Advisory Committee	C-TRAN, 2425 NE 65th Avenue, Vancouver	WA	20
2/22/2007	Pleasant Highlands Neighborhood Association	Pleasant Valley Middle School, 14320 NE 50th Ave, Vancouver	WA	30
2/22/2007	Carter Park Neighborhood Association	Vancouver Housing Authority, 2500 Main St.	WA	11
2/26/2007	WSDOT NW Region Design/Construction Training Session	Seattle, WSDOT NW Region	WA	n/a
2/27/2007	CRC Task Force meeting	Oregon Dept of Transportation, 123 NW Flanders St, Portland	OR	100
3/7/2007	ODOT Region 1 Leadership Team	ODOT Portland	OR	n/a
3/8/2007	Jantzen Beach SuperCenter meet and greet	Jantzen Beach SuperCenter	OR	27
3/8/2007	Hayden Island Neighborhood Network (HINooN), annual general membership meeting	12050 N. Jantzen Dr., Portland	OR	30
3/9/2007	Lions Club, Fort Vancouver chapter	Boppin' Bo's, 7809 NE Vancouver Plaza Dr., Vancouver	WA	40
3/12/2007	Fourth Alternative Subcommittee to CRC Task Force	Former Hayden Island Yacht Club, 12050 N. Jantzen Dr.	OR	35
3/13/2007	Hudson's Bay Neighborhood Association	Harney Elementary, Grand and Evergreen, cafeteria	WA	12
3/17/2007	Trinity Lutheran Church Men's Group	Trinity Lutheran Church, 309 W. 39th St., Vancouver	WA	30
3/19/2007	Fourth Alternative Subcommittee to CRC Task Force	Former Hayden Island Yacht Club, 12050 N. Jantzen Dr.	OR	35
3/21/2007	Kiwanis Club, Downtown Portland	Benson Hotel, SW Broadway and Oak St., Portland	OR	21
3/26/2007	Fourth Alternative Subcommittee to CRC Task Force	Former Hayden Island Yacht Club, 12050 N. Jantzen Dr.	OR	13
3/27/2007	CRC Task Force meeting	WSDOT SW Region	WA	25
3/28/2007	Columbia Corridor Association	Sheraton Airport Hotel, 8235 NE Airport Way, Portland	OR	20
4/3/2007	SW Washington Regional Transportation Council (RTC) board	Vancouver	WA	n/a
4/5/2007	Portland Freight Committee	Portland City Hall, Lovejoy Room	OR	35
4/9/2007	Northwest Oregon Labor Council	1125 SE Madison St., Portland	OR	26
4/9/2007	St Johns Neighborhood Association	St Johns Community Center, 8427 N. Central, Portland	OR	23
4/10/2007	Institute of Transportation Engineers/Women's Transportation Seminar (ITE/WTS) Joint Luncheon	Embassy Suites, downtown Portland	OR	130

Date	Activity/Organization	Location	State	Number of Public Participants
4/10/2007	Clark County Young Democrats	Longshoreman's Hall, 1205 Ingalls St., Vancouver	WA	12
4/16/2007	Battle Ground City Council	Battle Ground City Hall	WA	7
4/17/2007	Vancouver School District	CRC project office, 700 Washington St., Vancouver	WA	1
4/17/2007	Arlington Club	Portland	OR	35
4/18/2007	Portland State University, Urban Studies brownbag discussion	PSU Urban Center, room 270, 506 SW Mill	OR	40
4/19/2007	City Center Redevelopment Authority	Vancouver	WA	n/a
4/19/2007	West Minnehaha Neighborhood Association	1500 NE 49th St, Vancouver	WA	27
4/24/2007	City of Vancouver Neighborhood liaisons briefing	Vancouver City Council chambers	WA	10
4/24/2007	Rose Village Neighborhood Association	Memorial Lutheran Church, classroom, 2700 E. 28th St., Vancouver	WA	16
4/25/2007	Kiwanis Club, Peninsula chapter	Elmer's Restaurant, Delta Park, 9848 N. Whitaker Rd.	OR	11
4/26/2007	Andresen/St. Johns Neighborhood Association	4700 NE 78th, Vancouver, Clark County Public Works Maintenance Ctr.	WA	17
5/3/2007	North Salmon Creek Neigh. Association	Three Creeks Library	WA	25
5/9/2007	ODOT bridge design conference	Salem	OR	n/a
5/9/2007	SR-502 Open House, WSDOT	Battle Ground High School	WA	15
5/10/2007	Land Surveyors Association of Washington	Boppin' Bo's, 7809 NE Vancouver Plaza Dr., Vancouver	WA	17
5/12/2007	Walnut Grove Park dedication	58th Avenue, Vancouver	WA	18
5/14/2007	Congressional staffers visit CRC office and tour project area	CRC offices and Bridge Influence Area	WA	13
5/14/2007	Lincoln Neighborhood Association	Lincoln Elem. School, common area, 4200 NW Daniels St., Vancouver	WA	28
5/17/2007	American Society of Civil Engineers	Old Country Buffet, Vancouver	WA	22
5/24/2007	North Portland Business Association	New Dad's Restaurant, 8608 N. Lombard in St. Johns	OR	25
5/24/2007	Carter Park Neighborhood Association	2500 Main St., Vancouver Housing Authority	WA	21
5/30/2007	Central Park Neighborhood Association	Washington School for the Blind, cafeteria, 2214 E. 13th St., Vancouver	WA	23
6/1/2007	Washington Freight Mobility Strategic Investment Board	Frito Lay, 4808 NW Fruit Valley Road, Vancouver, conference room	WA	24

Date	Activity/Organization	Location	State	Number of Public Participants
6/4/2007	North Portland Neighborhood Services	Kenton Firehouse, 2209 N. Schofield at Brandon, Portland	OR	9
6/7/2007	Hayden Island Mobile Home Owners and Renters Association	South Shore Clubhouse, 12221 N. Westshore Drive, Portland OR 97217	OR	26
6/7/2007	Shumway Neighborhood Association	3101 Main St., Vancouver School of Arts and Academics, Media Center	WA	11
6/9/2007	Vista Meadows Neighborhood Park	NE 29t Ave and NE 147th St.	WA	20
6/9/2007	Vancouver Farmers Market	Esther Short Park, W. 8th and Esther St.	WA	39
6/11/2007	Lincoln Neighborhood Association	Lincoln Elem. School, common area, 4200 NW Daniels St., Vancouver	WA	39
6/12/2007	Rosemere Neighborhood Group	Washington Elementary, 2908 S. St., Vancouver	WA	13
6/12/2007	Hudson's Bay Neighborhood Association	Harney Elementary, 3212 E. Evergreen, Vancouver	WA	7
6/13/2007	Kenton Neighborhood Association	Kenton Lodge, 8130 N. Denver Ave., Portland	OR	40
6/13/2007	Clark County High Capacity Transit Sounding Board meeting	Clark County Elections, 1408 Franklin St., Vancouver	WA	3
6/14/2007	WSDOT SR 502 Open House	Battle Ground High School	WA	12
6/14/2007	City of Portland Bicycle Master Plan Open House	Jefferson High School	OR	16
6/14/2007	Hayden Island Neighborhood Network (HINooN)	Former Hayden Island Yacht Club, 12050 N. Jantzen Dr.	OR	48
6/14/2007	Arnada Neighborhood Association	2500 Main St., Vancouver Housing Authority	WA	19
6/19/2007	Hough Neighborhood Association	Hough Elementary School, 1900 Daniels St., Vancouver	WA	16
6/20/2007	ODOT I-5 Delta Park project open house	Ockley Green School, 6031 N. Montana Ave., Portland	OR	25
6/20/2007	Bridgeton Neighborhood Association	Columbia School, 716 NE Marine Dr. Portland	OR	33
6/21/2007	Uptown Village Association	Vancouver Housing Authority, 2500 Main Street	WA	14
6/21/2007	Vancouver's Downtown Association	Divine Consign, 904 Main St.	WA	35
6/23/2007	Good in the 'hood	King School Park, 4815 NE 7th Ave. Portland	OR	49
6/25/2007	Northwest Oregon Labor Council	Portland	OR	143
6/26/2007	CRC Task Force meeting	ODOT, Region 1 Portland	OR	n/a
6/26/2007	Rose Village Neighborhood Association	Memorial Lutheran Church, classroom, 2700 E. 28th St., Vancouver	WA	18

Date	Activity/Organization	Location	State	Number of Public Participants
7/9/2007	Neighborhood Associations Council of Clark County (NACCC)	4700 NE 78th, Vancouver, Clark County Public Works Maintenance Ctr.	WA	24
7/10/2007	East Columbia Neighborhood Association	East Columbia Bible Church, 420 NE Marine Dr.	OR	22
7/12/2007	Arnada Neighborhood Association	Arnada Park, at the pergola (park is south of Fourth Plain, Vancouver	WA	25
7/13/2007	Rotary, Vancouver Sunrise	Heathman Lodge, 7805 NE Greenwood Dr, Vancouver, WA 98662	WA	28
7/15/2007	Vancouver Farmers Market (transit focus)	8th and Esther	WA	84
7/17/2007	Humboldt Neighborhood Association	Public Services Education Building on the PCC Cascade Campus	OR	7
7/18/2007	West Hazel Dell Neighborhood Association	Clearwater Springs Assisted Living Center, 201 NW 78th Street	WA	9
7/19/2007	Bi-State Coordination Committee	1300 Franklin St., 6th floor, Vancouver	WA	n/a
7/19/2007	City Center Redevelopment Authority	Vancouver City Hall, council chambers	WA	n/a
7/19/2007	Six to Sunset Summer Concert Series	Esther Short Park	WA	50
7/20/2007	Regional Transportation Advisory Committee (RTAC)	1300 Franklin St., 6th floor, Vancouver	WA	n/a
7/20/2007	"Tour of Tomorrow" bi-state bike ride	Pearson Air Museum, 1115 E. 5th St., Vancouver	OR	10
7/21/2007	Battle Ground Harvest Days	Battle Ground fairgrounds	WA	84
7/23/2007	Vancouver City Council	Vancouver City Hall, Council Chambers	WA	n/a
7/23/2007	Hayden Island Neighborhood Network (HINooN) meeting on East Hayden Island neighborhood plan	South Shore Clubhouse, 12221 N. Westshore Drive, Portland OR 97217	OR	15
7/24/2007	Overlook Neighborhood Association	Kaiser Town Hall, 3704 N Interstate Ave. Portland	OR	31
7/25/2007	CRC Summer Drop-In Event ~ Hayden Island	Former Hayden Island Yacht Club, 12050 N. Jantzen Dr.	OR	84
7/25/2007	Piedmont Neighborhood Association	Holy Redeemer School, 127 N. Portland Blvd, Clare Hall	OR	24
7/26/2007	Cowlitz-Wahkiakum Council of Governments (CWCOG) Board Meeting	Kelso	WA	21
7/27/2007	Breakfast on the Bridges for Bicyclists	Broadway Bridge and Hawthorne Bridge	OR	59
7/28/2007	Ho'ike Hawaiian Festival	Esther Short Park	WA	113

Date	Activity/Organization	Location	State	Number of Public Participants
7/29/2007	International Festival	Esther Short Park, W. 8th and Esther St.	WA	n/a
8/2/2007	Rotary, Greater Clark County	Royal Oaks Country Club 8917 NE Fourth Plain Rd Vancouver, WA 98662	WA	64
8/3/2007	Clark County Fair	Clark County Fairgrounds	WA	n/a
8/4/2007	CRC Summer Drop-In Event ~ Vancouver Farmers Market	8th and Esther	WA	230
8/8/2007	Kiwanis, Russelville chapter	Courtyard Retirement Home, corner of NE Burnside and 103rd	OR	10
8/9/2007	Arnada Neighborhood Association	Arnada Park, Vancouver	WA	32
8/11/2007	CRC Summer Drop-In Event ~ Jantzen Beach SuperCenter	Jantzen Beach SuperCenter	OR	59
8/13/2007	Lincoln Neighborhood Association	First Presbyterian Church, 4300 Main Street, Vancouver	WA	125
8/16/2007	Camas-Washougal Rotary Club	Parker House Restaurant, 56 S 1st St.	WA	48
8/16/2007	Arbor Lodge Community Fair	Peace Lutheran Church 2209 N. Portland Blvd. Portland	OR	29
8/18/07 8/19/07	Uptown Village Street Festival	Uptown Village, Vancouver, WA Main & 13th	WA	316
8/21/2007	Congressional tour	I-5 Bridge	OR/WA	24
8/25/2007	Seaport Celebration	Port of Portland Terminal 6	OR	
8/25/2007	Oregon Symphony Concert and Arbor Lodge Park Festival	Arbor Lodge Park - N. Delaware Ave. and N. Dekum St.	OR	71
8/30/2007	Alberta Street Farmers Market, flyering	NE Alberta St., Portland	OR	n/a
9/4/2007	CRC public meeting on right of way	First Presbyterian Church, 4300 Main St., Vancouver	WA	38
9/5/2007	CREEC (Commercial Real Estate Economic Coalition)	Portland	OR	12
9/5/2007	CRC public meeting on right of way	Water Resources Center, 4600 SE Columbia Way, Vancouver	WA	7
9/6/2007	CRC public meeting on right of way	Vancouver Hilton	WA	25
9/8/2007	CRC public meeting on right of way	Hayden Island Yacht Club	OR	14
9/9/2007	"In the Neighborhood" block party, First United Methodist Church	First United Methodist Church front lawn, 401 E 33rd St, Vancouver	WA	34
9/10/2007	CRC public meeting on right of way	Hough Elementary School, 1900 Daniels St (at McLoughlin)	WA	13
9/10/2007	Lincoln Neighborhood Association ~ Fall Open House	Lincoln Elem. School, cafeteria, 4200 NW Daniels St., Vancouver	WA	70

Date	Activity/Organization	Location	State	Number of Public Participants
9/16/2007	Marshall Community Center re-opening	1009 E. McLoughlin, Vancouver	WA	61
9/17/2007	CRC public meeting on right of way	Hayden Island Yacht Club	OR	6
9/20/2007	Uptown Village Association	VHA, 2500 Main Street, Vancouver WA	WA	21
9/20/2007	Esther Short Neighborhood Association	Hilton Vancouver	WA	39
9/26/2007	SR 502 Open House #5	Battle Ground High School	WA	19
9/26/2007	Columbia Corridor Association	Hilton Airport, Portland, 12048 NE Airport Way	OR	n/a
10/2/2007	SW Washington Regional Transportation Council (RTC) board	1300 Franklin St., 6th floor, Vancouver	WA	n/a
10/4/2007	The Urban League	Portland	OR	3
10/4/2007	Shumway Neighborhood Association	Vancouver School of Arts and Academics, Media Center, 9101 Main St.	WA	17
10/5/2007	Oregon Business Magazine Tour	Columbian building, Vancouver	WA	40
10/8/2007	Portland Oregon Visitors Association (POVA)	Red Lion Jantzen Beach	OR	7
10/8/2007	East Metro Economic Alliance (EMEA)		OR	25
10/8/2007	Lincoln Neighborhood Association	Lincoln Elementary, 4200 NW Daniels Street, Vancouver WA	WA	30
10/9/2007	Hayden Island neighborhood plan steering committee	Former Hayden Island Yacht Club, 12050 N. Jantzen Dr.	OR	n/a
10/9/2007	Hudson's Bay Neighborhood Association	Harney Elementary, 3212 E. Evergreen Blvd., cafeteria	WA	9
10/10/2007	Uptown Village Association	Vancouver Housing Authority, 2500 Main Street	WA	12
10/10/2007	WSU Vancouver Alternative Transportation Fair	WSU Vancouver	WA	30
10/10/2007	Pacific Northwest Waterways Association	Red Lion at the Quay, 100 Columbia St	WA	65
10/10/2007	Portland Air Cargo Association	Sheraton Airport, 8235 NE Airport Way, Portland	OR	17
10/11/2007	City of Vancouver internal traffic safety mtg.	Vancouver City Hall, 210 E. 13th St., Vancouver	WA	15
10/11/2007	Transit Station Flyering	Salmon Creek Park and Ride (Clark Co)	WA	n/a
10/16/2007	Coldwell Banker Commercial	1500 D St., Vancouver	WA	20
10/16/2007	Uptown Village Association	Broadway Natural Health, 24th and Broadway, Vancouver	WA	5
10/16/2007	Identity Clark County, board	Vancouver	WA	n/a
10/16/2007	Transit Station flyering	7th Street TC (Vancouver)	WA	n/a
10/17/2007	CRC Open House	Hayden Island Yacht Club	OR	123

Date	Activity/Organization	Location	State	Number of Public Participants
10/18/2007	Oregon Business Association Transportation Committee	Stoel Rives LLP 900 SW Fifth Ave. Suite 2600 Portland	OR	20
10/18/2007	Women's Shipping Club	Port of Portland, 121 NW Everett	OR	9
10/20/2007	CRC Open House	Lincoln Elementary	WA	97
10/23/2007	Vancouver Port Commission	3103 NW Lower River Road	WA	27
10/24/2007	International Brotherhood of Electrical Workers (IBEW), Local Union 48	15937 NE Airport Way, Portland	OR	193
10/27/2007	Transit Roundtable Discussion for Portland and Vancouver Neighborhood and Business Leaders	Meet at Portland Expo stop on MAX line. Meeting at Kaiser Permanente Town Hall, N. Interstate Ave.	OR	30
11/6/2007	SW Washington Regional Transportation Council	1300 Franklin St., Vancouver	WA	n/a
11/7/2007	Evergreen Inn	5th and Main, Vancouver	WA	31
11/7/2007	Society of American Military Engineers, Portland Chapter	Kell's Restaurant, 112 SW Second Ave, Portland	OR	22
11/7/2007	Piedmont Neighborhood Association annual meeting	Holy Redeemer School, Clare Hall, Portland	OR	40
11/8/2007	Longview Transportation Club	Monticello Hotel, 1405 17th Ave., Longview	WA	21
11/8/2007	Hayden Island Neighborhood Network (HINooN)	Former Hayden Island Yacht Club, 12050 N. Jantzen Dr.	OR	38
11/12/2007	National Electrical Contractors Association (NECA)	601 NE Everett Street, Portland	OR	57
11/13/2007	East Columbia Neighborhood Association	East Columbia Bible Church, 420 NE Marine Dr.	OR	26
11/14/2007	Kelso-Longview Chamber of Commerce, Transportation Committee	Monticello Hotel 1405 17th Ave, Longview, WA 98632	WA	23
11/14/2007	Clackamas County Business Alliance	Oregon City	OR	25
11/14/2007	Pythian Home	3409 Main St., Vancouver	WA	54
11/15/2007	City Center Redevelopment Authority	Vancouver City Hall, council chambers	WA	n/a
11/19/2007	ODOT Division Managers Brownbag	ODOT offices, Mill Creek Building, Salem	OR	40
11/21/2007	120 Day Club (land use lawyers group)	Hunan Restaurant, downtown Portland	OR	20
11/21/2007	Cowlitz Economic Development Council	Lower Columbia College, Student Center, 1600 Maple St., Longview	WA	31
11/27/2007	CRC Task Force meeting	WSDOT, SW Region, Vancouver	WA	n/a
11/28/2007	National Association of Industrial & Office Properties (NAIOP)	Multnomah Athletic Club, Portland	OR	89

Date	Activity/Organization	Location	State	Number of Public Participants
11/28/2007	West Vancouver Freight and Industrial Businesses	Frito Lay 4808 NW Fruit Valley Rd.	WA	56
11/28/2007	ODOT Major Projects Branch	Salem	OR	n/a
12/5/2007	Oregon Freight Advisory Committee	ODOT region 1, Portland	OR	18
12/5/2007	City of Vancouver staff leadership	Water Resources Center	WA	50
12/10/2007	Clark County Democratic Central Committee	Longshoreman's Hall, 1205 Ingals St. Vancouver	WA	48
12/11/2007	Portland Business Alliance, Transportation Committee	200 SW Market St., Portland Lobby Level Conference Room, Portland	OR	15
12/11/2007	Oregon Association of Nurseries, Government Relations Committee	OAN, 29751 SW Town Center Loop W., Wilsonville	OR	20
12/12/2007	Port of Portland Commission	121 NW Everett St., Portland	OR	59
12/13/2007	Kiwanis, Cascade Park chapter	IHOP - 164th Vancouver	WA	17
12/13/2007	Professional Land Surveyors of Oregon/Land Surveyors Association of Washington (PLSO/LSAW) Joint Chapter Meeting	Portland Precision Instruments, 6015 NE 80th Ave # 400, Portland, OR 97218	OR	60
12/18/2007	Vancouver Chamber of Commerce, General Meeting	WSU Vancouver - 14204 NE Salmon Creek Ave., Vancouver, WA 98686	WA	31
1/8/2008	Ridgefield/Camas/Washougal Port Commissioners Joint Meeting	Ridgefield Community Center, 210 North Main Avenue, Ridgefield, Washington 98642	WA	53
1/9/2008	Transportation Association of Portland	Kell's Restaurant, 112 SW Second Ave, Portland	OR	23
1/10/2008	Responsible Growth Forum	1101 Broadway, Vancouver WA Suite 205	WA	10
1/22/2008	CRC Task Force meeting	Hilton Vancouver	WA	n/a
1/23/2008	Washington State Transportation Commission	SW Region WSDOT	WA	n/a
1/23/2008	Pleasant Highlands Neighborhood Association	Pleasant Valley Middle School – Library, 14320 NE 50th Ave. Vancouver	WA	30
1/24/2008	Northwest Neighborhood Association	Franklin Elementary School, 5206 Franklin St Vancouver	WA	31
1/28/2008	Transit Roundtable with Vancouver businesses	Vancouver Hilton	WA	63
1/30/2008	Washington State Legislature, Senate Transportation Committee	Senate Hearing, Cherberg Bldg, Olympia WA	WA	n/a
2/4/2008	Battle Ground City Council	109 SW First St., Battle Ground	WA	45
2/7/2008	Portland Freight Committee	Lovejoy Room in City Hall (1221 SW 4th Avenue).	OR	30
2/7/2008	Friends of Portland International Raceway	Nicola's Pizza, 4826 N Lombard St Portland	OR	10

Date	Activity/Organization	Location	State	Number of Public Participants
2/8/2008	Frito Lay	Frito Lay 4808 NW Fruit Valley Rd.	WA	70
2/11/2008	Vancouver City Council	Vancouver City Hall, Council Chambers, 10 E. 13th Street, Vancouver,	WA	n/a
2/12/2008	East Columbia Neighborhood Association	East Columbia Bible Church, 420 NE Marine Dr. Portland	OR	20
2/12/2008	Portland Bicycle Advisory Committee	Lovejoy Room in City Hall (1221 SW 4th Avenue).	OR	30
2/12/2008	Hudson's Bay Neighborhood Assn.	Harney Elementary, 3212 E. Evergreen Blvd. Vancouver WA cafeteria	WA	8
2/12/2008	City of Portland - Hayden Island Planning Group	Hayden Island Yacht Club	OR	60
2/14/2008	Hayden Island Neighborhood Network (HINooN)	12050 N. Jantzen Drive, Portland	OR	18
2/18/2008	Oregon House Transportation Committee	Oregon State Capitol - Room E, Salem	OR	12
2/19/2008	Clark County Bicycle Advisory Committee	Public Services Building 1300 Franklin St. Vancouver	WA	13
2/19/2008	Hough Neighborhood Association	Hough Elementary School, 1900 Daniels St., Vancouver	WA	23
2/20/2008	Rotary - Longview Chapter	Hotel Monticello (ballroom), 1405 17th Ave., Longview WA	WA	130
2/20/2008	Institute of Real Estate Management	Multnomah Athletic Club 1849 SW Salmon Street Portland,	OR	50
2/20/2008	Vancouver Neighborhood Forum on Light Rail	Water Resources Education Center, SE Columbia Way, Vancouver	WA	200
2/21/2008	SW Washington Regional Transportation Council briefing	Vancouver	WA	n/a
2/21/2008	Arnada Neighborhood Association	2500 Main St., Vancouver Housing Authority	WA	15
2/23/2008	CRC Transit Roundtable	Delta Park MAX station/KP Town Hall	OR	24
2/26/2008	Clark College Executive Cabinet	Clark College, Vancouver	WA	11
2/26/2008	SW Washington Regional Transportation Council, High Capacity Transit Study Open House	1200 Fort Vancouver Way (Clark County Public Utilities Building, community room)	WA	10
2/28/2008	C-TRAN Citizens Advisory Committee	C-TRAN, 2425 NE 65th Avenue, Vancouver	WA	16

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APPENDIX C
Early Screening of River Crossing and Transit Components

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Appendix C

Early Screening of River Crossing and Transit Components

The project team began the process of developing alternatives by identifying possible transportation components (i.e., transit technologies, and river crossing types and locations) that could be packaged into alternatives. Over 70 such components were identified in the 2002 I-5 Transportation and Trade Partnership Final Strategic Plan and through additional public and stakeholder outreach.

After identifying components, project staff evaluated their potential to address this project's purpose and need in order to narrow these options in preparation for packaging them into full alternatives. Only transit and river crossing components were screened. Other components, such as transportation demand management measures or highway improvements north and south of the river, could not be adequately evaluated at the time because their performance would critically depend on their integration with transit and river crossing improvements.

The initial screening effort in April 2006 evaluated 37 river crossing and transit components using a pass/fail test designed to eliminate ideas well outside the scope of this project and/or that clearly do not address this project's purpose and need. This test relied upon six pass/fail questions to determine which river crossing and transit components should advance for further consideration. These questions asked whether each component:

1. Increases vehicular capacity or decreases vehicular demand?
2. Improves transit performance within the bridge influence area?[1]
3. Improves freight mobility within the bridge influence area?
4. Improves safety and decreases vulnerability to incidents within the bridge influence area?
5. Improves bicycle and pedestrian mobility within the bridge influence area?
6. Reduces seismic risk of the I-5 Columbia River Crossing?

Components were eliminated from further consideration if they failed any of these six questions, as failure on any of these questions was deemed a fatal flaw for meeting this project's purpose and need. Transit components were only evaluated on the first, second, and fourth questions, as the other questions do not apply to the transit element of this project.

The following table summarizes the results of this screening process:

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[1] The bridge influence area is the I-5 corridor within the CRC project area, which spans from SR 500 in Vancouver, Washington to approximately Columbia Boulevard in Portland, Oregon.

Early Screening Results F = Fail P = Pass U = Undetermined – components were not dropped based upon this result			Increase vehicular capacity or decrease vehicular demand?	Improve transit performance?	Improve freight mobility	Improve safety and decrease vulnerability to incidents?	Improve bicycle and pedestrian mobility?	Reduce seismic risk of the I-5 Columbia River Crossing?	Overall
Transit	TR-1	Express Bus in general purpose lanes	P	P	N/A	U	N/A	N/A	P
Transit	TR-2	Express Bus in managed lanes	P	P	N/A	U	N/A	N/A	P
Transit	TR-3	Bus Rapid Transit (BRT)-Lite	P	P	N/A	U	N/A	N/A	P
Transit	TR-4	Bus Rapid Transit (BRT)- Full	P	P	N/A	U	N/A	N/A	P
Transit	TR-5	Light Rail Transit (LRT)	P	P	N/A	U	N/A	N/A	P
Transit	TR-6	Streetcar	P	P	N/A	U	N/A	N/A	P
Transit	TR-7	High Speed Rail	F	F	N/A	U	N/A	N/A	F
Transit	TR-8	Ferry Service	F	F	N/A	U	N/A	N/A	F
Transit	TR-9	Monorail System	P	F	N/A	U	N/A	N/A	F
Transit	TR-10	Magnetic Levitation Railway	F	F	N/A	U	N/A	N/A	F
Transit	TR-11	Commuter Rail	P	F	N/A	U	N/A	N/A	F
Transit	TR-12	Heavy Rail	P	F	N/A	U	N/A	N/A	F
Transit	TR-13	Personal Rapid Transit	F	F	N/A	U	N/A	N/A	F
Transit	TR-14	People Mover/Automated Guideway Transit	P	F	N/A	U	N/A	N/A	F
River Crossing	RC-1	Replacement Bridge-Downstream/Low-level/Movable	P	P	P	P	P	P	P
River Crossing	RC-2	Replacement Bridge-Upstream/Low-level/Movable	P	P	P	P	P	P	P
River Crossing	RC-3	Replacement Bridge-Downstream/Mid-level	P	P	P	P	P	P	P
River Crossing	RC-4	Replacement Bridge-Upstream/Mid-level	P	P	P	P	P	P	P
River Crossing	RC-5	Replacement Bridge-Downstream/High-level	P	P	P	F	P	P	F
River Crossing	RC-6	Replacement Bridge-Upstream/High-level	P	P	P	F	P	P	F
River Crossing	RC-7	Supplemental Bridge-Downstream/Low-level/Movable	P	P	P	U	P	U	P
River Crossing	RC-8	Supplemental Bridge-Upstream/Low-level/Movable	P	P	P	U	P	U	P
River Crossing	RC-9	Supplemental Bridge-Downstream/Mid-level	P	P	P	U	P	U	P
River Crossing	RC-10	Supplemental Bridge-Upstream/Mid-level	P	P	P	F	P	U	F
River Crossing	RC-11	Supplemental Bridge-Downstream/High-level	P	P	P	F	P	U	F
River Crossing	RC-12	Supplemental Bridge-Upstream/High-level	P	P	P	F	P	U	F
River Crossing	RC-13	Tunnel to supplement I-5	P	P	P	P	P	U	P
River Crossing	RC-14	New Corridor Crossing	P	F	P	F	F	F	F
River Crossing	RC-15	New Corridor Crossing plus widen existing I-5 Bridges	P	F	P	F	F	F	F
River Crossing	RC-16	New Western Highway (I-605)	F	F	F	F	F	F	F
River Crossing	RC-17	New Eastern Columbia River Crossing	F	F	F	F	F	F	F
River Crossing	RC-18	I-205 Improvements	F	F	F	F	F	F	F
River Crossing	RC-19	Arterial Crossing to supplement I-5	F	P	F	F	P	F	F
River Crossing	RC-20	Replacement Tunnel	F	F	F	P	F	P	F
River Crossing	RC-21	33rd Avenue Crossing	F	F	F	F	F	F	F
River Crossing	RC-22	Non-Freeway Multimodal Columbia River Crossing	F	P	F	F	P	F	F
River Crossing	RC-23	Arterial Crossing with I-5 Improvements	P	P	P	P	P	P	P

APPENDIX D
Comprehensive List of Potential Property Acquisitions

Columbia River CROSSING

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Appendix D

Comprehensive List of Potential Property Acquisitions

This appendix includes a list of all of the property acquisitions potentially required by the physical improvements that comprise the alternatives evaluated in this DEIS. This is a comprehensive list that includes the potential acquisitions required for any of the components and/or design options included in any of the alternatives. No single alternative would require all the property acquisitions included in this appendix.

This list of potential property acquisitions is spilt into three general geographical areas: Hayden Island, Downtown Vancouver, and northern Vancouver. The property acquisitions are divided in the following fashion:

River Crossing	Replacement				Supplemental			
Hayden Island	Offset		Adjacent		Offset		Adjacent	
Downtown Vancouver	Two-way Washington		Washington-Broadway Couplet		Two-way Washington		Washington-Broadway Couplet	
Full length Terminus Options[a]	**Kiggins Bowl**		**Lincoln**		**Kiggins Bowl**		**Lincoln**	
Northern Vancouver Connection	16th Street	McLoughlin	Two-way Broadway	Broadway-Main Couplet	16th Street	McLoughlin	Two-way Broadway	Broadway-Main Couplet

[a] The Clark College MOS option would require the acquisitions shaded in gray in the table for the "Northern Vancouver Connection;"The Mill Plain MOS would avoid most of these impacts in northern Vancouver except for

For example, under the Replacement column heading there are two choices for transit over Hayden Island—Offset or Adjacent. All of the acquisitions that would be caused by the river crossing and the transit terminus and alignment options in this area are listed under that column heading. This is repeated for the Supplemental river crossing, and for each of the other two geographical areas. For more information regarding the river crossings and transit terminus/alignment options, please see the Description of Alternatives (Chapter 2). For more summary level information regarding potential acquisitions, please see Section 3.4, Acquisitions and Displacements.

The acquisitions reported in this appendix are based on early engineering designs. These designs will continue to be refined to avoid or minimize property acquisitions. Those acquisitions that cannot be avoided would be appropriately mitigated. For more information regarding potential measures to mitigate acquisition impacts please see Section 3.4, Acquisitions and Displacements.

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Potential Property Acquisitions on Hayden Island and South Downtown Vancouver[a]

				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	Offset	Adjacent	Offset	Adjacent
38279906	610 E 5TH ST Vancouver	Park/Historic Site/Museum	Partial with displacement	x	x		
			Partial w/o displacement			x	x
38279911	654 OFFICERS RW Vancouver	Office/Professional/Health Care	Partial w/o displacement	x	x	x	x
38279916	605 E EVERGREEN BL Vancouver	Civic Service with Employees	Partial w/o displacement	x	x		
38279920	1009 E MCLOUGHLIN BL Vancouver	Religious/Community Center	Partial w/o displacement			x	x
38279927	*no address available* Vancouver	Vacant	Partial w/o displacement	x	x	x	x
38279930	*no address available* Vancouver	Railroad right-of-way	Partial w/o displacement			x	x
38279934	*no address available* Vancouver	Park/Historic Site/Museum	Partial w/o displacement			x	x
38279935	*no address available* Vancouver	Park/Historic Site/Museum	Partial w/o displacement	x	x		
38820000	318 E 7TH ST Vancouver	Multi-Family Residential	Partial w/o displacement	x	x		
38823000	317 E EVERGREEN Vancouver	Single Family Residential	Partial w/o displacement	x	x		
38826000	*no address available* Vancouver	Retail/Services	Partial w/o displacement	x	x		
38830000	901 C ST Vancouver	Retail/Services	Partial with displacement	x	x		
38840000	801 C ST Vancouver	Retail/Services	Partial w/o displacement	x	x		
39200000	315 E EVERGREEN BL Vancouver	Office/Professional/Health Care	Partial w/o displacement	x	x		
39210000	*no address available* Vancouver	Retail/Services	Partial w/o displacement	x	x		
39212000	*no address available* Vancouver	Parking	Partial w/o displacement	x	x		

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				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	Offset	Adjacent	Offset	Adjacent
39214000	411 E EVERGREEN BL Vancouver	Office/Professional/Health Care	Partial with displacement	x	x		
39216000	319 E EVERGREEN Vancouver	Retail/Services	Partial w/o displacement	x	x		
39218000	902 RESERVE ST Vancouver	Retail/Services	Partial w/o displacement	x	x		
39220000	400 E EVERGREEN BL Vancouver	Office/Professional/Health Care	Partial w/o displacement	x	x		
47580000	100 SE COLUMBIA WY Vancouver	Retail/Services	Partial with displacement			x	x
			Partial w/o displacement	x	x		
47600000	*no address available* Vancouver	Railroad right-of-way	Partial w/o displacement	x	x	x	x
47615000	*no address available* Vancouver	Vacant	Partial w/o displacement	x	x	x	x
48380000	*no address available* Vancouver	Vacant	Partial with displacement			x	x
			Partial w/o displacement	x	x		
48390000	300 WASHINGTON ST Vancouver	Vacant	Partial w/o displacement	x	x		
48400000	215 W 4TH ST Vancouver	Retail/Services	Partial w/o displacement	x	x		
48410000	*no address available* Vancouver	Office/Professional/Health Care	Full	x	x	x	x
48420000	210 W 3RD ST Vancouver	Retail/Services	Full	x	x	x	x
48430000	300 WASHINGTON ST Vancouver	Retail/Services	Full	x	x	x	x
48440000	*no address available* Vancouver	Vacant	Partial w/o displacement	x	x	x	x
48450000	*no address available* Vancouver	Railroad right-of-way	Partial w/o displacement	x		x	x
48460000	*no address available* Vancouver	Vacant	Partial w/o displacement	x	x	x	x
48470000	*no address available* Vancouver	Vacant	Full	x	x	x	x
			Partial w/o displacement			x	x

				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	**Address**	**Land Use**	**Estimated Acquisition Level**	**Offset**	**Adjacent**	**Offset**	**Adjacent**
48475000	*no address available* Vancouver	Lodging	Full	x	x		
			Partial w/o displacement	x	x	x	x
48480000	*no address available* Vancouver	Vacant	Full	x	x		
			Partial w/o displacement			x	x
502250000	*no address available* Vancouver	Lodging	Partial with displacement	x	x		
			Partial w/o displacement	x	x	x	x
R426800050	N JANTZEN DR Portland	Private Road	Full	x	x	x	x
R426800100	11875 N JANTZEN DR Portland	Retail/Services	Partial with displacement	x	x		
			Partial w/o displacement			x	x
R426800150	12050 N JANTZEN DR Portland	Retail/Services	Partial with displacement	x	x		
			Partial w/o displacement			x	x
R426950010	N JANTZEN AVE Portland	Private Road	Partial w/o displacement	x	x	x	x
R426950030	N CENTER AVE Portland	Private Road	Partial with displacement				x
			Partial w/o displacement	x	x	x	x
R426950120	1521-1523 N JANTZEN AVE Portland	Retail/Services	Partial with displacement	x	x	x	x
			Partial w/o displacement	x		x	
R426950140	11950 N CENTER AVE Portland	Retail/Services	Full				x
			Partial with displacement		x	x	x
			Partial w/o displacement	x	x		
R611250050	N ANCHOR WY Portland	Parking	Partial w/o displacement			x	x
R611250400	1250 N ANCHOR WY Portland	Lodging	Partial w/o displacement			x	x
R649755760	10365 N VANCOUVER WY Portland	Industrial	Partial w/o displacement	x	x	x	x
R941030380	N ANCHOR WY Portland	Lodging	Partial w/o displacement			x	x
R941030400	N MARINE DR Portland	Parking	Partial w/o displacement			x	x
R941030480	10510 WI/N VANCOUVER WY Portland	Vacant	Partial w/o displacement	x	x	x	x
R941032110	1415 WI/N MARINE DR Portland	Retail/Services	Partial w/o displacement			x	x

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				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	Offset	Adjacent	Offset	Adjacent
R941032300	10931 N VANCOUVER WY Portland	Industrial	Partial w/o displacement	x	x	x	x
R941040090	N MARINE DR Portland	Vacant	Full	x	x		
R941040100	*no address available* Portland	Vacant	Full	x	x		
R941040160	*no address available* Portland	Vacant	Full	x	x		
R941040290	*no address available* Portland	Vacant	Full	x	x		
R941040310	N MARINE DR Portland	Vacant	Full	x	x		
R951330050	2060 N MARINE DR Portland	Other Public Infrastructure	Partial w/o displacement	x	x	x	x
R951330090	1610 N PIER 99 ST Portland	Retail/Services	Partial with displacement			x	x
			Partial w/o displacement	x	x		
R951330210	1801-1809 N PIER 99 ST Portland	Retail/Services	Partial with displacement			x	x
			Partial w/o displacement	x	x		
R951330240	1835 N MARINE DR Portland	Industrial	Partial w/o displacement	x	x	x	x
R951330470	1500 WI/N HAYDEN IS DR Portland	Retail/Services	Partial with displacement				x
			Partial w/o displacement	x	x	x	x
R951330520	1500 N HAYDEN IS DR Portland	Retail/Services	Partial with displacement				x
			Partial w/o displacement	x	x	x	x
R951330720	1501 N JANTZEN AVE Portland	Floating Home Facility	Partial with displacement		x	x	x
			Partial w/o displacement	x	x		
R951330760	*no address available* Portland	Parking	Partial w/o displacement	x	x	x	x
R951330780	*no address available* Portland	Parking	Partial w/o displacement			x	x
R951330870	N MARINE DR Portland	Industrial	Partial w/o displacement	x	x	x	x
R951330900	N MARINE DR Portland	Parking	Full			x	x
			Partial w/o displacement	x	x		

				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	Offset	Adjacent	Offset	Adjacent
R951330930	2060 E/N EXPO RD Portland	Parking	Partial with displacement				x
			Partial w/o displacement	x	x	x	x
R951340120	N CENTER AVE Portland	Retail/Services	Full	x	x	x	x
R951340130	12205 WI/NE M L KING BLVD Portland	Retail/Services	Full	x	x	x	x
			Partial with displacement		x		
R951340140	1401 N HAYDEN IS DR Portland	Lodging	Partial with displacement	x	x	x	x
			Partial w/o displacement			x	
R951340150	12105 WI/N JANTZEN DR Portland	Retail/Services	Partial with displacement			x	x
			Partial w/o displacement	x	x		
R951340160	12237 N JANTZEN DR Portland	Retail/Services	Partial w/o displacement	x	x	x	x
R951340170	12118 N JANTZEN AVE Portland	Retail/Services	Partial w/o displacement	x	x	x	x
R951340180	12225 N JANTZEN AVE Portland	Retail/Services	Partial with displacement			x	x
			Partial w/o displacement	x	x		
R951340190	1321-1337 N HAYDEN IS DR Portland	Retail/Services	Partial with displacement	x	x	x	
R951340210	12345 N M L KING BLVD Portland	Civic Service with Employees	Partial with displacement	x	x	x	x
R951340300	12005 N CENTER AVE Portland	Retail/Services	Full			x	x
			Partial with displacement	x	x		
R951340310	12105 N CENTER AVE Portland	Retail/Services	Full			x	x
			Partial with displacement		x		
			Partial w/o displacement	x	x		
R951340340	909 N HAYDEN IS DR Portland	Lodging	Partial w/o displacement	x	x		
R951340370	12226 N JANTZEN DR Portland	Lodging	Partial with displacement			x	x
			Partial w/o displacement	x	x		
R951340380	11915 N CENTER AVE Portland	Retail/Services	Full			x	
			Partial with displacement	x	x		x
R951340410	N CENTER AVE Portland	Retail/Services	Full		x	x	x
R951340420	N JANTZEN AVE Portland	Other Public Infrastructure	Full	x	x	x	x

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				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	Offset	Adjacent	Offset	Adjacent
R951340440	11901-11919 N JANTZEN DR Portland	Retail/Services	Partial with displacement	x	x	x	x
R951340460	N CENTER AVE Portland	Vacant	Full	x	x	x	x
			Partial w/o displacement		x		
R951340520	12240 N JANTZEN AVE Portland	Retail/Services	Partial w/o displacement	x	x	x	x
R951340600	1401 WI/N HAYDEN IS DR Portland	Parking	Partial w/o displacement	x	x		
R951340730	N CENTER AVE Portland	Vacant	Full			x	x
			Partial w/o displacement	x	x		
R951340770	*no address available* Portland	Floating Home Facility	Partial with displacement	x	x	x	x
R951340780	N JANTZEN AVE Portland	Parking	Full	x	x	x	x
R951340820	1415 N MARINE DR Portland	Floating Home Facility	Partial with displacement	x	x	x	x
R951340920	1401 WI/N HAYDEN IS DR Portland	Parking	Partial with displacement				x
			Partial w/o displacement	x	x	x	x
R951340930	*no address available* Portland	Vacant	Full	x	x		
R951340940	909 WI/N HAYDEN IS DR Portland	Parking	Full	x	x		
			Partial w/o displacement			x	x

[a] All property acquisitions show in this table are the best estimates given the information available at this time. As the project progresses and a locally preferred alternative is identified, the estimated acquisitions may change.

Potential Property Acquisitions through Downtown Vancouver (north of Sixth Street)[a]

				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	Two-way Washington	Washington-Broadway Couplet	Two-way Washington	Washington-Broadway Couplet
40240000	1514 BROADWAY ST Vancouver	Office/Professional/Health Care	Partial w/o displacement	x	x	x	x
40250000	1511 MAIN ST Vancouver	Park/Historic Site/Museum	Partial w/o displacement	x	x	x	x
40980000	*no address available* Vancouver	Retail/Services	Full		x		x
			Partial w/o displacement	x		x	
40990000	*no address available* Vancouver	Retail/Services	Full		x		x
41000000	1607 MAIN ST Vancouver	Retail/Services	Full		x		x
			Partial w/o displacement	x		x	
41010000	*no address available* Vancouver	Retail/Services	Full		x		x
41020000	*no address available* Vancouver	Retail/Services	Full		x		x
			Partial w/o displacement	x		x	
41030000	*no address available* Vancouver	Retail/Services	Full		x		x
			Partial w/o displacement	x		x	
41040000	*no address available* Vancouver	Retail/Services	Full		x		x
			Partial w/o displacement	x		x	
41050000	*no address available* Vancouver	Retail/Services	Full		x		x
			Partial w/o displacement	x		x	
41060000	1714 BROADWAY ST Vancouver	Retail/Services	Partial with displacement	x		x	
41070000	1707 MAIN ST Vancouver	Retail/Services	Partial w/o displacement	x	x	x	x
46390000	1514 MAIN ST Vancouver	Parking	Full	x	x	x	x
46485000	1506 MAIN ST Vancouver	Parking	Full	x	x	x	x
47272000	*no address available* Vancouver	Parking	Full	x	x	x	x

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				Alternatives 2 & 3: Replacement River Crossing		Alternatives 4 & 5: Supplemental River Crossing	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	Two-way Washington	Washington-Broadway Couplet	Two-way Washington	Washington-Broadway Couplet
47277000	*no address available* Vancouver	Parking	Full	x	x	x	x
47280000	*no address available* Vancouver	Parking	Full	x	x	x	x
47291000	1500 WASHINGTON ST Vancouver	Retail/Services	Partial w/o displacement	x		x	
56890000	*no address available* Vancouver	Retail/Services	Partial w/o displacement	x		x	

[a] All property acquisitions show in this table are the best estimates given the information available at this time. As the project progresses and a locally preferred alternative is identified, the estimated acquisitions may change.

Potential Property Acquisitions for Connections to Terminus Options in Northern Vancouver[a]

				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
7590000	3200 MAIN ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
7605000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
7630000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
7635000	3112 MAIN ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
8530000	2912 MAIN ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
8540000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
8700000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
8810000	3212 MAIN ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
9780000	2904 MAIN ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
10000000	317 E 39TH ST Vancouver	Retail/Services	Partial with displacement			x	x			x	x
10075000	3800 MAIN ST Vancouver	Retail/Services	Partial with displacement			x				x	
			Partial w/o displacement				x				x
10362000	3714 MAIN ST Vancouver	Retail/Services	Full			x	x			x	x
10390000	300 E 37TH ST Vancouver	Office/Professional/ Health Care	Full				x				x
			Partial with displacement			x				x	
10440000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
10470000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x

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				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
10740000	3512 MAIN ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
10780001	*no address available* Vancouver	Office/Professional/ Health Care	Partial with displacement			x	x			x	x
10790000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
10880000	2707 MAIN ST Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
10885000	*no address available* Vancouver	Parking	Partial w/o displacement			x	x			x	x
11040000	*no address available* Vancouver	Parking	Partial w/o displacement			x	x			x	x
11050000	*no address available* Vancouver	Parking	Partial w/o displacement				x				x
11060000	2615 MAIN ST Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
11070000	2615 MAIN ST Vancouver	Retail/Services	Partial w/o displacement				x				x
11075000	2607 MAIN ST Vancouver	Retail/Services	Partial w/o displacement				x				x
11080000	*no address available* Vancouver	Vacant	Partial w/o displacement			x	x			x	x
11240000	103 E 29TH ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
11251000	3400 MAIN ST Vancouver	Office/Professional/ Health Care	Partial with displacement			x	x			x	x
11252000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
11254000	3101 MAIN ST Vancouver	School	Partial w/o displacement			x	x			x	x
11256000	2903 MAIN ST Vancouver	Single Family Residential	Partial with displacement			x	x			x	x

				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
11265000	2901 MAIN ST Vancouver	Office/Professional/ Health Care	Partial with displacement			x	x			x	x
11277001	*no address available* Vancouver	Vacant	Partial w/o displacement			x	x			x	x
11295000	401 E 33RD ST Vancouver	Religious/Community Center	Partial w/o displacement			x	x			x	x
11405000	*no address available* Vancouver	Park/Historic Site/Museum	Partial w/o displacement	x	x			x	x		
11531000	*no address available* Vancouver	Park/Historic Site/Museum	Partial w/o displacement	x	x	x	x	x	x	x	x
11538000	*no address available* Vancouver	Park/Historic Site/Museum	Partial w/o displacement	x	x	x	x	x	x	x	x
12330000	*no address available* Vancouver	Vacant	Full			x	x			x	x
12340000	210 E 39TH ST Vancouver	Retail/Services	Full			x	x			x	x
12350000	3916 MAIN ST Vancouver	Single Family Residential	Full			x	x			x	x
12370000	3906 MAIN ST Vancouver	Single Family Residential	Full			x	x			x	x
12410000	200 E 39TH ST Vancouver	Single Family Residential	Full			x	x			x	x
12432000	4003 CRESTON AVE Vancouver	Vacant	Full			x	x			x	x
12434000	4200 MAIN ST Vancouver	Civic Service with Employees	Full			x	x			x	x
12435000	3915 CRESTON AVE Vancouver	Multi-Family Residential	Full			x	x			x	x
12436000	202 E 39TH ST Vancouver	Single Family Residential	Full			x	x			x	x
12437000	3903 CRESTON AVE Vancouver	Single Family Residential	Full			x	x			x	x

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				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
12439000	3920 MAIN ST Vancouver	Parking	Full			x	x			x	x
12441000	4001 MAIN ST Vancouver	Office/Professional/ Health Car	Partial w/o displacement			x	x			x	x
12451000	3919 CRESTON AVE Vancouver	Multi-Family Residential	Full			x	x			x	x
12454005	800 E 40TH ST Vancouver	School	Partial w/o displacement	x	x	x	x	x	x	x	x
12490000	3925 MAIN ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
12500000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
12510000	*no address available* Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
12520000	3909 MAIN ST Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
12530000	3901 MAIN ST Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
12882000	3921 I ST Vancouver	Multi-Family Residential	Partial with displacement	x	x	x	x				
12884000	3919 I ST Vancouver	Multi-Family Residential	Partial with displacement	x	x	x	x				
12885000	3917 I ST Vancouver	Single Family Residential	Partial with displacement	x	x	x	x				
12887000	3915 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
13455000	3114 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
13460000	3110 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
13470000	3106 K ST Vancouver	Multi-Family Residential	Partial w/o displacement					x	x	x	x

				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
13471000	3100 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
13668000	902 E 30TH ST Vancouver	Single Family Residential	Partial with displacement	x	x						
			Partial w/o displacement					x	x		
13670000	903 E 31ST ST Vancouver	Single Family Residential	Partial with displacement	x	x						
			Partial w/o displacement					x	x		
13700000	3014 K ST Vancouver	Single Family Residential	Partial w/o displacement	x	x			x	x	x	x
13710000	3012 K ST Vancouver	Single Family Residential	Partial w/o displacement	x	x			x	x	x	x
13720000	3004 K ST Vancouver	Multi-Family Residential	Partial w/o displacement	x	x			x	x	x	x
13725000	3000 K ST Vancouver	Single Family Residential	Partial w/o displacement	x	x			x	x	x	x
14686000	3701 NE I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
14763000	3601 I ST Vancouver	Multi-Family Residential	Partial w/o displacement	x	x						
14765000	3605 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
14766000	3609 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
14768000	3615 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
15080000	904 E 35TH ST Vancouver	Single Family Residential	Partial with displacement	x	x						
			Partial w/o displacement			x	x				
15095000	*no address available* Vancouver	Vacant	Partial w/o displacement	x	x	x	x				
15105000	3515 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
15230000	900 E 34TH ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x				
15240000	3405 I ST Vancouver	Multi-Family Residential	Partial w/o displacement	x	x	x	x				

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				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
15241000	3409 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x				
15250000	3415 I ST Vancouver	Single Family Residential	Partial with displacement			x	x				
			Partial w/o displacement	x	x						
15675000	904 E 33RD ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x				
15680000	905 E 34TH ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x				
15840000	3214 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
15850000	3208 K ST Vancouver	Multi-Family Residential	Partial w/o displacement					x	x	x	x
15860000	3204 K ST Vancouver	Single Family Residential	Partial w/o displacement	x	x			x	x	x	x
15870000	3200 K ST Vancouver	Single Family Residential	Partial w/o displacement	x	x			x	x	x	x
15970000	3201 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
15975000	3205 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
15980000	3211 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
15985000	3215 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x	x	x	x	x
16225000	904 E 31ST ST Vancouver	Single Family Residential	Full	x	x						
16234000	905 E 32ND ST Vancouver	Single Family Residential	Full	x	x						
16370000	2611 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
16380000	2613 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
16750000	2914 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x

				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
16775000	2900 K ST Vancouver	Single Family Residential	Partial w/o displacement							x	x
16776000	2904 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
16815000	904 E 29TH ST Vancouver	Single Family Residential	Full	x	x						
			Partial w/o displacement			x	x	x	x		
16820000	903 E 30TH ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x	x	x		
17275000	904 E 28TH ST Vancouver	Single Family Residential	Full	x	x						
			Partial w/o displacement					x	x		
17280000	905 E 29TH ST Vancouver	Multi-Family Residential	Full	x	x						
			Partial w/o displacement			x	x	x	x	x	x
17285000	901 E 29TH ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x	x	x	x	x
17290000	2816 K ST Vancouver	Single Family Residential	Partial with displacement			x	x	x	x		
			Partial w/o displacement	x	x			x	x	x	x
17300000	2800 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
17570000	2714 K ST Vancouver	Multi-Family Residential	Partial w/o displacement					x	x	x	x
17580000	2708 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
17586000	2700 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x	x	x
17630000	900 E 27TH ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
17632000	2707 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
17634000	2709 I ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
17636000	901 E 28TH ST Vancouver	Single Family Residential	Partial w/o displacement	x	x						
17925000	2614 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x		

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				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
17935000	2610 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x		
17950000	2600 K ST Vancouver	Single Family Residential	Partial w/o displacement					x	x		
18940000	3802 M ST Vancouver	Multi-Family Residential	Partial w/o displacement	x	x						
19020000	3725 L ST Vancouver	Multi-Family Residential	Partial w/o displacement	x	x	x	x				
19025000	3801 E L ST Vancouver	Vacant	Partial w/o displacement	x	x	x	x				
19150000	3805 M ST Vancouver	Multi-Family Residential	Partial w/o displacement	x	x	x	x	x	x	x	x
19152000	3807 M ST Vancouver	Vacant	Partial w/o displacement	x	x	x	x	x	x	x	x
37918006	304 E 45TH ST Vancouver	Single Family Residential	Partial with displacement	x	x			x	x		
37918074	4506 MAIN ST Vancouver	Retail/Services	Full	x	x			x	x		
37918080	4611 MAIN ST Vancouver	Parking	Full	x		x	x	x		x	x
			Partial w/o displacement		x				x		
37918086	4510 MAIN ST Vancouver	Vacant	Partial w/o displacement	x	x			x	x		
37918290	4500 MAIN ST Vancouver	Retail/Services	Full	x	x			x	x		
37918294	*no address available* Vancouver	Retail/Services	Partial w/o displacement	x	x			x	x		
38279906	610 E 5TH ST Vancouver	Park/Historic Site/Museum	Partial w/o displacement	x	x	x	x	x	x	x	x
38279907	1800 E MCLOUGHLIN BL Vancouver	School	Partial w/o displacement	x	x	x	x	x	x	x	x
38279909	*no address available* Vancouver	Vacant	Full		x	x	x		x	x	x
			Partial w/o displacement	x	x	x	x	x	x	x	x
38279920	1009 E MCLOUGHLIN BL Vancouver	Religious/Community Center	Partial w/o displacement	x	x	x	x	x	x	x	x

				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
38279934	*no address available* Vancouver	Park/Historic Site/Museum	Partial w/o displacement	x	x						
40310000	1511 BROADWAY ST Vancouver	Retail/Services	Partial w/o displacement	x				x			
40350000	303 E 16TH ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement	x				x			
40415000	409 E 16TH ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement	x				x			
40420000	*no address available*	Office/Professional/ Health Care	Partial w/o displacement	x				x			
40485000	509 E 16TH ST Vancouver	Single Family Residential	Partial w/o displacement	x				x			
40560000	*no address available* Vancouver	Retail/Services	Partial w/o displacement	x				x			
40565000	611 E 16TH ST Vancouver	Retail/Services	Partial w/o displacement	x				x			
40570000	601 E 16TH ST Vancouver	Retail/Services	Partial w/o displacement	x				x			
41100000	211 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial with displacement		x				x		
41115000	207 E MCLOUGHLIN BL Vancouver	Retail/Services	Partial with displacement		x				x		
41170000	1706 D ST Vancouver	Retail/Services	Partial w/o displacement		x				x		
41180000	301 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41215000	415 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41220000	409 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41230000	405 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41240000	401 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		

				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
41270000	515 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41275000	509 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41280000	505 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41290000	501 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41341000	611 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41350000	605 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41360000	601 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41600000	*no address available* Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41601000	1803 F ST Vancouver	Multi-Family Residential	Partial w/o displacement		x				x		
41602000	602 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41630000	502 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41640000	510 E MCLOUGHLIN BL Vancouver	Single Family Residential	Partial w/o displacement		x				x		
41650000	1800 F ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41700000	1801 D ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41741000	*no address available* Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41750000	1803 C ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41760000	314 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		

				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
41810000	202 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41820000	210 E MCLOUGHLIN BL Vancouver	Office/Professional/ Health Care	Partial w/o displacement		x				x		
41830000	214 E MCLOUGHLIN BL Vancouver	Retail/Services	Partial w/o displacement		x				x		
41860000	1811 MAIN ST Vancouver	Retail/Services	Partial w/o displacement		x	x	x		x	x	x
41900000	1801 MAIN ST Vancouver	Retail/Services	Partial w/o displacement		x	x	x		x	x	x
41910000	1800 BROADWAY ST Vancouver	Retail/Services	Partial w/o displacement		x	x	x		x	x	x
42630000	*no address available* Vancouver	Retail/Services	Partial w/o displacement			x				x	
42640000	*no address available* Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
44420000	821 E 22ND ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x				
44450000	2010 W RESERVE ST Vancouver	Vacant	Partial w/o displacement	x	x	x	x				
44460000	2000 E RESERVE ST Vancouver	Single Family Residential	Partial w/o displacement	x	x	x	x				
45320000	2515 MAIN ST Vancouver	Retail/Service	Partial w/o displacement				x				x
45335000	2521 MAIN ST Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
45375000	2509 E BROADWAY ST Vancouver	Retail/Services	Partial w/o displacement			x	x			x	x
45380000	200 E 25TH ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x
45400000	208 E 25TH ST Vancouver	Retail/Services	Partial w/o displacement				x				x
45690000	2200 BROADWAY ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x	x			x	x

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				Alternatives 2 & 3: Replacement River Crossing				Alternatives 4 & 5: Supplemental River Crossing			
				Kiggins Bowl Terminus		Lincoln Terminus		Kiggins Bowl Terminus		Lincoln Terminus	
TLID/Serial Number	Address	Land Use	Estimated Acquisition Level	16th	McLoughlin	Two-way Broadway	Broadway-Main	16th	McLoughlin	Two-way Broadway	Broadway-Main
45693000	2400 BROADWAY ST Vancouver	Office/Professional/ Health Care	Partial w/o displacement			x				x	
56800000	1800 MAIN ST Vancouver	Retail/Services	Partial w/o displacement		x				x		
56810000	*no address available* Vancouver	Retail/Services	Partial w/o displacement		x				x		
100358000	*no address available* Vancouver	Vacant	Partial w/o displacement	x	x	x	x	x	x	x	x
100385000	*no address available* Vancouver	Vacant	Partial w/o displacement	x	x	x	x	x	x	x	x

[a] All property acquisitions show in this table are the best estimates given the information available at this time. As the project progresses and a locally preferred alternative is identified, the estimated acquisitions may change.

APPENDIX E

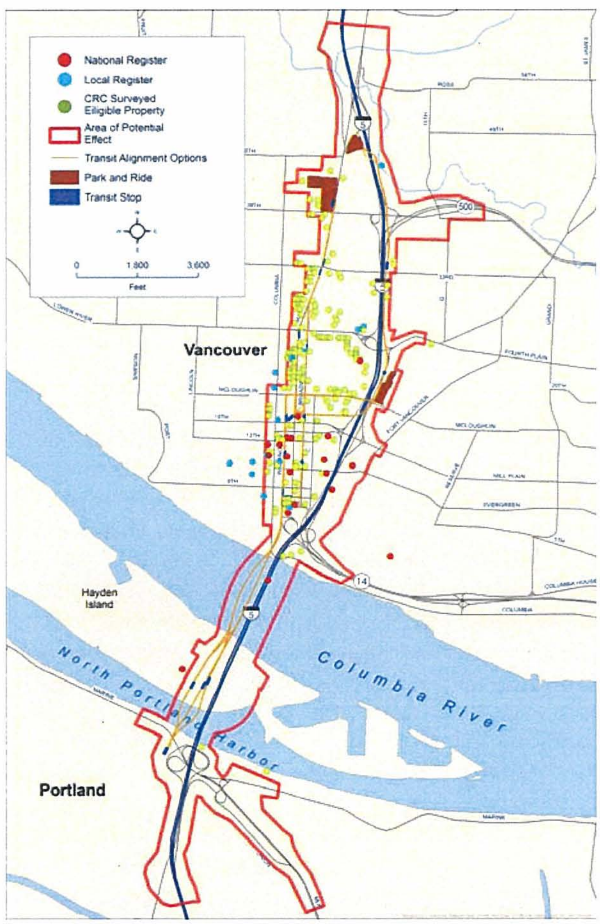
Registered, Eligible, and Previously Inventoried Historic Properties and Resources

Columbia River CROSSING

Appendix E

Registered, Eligible, and Previously Inventoried Historic Properties and Resources

This appendix includes a comprehensive list of all of the registered, eligible, and previously inventoried historic properties and resources in the Area of Potential Effect (APE) for the Columbia River Crossing (CRC) project. "Registered" Historic Properties can be found on the National Register for Historic Places (NRHP), the State Register, or on a local (county or city) register. Those properties that are not registered, but have been deemed eligible for the NRHP during historic resources surveys conducted by the CRC project team, are also included on this list. These resources are displayed on the map below. A larger version of the map can be found in the Historic and Archeological Resources section of the DEIS.



Lastly, those resources that have previously been inventoried by a group or agency other than CRC (e.g., the City of Vancouver, etc.) are indicated in Table E-1.

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Table E-1: Registered, Eligible, and Previously Inventoried Historic Properties and Resources in CRC APE

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
6	605 Esther St	ca.1853			x		Recreation and Culture - Outdoor Recreation	
7	209 W 6th St	ca.1935				x	Commerce/Trade - Business	
8	507 Columbia St	ca.1940					Unknown	
10	515 Washington St	ca.1966				x	Unknown	
11	114 6th St	ca.1930					Unknown	
13	111 W 7th St	ca.1925					Commerce/Trade - Restaurant	
14	809 Washington St	ca.1950				x	Commerce/Trade - Business	
16	614 Main St	ca.1906				x	Commerce/Trade - Business	Donegan Building
17	600-606 Main St	ca.1910					Commerce/Trade - Business	Schoefield Block
19	518 Main St	ca.1906/1926			x	x	Commerce/Trade - Business	Vancouver National Bank
21	500 Main St	ca.1928	x	x		x	Domestic - Multiple Family House	Evergreen Hotel
22	811 Main St	ca.1940					Commerce/Trade - Business	
23	801 Main St	ca.1942					Commerce/Trade - Business	
24	101 E 8th St	ca.1932					Commerce/Trade - Business	
28	605-609 Main St	ca.1908					Commerce/Trade - Business	
29	601-603 Main St	1912	x	x			Commerce/Trade - Business	US National Bank Building
30	916 Main St	1911	x	x		x	Commerce/Trade - Business	Elks Building
32	100 W 13th St	1884	x	x	x	x	Commerce/Trade - Business	Lowell Mason Hidden House

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Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
35	110 W 13th St	1913	x	x	x	x	Commerce/Trade - Professional	W. Foster Hidden House
37	1001 Broadway St	ca.1950					Commerce/Trade - Business	
38	112 W 11th St	1934-36	x	x	x	x	Commerce/Trade - Business	Vancouver Telephone Exchange
39	409 E Mill Plain Blvd	ca.1905	x			x	Domestic - Single Family House	
41	411 E Evergreen Blvd	1907	x	x		x	Commerce/Trade - Professional	Kiggins House
42	1511 Main St	ca.1909	x	x	x	x	Recreation and Culture - Museum	Carnegie Library
44	501 E McLoughlin Blvd	ca.1929				x	Commerce/Trade - Professional	
47	510 E McLoughlin Blvd	ca.1910				x	Commerce/Trade - Professional	
48	502 E McLoughlin Blvd	ca.1900				x	Commerce/Trade - Business	
50	611 E McLoughlin Blvd	ca.1880/1910				x	Domestic - Single Family House	
54	401 E 33rd St	1948-50/1960					Religion - Religious Facility	
55	3200 Main St	ca.1956					Health Care - Clinic	
59	3110 K St	ca. 1910					Domestic - Single Family House	
61	3000 K St	ca.1915					Domestic - Single Family House	
62	903 E 31st St	ca.1910					Domestic - Single Family House	
67	1001 Main St	ca.1925				x	Commerce/Trade - Business	
68	1011 Main St	ca.1935					Recreation and Culture - Theater	Kiggins Theatre
70	102 E Evergreen Blvd	ca.1925				x	Commerce/Trade - Business	
73	1300 Washington St	ca.1940				x	Commerce/Trade - Business	Luepke Florist

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
74	218 W 12th St	1885	x	x		x	Religion - Religious Facility	St James Cathedral
75	1012 Washington St	ca.1920			x	x	Commerce/Trade - Business	Greely Building
77	204 W Evergreen Blvd	ca.1920					Commerce/Trade - Business	
78	311 W 11th St	ca.1950					Commerce/Trade - Business	
79	1112 Columbia St	ca.1905				x	Domestic - Single Family House	Shumway House
80	208 W 13th St	ca.1930				x	Commerce/Trade - Business	
82	1315 Columbia St	ca.1930					Commerce/Trade - Business	
83	1211 Daniels St	1918	x	x		x	Government - Post Office	Vancouver Main Post office
84	314 W 11th St	ca.1908			x	x	Domestic - Single Family House	Kettenring House
85	310 W 11th St	1903	x	x	x	x	Domestic - Single Family House	Chumasero-Smith House
86	309 W 12th St	ca.1905				x	Domestic - Single Family House	The Hamilton House
87	311 W Evergreen Blvd	ca.1950				x	Commerce/Trade - Business	
88	1515 Daniels St	ca.1925				x	Domestic - Single Family House	
89	1601 Daniels St	ca.1945					Domestic - Multiple Family House	
90	310 W 16th St	ca.1915				x	Domestic - Single Family House	
93	1615 Daniels St	ca.1905					Domestic - Single Family House	
95	1812 Columbia St	ca.1900			x	x	Domestic - Single Family House	Charles Zimmerman House
96	1501 Columbia St	ca.1921			x	x	Domestic - Single Family House	
99	1812 Washington St	ca.1940				x	Commerce/Trade - Business	

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
101	1411 Washington St	ca.1950				x	Commerce/Trade - Business	
103	1812 Main St	ca.1923				x	Religion - Religious Facility	
104	1416 Main St	ca.1920				x	Commerce/Trade - Business	
107	1701 Broadway St	ca.1935					Commerce/Trade - Business	
108	2901 Main St	ca.1915					Domestic - Single Family House	
109	SE Columbia Way,	ca.1827					Recreation and Culture - Monument/Marker	Heritage Apple Tree
113	1500 Broadway St	ca.1925					Commerce/Trade - Business	
119	415 E 17th St	ca.1925				x	Commerce/Trade - Business	
120	301 E 19th St	ca.1905				x	Domestic - Single Family House	
121	409 E 19th St	ca.1925					Domestic - Single Family House	
123	501 E 19th St	ca.1925					Domestic - Single Family House	
124	1810 F St	ca.1910					Domestic - Single Family House	
125	601 E 19th St	ca.1940					Domestic - Single Family House	
126	1605 F St	ca.1945				x	Commerce/Trade - Professional	
128	304 E 15th St	ca.1945					Domestic - Single Family House	
129	404-406 E 17th St	ca.1940					Domestic - Multiple Family House	
130	700 E McLoughlin Blvd	ca.1902				x	Domestic - Single Family House	
132	612 E McLoughlin Blvd	ca.1958					Commerce/Trade - Business	
133	604 E 17th St	ca.1899				x	Domestic - Single Family House	

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
134	604 E 16th St	ca.1909				x	Commerce/Trade - Professional	
136	2001 H St	ca.1930					Domestic - Single Family House	
140	807 E 22nd St	ca.1906				x	Domestic - Single Family House	
143	2224 G St	ca.1916					Domestic - Single Family House	
144	2223 G St	ca.1935					Domestic - Single Family House	
145	2217 G St	ca.1927					Domestic - Single Family House	
146	2213 G St	ca.1926					Domestic - Single Family House	
147	2607 Main St	ca.1940					Commerce/Trade - Business	
148	300 E 37th St	ca.1950					Health Care - Medical Business/Office	
149	318 E 7th St	ca.1925					Domestic - Multiple Family House	
150	400 E Evergreen Blvd	ca.1873	x	x			Commerce/Trade - Business	House of Providence - Academy
151	401 E McLoughlin Blvd	ca.1916				x	Commerce/Trade - Professional	
153	307 E Mill Plain Blvd	ca.1961				x	Commerce/Trade - Restaurant	Burgerville USA
155	2209 G St	ca.1925					Domestic - Single Family House	
156	714 E 22nd St	ca.1930	x				Domestic - Single Family House	
157	2208 H St	ca.1937					Domestic - Single Family House	
158	2413 F St	ca.1916				x	Domestic - Single Family House	
159	2409 F St	ca.1915				x	Domestic - Single Family House	
160	2405 F St	ca.1925					Domestic - Single Family House	

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Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
161	2401 G St	ca.1921				x	Domestic - Single Family House	
165	1901 H St	ca.1929					Domestic - Single Family House	
166	319 E Evergreen Blvd	ca.1905					Vacant/Not in Use	
167	300 E 13th St	ca.1960					Government - Government Office	
168	500 E 13th St	ca.1957				x	Domestic - Multiple Family House	
169	601 Broadway St	ca.1960					Domestic - Hotel	
171	110 E 13th St	ca.1965				x	Commerce/Trade - Business	
172	1111 Broadway St	ca.1949				x	Commerce/Trade - Business	
176	3305 Main St	ca.1965					Commerce/Trade - Business	
177	111 W 28th St	ca.1955					Religion - Religious Facility	
178	122 E 28th St	ca.1900					Domestic - Single Family House	
179	112 E 28th St	ca.1944				x	Domestic - Multiple Family House	
180	121 E 28th St	ca.1910					Domestic - Single Family House	
182	211 E 4th Plain Blvd	ca.1906				x	Domestic - Single Family House	
184	130 W 29th St	ca.1932					Domestic - Single Family House	
185	118 W 29th St	ca.1930					Domestic - Single Family House	
186	112 W 29th St	ca.1918					Domestic - Single Family House	
187	110 W 29th St	ca.1918					Domestic - Single Family House	
188	2501 F St	ca.1925					Domestic - Single Family House	
189	604 E 25th St	ca.1911					Domestic - Single Family House	

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
191	3405 K St	ca.1920					Domestic - Single Family House	
192	3317 K St	ca.1920					Domestic - Single Family House	
195	901 E 32nd Ave	ca.1939				x	Domestic - Single Family House	
197	108 W 33rd St	ca.1937					Domestic - Single Family House	
198	112 W 33rd St	ca.1930					Domestic - Single Family House	
199	102 E 31st St	ca.1927					Domestic - Single Family House	
200	108 E 31st St	ca.1920					Domestic - Single Family House	
202	4300 Main St	ca.1965					Religion - Ceremonial Site	
203	518 E 25th St	ca.1920					Domestic - Single Family House	
204	510 E 25th St	ca.1920					Domestic - Single Family House	
206	504 E 25th St	ca.1953					Domestic - Single Family House	
208	408 E 25th St	ca.1926					Domestic - Single Family House	
209	404 E 25th St	ca.1911					Domestic - Single Family House	
210	400 E 25th St	ca.1910				x	Domestic - Single Family House	
211	314 E 25th St	ca.1910				x	Domestic - Single Family House	
212	306 E 25th St	ca.1936					Domestic - Single Family House	
213	304 E 25th St	ca.1927					Domestic - Single Family House	
214	300 E 25th St	ca.1915				x	Domestic - Single Family House	
217	426 E 4th Plain Blvd	ca.1932					Religion - Religious Facility	

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
219	512 E 27th St	ca.1900					Domestic - Single Family House	
220	419 E 28th St	ca.1926					Domestic - Single Family House	
225	201 E 29th St	ca.1926					Domestic - Single Family House	
227	2613 H St	1907			x		Domestic - Single Family House	Bailey-Dickerson House
228	714 E 26th St	ca.1906			x		Domestic - Single Family House	Swan House
229	804 E 26th St	ca.1911					Domestic - Single Family House	
231	2415 F St	ca.1920					Domestic - Single Family House	
232	514 E 28th St	ca.1905					Domestic - Single Family House	
233	502 E 28th St	ca.1942					Domestic - Multiple Family House	
246	3200 F St	ca.1928					Domestic - Single Family House	
248	521 E 33rd St	ca.1945					Domestic - Single Family House	
250	123 E 33rd St	ca.1940					Domestic - Single Family House	
251	119 E 33rd St	ca.1940					Domestic - Single Family House	
252	115 E 33rd St	ca.1940					Domestic - Single Family House	
254	101 E 33rd St	ca.1940					Domestic - Single Family House	
256	105 E 32nd St	ca.1940					Domestic - Single Family House	
257	111 E 32nd St	ca.1919					Domestic - Single Family House	
258	100 E 30th St	ca.1920					Domestic - Single Family House	
259	123 W 30th St	ca.1941					Domestic - Single Family House	

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
261	125 W 30th St	ca.1941					Domestic - Single Family House	
262	129 W 30th St	ca.1920					Domestic - Single Family House	
263	109 E 39th St	ca.1935					Domestic - Single Family House	
265	123 E 40th St	ca.1905					Domestic - Single Family House	
266	207 E 39th St	ca.1935				x	Domestic - Single Family House	
269	200 E 38th St	ca.1929					Domestic - Single Family House	
279	116 E 40th St	ca.1950					Domestic - Single Family House	
285	100 E 40th St	ca.1946					Domestic - Single Family House	
295	43rd amd Washington St	ca.1950				x	Other	
298	1906 Main St	ca.1950					Commerce/Trade - Business	
299	1908 Main St	ca.1925				x	Commerce/Trade - Business	
301	1916 Main St	ca.1915				x	Commerce/Trade - Business	
302	2006 Main St	ca.1940				x	Commerce/Trade - Business	
303	2012 Main St	ca.1910				x	Domestic - Single Family House	
304	2014 Main St	ca.1910				x	Commerce/Trade - Business	
305	2100 Main St	ca.1925				x	Commerce/Trade - Business	
306	2300 Main St	ca.1925				x	Social - Meeting Hall	
307	108 23rd St	ca.1927				x	Domestic - Single Family House	
308	114 W 23rd St	ca.1918				x	Domestic - Single Family House	
309	116 W 23rd St	ca.1910				x	Domestic - Single Family House	

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
310	2310 Main St	ca.1920				x	Commerce/Trade - Business	
312	2219 Main St	ca.1920					Commerce/Trade - Business	
317	1907 Broadway St	ca.1926				x	Domestic - Multiple Family House	
319	3409 Main St	ca.1930/1970				x	Social - Meeting Hall	
327	2221 Broadway St	ca.1912				x	Domestic - Single Family House	
328	2414 Broadway St	ca.1941				x	Domestic - Multiple Family House	
331	2312 Main St	ca.1920					Commerce/Trade - Business	
332	1915 Washington St	ca.1909				x	Commerce/Trade - Business	
333	114 W 20th St	ca.1926				x	Domestic - Single Family House	
334	2005 Washington St	ca.1927				x	Domestic - Single Family House	
335	2009 Washington St	ca.1908				x	Domestic - Single Family House	
336	111 W 23rd St	ca.1925			x	x	Domestic - Single Family House	
337	117 W 23rd St	ca.1925				x	Domestic - Single Family House	
338	121 W 23rd St	ca.1925				x	Domestic - Single Family House	
339	111 W 24th St	ca.1924				x	Domestic - Single Family House	
342	2413 Main St	ca.1955				x	Commerce/Trade - Business	
343	2407 Main St	ca.1950					Commerce/Trade - Business	
344	1929 Main St	ca.1925				x	Commerce/Trade - Business	
347	1914 Broadway St	ca.1921				x	Commerce/Trade - Professional	

Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
348	1920 Broadway St	ca.1910				x	Commerce/Trade - Professional	
349	2000 Broadway St	ca.1914				x	Commerce/Trade - Professional	
350	2008 Broadway St	ca.1920				x	Domestic - Single Family House	
351	2214 Broadway St	ca.1927				x	Domestic - Multiple Family House	
352	2218 Broadway St	ca.1929			x	x	Domestic - Multiple Family House	Wisteria Court - Uptown Villa Apartments
354	111 W 27th St	ca.1912					Domestic - Single Family House	
355	112 W 28th St	ca.1910					Domestic - Single Family House	
356	110 W 28th St	ca.1916					Domestic - Single Family House	
357	123 W 29th St	ca.1928					Domestic - Single Family House	
358	121 W 29th St	ca.1937					Domestic - Single Family House	
359	115 W 29th St	ca.1915					Domestic - Single Family House	
360	111 W 29th St	ca.1915					Domestic - Single Family House	
361	120 W 33rd St	ca.1947					Domestic - Multiple Family House	
367	Vancouver, WA	start 1908				x	Transportation - Rail-Related	Burlington Northern Railroad
368	610 E 5th St	ca.1903-04	x				Defense - Military Facility	Post Hospital (HQ 6229th USAR School)
369	1105 E 5th St	ca.1904-1921	x				Transportation - Air-Related	Pearson Airfield
381	Vancouver, WA	ca.1917/1958	x				Transportation - Road-Related (vehicular)	I-5 Bridge
382	1601 E 4th Plain Blvd	ca.1941					Unknown	US Army Barnes General Hospital Communications Building
900	4201 Main St	ca.1848			x		Unknown	Covington House
917	4201 Main St						Unknown	Vancouver Obelisk

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Historic ID	Address	Date of Construction	National Register of Historic Places (NRHP)	State Register	Local Register	Previously Inventoried	Current Building Use	Historic Name
918	601-850 E Evergreen (also known as Officers Row)	1878-1907	x				Commerce/Trade - Professional	Officers Row
993	800 E 4oth St	ca.1933				x	Landscape - Park	Kiggins Bowl
OR1	1441 North Marine Drive, Portland, OR	1960					Commerce/Trade - Business	Pier 99
OR2	Portland, OR	1916-1960	x				Unknown	Columbia Slough Levee

APPENDIX F

References

Columbia River CROSSING

Appendix F

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APPENDIX G
List of Preparers

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Appendix G

List of Preparers

Name, (Registration)/ Affiliation	Project Role	Education	Years of Experience
Sine Adams/PB	Author, Transit Technical Report	MS, Urban and Regional Planning BA, Geography	2
Mike Baker, PE/DEA	Author, DEIS Transportation	MS, Civil Engineering BS, Civil Engineering	16
Debora Byrd/Parametrix	Document Production		20
Theresa Carr, AICP/ CH2M HILL	Author, Economics Technical Report	MA, Economics MS, Urban and Regional Planning	10
Peter Chen/Parametrix	Author, Energy Technical Report	MS, Transportation Engineering BA, Environmental Studies BS, Biology	4
Derek Chisholm, AICP/ Parametrix	Built Environment Lead, Author, DEIS, Land Use Technical Report, Environmental Justice Technical Report, Visual and Aesthetics Technical Report, Cultural Resources Advisor	MS, Environmental Planning BS, Organizational Management	14
Paul Dailey/DEA	Right-of-way Analyst	BS, Business Administration MPA, Masters of Public Administration	15
Matt Deml, PE/PB	Author, Aviation and Navigation Technical Reports	MS, Civil and Environmental Engineering BS, Civil and Environmental Engineering	9
Michelle Eraut/Federal Highway Administration	Environmental Program Manager, DEIS Reviewer	BS, Aviation Management MPA, Public Administration	12
John Evans/Parametrix	Author, Parks and Recreation Technical Report	BA, Planning and Public Policy and Politics	21

Name, (Registration)/ Affiliation	Project Role	Education	Years of Experience
Quinn Fahey/Parametrix	Author, Neighborhoods and Populations Technical Report	MS, Urban and Regional Planning BA, Planning, Public Policy, and Management	6
Tina Farrelly/Parametrix	Author, Wetlands and Jurisdictional Waters Technical Report	BS, Biological Sciences	6
Doug Ficco, PE/WSDOT	Columbia River Crossing Project Co-Director	BS, Structural Engineering	32
Mike Gallagher/Parametrix	Cultural Environment Lead	MS, Resource Geography, Anthropology BS, Anthropology	27
Susan Garland/Parametrix	Lead Technical Editor, Author, DEIS	MS, Environmental Science and Resources Grad. Cert. Technical Writing BA, English	10
Linda Gehrke/Federal Transit Administration	Deputy Regional Administrator, DEIS Reviewer	BA, Geography MPA, Policy Administration	26
Jeff Graham, PE/Federal Highway Administration	Area Engineer, DEIS Reviewer	BS, Civil Engineering	18
Cameron Grile, EIT/DEA	Author, Traffic Technical Report, DEIS Transportation	MS, Civil Engineering BS, Civil Engineering	4
Heather Gundersen/ODOT	Environmental Manager	MS, Urban and Regional Planning BS, Environmental Science	7
Craig Hainey/Parametrix	GIS Analyst	BS, Political Science	10
William Hall/Parametrix	Natural Environment Lead	MS, Biology BS, Biology	15
Michael Harrison/Parametrix	Author, Public Involvement Appendix, Agency and Tribal Coordination Appendix, Public Comment Reports, Environmental Justice Advisor	MS, Urban and Regional Planning BA, Political Science	14
Bob Hart/RTC	Local Sponsor, DEIS Reviewer	BS, Political Science	25
Elizabeth Healy/Federal Highway Administration	Area Engineer, DEIS Reviewer	BS, Civil Engineering	13
Jeff Heilman, AICP/Parametrix	Environmental Manager, Author, DEIS	MS, Urban and Regional Planning BS, Biology	20
Zachary Horowitz/DEA	Author, Traffic Technical Report, DEIS Transportation	MS, Civil Engineering BA, Geography	3

Name, (Registration)/ Affiliation	Project Role	Education	Years of Experience
Jennifer Hughes/Parametrix	Author, Public Services Technical Report	MS, Urban and Regional Planning BS, Physical Geography	7
Rosalind Keeney/Parametrix	Author, Historic Built Environment Technical Report		26
Roger Kitchin/CH2M HILL	Author, Conceptual Stormwater Design Report, Utilities Technical Report	BS, Civil Engineering MBA	35
Jim Koloszar/Parametrix	Lead GIS Analyst	BS, Wildlife Science Grad. Cert. GIS	19
Mara Krinke/Parametrix	Author, Acquisitions and Cumulative Effects Technical Reports	MA, Public Affairs BA, Economics BA, Botany	12
Alan Lehto/TriMet	Local Sponsor, DEIS Reviewer	BA, Psychology MS, Personality and Social Psychology MS, Masters in Urban and Regional Planning	14
Ryan LeProwse, PE/DEA	Author, Traffic Technical Report, DEIS Transportation	BS, Civil Engineering	8
Margi Lifsey/ODOT	Environmental Coordinator, Author, Agency and Tribal Coordination Appendix, Stacked Transit/Highway Bridge Technical Memorandum	JD, Law, Certificate in Environmental and Natural Resources Law BS, Environmental Science	15
Jennifer Lord/Parametrix	Author, Ecosystems Technical Report	MS, Forest Sciences BS, Natural Resource Management BA, French Literature	8
Sharon Love, PE/Federal Highway Administration	Environmental Program Manager, DEIS Reviewer	BS, Civil Engineering	20
Mike Marshall/Parametrix	Author, Geology and Soils Technical Report	BS, Geology	4
Karen Martinek/Parametrix	Lead Graphic Artist	AAS, Graphic Design MS, Journalism BA, English	10
Gary Maynard, AICP/ Parametrix	Author, EMF Technical Report, Energy Advisor	BA, Geography	21
John McAvoy/Federal Highway Administration	Major Project Manager, DEIS Reviewer	BS, Environmental Technology	20
Colin McConnaha/ Parametrix	Assistant Environmental Manager, Author, DEIS, Mill Plain MOS Technical Memorandum (Lead)	MS, Urban and Regional Planning BS, Biology BS, Geography	4

Name, (Registration)/ Affiliation	Project Role	Education	Years of Experience
Allan McDonald, PE/DEA	Author, DEIS Transportation	BS, Civil Engineering	30
Cheryl McNamara/Washington State Department of Transportation	Environmental Projects, DEIS Reviewer	BS, Environmental Studies	10
Rick Minor/Heritage Research Associates	Author, Archaeology Technical Report	PhD, Anthropology MA, Anthropology	35
Michael Minor/Michael Minor & Associates	Author, Noise and Vibration Technical Report	BA, Physics BA, Mathematics	19
Bernadette Niederer/ Parametrix	Historic Resources DAHP Database	MS, Historic Preservation BA, Cultural Anthropology	6
Dawn J. Nilson/Parametrix	Author, Hydrology and Water Quality Technical Report	BS, Environmental Resources Management	23
John Osborn, PE/ODOT	Columbia River Crossing Project Co-Director	MS, Engineering BS, Engineering	20
Julie Osborne/Parametrix	Author, Historic Built Environment Technical Report	MS & BS, Architectural Studies/Historic Preservation	16
David Parisi, PE/ Parisi & Assoc.	Traffic Consultant Manager, Author, DEIS Transportation, Traffic Technical Report	BS, Civil Engineering	22
Jodi Peterson/Federal Highway Administration	Civil Rights Program Manager, DEIS Reviewer		
Dan Pitzler/CH2M HILL	Author, Economics Technical Report	MA, Economics BA, Economics	23
Saundra Powell/Parametrix	Document Production Lead, Historic Resources DAHP Database	BA, English Literature	17
Carol Lee Roalkvam/Washington State Department of Transportation	Policy Branch Manager, DEIS Reviewer	MA, Environmental Studies/Policy BA, History and Anthropology	15
Donna Robinson, ASLA/ Parametrix	Senior Reviewer	BS, Landscape Architecture MA, Architecture/ Urban Design	23
Eric Roth/Parametrix	Author, Hazardous Materials Technical Report	MS, Geology BS, Geology	12
Steve Saxton/Federal Transit Administration	Transportation Program Specialist, DEIS Reviewer	BS, Civil Engineering	12

Name, (Registration)/ Affiliation	Project Role	Education	Years of Experience
Steven Siegel/ Siegel Consulting	Author, Financial Chapter	BS, Industrial Engineering, Operations Research MS, Industrial Engineering, Operations Research JD, Law	31
Gregg Snyder/PB	Transit Consultant Manager, Author, DEIS Transit, Transit Technical Report	MS, Transportation Planning BA, Political Science	16
Kris Strickler, PE/WSDOT	Deputy Project Director	BS, Civil Engineering	8
Anne Sylvester, PTE/ Parametrix	Author, DEIS Transportation	BA, Economics	34
Christine Sylvester/ Parametrix	Author, DEIS Transportation	BA, International Political Science	4
Megan Taylor/Parametrix	Environmental Team Coordinator, Author, DEIS	BA, Environmental Studies	1
Kathryn Toepel/Heritage Research Associates	Author, Archaeology Technical Report	PhD, Anthropology MA, Linguistics MS, Anthropology	31
Virginia Tsu/Federal Highway Administration	Right-of-Way/Civil Rights Manager, DEIS Reviewer		
Ted Uyeno/Federal Transit Administration	DEIS Reviewer	JD, Law	20
Susan Wessman/Parametrix	Author, Visual and Aesthetics Technical Report	MS, Landscape Architecture MS, Applied Physics BA, Physics	27
Roger Whitaker/ Michael Minor & Associates	Author, Noise and Vibration Technical Report	BS, Mechanical Engineering	14
Christina Weber/DEA	Right-of-way Specialist	BA, Communications/Video Production	6

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APPENDIX H
List of Recipients

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Appendix H

List of Recipients

Government Agencies

Federal Agencies

Advisory Council on Historic Preservation

Federal Highway Administration

Federal Railroad Administration

Federal Transit Administration

Federal Aviation Administration

National Oceanic and Atmospheric Administration, National Marine Fisheries Service

National Park Service

U.S. Army Corps of Engineers

U.S. Army, Military Reserves

U.S. Coast Guard

U.S. Department of the Interior

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

FHWA Western Federal Lands Highway Division

United States Congress

Senator Ron Wyden

Senator Gordon Smith

Senator Patty Murray

Senator Maria Cantwell

Rep. Brian Baird

Rep. Earl Blumenauer

Rep. David Wu

Rep. Darlene Hooley

Rep. Peter DeFazio

Rep. Greg Walden

Rep. Rick Larson

Rep. James Oberstar

State Agencies

Washington

Office of the Attorney General

Office of the Governor

Senate and House Transportation Committees

Washington State Department of Archaeology and Historic Preservation

Washington State Department of Ecology

Washington State Department of Fish and Wildlife

Washington State Department of Natural Resources

Washington State Recreation and Conservation Office

Oregon

Office of the Attorney General

Office of the Governor

Oregon Department of Environmental Quality

Oregon Department of Fish & Wildlife

Oregon Department of Land Conservation and Development

Oregon Department of State Lands

Oregon State Historic Preservation Organization

Oregon Transportation Commission

Senate and House Transportation Committees

Regional and Local Jurisdictions

Washington

C-TRAN

City Center Redevelopment Authority

City of Battle Ground

City of Camas

City of Ridgefield

City of Vancouver

City of Vancouver, Water Resources Education Center

City of Washougal

Clark County Community Development Department

Clark County Commission

Clark County Development Services

Clark Public Utilities

Cowlitz County

National Park Service, Fort Vancouver National Historic Site

Port of Vancouver

Southwest Clean Air Agency

Southwest Regional Transportation Council (RTC)

Vancouver City Council

Vancouver Housing Authority

Oregon

City of Gresham

City of Portland Bureau of Environmental Services (BES)

City of Portland Bureau of Development Services

City of Portland Bureau of Water Works

City of Portland Department of Transportation

City of Portland Fire and Rescue

City of Portland Office of Neighborhood Involvement

City of Portland Police Bureau

City of Portland Parks and Recreation

City of Portland Planning Bureau

Metro

Multnomah County Commission

Port of Portland

Portland City Council

Portland Development Commission

TriMet

Native American Tribes

Chinook Tribe

Columbia River Intertribal Fish Commission

Confederated Tribes of Grande Ronde

Confederated Tribes of the Umatilla Indian Reservation

Confederated Tribes of Warm Springs

Cowlitz Indian Tribe

Nez Perce Tribe

Siletz Tribe

Spokane Tribe

Yakama Nation

Columbia River Crossing Project Committees

Bicycle and Pedestrian Advisory Committee

Columbia River Crossing Task Force

Community and Environmental Justice Group (CEJG)

Freight Working Group

InterCEP

Urban Design Advisory Group

(All members of these groups will be contacted individually)

Libraries

Public Libraries

Fort Vancouver Regional Library

Multnomah County Library

University and College Libraries

Clark College Library

Portland State University Library

Portland Community College, Cascade Campus

Washington State University Library, Vancouver Campus

University of Portland Library

Community and Special Interest Organizations

Neighborhood Associations

Washington

Arnada

Carter Park

Central Park

Esther Short

Hough

Hudson's Bay

Lincoln

Northwest

Rose Village

Rosemere group

Shumway

West Minnehaha

West Hazel Dell

Neighborhood Associations Council of Clark County

Meadow Homes

Oakbrook

Vancouver Heights

Pleasant Highlands

Oregon

Arbor Lodge

Bridgeton

East Columbia

Hayden Island Neighborhood Network (HINooN)

Hayden Island Mobile Home Owners and Renters Association

Humboldt

Jantzen Beach Moorage, Inc.

Kenton

North Portland Neighborhood Services (coalition office)

Overlook

Piedmont

St. Johns

Community Centers

Esther Short Building

Marshall Center

Lupke Center

Firstenburg Center

Peninsula Park Community Center

St. Johns Community Center

Matt Dishman Community Center

University Park Community Center

Schools

Evergreen School District

Portland Public Schools

Vancouver School District

Washington State School for the Blind

Washington School for theDeaf

Business Associations

Washington

Battle Ground Chamber of Commerce

Camas-Washougal Chamber of Commerce

Clark County Chamber of Commerce

Columbia River Economic Council

Columbia River Towboat Association

Cowlitz Economic Development Council

Identity Clark County

Greater Vancouver Chamber of Commerce

North Clark County Chamber of Commerce

Northwest Natural Gas

Uptown Village Association

Vancouver's Downtown Association

Washington Freight Mobility Strategic Investment Board

Washington Office of Minority and Women's Business Enterprises

Washington Trucking Association

Oregon

African American Chamber of Commerce

Bank of America

Clackamas County Business Alliance

Columbia Pacific Building Trades

East Metro Economic Alliance

Hispanic Metropolitan Chamber

Kenton Business Association

North Portland Business Association

North/Northeast Business Association

Starboard Alliance Company

Swan Island Business Association

Columbia Corridor Association

Philippine American Chamber of Commerce

Portland Business Alliance

Portland Freight Committee

Portland Oregon Visitors Association

Oregon Association of Minority Entrepreneurs

Oregon Business Association – Transportation Committee

Oregon Freight Advisory Committee

Oregon Native American Chamber of Commerce

Oregon Trucking Association

Urban League of Portland

Westside Economic Alliance

Community Groups

Bicycle Transportation Alliance

Coalition for a Livable Future

Columbia Pacific Building Trades

Environmental Justice Action Group

Friends of Clark County

Vancouver National Historic Reserve Trust

1,000 Friends of Oregon

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APPENDIX I

List of Technical Reports and Memoranda

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Appendix I

List of Technical Reports and Memoranda

Acquisitions Technical Report
Air Quality Technical Report
Archaeology Technical Report
Aviation Technical Report
Conceptual Stormwater Design Report
Cost Risk Assessment Final Report
Cumulative Effects Technical Report
Economics Technical Report
Ecosystems Technical Report
Electromagnetic Fields Technical Report
Energy Technical Report
Environmental Justice Technical Report
Geology and Soils Technical Report
Hazardous Materials Technical Report
Historic Built Environment Technical Report
Hydrology and Water Quality Technical Report
Land Use Technical Report
Navigation Technical Report
Neighborhoods and Population Technical Report
Noise and Vibration Technical Report
Parks and Recreation Technical Report
Public Services Technical Report
Transit Alignment Options Maps
Traffic Technical Report
Transit Technical Report
Stacked Transit/Highway Bridge Memorandum
Utilities Technical Report
Visual and Aesthetics Technical Report
Wetlands and Jurisdictional Waters Technical Report
These supplemental documents are available on the CD included with this document.

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APPENDIX J

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APPENDIX K
Glossary

Columbia River
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Appendix K

Glossary

Auxiliary Lanes: Can improve safety reduce congestion by accommodating cars and trucks entering or exiting the highway or traveling short distances between adjacent interchanges, and reduce conflicting weaving and merging movements. This is especially important at the river crossing, where three large interchanges (Marine Drive, Hayden Island, and SR 14) all have traffic entering and exiting I-5 within a 1.5 mile segment.

Average: The average traffic condition is defined as the vehicle flow on a weekday during the average month for a given time period, usually Tuesday, Wednesday, or Thursday.

Community Cohesion: Measures how well residents can connect with one another within their community. These connections can occur at gathering places such as schools, community centers, parks, or transit stations. High home ownership rates and active neighborhood associations also contribute to cohesion.

Community Resources: Typically include educational, religious, health care, cultural, or recreational facilities.

Congestion: For highways, congestion occurs when average speed is below 30 mph.

Couplet: A fixed method of routing two directions of travel on two adjacent, parallel streets, instead of placing both directions of travel on a single street. For example, the HCT couplet design Broadway would place northbound transit vehicles on Broadway, and southbound transit vehicles on Washington.

CRC CEI: Measures the total annualized cost per transit guideway river crossing.

Demand: The total number of users attempting to access the transportation system, including those caught in congestion.

Express bus: Operates point-to-point service, generally during peak times, typically connecting outlying points to business cores without intermediate stops.

FTA CEI: Measures the incremental transit cost per incremental transit passenger over the No-Build Alternative.

Glide: A section of stream with little or no turbulence.

Guideway: A transit right-of-way separated from general purpose vehicle transit. A guideway may have train tracks or separated bus lanes.

Headway: Amount of time that elapses between two transit vehicles passing the same point traveling in the same direction on a given route.

Hydrology: Refers to the flow of water—its volume, where it drains, and how quickly the flow rate changes in a storm.

Limited bus: Operates only during the peak period on weekdays and has a stop spacing of one-half to one mile.

Liquefaction: A phenomenon associated with earthquakes in which sandy to silty, water-saturated soils behave like fluids. As seismic waves pass through saturated soil, the structure of the soil distorts, and spaces between soil particles collapse, causing ground failure. In general, young, loose sediment and areas with high water tables are the most vulnerable to liquefaction.

Local bus: Operates throughout the day and week with frequent stop spacing.

Mode Split: The percentage travel by different forms of transportation, typically single-occupant vehicles, high-occupancy vehicles (two or more persons in a car), transit, walk, and bicycle.

Non-Revenue Hours: Hours of transit service that are unavailable to paying riders.

Other CEI: Measures the total annual incremental operating cost per place mile.

Peak Period: This is a more technically defined description of "rush hour", when travel patterns generate the most traffic, especially in a certain direction.

Performance Standards: Local traffic impacts are measured by impacts to intersection LOS, delay, and queuing. WSDOT, ODOT, the City of Vancouver and the City of Portland all have definable standards for intersections. Further description of these standards can be found in the Traffic Technical Report.

Piles: Large-diameter steel pipes hammered or drilled into the soil until they reach dense soil or bedrock. The piles provide support to hold the weight of the bridge and traffic. Piles also provide stability in the event of an earthquake.

Platform Hours: Total of Revenue and Non-Revenue Hours of transit service.

Pool: A deep, slow moving area with smooth water surface.

Queuing: Occurs when traffic lanes cannot fit all the vehicles trying to use them, or if the line at an intersection extends into an upstream intersection.

Revenue Hours: Hours of transit service available for carrying paying riders.

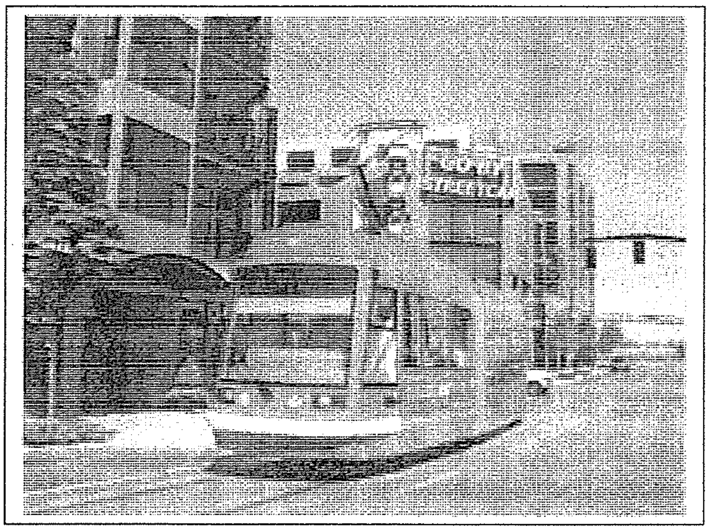
Riffle: A shallow, fast-moving stream section with water broken by rocks and boulders.

Throughput: The number of users being served at any time by the transportation system.

Vehicle Hours of Delay: Cumulative delay experienced by transit vehicles during high traffic periods.

Water Quality: Refers to the characteristics of the water—for example, its temperature and oxygen levels, how clear it is, and whether it contains pollutants.

PORTLAND STREETCAR
DEVELOPMENT ORIENTED TRANSIT



PREPARED BY THE OFFICE OF TRANSPORTATION
AND
PORTLAND STREETCAR, INC.

PORTLAND, OREGON

Sam Adams, City Commissioner
Michael Powell, Board Chair

April 2008

Portland Streetcar
Development Oriented Transit
April 2008

On July 20, 2001, the Portland Streetcar opened and became the first modern streetcar system in North America. It is part of a unique public/private strategy to link investment in high quality transit service with major redevelopment.

Like many other cities, Portland is growing in population and is proactively looking for ways to promote economic development while managing growth. Keeping Downtown Portland healthy is critical to the region's economic stability. The Portland Streetcar is at the heart of a new approach to shaping cities that promotes investment at the City's core, provides homes for people of diverse income groups and supports the urban amenities that make great cities great. Since 1997 when the original streetcar alignment was identified, properties along its length have experienced significant changes:

- $3.5 billion has been invested within two blocks of the streetcar alignment.
- 10,212 new housing units and 5.4 million square feet of office, institutional, retail and hotel construction have been constructed within two blocks of the alignment.
- 55% of all CBD development since 1997 has occurred within 1-block of the streetcar and properties located closest to the streetcar line more closely approach the zoned density potential than properties situated farther away.
- Developers are building new residential buildings with significantly lower parking ratios than anywhere else in the region.

Development Oriented Transit

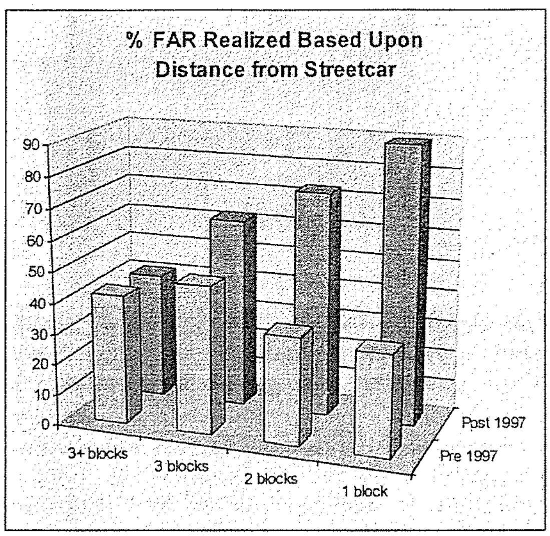
The Portland Streetcar was initiated by the City of Portland to connect two major redevelopment areas: 70 aces of abandoned rail yards and a contaminated brownfield site just north of Downtown (the River District) with another 128 acres of largely underused or vacant industrial land requiring environmental remediation at the opposite end of Downtown (the South Waterfront).

Over the 17-year evolution of the Portland Streetcar, the goals have remained consistent:

- Use a commitment to a high quality transit service as an incentive for high density mixed-use development within the Central City. Link neighborhoods with a convenient and attractive transportation alternative and attract new transit ridership.
- Connect major attractions in the Central City with high quality transit.
- Build and operate in mixed traffic and on existing right-of-way at lower cost than other fixed rail options. Fit the scale and traffic patterns of existing neighborhoods.
- Reduce short inner-city auto trips, parking demand, traffic congestion and air pollution.

Development Density and Concentration

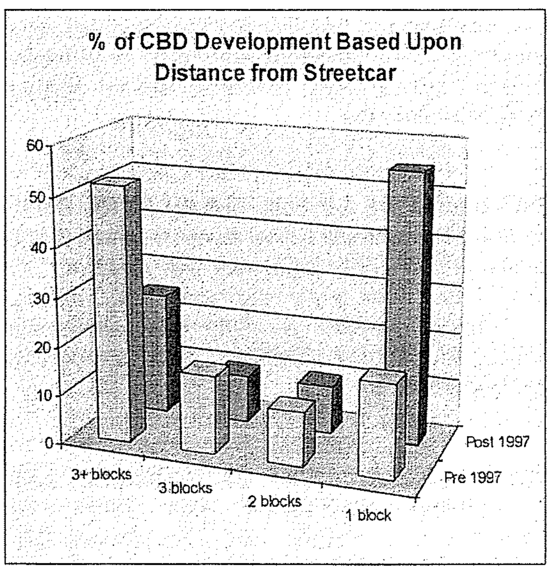
The Streetcar investment has become the centerpiece of a significant shift in the density and location of new development within Portland's Central Business District. In a 2005 study, E.D. Hovee & Company found that the "properties located closest to the streetcar line have experienced the largest share of development – and at Floor Area Ratios (FARs) that more closely approach the properties' zoned density potential – than properties situated further from the streetcar alignment."



Prior to 1997, new projects were built to less than half of the allowable density allowed on a site in the CBD.

Since the streetcar alignment was chosen in 1997, new development achieved an average of 90% of the FAR potential within one block of the streetcar line. This percentage steadily drops to 43% at three or more blocks from the alignment.

Source: ED Hovee & Company, *Portland Streetcar Development Impacts*, October 2005



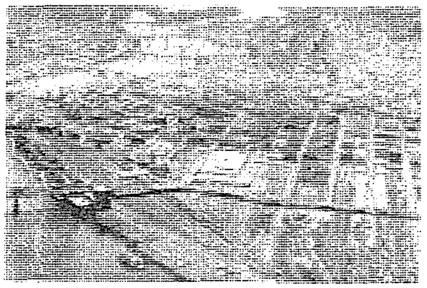
Prior to 1997, land located within one block of the streetcar alignment captured 19% of all development.

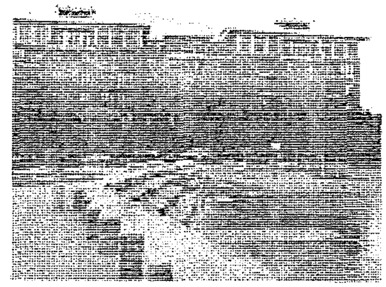
Since the streetcar alignment was identified, 55% of all new development within the CBD has occurred within one block of the streetcar.

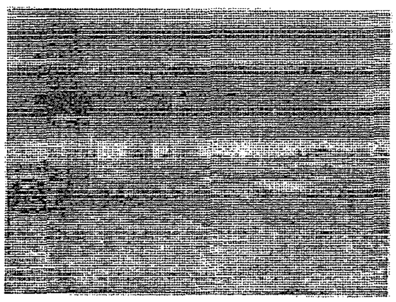
Source: ED Hovee & Company, *Portland Streetcar Development Impacts*, October 2005

Development Impacts

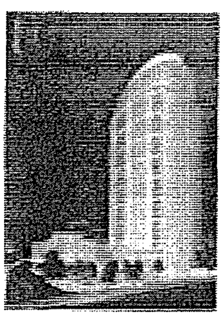
The River District/Pearl District. Where once there was a contaminated railyard, a new neighborhood has emerged. New grocery stores, restaurants, galleries, shops and banks now line the streets. Portland Streetcar goes through the heart of this area, stopping every two or three blocks and providing high quality transit access for business and residents.



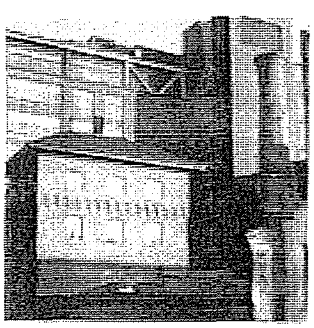




New Urban Neighborhoods. The streetcar, limited parking and excellent pedestrian amenities have combined to create a new urban living option in Portland. It serves not only those living and working along the alignment, it brings new people into parts of the central city they may not have experienced before. It has served as an economic boost to businesses along the alignment while preserving much-needed auto access. It provides direct access to employment, educational facilities and health care for residents with a mix of incomes. The Streetcar has been seamlessly integrated into TriMet's regional transit system, further enhancing its effectiveness.



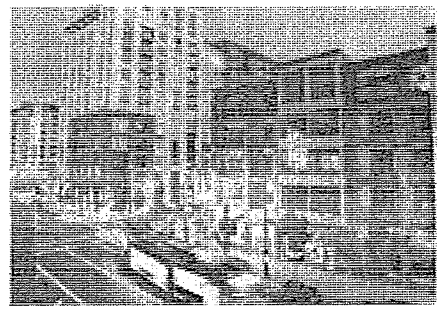
South Waterfront. At full build-out by 2015, South Waterfront development will bring a minimum of 5,000 housing units and 10,000 jobs into the Central City along with a major river greenway and park, parking, emerging Oregon Health & Sciences University development, educational facilities and supporting retail goods and services.



The Brewery Blocks. One of Portland's most significant building renovations has been the redevelopment of the historic and abandoned Blitz Weinhard Brewery. This five-block project on the Streetcar line is Portland's largest single development involving commercial, residential and retail uses.

Development Lessons Learned

Public and Private Responsibilities. The enormous success of linking transportation investments with development can be replicated in municipalities that have one or more large development sites with owners who are willing to work together to advance a common vision. The City's obligation has been to provide a stable source of funding to build public improvements. The developers' obligation has been to contribute to the infrastructure costs and commit to build high-density, mixed-income housing meeting the City's housing targets. From a political standpoint, the ability to point to an agreement with joint obligations of the respective public and private partners carries substantial clout and provides dependability and flexibility that both parties can rely upon.



Development Agreements. The Portland Development Commission (PDC) negotiated a Master Development Agreement with Hoyt Street Properties, owners of a 40-acre brownfield in the heart of the River District. The Agreement tied development densities to public improvements with the minimum required housing density increased incrementally from 15 to 87 units per acre when the Lovejoy Viaduct was deconstructed, to 109 units/acre when the streetcar construction commenced and 131 units/acre when the first neighborhood park was built. The developer has stated that without the Streetcar and the accessibility it provides, these densities would not have been possible. The agreement was a unique and essential piece of the public/private partnership that catalyzed development of the River District and serves as a model for the agreement established for in South Waterfront.

Local Improvement District. The innovative $19.4 million Streetcar Local Improvement District (LID) has been a useful tool and includes those property owners that stand to receive the greatest financial benefit from their proximity to the Streetcar. This, coupled with other public and private resources, helped fund both the Streetcar and the critical investments in the urban environment that complement the higher density vision for the area.

Stakeholder Involvement. Involving stakeholders in the Streetcar project design has been absolutely critical to its success and expansion. Without public support, projects of this magnitude can get bogged down to the degree that the public investment cannot move in tandem with development. The individuals and agencies that make up Portland Streetcar, Inc. are nimble and astute individuals that make the Streetcar a development investment that you can count on. In addition, a whole new interest group is emerging composed of those devoted to high-density urban living—a perspective that didn't exist before.

Reduced Parking. The success of early projects in the River District demonstrated a market demand for a new type of higher density community—one that supports living with or without a car. Due in part of the high quality transit service provided by Streetcar, developers are able to construct mixed use projects with parking ratios lower than found elsewhere in the city. Reducing the amount of parking that a developer must build makes a building more financially feasible. Now, with a full understanding of the role that Streetcar can play in affecting the urban environment and market confidence in urban living, developers have begun construction on larger, higher-risk projects in South Waterfront. The first River District projects were six stories—South Waterfront has started with 21 to 35-story condominium towers.

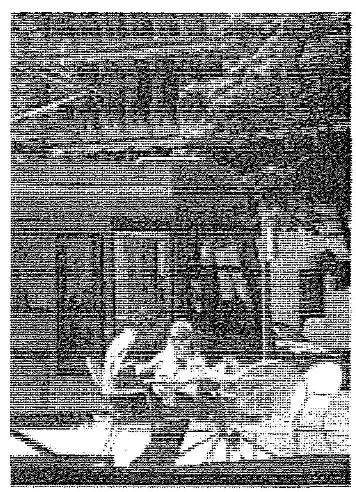
Underlying Values

Improving Livability. Development oriented transit supports improved livability for high density environments that support public goals for urban containment, sustainable living and rèduced dependence on an automobile. But higher density development does not always mean a more "livable" community. In the case of development near Streetcar; however, the package includes parallel public and private efforts to ensure that affordable housing, public open spaces, brownfield redevelopment, high quality urban design and public art occur in unison.

Fit Within the Urban Environment. Design tradeoffs were made to better fit the Portland Streetcar into the scale and traffic patterns of the neighborhoods through which it travels. Streetcar vehicles, manufactured in the Czech Republic, are 8 feet wide and 66 feet long. They run in mixed traffic and, except at stops, accommodate existing curbside parking and loading. Streetcar stops occur every few blocks and shelters are smaller to fit within the neighborhood's architecture.

Economical Construction and Operation. The Streetcar technology is less expensive than other forms of fixed-rail transportation. The project is designed so that the system is economical to build and operate. There were four critical design principles: 1) use available rights-of-way; 2) limit the investment in facilities to essentials, 3) to the extent possible, use off-the-shelf equipment, 4) operate the system on a safe, no-frills basis, and 5) use construction methods that minimize costs. The project was also designed to avoid costly expenses associated with relocating utilities and the stations were developed similar to bus stops to reduce system costs.

Partnerships Matter. The City of Portland owns the Streetcar while Portland Streetcar Inc (PSI), a nonprofit corporation, is responsible for designing, managing construction and operating the system. The PSI Board is made up of individuals representing the perspectives of citizens, city agencies and property owners along the Streetcar alignment. The trade-offs made in this type of decision-making body have continued to make the Portland Streetcar a better project by serving the needs of a diverse community.



Minimize Disruption to Businesses and Residents. Project design and construction methods were designed to build the Streetcar quickly and efficiently to minimize construction impacts on adjacent businesses and residents. In addition, design decisions were made with implications for the ultimate Streetcar operations by preserving on-street parking, keeping construction within the existing right-of-way and sharing the streetcar lane with autos. The project also placed a very high priority on responsiveness to inquiries received from adjacent property owners throughout the construction process.

System Description

Key Milestones: In 1990, the City of Portland initiated a feasibility study for the Streetcar, hired a project manager, established a Citizen Advisory Committee (CAC) and began hosting a series of public meetings with a plan emerging at the end of that year. Key project milestones include:

1992	City of Portland secures $900,000 federal HUD grant and matches with local funds
1995	May, City issues RFP to design, build, operate and maintain Streetcar. The nonprofit corporation, Portland Streetcar Inc is selected
1999	May, Construction begins from Legacy Good Samaritan Hospital to Portland State University
2001	January, Project Substantial Completion
2001	July, Begin passenger service
2005	March, Streetcar service to RiverPlace begins
2006	October, Service to South Waterfront & Portland Aerial Tram Connection
2006	Loop Extension alignment selected
2007	August, Service into South Waterfront begins

Financing. Locally funding the $56.9 million, 2.4 mile first phase made the Streetcar a unique transportation project. The total Phase 1 project cost was under $25 million per alignment mile and included purchase of seven vehicles. Total capital construction costs for the .6 mile extension to RiverPlace was $16 million or $13 million per track mile and included a new roadway on a retained structure to provide access to properties along the riverfront in preparation for an extension to South Waterfront. The capital budget for the .6 mile single-track extension from RiverPlace to Gibbs Street was $15.8 million, or $13 million per track mile, and included purchase of three vehicles. The .4 mile extension from Gibbs to Lowell cost $14.45 million, or $12 million per track mile, and included roadway work. Total capital cost was $103,150,000 for 4.0 mile alignment averaging $12.9 million per track mile.

Funding sources for these phases of the project (in millions) include:

-	$ 28.60	Bonds backed by revenues from a $.20/hour short-term parking rate increase in City-owned parking garages
-	$ 21.50	Tax increment financing from the City's urban renewal agency (PDC)
-	$ 19.40	Property owner contribution through an LID on non-owner occupied residences
-	$ 10.00	Regional transportation funds
-	$ 8.75	City funds
-	$ 2.10	Connect Oregon
-	$ 5.00	Reallocated transit funds from TriMet
-	$ 3.10	Transportation land sale
-	$ 4.70	Other sources
-	**$103.15**	**million total construction costs**

Ridership. When Streetcar initially opened in 2001, the projected ridership target was 3,500 weekday rides. Not only was that target immediately exceeded, ridership by the fall of 2005 grew to over 9,000 riders each week day. Saturday ridership has demonstrated the greatest percentage growth from 3,200 to 9,000 in the past six years. Weekday ridership in the winter of 2007/08 is 11,900 per day.

Management. The City of Portland has contracted with Portland Streetcar, Inc (PSI) for professional services related to the design, construction and operation of the streetcar system. PSI is a private non-profit corporation formed for the single purpose of implementing the Portland Streetcar as a project that will benefit the livability and economic vitality of Portland and its central city. It is governed by a Board of Directors, the members of which come from both the public and private sectors and who represent institutions, businesses and other constituents along the alignment.

For more information, visit the Portland Streetcar website at www.portlandstreetcar.org.

Streetcar-Development Linkage: The Portland Streetcar Loop

Revised Draft

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Tess Jordan, Senior Economic Planner

February 2008

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I. INTRODUCTION

Starting in the mid to late 1800s, streetcar systems were implemented across America. Real estate owners and developers sought to increase sales by connecting their newly-built homes to Central City employment and retail via streetcar transit. Mass marketing of the automobile deflected attention from – and investment in – these systems in the 1900s in all but a handful of cities, including Toronto, New Orleans, Philadelphia and San Francisco.

In 2001, Portland opened a new Central City streetcar line, the first modern streetcar system built in America. Since that time, America appears to have collectively recalled the power of streetcar to support and compliment land use development, and five years later more than 80 American communities were planning for streetcar implementation. Portland is now seeking funding for the extension of its 4-mile streetcar line to a Portland Streetcar Loop encompassing both the west and east sides of its Central City.

Development Oriented Transit

The popularity of streetcar is attributed in part to its relative low cost and ease of construction in comparison with light rail. But perhaps even more so, streetcar's success can be attributed to the notable increases in development that have accompanied implementation in the handful of cities that now have demonstrated *post-streetcar development* track records.

Even more than with light rail, the economic development benefits of streetcar investment appears traceable to streetcar's fine-grained scale and intimate relationship with the street environment. If light rail systems function as highways and arterials, streetcar systems function as the *local streets*. Interest in bringing streetcar to more cities – and the higher density development with which it is associated – is constrained only by funding availability.

FTA Small Starts Funding

In 2005, the U.S. Congress created a *Small Starts* program to fund projects such as streetcar, bus rapid transit and smaller light rail systems. The program – authorized in the Federal Transit Administration – is similar to the existing New Starts program but targets smaller projects costing less than $250 million and receiving no more than $75 million in federal funds. The intent of Congress was to support fixed guideway projects that were lower in cost and to simplify the federal review process.

FTA funding criteria has relied upon a cost-effectiveness rating based substantially on travel time savings. Transit System User Benefit (TSUB) is calculated by determining total benefit and dividing into the total cost of the project. This funding methodology does not recognize or reward the ability of transit investment to influence travel patterns by influencing the built environment, and in doing so, increase transit ridership.

FTA has proposed that Small Starts projects be rated for funding with the same TSUB cost effectiveness measure. The interim rules require that a medium rating on TSUB be achieved for a project to be eligible for funding.

Enabling legislative also includes economic development and proposed rulemaking as a factor in considering projects for funding; the FTA lists "positive effect[s] on local economic development" as one of its three primary criteria. This report suggests a methodology which with to implement this intent.

MEASURING ECONOMIC DEVELOPMENT

This report is intended as a discussion paper for evaluating the *streetcar-economic development nexus* more broadly across the U.S. It ultimately suggests five quantitative measures with which to evaluate streetcar projects seeking federal funding support.

- The first part of this report addresses the relationship between transit and development – particularly high density development – and the evidence that exists for the *streetcar-development linkage as experienced* to date in Portland, Oregon. This analysis also describes and quantifies five public benefits that high density development supports.
- The second part of this report suggests how 'economic development' – operationalized as real estate investment – *can be measured* for proposed Small Starts projects both now and in the future. Three criteria are suggested for evaluating streetcar projects that encompass both the regulatory and market environment. These criteria encompass the basic preparation and research that cities can take to ensure that transit investment is leveraged to the greatest extent possible – to truly yield the public benefits including ridership gains and containment of suburban sprawl that higher density urban development offers.
- Proposed measures include two metrics related to higher density development: global warming and trip reduction. High density development – which streetcar supports – has enormous and measurable impacts on these two key factors that are not currently considered in the FTA evaluation criteria. Calculations are offered on the amount of vehicle miles traveled (VMT) by residents that have chosen to live in the higher density environment supported by streetcar.

For the economic development criteria portion of the report, details are provided on an illustrative basis for the Portland Streetcar Loop Project, which is now seeking funding. This project will extend tracks, stations and service from the west side of the Willamette River (including Portland's historic downtown) across the existing Broadway Bridge to serve the eastern half of Portland's expanding Central City urban environment. The expanded project will serve 18 new and 16 existing stations (and station pairs), bringing new service to the eastside and also essentially doubling service frequency for westside stations.

Two appendices are provided with this report. Appendix A briefly profiles E. D. Hovee & Company, LLC as preparers of this document.

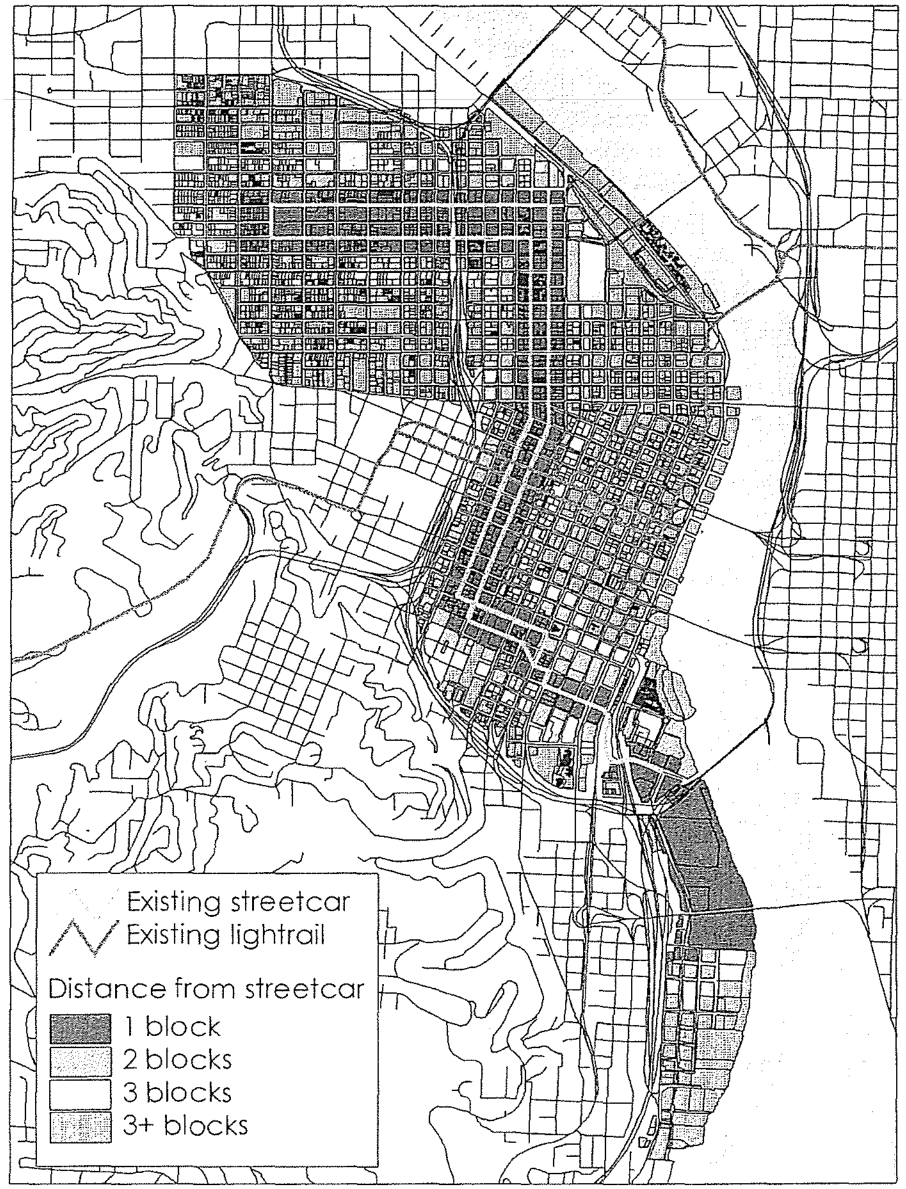
II. STREETCAR-DEVELOPMENT EXPERIENCE

Portland's westside streetcar line was committed in 1997, constructed in 2001, and extended three times by 2006. The now 10 years since initial funding was committed yields a track record of investment and development activity through which the impacts of this investment can be assessed. The observed relationship between Portland Streetcar investment and Portland's built environment supports the conclusion that streetcar promotes adjacent development at urban densities.

Portland's streetcar experience has demonstrated the importance of looking beyond *transit oriented development.* Because of streetcar's role as a development catalyst – not just at station area nodes but along an entire transit corridor – the more appropriate term may be *development oriented transit.* This chapter lists evidence gathered to date of this relationship.

A second focus of this chapter is to outline the broader community benefits of higher density development. These benefits can be conceived of as both public and private return on investment (ROI), and accrue to a city or neighborhood to the extent that high density development occurs.

Figure 1. Westside Streetcar Alignment with Area of Development Impact



Source: 2005, *Portland Streetcar Development Impacts*, E. D. Hovee & Company, LLC.

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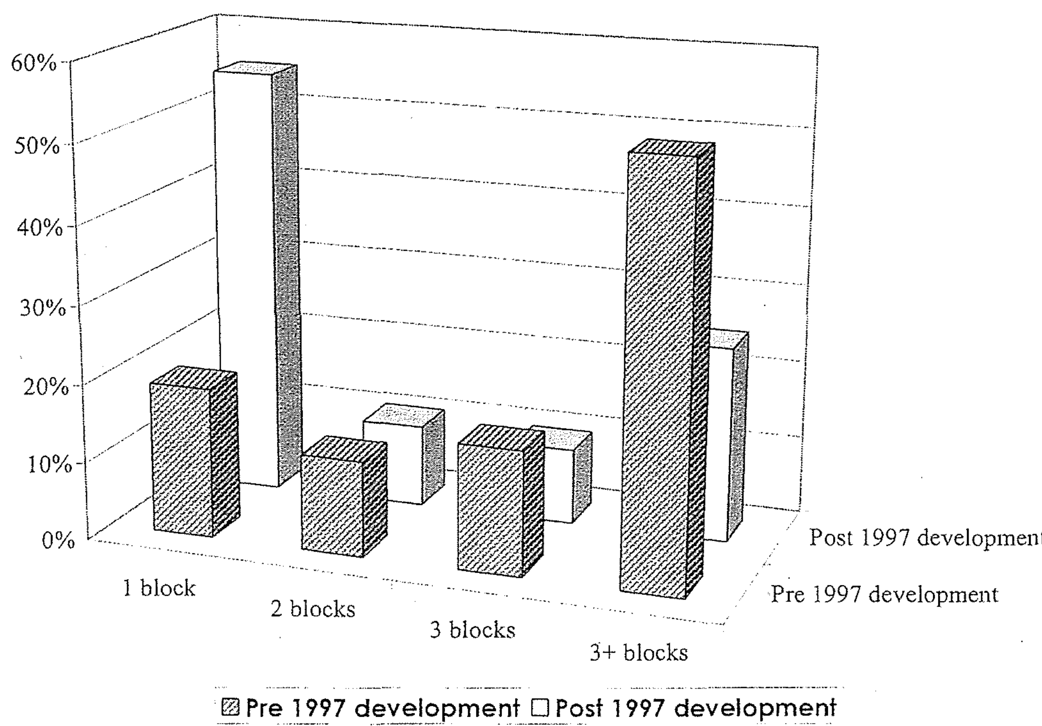
A. STREETCAR PROMOTES HIGH DENSITY DEVELOPMENT

1. *Documented Results:* In Portland, tax assessor records indicate that post-streetcar development clustered near the alignment and achieved higher densities as proximity to the alignment increased.
2. *Developer Confidence:* Interviews with Portland developers and property owners reveal the development community's confidence in the catalytic potential of streetcar investment. Developer confidence may be the first and foremost indicator of successful development oriented transit investment.
3. *Property Owner Participation in Streetcar Investment:* Property owners expect that streetcar investment will increase in land value, as evidenced through the self-imposed taxing districts that have funded five phases of streetcar investment to date.

1. Documented Results: A 2005 study of real estate development within streetcar-served neighborhoods tracked Portland's development trends (pre- and post-streetcar) based on distance from the streetcar alignment.[1] It found that after streetcar investment was secured, lots within *one-block* of streetcar captured 55% of all new development within neighborhoods through which streetcar passed.

Figure 2. Percent of New Development by Distance from Streetcar



Source: E. D. Hovee & Company, LLC, *Portland Streetcar Development Impacts*, prepared for Portland Streetcar, Inc. November 2005.

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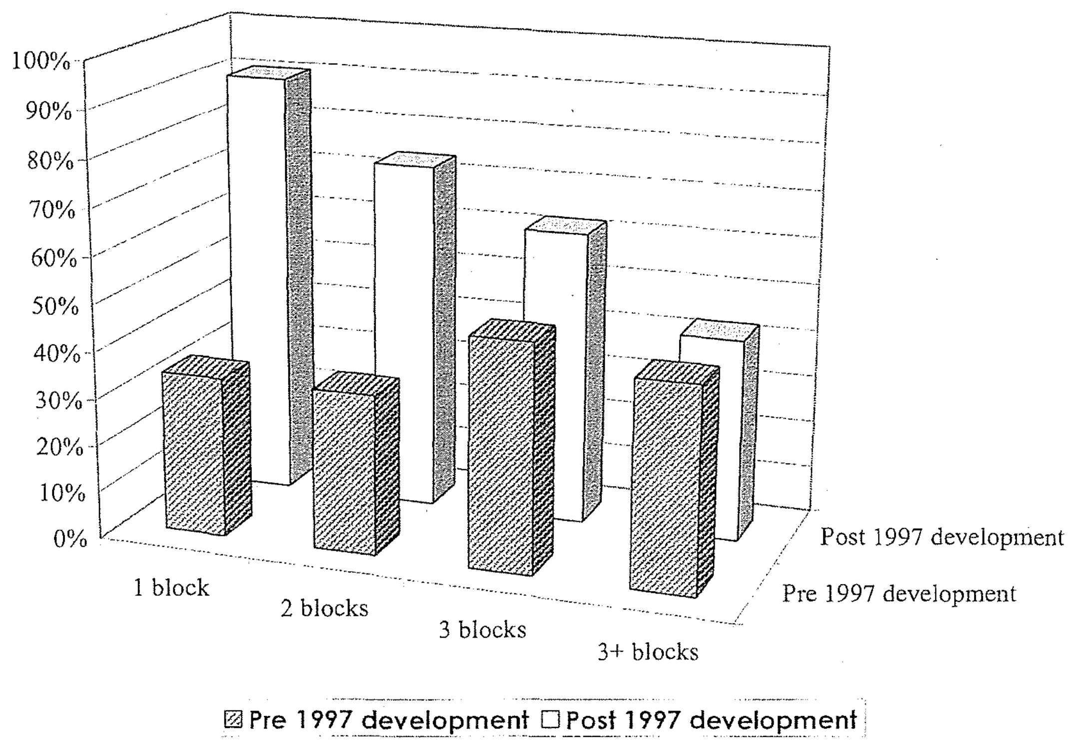
Post-streetcar development was also much denser than development further from the streetcar line. Within one block of the streetcar line, post-streetcar development achieved 90% of the Floor Area Ratio (FAR) the zoning allowed.

The ratio of development experienced to zoned capacity steadily decreased as distance from streetcar increased – to only 43% of FAR for development more than three blocks from streetcar – despite a consistent FAR limit across all neighborhoods considered of around 6.0.[2]

The total estimated value of development along the westside alignment between 1997 – the year in which funding was secured – and January 2006 is more than $2.4 billion.

Figure 3. Density of Development by Distance to Streetcar



Source: E. D. Hovee & Company, LLC.

While this convergence of streetcar investment and high density development does not assert causality – and statistical research methods such as regression/hedonic modeling have not yet been employed – it is increasingly clear that more than chance has influenced Portland's development trends. This observation is based on the strength of the statistical evidence to date combined with what private developers and investors responsible for this change have to say.

Along with streetcar, key factors in recent Portland development have included development agreements with major property owners and consolidated land ownership, both of which

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accompanied the first wave of development activity along the alignment. In Portland today, it is hard to imagine that in 1994 – when the westside alignment was first adopted – zoning within key downtown neighborhoods was a mere 14 units per acre and a market assessment projected potential condo absorption at just 30 units per year.

2. Developer Confidence: Over the past decade, the Portland Streetcar project has been recognized by the real estate and development community as a significant catalyst for redevelopment in Portland's extended downtown core area. Tax assessor records illustrate the catalytic role that streetcar has played to stimulate higher density urban development over the last decade. But the #1 consideration is: what does streetcar mean for developers investing in redevelopment and new construction of residential, commercial and mixed use space?

Interviews with property owners and developers along Portland's existing westside line and planned eastside line consistently indicate that streetcar investment supports development through three primary factors:

- *Timing:* Property owners and developers are willing to invest in an area earlier in the redevelopment trajectory because they recognize streetcar as a sign of public-private sector investment confidence. The investor is more comfortable putting debt and equity capital where others have already put their money. Even when private re-investment is in its early stages, streetcar investment facilitates developer comfort and confidence.
- *Scale:* Increased density means increased investment, and brings greater numbers of households and jobs to a site. Developer and property owner interviews indicate that streetcar investment increases developer comfort with larger buildings and the associated risks (more units to absorb, higher construction costs).
- *Pricing:* Developers indicate willingness to bring higher-end products to the market with the presence of streetcar. With an initial Central City alignment in place and redevelopment along the entire length now realized, developers have judged that streetcar's convenience, cost savings and cachet translates into consumer willingness to pay higher rents and sales prices. Increasingly, transit convenience makes it more possible to forego an automobile, freeing discretional financial resources for a more urban lifestyle. These new market trends, in turn, draw yet higher density projects to market within a shorter time frame.

Members of Portland's development community repeatedly express their confidence in the ability of streetcar to change the built environment. This is evidenced both in Portland's westside (Downtown, NW 23rd, Pearl and South Waterfront Districts) and eastside, for which the extension of the Streetcar Loop is planned.

Developers and property owners near the eastside alignment of the planned Portland Streetcar Loop are incorporating streetcar into their plans for their own properties and for larger neighborhoods. Examples of property owners' comments on the planned eastside alignment are reported below.

"From a development standpoint, streetcar is extremely important. I knew [streetcar was planned] when I bought the property years ago. Any 21st Century development comes down to transportation."

"Streetcar is an enhancement to the building's success and vice versa. The developer isn't opposed to creating units without parking because of the presence of streetcar."

"Streetcar is essential for the hotel and the development of the Convention Center district. The district has to grow for the health of the convention center and its future bookings, and streetcar is integral to that."

3. Property Owner Participation in Streetcar Investment: Lastly, adjacent property owners to the planned eastside alignment have asserted their conviction that streetcar investment increases property value by shouldering $15 million of the cost of streetcar development. This parallels westside experience where property owners have funded $19.4 million of the streetcar investment to date.

Figure 4. Westside Property Owner Contributions to Streetcar

Phase	Total Cost	LID Total	Percent LID	Assessment Methodology
Phase I & 2	$56.9	$9.6	17%	Frontage + rate x total value, 2 zones, rates vary by land use
Phase 3a	$14.4	$3.0	21%	Rate x total value with minimum
Phase 3b	$15.8	$2.0	13%	Rate x total value x distance factor
Phase 3c	$13.4	$4.8	36%	Rate x land area x distance factor
	$100.5	$19.4	19%	

Note: Dollars in millions.

Source: Portland Department of Transportation, E. D. Hovee & Company, LLC.

Local property owner investment has and will continue to occur through the property assessment mechanism of a Local Improvement District (LID). For the eastside, this investment represents over 10% of the project's anticipated cost.

B. DENSITY YIELDS PUBLIC & PRIVATE RETURN ON INVESTMENT

The high density development observed along Portland's existing westside alignment is associated with numerous public benefits that can be understood as a return on the public's investment in streetcar (ROI). These benefits include:

1. Reduced auto dependence by promoting *the trip not taken.*
2. Reduced *infrastructure* costs by reducing suburban greenfield development.
3. Reduced *sprawl* (land consumption).
4. Reduced *carbon footprint* resulting both from increased density of development and reduced auto dependence.
5. Increased *business and job generation* through attracting the *creative class* demographic to which future and ongoing economic vitality is linked.

1. Denser Development Reduces Auto Dependence: The relationship between land use and mode split – whether residents make trips by autos, bikes, streetcar or buses – is well established in Portland and throughout the U.S. The following table documents how mode split varies by transit availability and land use type within the Portland metro region.

Figure 5. Mode Split by Development Type

Land Use Type	Mode Split: Auto	Mode Split: Walk	Mode Split: Transit	Mode Split: Bike	Mode Split: Other	Daily Vehicle Miles per Capita	Auto Ownership per Household
Good Transit / Mixed Use	58.1%	27.0%	11.5%	1.9%	1.5%	9.8	0.9
Good Transit Only	74.4%	15.2%	7.9%	1.4%	1.1%	12.4	1.5
Remainder of Multnomah Co.	81.5%	9.7%	3.5%	1.6%	3.7%	17.3	1.7
Remainder of Region	87.3%	6.1%	1.2%	0.8%	4.6%	21.8	1.9

Source: Metro 1994 Travel Survey.

Residents of *mixed use neighborhoods* (integrated commercial and residential development) with *good transit service* are less likely to use autos than are residents with good transit service but no mixed use development: 58 versus 74 percent of trips are auto-based. Region-wide, the average percentage of auto-based trips across all neighborhoods is even higher, at 87%.

In mixed use neighborhoods, residents are almost twice as likely to walk, but they are also 45% more likely to use transit. This is because mixed use neighborhoods bring trip destinations within closer proximity, making non-auto modes of all kinds more convenient and attractive. Avoiding the need for auto-based travel can be referred to as *the trip not taken.*

Transit investment – and particularly fixed transit investment such as streetcar – creates a positive feedback loop, in which streetcar encourages denser development, which encourages transit usage and other non-auto modes of transportation, which facilitates yet denser urban-scale development.

Total daily vehicle miles per capita decrease significantly for residents living in mixed use, transit-rich neighborhoods: at 9.8 miles, it is 26% lower than transit-rich but non mixed use neighborhoods and 122% lower than the regional average. When this savings is compounded by the number of households located near streetcar, the impact on regional congestion, CO_2 omissions and air quality is significant.

A 2006 Portland Office of Transportation study *Portland Streetcar Development Oriented Transit* reported that 7,248 housing units had been constructed along Portland's westside streetcar line by the end of 2005. The following table illustrates the VMT savings of locating these households within a mixed use, transit-rich environment as opposed to an 'average' suburban environment.

Figure 6. VMT Reduced by Development Type (Portland Westside Results)

	High Density Environment	Suburban Environment
No. of Households	7,248	7,248
Total Persons*	15,946	15,946
Avg. Vehicle Miles/Day/Capita	9.8	21.8
Number of Days	315	315
Vehicle Miles/Year	49 million	109 million
Vehicle Miles Savings/Year	**60 million and growing**	

*Note: Assumed average households size of 2.2 persons.

Source: 1994 Metro Travel Survey, E. D. Hovee & Company, LLC.

The urban housing that has been developed within streetcar-served neighborhoods over the past few years – within six years of streetcar opening – has reduced vehicle travel on Portland's roadways by an estimated 70 million miles annually. This savings both reduces congestion and improves air quality.

The true cost of congestion is just beginning to be documented and quantified. A 2005 study by the Economic Development Research Group concluded that congested transportation networks have a significant impact on Portland's transportation-dependent economy, including the movement of freight.

Even with an anticipated $4.2+ billion in planned investments on the region's transportation capital improvements project list over the next 20 years, increased congestion was calculated to cost the Portland metro region $844 million annually by 2025 and 118,000 hours of vehicle time daily. Investments in transportation above what has been planned are estimated to generate an economic benefit (or ROI) of $2 for every dollar spent.[3]

2. Denser Development Reduces Infrastructure Costs: The Portland metro area is expected to add one million new residents by 2030. This is equivalent to adding two new cities the size of Portland to the region. The cost of providing infrastructure for household growth varies dramatically according to where these households locate.

One option is to locate households in greenfields, converting rural land uses to urban. The City of Damascus – a newly incorporated city on the eastern edge of the metro region – is an example of this approach, and is currently struggling to finance infrastructure for its 12,200 acres to accommodate a projected 24,900 new households. Damascus's transportation network alone is estimated to cost between $1.9 and $2.8 billion.

In contrast, westside streetcar investment of $100 million to date was instrumental in bringing over 7,000 new households within three blocks of the alignment (as of January 2006). On a cost per added household basis, streetcar investment was $14,000, an incremental number that falls as new units are constructed. In contrast, transportation infrastructure to serve the City of Damascus is estimated to cost between $76,000 and $112,000 per household.

Figure 7. Infrastructure Cost by Development Type (Westside Alternative vs. Suburban Alternative)

	Streetcar Alignment	Damascus	
Number of households	7,248	24,952	
Public investment	Actual	High	Low
Transportation infrastructure	$100,000,000	$2,800,000,000	$1,900,000,000
Cost per household	$14,000 and falling	$112,000	$76,000

Source: Portland Office of Transportation, *Portland Streetcar Development Oriented Transit*, January 2006, www.co.clackamas.or.us/dtd/damascus/, E. D. Hovee & Company, LLC.

Capturing future growth within mixed use, transit-served neighborhoods will best preserve our transportation infrastructure and reduce the staggering – and unfunded – costs associated with maintaining and expanding the transportation networks fundamental to continued economic growth for the city and the metro region.

3. Denser Development Limits Sprawl: In addition to reducing infrastructure costs, denser communities conserve land. Housing developed along Portland's westside streetcar alignment uses a remarkable 1760% less land than will planned housing development within the newly incorporated City of Damascus.

Figure 8. Land Use by Development Type (Westside Experience vs. Suburban Alternative)

	Streetcar Alignment	Suburban Environment
Households	7,248	7,248
Households per Acre	137	7.8
	Average realized units per building	Damascus average lot size is 5,600 square feet
Acres Required	53	932
Acres Saved	**879 and growing**	

Source: Portland Office of Transportation, *Portland Streetcar Development Oriented Transit*, January 2006, www.co.clackamas.or.us/dtd/damascus/, E. D. Hovee & Company, LLC.

The average number of units within the 52 residential buildings developed within three blocks of Portland's existing westside streetcar alignment is 137. Some of these buildings are smaller than a city block (which is roughly one acre), so this unit count per acre is conservative. In contrast, average planned lot size within Damascus equates to fewer than eight housing units per acre.

When these densities are multiplied by the units realized so far along the westside streetcar alignment, the resulting land savings is enormous. If streetcar-associated housing were located in greenfield development, it would have required an additional 879 acres, as opposed to the (maximum) 53 acres it now occupies.

4. Denser Development Reduces Carbon Footprint: A carbon footprint represents the total amount of carbon dioxide (CO_2) and related greenhouse gases emitted over the full life cycle of a product or service such as transportation or real estate development. Carbon footprint describes both construction carbon (carbon released through the manufacture, shipment and installation of materials) and operational carbon (released in heating, cooling, running electrical appliances, etc.).

Initial modeling indicates significant carbon savings for high density urban development compared to traditional suburban development: a 64% savings in transportation and 45% CO_2 improvement associated with an urban versus suburban development footprint.

Figure 9. Carbon Footprint by Development Type (Illustrative Westside Experience vs. Suburban Alternative)

	High Density Environment	Suburban Environment
Residential Footprint		
Annual Tons of CO_2 per Household	5.9	17.1
Annualized Per Household Savings	11.2	
Number of Households	7,248	7,248
Annual Tons of CO_2	43,007	118,466
Annualized High Density Savings	75,459	
% High Density Savings	64%	
Employment Footprint		
Annual Tons of CO_2 per Job	5.1	9.2
Annualized Per Job Savings	4.1	
Number of Jobs	11,500	11,500
Annual Tons of CO_2	14,016	25,283
Annual High Density Savings	11,267	
% High Density Savings	45%	

Note: Job growth was derived from 4,600,000 square feet of recorded commercial building development between 1998 and 2005, with an assumed job density of 400 square feet per employee. 25% of the demonstrated job growth has been attributed to streetcar investment.

Source: E. D. Hovee & Company, LLC.

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Combined savings vary with environment, according to the mix of commercial and residential development realized. Carbon savings specifically derive from:

- Lower daily VMT per resident and employee;
- Less land and building area used for housing and commercial development;
- Reduced ongoing energy consumption with urban versus suburban densities of development; and
- Potential for further carbon reduction (beyond what is calculated to date) if future streetcar investments are accompanied by commitment for purchase of *green energy*.

5. Denser Development Facilitates Economic Development. Dense development – a key to pedestrian-filled streets and successful mixed use neighborhoods – is increasingly recognized as an economic generator because it attracts both residents and businesses who want to live in quality, vibrant communities. The idea that lifestyle can drive economic development was heralded by Richard Florida through this introduction of the 'Creative Class.' Florida attributes this newly coined demographic sector – and its lifestyle preferences – as the key driving force for post-industrial economic development in the USA.[4]

Economist Joe Cortwright operationalized the Creative Class concept by focusing on college-educated 25 to 34 year olds as the people creating the new ideas that help drive the economy forward, and documented his research in his 2004 study *The Young and Restless*.[5] This age group has completed its education and is pursuing careers; beyond this age, the likelihood of moving decreases sharply. If a region can attract young talent, it is likely to keep it. Cortright reports that Portland is succeeding in attracting this demographic cohort: between 1990 and 2000, this age group increased by 12% in Portland, in sharp contrast to its overall national decline of 8%.

Cortright conducted focus group in six American cities – Philadelphia, Memphis, Providence, Richmond, Tampa and Portland – and found that Portland elicited the most positive reviews:

> *"Its urban fabric has the special appeal, with participants citing the city's size, walkability, public transportation, bike-friendliness, distinctive neighborhoods and independent businesses as contributing to a feeling of community, manageability and safety."*

The focus groups generated themes to attractive communities, including the theme of *Vibrant Places*. Cortright's report states that the desire for Vibrant Places is expressed in many different ways, but always includes a successful downtown.

> *"Many mentioned their desire for a city animated by its walkability and mixed uses which give people reasons to walk. To supplement a city's walkability was the desire for mass transit. Based on the comments of focus group participants, good public transit seems to be required for a city to be judged the complete package for this demographic."*

Cortright's study concludes that the region's growth in young, college-educated adults has been fueled by the attractiveness of the Central City and Washington County, particularly the denser inner neighborhoods – both in and near the Central City area. Young adults generally, and college-educated 25 to 34 year olds in particular, are now disproportionately represented in close-in Portland neighborhoods; residents within three miles of the city center are 50% more likely to be 25 to 34 years old.

Denser development – and the walkability, mix of uses, and supportive transit that it entails – is a proven attraction for older empty nesters and now is increasingly valued by young professionals. Attracting these professionals is an important economic development strategy for America's cities. This is especially true in an impending era of stagnant or shrinking labor force availability as baby boomers begin to exit the work force.

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III. STREETCAR-DEVELOPMENT FUTURES

The reintroduction of streetcar to America's cities is so recent that there has not been time to consider long-term opportunities. Is streetcar a one-shot experience to link high amenity attractors – tourist, residential, retail, and institutional? Or should these initial streetcar investments be considered as step one to a more systematic, city- or region-wide approach to neighborhood based transit service?

The experience of cities with existing systems – notably San Francisco and Philadelphia – clearly suggest that streetcar is best viewed not as a single alignment, but in the context of a broader network of transportation accessibility and associated economic development opportunity.

This is clearly the path the City of Portland is currently pursuing:

- As its next initiative, Portland has proposed a 3.35-mile extension of the existing westside alignment across the Willamette River to the eastside, creating a Streetcar Loop.
- The city has embarked on an even more ambitious long-term planning program – a Portland Streetcar System Plan – outlining a possible streetcar network with multiple alignments as integral to the city's transportation and economic development future.

Using the Portland experience as a *springboard* for discussion, this chapter suggests criteria with which proposed streetcar projects can be ranked according to their potential economic development impact.

The private investment that cities leverage through their investment in streetcar may prove as diverse as the cities, neighborhoods and business districts that streetcars can serve. However, there are fundamental steps that cities can take to ensure that the regulatory environment is prepared to encourage investment. Beyond this, an independent assessment of an area's *market readiness for investment* is the best available means to estimate market response to streetcar.

Portland is investing in additional streetcar infrastructure to transform its current westside alignment into a complete loop encompassing both the west and east sides of its Central City. This chapter includes responses to the proposed criteria for the Portland Streetcar Loop. Responses indicate that further investment in Portland's streetcar infrastructure is a sound financial strategy: Portland streetcar is positioned to succeed in generating economic development returns.

Four primary criteria are proposed:

- How does streetcar investment promote and expand employment centers;
- Does the regulatory environment uniformly impel higher density development;
- Do market conditions support higher density development; and
- What public incentives beyond transit are available to support high density development?

A. PORTLAND STREETCAR LOOP WILL ADVANCE EMPLOYMENT CENTERS

1. The Streetcar Loop Connects Regional Employment Centers with Significant Development Potential. The existing westside alignment runs through the west end of downtown Portland, connecting two major medical institutions, two universities, and two significant tracks of largely vacant and redevelopable land. The proposed Portland Streetcar Loop will both extend and reinforce the benefits generated through the westside alignment.

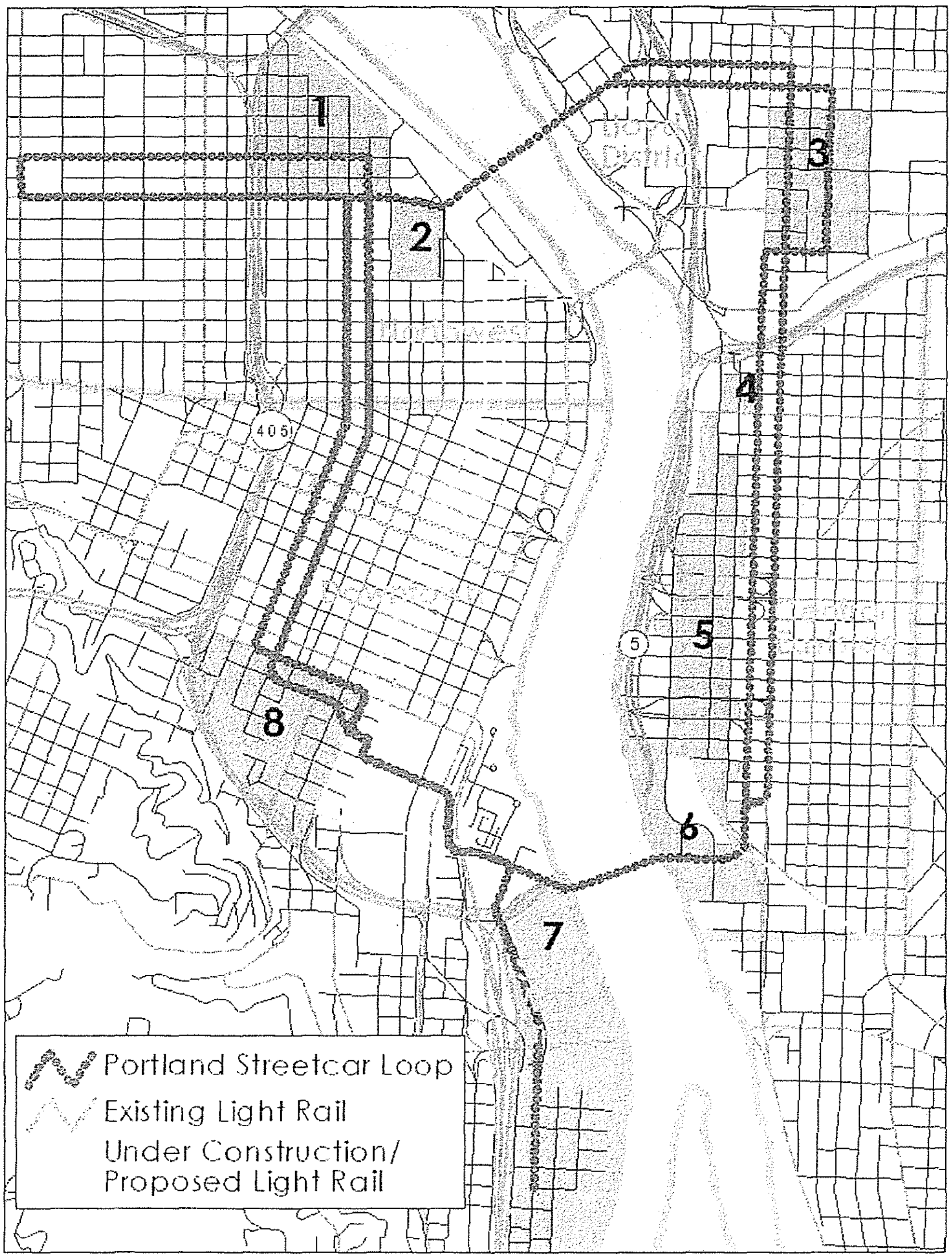
The area within ½ mile of existing westside streetcar stations and planned eastside streetcar stations accommodated 204,800 jobs in 2005 and is expected to support 217,300 jobs by the year 2011. Job density in 2005 within this area was 37,923 jobs per square mile, forecast to increase to 40,240 jobs per square mile in the year 2011. Employment within this area represents virtually every economic sector.

The Portland Streetcar Loop will connect the following Central City inner neighborhoods, each of which is a significant employment center:

- The Downtown Core, encompassing the region's highest densities of government and private offices at just under 17 million square feet of multi-tenant leased office space. As of fall 2007 Class A vacancies were 5%; four significant office towers are slated to begin construction in 2008 bringing an additional roughly one million square feet or 3,000 jobs to the district. Downtown also hosts the region's greatest density of art galleries and arts organizations, hotels, and entertainment venues.
- Northwest (including the Pearl, River District and Old Town neighborhoods), adjacent to downtown and distinguished by its industrial roots, considerable warehouse-to-condominium conversions, and significant recent investment in both urban housing and amenity-rich green office buildings (now 2.4 million square feet of multi-tenant leased office space, 425,000 additional square feet proposed for 2008).
- The Lloyd District, a regional retail destination with substantial federal, state and private office buildings (2.2 million square feet of multi-tenant leased office space), the state's largest professional sports complex and the Oregon Convention Center (newly expanded to 225,000 square feet of exhibition space).
- Central Eastside, a transforming industrial district that over the past decade has seen the highest density of redevelopment on the city's east side.
- South Waterfront, a former and largely vacant industrial area that since 2005 has realized three completed residential projects with four more underway or in planning. Approximately 30 acres is owned by Oregon Health Sciences University, which has completed its first building and plans to bring additional health, research and educational facilities to the district.

Eight areas within these neighborhoods – ranging from four blocks to 85 acres – are notable for their significant development potential and active development planning. All are served by the Portland Streetcar Loop Project. Combined, they represent close to 250 acres and an estimated potential of over $5 billion in additional investment. For each area, the realization of redevelopment planning at the densities envisioned is dependent upon major access improvements.

Figure 10. Streetcar Loop Economic Development Generators



Source: PDC, Metro, E. D. Hovee & Company, LLC.

Areas of significant development potential are detailed below.

1. **North of Lovejoy:** Northwest Portland's Pearl District was developed primarily by Hoyt Street Properties, which owned the 40-acre Burlington Northern rail yards that were converted into a vibrant, urban mixed use district. This initial development was predicated on city investment in establishing the Portland Streetcar. The company's remaining undeveloped land plus additional acquisitions now total 20 acres. The service improvement associated with the Portland Streetcar Loop extension will increase accessibility and frequency of service, and support continued high value development in the area. Hoyt Street Properties' program for full build-out includes 1,700 units and 725,000 square feet of commercial space.
2. **Post Office Blocks:** On the westside of the Central City at NW Lovejoy and Broadway is a 12.4-acre site currently occupied by the U.S. Post Office. Initial feasibility work has been completed for relocating this facility to the Portland Airport, freeing up this central site for high density development with connections to Union Station, the Portland Transit Mall and Pearl District. Extension of the existing streetcar to the eastside would pass by this redevelopment site, before crossing the Willamette River. The planned streetcar and existing transit service would provide excellent access, enabling more intense development of the site.
3. **Lloyd Crossing:** The 25-acre site of the Lloyd Crossing – the heart of Portland's Lloyd District – has a zoned density that would allow 10 million square feet of additional construction. The property is primarily owned by Ashforth Pacific and Kaiser Permanente, both of whom have participated in area planning efforts such as the 2004 Lloyd Crossing Plan. Streetcar will provide an organizing principal for a new Main Street within this district along 7th Avenue, the planned northbound alignment. Area plans call for the transition of the district's adjacent surface lots into high density developments with structured parking (FAR in this area is 15:1). Ashforth Pacific President Hank Ashforth describes streetcar commitment as fundamental to realization of the district's potential.
4. **Burnside Bridgehead:** The Burnside Bridgehead project is a four-acre mixed used project in a pivotal location at the eastern end of downtown's gateway bridge. This project's key location at a north-south and east-west crossroads and significant size result in considerable potential to induce adjacent development. The development will be mixed use, with office or retail leading the first phase. Anticipated total development value ranges from $150 to $250 million.
5. **Employment Opportunity Subarea (EOS):** Effective in January 2007, this newly designated EOS zoning applies to 85 acres within the Central Eastside Industrial Sanctuary, which is located within one block of the proposed eastside alignment. The zoning allows for greater flexibility in office development, increasing square footage maximums and liberalizing the types of office use allowed outright within the industrial district. It responds to private market interest in transitioning this former warehousing district to flexible office space in demand by creative firms. The EOS will serve as an important test application for extending streetcar benefits to major sources of employment as well as residence.

6. **OMSI District:** The OMSI District centers on 22 acres owned by the Oregon Museum of Science and Industry (OMSI), but also includes the Portland Opera offices and Portland Community College. OMSI is now undertaking a master planning process that includes the redevelopment of existing surface parking and a recently acquired 6.2-acre parcel. Phase I plans call for a 100,000 square foot museum expansion and a 100,000 square foot science academy, to be run in partnership with Oregon Health Sciences University, that will attract high school students from throughout the state.

   Phase II plans focus on the newly acquired 6.2 acres. OMSI envisions office development compatible with its science focus. Current zoning would enable the development of over one million square feet. Phase II construction is slated for 2013-2014.

   In 2015, this district will connect to OHSU South Waterfront by the proposed Portland to Milwaukie light rail bridge, which is also proposed to accommodate the Portland Streetcar Loop when completed. The connection to the OHSU South Waterfront District will further development interest in both areas by increasing connectivity between these two related employment centers. Anticipated density has increased as a result of the increased access that both light rail and streetcar will provide.

7. **OHSU South Waterfront:** The south end of the Portland Streetcar Loop is proposed to be served by both streetcar and light rail. Approximately 25 acres within the South Waterfront District are owned by Oregon Health Sciences University, which has recently expanded its campus to the South Waterfront by building an aerial tram to connect the main campus on the Marquam Hill with the new streetcar-served waterfront property, 500+ feet below. The first 400,000 square foot building was completed in 2006 and represents a $145 million investment. An additional building is planned every five years, with a total build out capacity exceeding 3 million square feet. The ability to develop the transportation-constrained South Waterfront District at the planned intensity is entirely dependent upon assuring effective and convenient access to the district.

   The new light rail bridge – planned to open in 2015 – will connect South Waterfront with the emerging OMSI District, bringing together two employment and science centers on opposite sides of the Willamette River that will be within 90 seconds of one another.

8. **University District:** Portland State University is now Oregon's largest educational institution, with more students enrolled than at any other campus in the state. PSU currently owns 49 acres in the southern end of downtown Portland, and is acquiring more. Over the next ten years, the university plans to increase enrollment from 25,000 to 35,000 students; double research grants to $80,000,000 annually; develop close to 0.5 million square feet for academic, lab, research and classroom space; develop 200,000 square feet for retail and collaboration space, and develop between one and two million square feet of housing and dining services.

The acreage and value associated with each of these significant development areas is summarized in the following table.

Figure 11. Significant Development Areas Summary

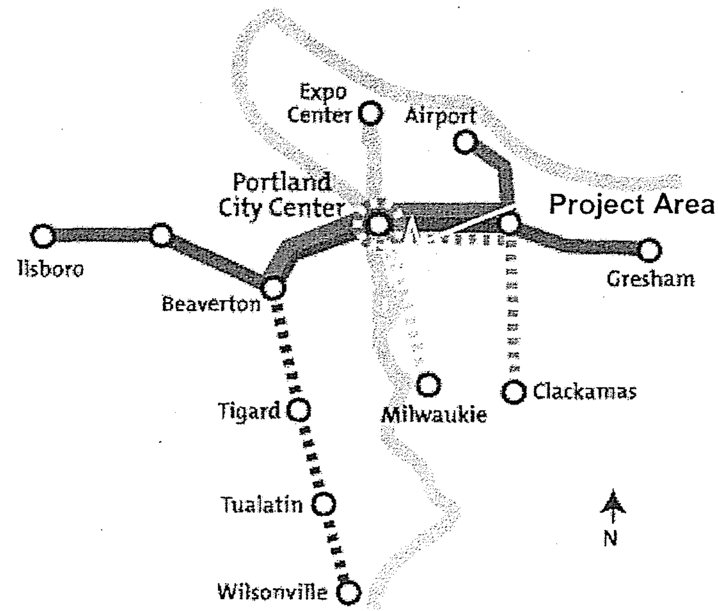
Map ID	Development Area Name	Acres	Potential Value	Use
1	North of Lovejoy *Contact: Tiffany Sweitzer, Hoyt Realty:*	20	More than $0.5 billion (50% of observed density of 137 units/acre)	Residential / Commercial
2	Post Office *Contact: Sarah Harpole, PDC:*	12.4	$0.5 billion (assuming FAR of 6, 25% infrastructure set aside, 50% development)	Residential / Commercial
3	Lloyd Crossing *Contact: Hank Ashforth, Ashforth Pacific*	25	More than $1 billion (50% of max potential SF)	Office / Retail / Residential
4	Burnside Bridgehead *Contact: Kia Selley, PDC*	4	$150 - $250 million (all phases)	Office / Retail / Residential
5	Employment Opportunity Subarea *Contact: Denyse McGrif, PDCf*	85	More than $0.5 billion (assuming 20% of property redevelops at an FAR of 3)	Office / Retail
6	Oregon Museum of Science & Industry (OMSI) District *Contact: Pat LaCrosse*	22	$229 million (50% of max potential SF)	Institutional / Educational / Office
7	OHSU South Waterfront *Contact: Mark Williams, OHSU:*	25	$3 billion +	Institutional / Office
8	University District *Contact: Mark Gregory, PSU*	49+	$700 million	Institutional / Residential / Commercial
	Total	242	Over $5 billion	

Source: Development representatives; E. D. Hovee & Company, LLC.

2. The Alignment Integrates with Existing Transit Investment to Connect Growing Neighborhoods with Employment. The proposed Portland Streetcar Loop Project would connect with five regional light rail lines, the existing streetcar line and 13 high-frequency bus lines. Approximately 80% of the regional system's riders – 240,000 on an average weekday – will have the opportunity to transfer to or from the Streetcar Loop.

The project would also pass approximately three blocks from Amtrak's Union Station and two blocks from the Greyhound bus station, offering daily intercity service to all of the cities of the west coast and the nation.

Figure 12. Overview of Portland Metro Area Rail System



Note: Red, blue and yellow solid lines represent existing light rail. Dashed lines are light rail extensions currently underway.

Source: TriMet, Metro.

This map illustrates streetcar's central position and transportation role from a regional perspective, illustrating the Regional Centers that fixed transit serves today and will serve in the future. The Streetcar Loop Project complements this system by intersecting with it and providing more frequent service within the region's most dense and mixed use central neighborhoods.

The light rail lines that connect the Central City with Portland's suburbs serve as *highways and arterials;* by comparison streetcar serves as a *local street* within the finer grain environment of Portland's Central City neighborhoods.

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B. CITY PLANNING PROMOTES HIGHER DENSITY DEVELOPMENT

City planning positively affects density of development in two ways – encouragement of higher floor area ratios (FARs) together with facilitation of mixed use rather than single purpose development.

1. Zoning Allows for Floor Area Ratios Well in Excess of Current Development.

Since 1980 and the adoption of the Portland *Central City Plan*, the city has envisioned a transit streetcar circulator and crafted all city policies and regulations – including zoning, height limits and Floor Area Ratios (FARs) – to support high density land uses consistent with a streetcar-supported urban environment.

Portland measures density through Floor Area Ratios (FARs), which are regulated by zoning.[6] Maximum FARs for properties situated along the planned eastside alignment range from 4:1 to 12:1; most properties fall between 6:1 and 9:1. The amount of development potential – the difference between the maximum allowed FAR and the existing FAR – along and around the planned eastside alignment is substantial. Within the Central Eastside (the southern portion of the eastside alignment), the overall ratio of potential to existing building square footage is 6.5:1 – meaning that the district can support 6.5 times more square footage (by zoning) than is currently on the ground.

Within *three blocks* of the planned eastside alignment (the primary impact area), current development equals only 15% of maximum allowed development (according to FAR limits). Much of the existing development is single-story buildings, surface parking lots, or other undeveloped space. With the exception of the Oregon Convention Center blocks, there are fewer than four city blocks within the Project Area that currently utilize more than 50% of the allowed FAR.

Highlights of the density potential within the Portland Streetcar Loop Project Area include:

- The equivalent of approximately 36 city blocks zoned at 12:1 maximum FAR in the Lloyd District, 16 of them immediately adjacent to the Portland Streetcar Loop alignment.
- Fifty-three city block equivalents within one block of the alignment that are zoned for a maximum FAR of between 7:1 and 9:1.
- Thirty-two city block equivalents within one block of the alignment that are zoned for a maximum of between 5:1 and 6:1 FAR.

Existing and potential development is illustrated in the following two graphics. The red circle in the *first graphic* highlights the existing low densities along the proposed eastside extension.

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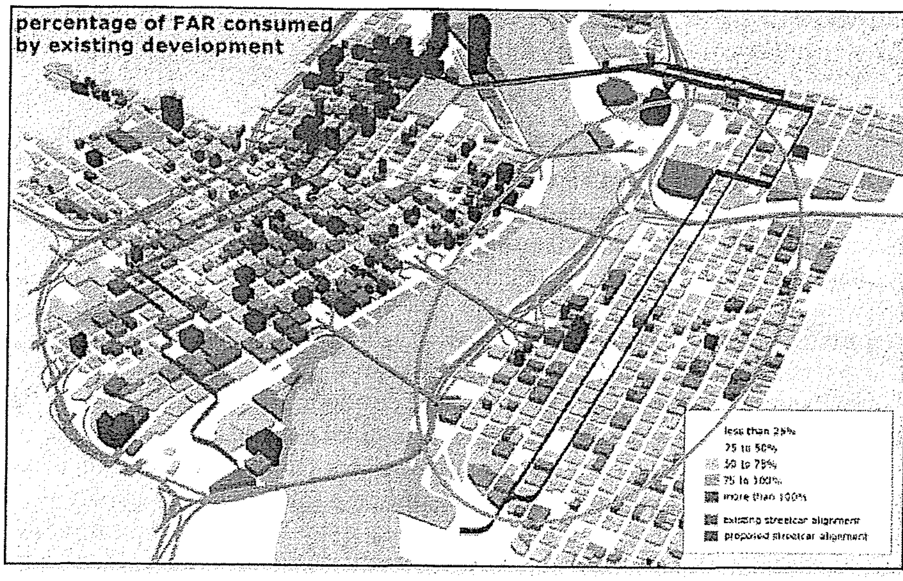
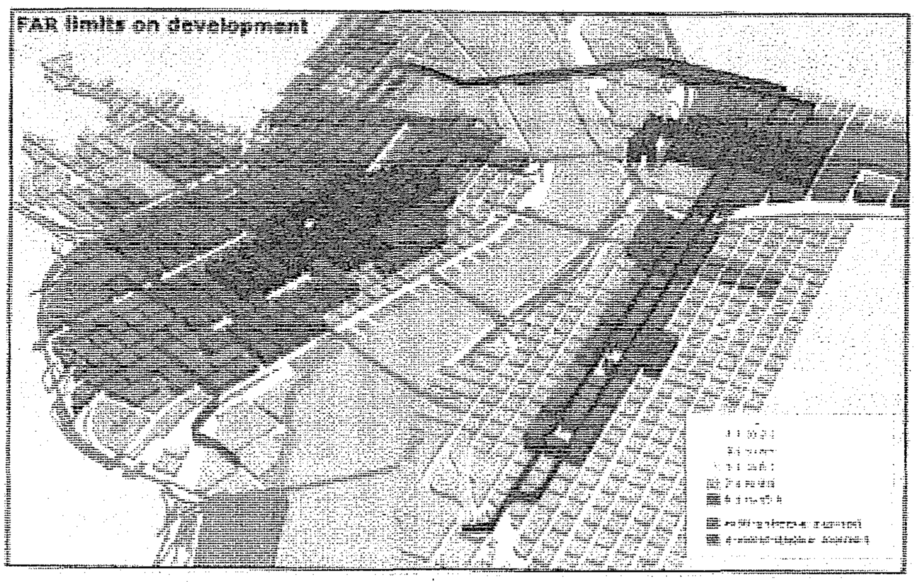
Figure 13. Existing FAR Density & Portland Streetcar Loop



Source: City of Portland, Bureau of Planning.

The *second graphic* (below) illustrates the significantly higher densities that zoning permits and which the proposed alignment is increasingly well-positioned to support.

Figure 14. FAR Development Potential with Portland Streetcar Loop



Source: City of Portland, Bureau of Planning.

The following table provides additional detail regarding existing and potential development surrounding the planned eastside streetcar alignment within the Central Eastside, the southern portion of the eastside alignment.

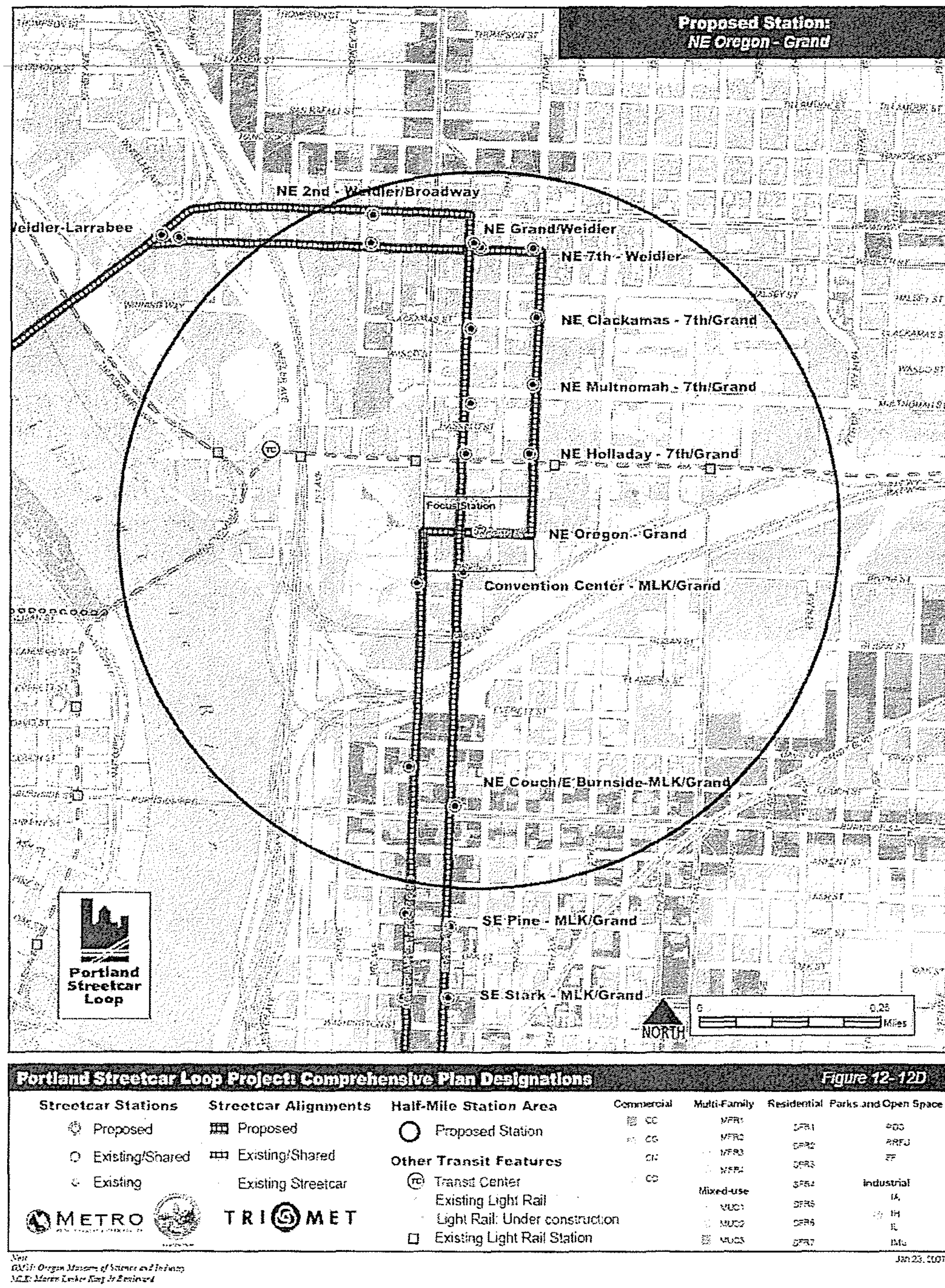
Figure 15. Existing Vs. Potential Building Square Footage, Central Eastside

Distance from Streetcar	Land Area (SF)	Existing Building SF	FAR	Potential Building SF	Potential to Existing SF Ratio
1 block	6,074,000	5,053,000	5.9	35,836,600	7.1
2 block	1,923,000	1,862,000	5.1	9,807,300	5.3
3 block	785,999	512,000	3.8	2,986,796	5.8
3 block+	707,000	687,000	5.3	3,747,100	5.5
	9,489,999	8,114,000	5.5	52,377,796	6.5

Source: City of Portland, E. D. Hovee & Company, LLC.

2. Zoning Encourages Mixed Use Development. In addition to the provision of good transit service, a mixed use environment is instrumental to facilitating high rates of transit usage. The planned eastside alignment has both comprehensive plan and zoning designations that provide for dense mixed use development, setting the stage for a compact and vibrant urban neighborhood. Figure 16 illustrates the comprehensive plan designations surrounding the proposed NE Oregon - Grand Ave. streetcar station. Purple and pink designate mixed use development, red is commercial, and orange is multi-family residential.[7]

Figure 16. Streetcar Alignment Comprehensive Plan Designations



Source: Metro.

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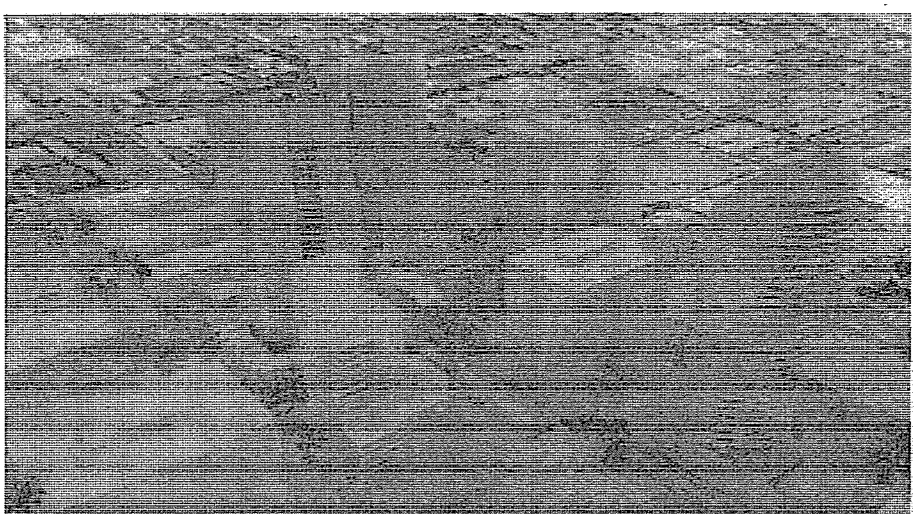
3. Beyond Regulations, Development Strategies Have Emphasized Denser Development. Portland's westside experience of significant redevelopment within streetcar-served neighborhoods was facilitated by both streetcar and accompanying investments and development agreements. These additional pubic incentives included master development agreements ensuring minimum densities with significant property owners in Northwest Portland and South Waterfront. In previously vacant areas within these districts, this public contribution to new parks development and support of unique district streetscape design (such as street lighting) furthered both the city's and developers' interest in creating distinctive urban neighborhoods.

Along the planned eastside alignment, the City of Portland is actively engaging property owners to encourage and influence redevelopment planning in response to the significant investment that streetcar represents. One example is the 2004 Lloyd Crossing project, which encompasses the 25-acre/34-block core of the Lloyd District – just east of the Willamette River. Project concepts developed to date have encouraged both visionary thinking and communication between large property owners.

Figure 17. High Rise Catalyst Project Concept, Lloyd Crossing



Source: Lloyd Crossing Sustainable Urban Design Plan & Catalyst Project, PDC.

Property owners have worked together to detail siting and design for over 8 million square feet of new development with an environmental footprint smaller than the area's existing 2 million square feet of building space. The amount of new development envisioned equates to about 70% of the area's zoned FAR. Streetcar will provide an organizing principal for a new Main Street within this district along 7th Avenue, the planned northbound alignment.

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The Convention Center Hotel and the Burnside Bridgehead project are two additional major projects situated adjacent to the planned eastside alignment, both supported by public-private development agreements currently in negotiations. These projects are detailed in later sections of this report.

Even though eastside streetcar is still only in the planning stage, twenty planned investments have been identified along the alignment (also detailed below). The City or Portland is communicating with these property owners to encourage progress and identify means for public support. Through its development and transportation agencies, the city recognizes the importance of ongoing and in-depth conversations with and between property owners to encourage visionary thinking about the area's potential and to move the pace of redevelopment forward.

C. Market Conditions Support Higher Density Redevelopment

Based on Portland experience to date, indicators of market conditions supporting higher density development include increasing investment interest, capitalizing on low improvement to land value ratios, encouragement of new development along a proposed alignment, and confidence necessary to replicate this experience in one urban location, then another – all leading to development increasingly predicated on and oriented to streetcar investment.

1. Market Trends Indicate Opportunity for Increased Investment Interest.

Significant development was realized within just five years of Portland's *westside* streetcar investment. Many factors supported this extraordinary response in addition to streetcar, including public-private development agreements, significant under-developed tracts of land, consolidated land ownership, and a national resurgence in Central City housing options. These development factors can be found within neighborhoods adjacent to the planned eastside alignment as well.

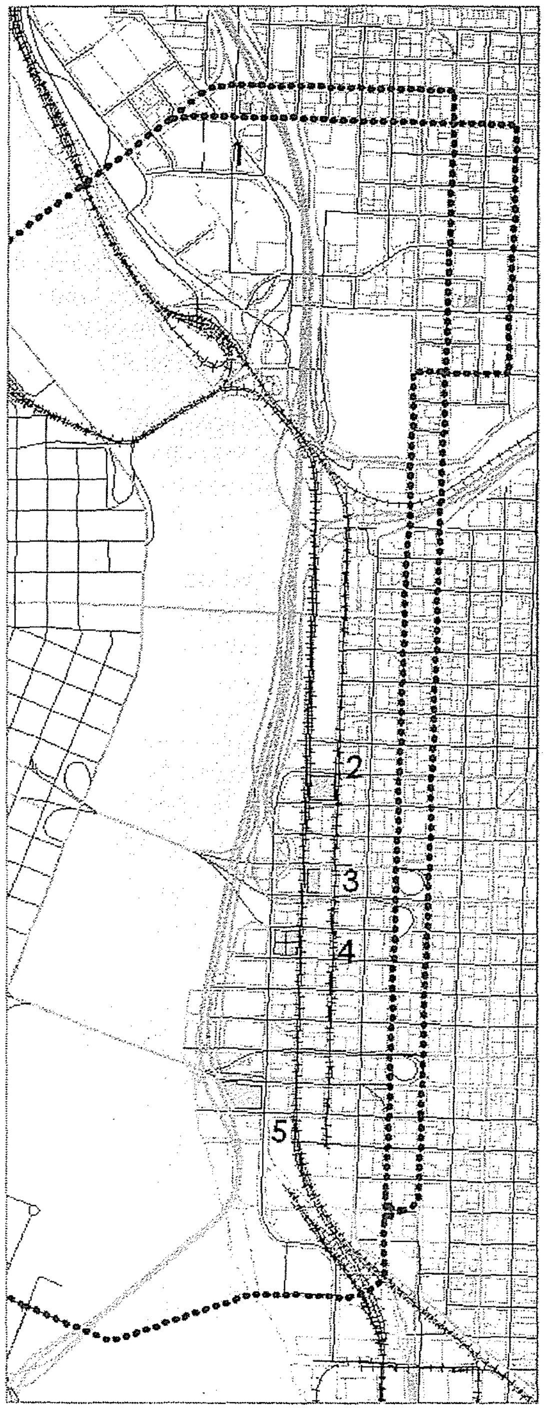
The *eastside* of Portland's Central City includes a wide range of buildings types, ranging from newer office towers and larger institutional and civic uses in the northern end to historic, vacant warehouses in the southern portion. Over the past decade, numerous significant historic warehouses have been renovated and occupied at much higher densities.

This reinvestment in and reuse of historic building stock is a recognized *first stage* of the urban real estate cycle. Lower cost renovated space attracts small, creative firms. Then, as occupancy and pedestrian activity increase, rents increase to a level that can support new construction.

The southern portion of the eastside alignment runs within one block of industrial sanctuary zoning. Recognizing market pressure to transform the aging warehouse stock within this centrally located industrial district, the City of Portland liberalized its zoning for the Employment Opportunity Subarea (EOS) in January 2007 to broaden the types of office and related uses considered appropriate for this district.

Examples of investment already occurring are described in the following table. This list is a sample only and by no means exhaustive.

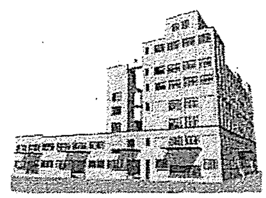
Figure 18. Recent Investment in Eastside Neighborhoods Planned for Streetcar



1. E. Alexander Building

This former garage and inventor's workshop was renovated as office and commercial space in 2006. The developer is now beginning work on the full-block building immediately to the west.

2. Olympic Mills Commerce Center

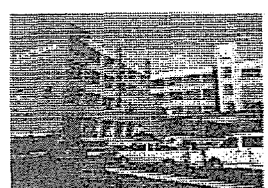


Renovation of this 172,000 square foot historic surplus grain mill is currently underway. Flexible work space will be ready for occupancy in early 2008.

3. Jones Cash Building

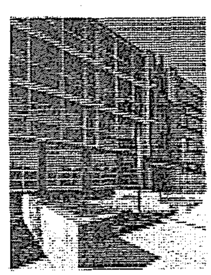
This 80,000 square foot former warehouse is one of Portland's first retail mail-order businesses; it was later renovated for use as a cold-storage warehouse. Portland firm Venerable Properties purchased and renovated the building in 2000 for creative workspace.

4. Eastbank Commerce Center



With renovation completed in 2002, this 160,000-square-foot former warehouse now houses light industrial facilities, office space, a restaurant and services under one roof with shipping, production and warehousing capabilities.

5. RiverEast Center



In 2006, this 91,000 square foot warehouse was remodeled and occupied by co-owners Group Mackenzie (architecture and engineering) and Coaxis (software development). The riverfront building features about 15,000 square feet of groundfloor space leased to Portland Boathouse Inc., including space for boat storage and public boat rentals.

2. Improvement to Land Value Ratios are Low Surrounding Planned Alignment.

Improvement to land value ratios are a clear indicator of the relative market worth of buildings to land. A low improvements to land value ratio can indicate that investment in an area is low enough that redevelopment of properties makes economic sense.[8]

On Portland's *westside*, an estimated 68% of new construction experienced post 1997 occurred on sites that had a *pre-development* building improvements.to land value ratio of less than 0.5. For this redevelopment, on-site building improvements pre-1997 were valued at less than 50% of land value.

This data is compiled for sites for which there is complete valuation and square footage information covering pre-1997 and 2005 conditions.[9] An additional 19% of building square footage occurred on sites with improvements to land valuation of 0.5-1.0 and 13% on sites with improvements valuation that exceeded land valuation.

For Portland's westside, more than 200 acres (or 37%% of land area evaluated) within three blocks of the streetcar alignment had building improvements to land valuation ratios of less than 0.5 as of 1997. Despite substantial new investment, there is still substantial opportunity for continuing development on vacant and underutilized properties on Portland's westside.

Figure 19. Pre-1997 Improvement to Land Value Ratios of Westside Lots that Redeveloped from 1997-2005 (Portland Westside)

Improvement to Land Valuation Ratio	Tax Lots	Square Footage Developed	Percent of Square Footage Developed*
< 0.5	30	2,803,000	68%
0.5 - 1.0	11	767,000	19%
> 1.0	7	557,000	13%
Parcels w/incomplete data	90	3,101,000	---
Total	138	7,228,000	100%

* Note: Percentage distribution is for parcels with complete data available.

Source: Metro RLIS 1997-2005, E. D. Hovee & Company, LLC.

Applying these thresholds based on westside experience to eastside neighborhoods indicates strong potential for development stimulated with the extension of streetcar to the full Portland Streetcar Loop configuration as currently proposed. As was the case on the westside, a substantial portion of land within inner eastside neighborhoods at present supports only low value building investments – an important criterion in estimating the likelihood that redevelopment and increased investment will occur.

An estimated 37% percent of acreage within three blocks of the planned *eastside* alignment is associated with improvement to land value ratios of less than 0.5. This represents just over 120 acres of land that is either vacant or with low value building improvements at present. In effect, these sites can be considered as the most viable candidates for substantial redevelopment and new construction with an extension of streetcar to Portland's eastside.

An additional 6% of acreage within three blocks of the proposed eastside alignment (or close to 20 acres) falls within a ratio range of 0.5-1.0, representing a second (but smaller) tier of redevelopment candidates.

Figure 20. Improvement to Land Value Ratios within Three Blocks of Proposed Alignment (Portland Eastside)

Improvement to Land Value Ratio	Taxlots	Acres	Percent of Acreage
Less than 0.5	387	120.1	37%
0.5 - 1	83	19.8	6%
Over 1.0	461	187.7	57%
Excluded*	109	24.9	---
Total	1,040	352.5	100%

*Note: Excluded land includes right-of-ways and open space. This land was not included in the percentage allocation of land by improvement to land value ratio.

Source: Metro RLIS August 2007 update, E. D. Hovee & Company, LLC.

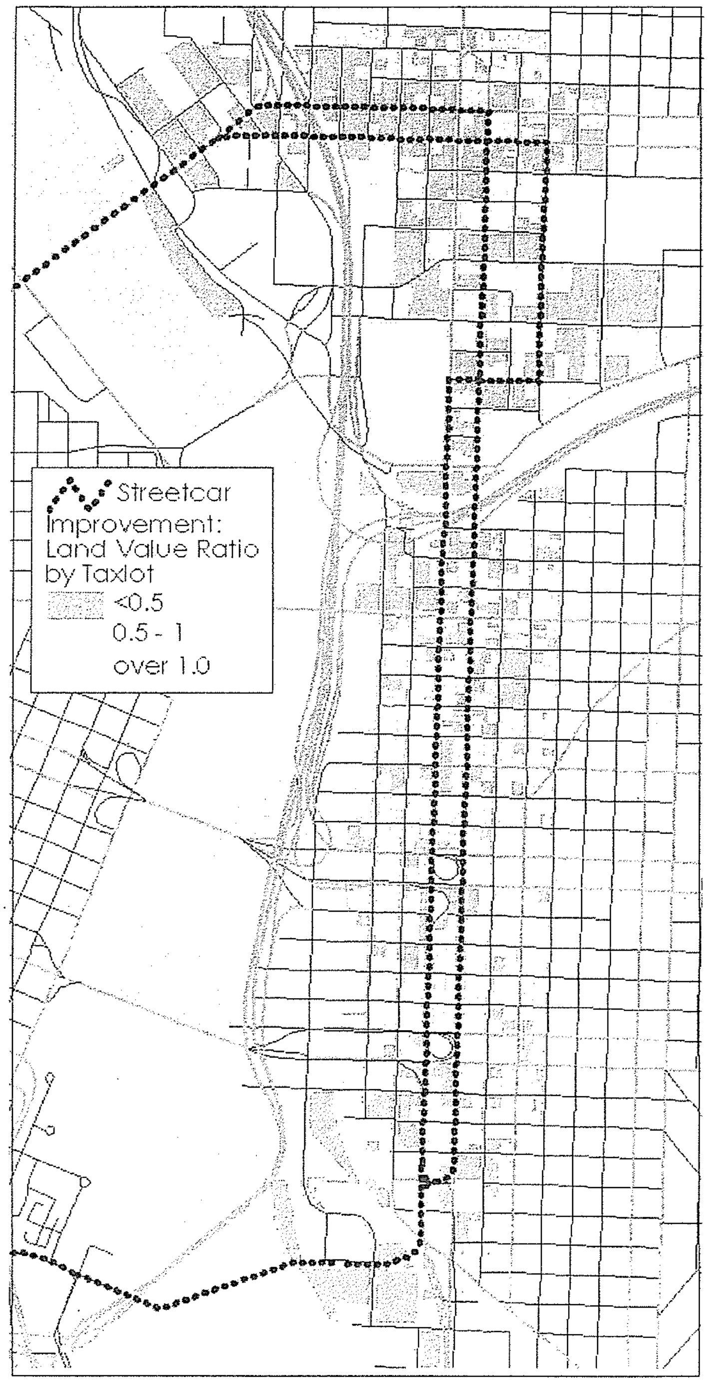
This measure does not ensure that all properties with low improvement values will eventually redevelop. Some low value buildings or even surface lots may provide income streams at very low risk compared with returns available from redevelopment.

However, given the strong correlation of sites with low valued building improvements on Portland's westside to subsequent redevelopment, these currently 'under-improved' sites clearly become front-runner candidates for streetcar oriented reinvestment and development.

A visual overview of the building to land value relationship for Portland's eastside is provided in the following map. This map indicates that under-improved land is distributed throughout the district, but is especially prominent in the Lloyd District (the northern portion of the planned eastside alignment).

The Lloyd District tends to have more contiguous whole block parcels with low improvement to land value ratios. By comparison, Central Eastside sites (south of the I-84 freeway) tend to be more fragmented and are more often situated in less than whole block configurations.

Figure 21. Map of Improvement to Land Value Ratios



Source: RLIS August 2007 update, E. D. Hovee & Company, LLC.

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3. Significant New Development is Planned for the Proposed Alignment. Increased investment is already planned along the eastside alignment, despite the fact that complete funding has yet to be secured. (With funding not yet committed, it is too early to expect the market to fully respond to the catalytic potential of streetcar investment). Planned investment does, however, indicate the general trajectory of the neighborhoods for which streetcar introduction is planned.

Planned projects that have been shared with the authors of this updated Template 14 report are summarized below and organized within two categories:

- **Significant Projects** describe sizable projects dependent upon a development agreement with the City of Portland to proceed. These projects are highly dependent upon streetcar investment, for which developers are willing to commit to higher density construction.
- **Planned Projects** describe projects currently in planning phase, undertaken by property owners without city input. The size and value of Planned Projects has been estimated; project representatives have also rated the impact of streetcar investment on project plans and timing.

Significant Projects: There are two negotiations underway for two locally and regionally Significant Projects adjacent to the streetcar alignment. Streetcar development is a significant factor in both projects. Projects are mapped in Figure 23.

- **Convention Center Hotel (9):** The City of Portland has selected a hotel operator and development team for a two-block site adjacent to the Oregon Convention Center. Negotiations are underway to secure project financing. Developers state that the streetcar will provide access to the Pearl and OMSI Districts for convention visitors and significantly enhance the viability of the proposed hotel. Streetcar is also pivotal to redevelopment of the blocks adjacent to the Convention Center, which is necessary for bookings to grow.
- **Burnside Bridgehead (11):** This project was also listed above as a Development Area due to its magnitude. The four-acre site will be developed in a mix of uses; Phase I will focus on commercial and retail uses. The development team is now seeking tenants. Public commitment to streetcar is a key factor in negotiations with the city that include minimum site densities.

Other Planned Projects. The final category of anticipated investment is projects now in planning or construction phase that will be undertaken without city involvement.

The following table reports 20 projects identified to date (including the two significant projects detailed above). These projects represent a total estimated investment value of close to $1.2 billion. Private investment will only grow as streetcar funding is secured and the alignment is realized.

In the following table, all projects have been rated by project spokespeople in regard to their dependence on streetcar to move forward as planned. All but three project representatives describe their dependence on streetcar as 'high.'

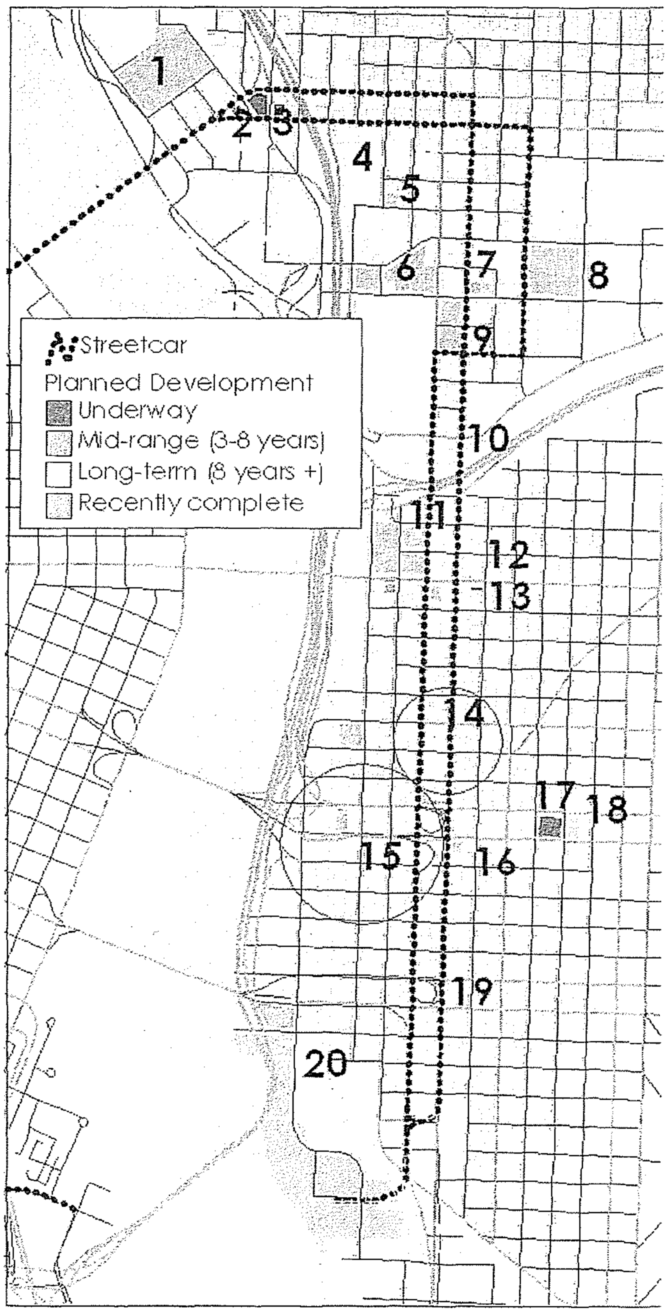
This list includes only eastside projects. However, the Portland Streetcar Loop Project will also support additional high density development on the westside by doubling the current frequency of service.

Figure 22. Planned Projects within Three Blocks of Eastside Streetcar

Project Name	Square Feet	Potential Value	New/Rehab Units	Use	Timing	Streetcar Dependence
1 **Blanchard Building** 501 N Dickson St *Carter MacNichol, Shiels Obletz Johnsen*	348,000	$70 million	Rehab	Office / Retail	2010+	High
2 **Left Bank** 240 N Broadway Blvd *Daniel Deutsch, Alora Properties*	66,000	$14.9 million	Rehab	Office / Retail	2007	High
3 **1618 N Vancouver Avenue** *Daniel Deutsch, Alora Properties*	20,000	$4.5 million	Rehab	Office / Retail	2007	High
4 **Bee Car Rental** NE 1st Ave & Weidler Blvd *Sara King, Portland Development Commission*	125,000	$36 million	New Units TBD	Residential	2010+	High
5 **Old Rosary Housing Site** NE Wasco & 2nd Ave *Sara King, Portland Development Commission*	50,000	$15 million	New Units TBD	Residential	2010+	High
6 **Schlesinger Holdings** Blocks 47-49 *Barry Schlesinger, Schlesinger Properties*	530,000 (Phase I)	$120 million	New	Office / Retail	2010	Medium
7 **Cosmopolitan Tower** NE Grand & Holladay St *Tom Gibbons, LRS Architects*	274,000	$82 million	New 204 units	Residential	2009	High
8 **Urban Village** NE 7th/9th/Holladay/Mult superblock *Hank Ashforth, Ashforth Pacific*	750,000	$300 million	New Units TBD	Office or Office/ Residential	Currently Marketing	High
9 **Westin Convention Center Hotel** NE MLK & Holladay St *Reed Wagner, Metro*	400,000 (Phase I)	$180 million	New	Hotel	2010+	High
10 **Rich's Deli** 430 NE Lloyd St *Joe Angel, Pacific Star*	35,000	$10.5 million	New Units TBD	Office / Residential	2010	High
11 **Burnside Bridgehead** East end of Burnside Bridge *Brian Bennett, OPUS*	365,000	$200 million	New	Office/ Retail / Residential	2010+	High
12 **United Finance** NE corner of Burnside & Grand *Richard Parker, United Finance*	33,500	$9.7 million	Rehab	Office	2010+	High
13 **Bside6** 340 SE 6th Ave *Lance Mars*	26,000	$5.5 million	New	Office	2007	High
14 **Burns Bros Inc. Properties** 4 blocks in CES *Bruce Burns*	Have long-term leases in place but have also been working with architects and feasibility consultants.				2010+	High
15 **Walt Pelett Properties** 5 blocks in CES Walt Pelett	Has considered offers for holdings				2010+	High
16 **514 SE Belmont St** *Mike Bolliger*	54,000	$19 million	New Units TBD	Retail / Residential	2010+	High
17 **Grand Central Building** 808 SE Morrison St *John Plew, Concept Entertainment*	37,600	$11.5 million	Rehab	Retail	2007	Low
18 **East of Grand Central** *John Plew, Concept Entertainment*	175,000	$60 million	New	Retail / Office / Residential	2010+	Low
19 **Burger King** 1525 SE Grand Ave *Joe Angel, Pacific Star*	40,000	$12 million	New	Office / Retail	2010+	High
20 **OMSI** 1945 SE Water Ave *Pat LaCrosse*	200,000	$79 million (phase I)	New	Institutional	2012+	High
TOTALS	**3,529,100**	**$1,229 million**				

Source: Development representatives; E. D. Hovee & Company, LLC.

Figure 23. Mapped Eastside Projects



Planned Projects Key

1 Blanchard Building
2 Left Bank
3 1618 N Vancouver Ave
4 Bee Car Rental
5 Old Rosary Housing Site
6 Schlesinger Holdings
7 Cosmopolitan Tower
8 Urban Village
9 Westin Convention Center Hotel
10 Rich's Deli
11 Burnside Bridgehead
12 United Finance
13 Bside6
14 Burns Brothers Inc. Properties
15 Walt Pelett Properties
16 514 SE Belmont St
17 Grand Central Building
18 East of Grand Central
19 Burger King
20 OMSI

Source: City of Portland, development representatives, E. D. Hovee & Company, LLC.

4. If Eastside Neighborhoods Mirror Westside Development Response, Eastside Development will Increase 65%. In 2005, an aspirational projection through 2025 was created for the proposed eastside alignment in which the rate and intensity of development mirrored that experienced along the westside alignment. The result was a 65% increase in the Central Eastside (CES) building stock and a 310% increase in the number of housing units anticipated. Details of the projection are summarized in the following table.[10]

Figure 24. Westside Development Experience Extrapolated to Eastside

Distance from streetcar	Land SF in redevelopment lots (2004)	Building SF in redevelopment lots (2004)	2007-2025 annual building dev.	Added building SF by 2025	Avg. zoned FAR	% of FAR realized 2007-2025	Land dev'd (SF) by 2025	Percent of land area vacant 2025*
1 Block	6,074,000	5,053,000	5.8%	4,752,000	5.9	90%	886,000	11%
2 Blocks	1,923,000	1,862,000	1.7%	429,000	5.1	74%	114,000	26%
3 Blocks	785,000	512,000	1.2%	71,000	3.8	62%	30,000	29%
3+ Blocks	707,000	687,000	1.0%	51,000	5.3	43%	22,000	16%
Total	9,489,000	8,114,000	2.0%	5,303,000	-		1,052,000	16%

Source: City of Portland, E. D. Hovee & Company, LLC.

The key ingredients in this Central Eastside development scenario were:

1. The westside track record of post-streetcar development trends;
2. Zoned FAR limits within the Central Eastside, and
3. Extent of existing development within the Central Eastside.

The zoned capacity of the CES is significant; its existing building stock is not. Applying westside experience – the percent of zoned FAR achieved by block from streetcar and the rate of development as a percentage of the existing building stock – to the CES produces an *aspirational projection* of over 5 million square feet of development that might be achieved within this district.

5. Eastside Development Forecasts Attribute 30-40% of Future Development Activity to Streetcar Investment. Two market studies have been completed for the eastside extension of the Portland Streetcar Loop project which provide a contextualized alternative to the aspirational projection summarized below.

Central Eastside Forecast: Development within the southern portion of the eastside extension – the Central Eastside Urban Renewal Area – was forecast in May 2007 May 2007 to inform tax revenue projections for the Central Eastside Urban Renewal Area.[11] This alternative forecast scenario was prepared for the more immediate purpose of issuing tax increment bonds based on a conservative estimate of future tax revenue growth. The long-term aspirational methodology for the entire eastside was accordingly modified to reflect a more conservative, bankable approach.

This modified approach was rooted in the specifics of the Central Eastside neighborhood, and also involved estimating prospective impacts of streetcar investment *in isolation* from other development influences. Key ingredients of this forecast were:

- 'Baseline' redevelopment trends covering documented activity over the past nine years were calculated from Multnomah County tax assessor records;
- The anticipated value and timing of known projects – both significant and planned, in the nomenclature of this report – were then layered onto baseline trend development; and
- A 'streetcar premium' was then estimated to reflect current market conditions with the addition of streetcar investment. This premium was the subjective assessment of economic development professionals familiar with the performance of the planned streetcar corridor over the past half decade. It reflects the most likely scale, land use type, volume and location of new investment along the corridor (for which a track record has not yet been established) should the corridor achieve a *tipping point* at which new construction can be supported.
- Two forecast scenarios were modeled, conservative and aggressive. The conservative scenario assumes no public involvement in supporting adjacent development. The aggressive scenario is predicated on additional public investment in traffic calming, streetscape improvements and development agreements along the alignment, to create the best possible pedestrian environment along the corridor (a key precursor to westside development along the alignment).[12]

Key conclusions of the 2007 market-based optimal investment/aggressive forecast are:

- Approximately 18% of projected investment in *building renovation* (much of which is already underway) can be attributed to streetcar investment;
- Up to 45% of projected investment in *new commercial construction* can be attributed to streetcar investment; and
- Up to half of projected *new residential construction* can be attributed to streetcar investment – an arena where streetcar clearly makes a difference based on westside experience.

Details of the Central Eastside urban renewal forecast scenarios are included with the following table.

Figure 25. Central Eastside Development Projections May 2007

	Commercial SF		Housing	
	Rehabilitated	New	Units	Notes
Conservative Scenarios				
a) Trend	2,325,000	-	-	Continuation of observed trends
b) Bridgehead	-	487,500	150	3 towers, reduced by 25%
c) Planned Projects	-	334,000	474	Plans delayed, reduced
d) Streetcar	512,000	480,000	-	Office/flex construction only
Total	2,837,000	1,301,500	624	
Subtotal w/o Streetcar	*2,325,482*	*821,500*	*624*	a + b + c
% Attributed to Streetcar	*18%*	*37%*	*0%*	d as percent of total
Aggressive Scenarios				
a) Trend	2,325,000	-	-	Trend scenario remains unchanged
b) Bridgehead	-	650,000	200	As profiled by PDC – value of increased density attributed to streetcar
c) Planned Projects	-	354,000	713	As profiled by developers – value of increased density attributed to streetcar
d) Streetcar	512,000	480,000	270	Commercial + housing with enhanced investment
Total	2,837,000	1,484,000	1,183	
Attributed to Streetcar	*512,405*	*662,500*	*559*	*Total of basic streetcar plus related public investment enhancements*
% Attributed to Streetcar	*18%*	*45%*	*47%*	

Source: E. D. Hovee & Company, LLC *Central Eastside Development Scenarios*, May 2007.

When projected development is reported in terms of *market value*, the total estimated value for the aggressive scenario is $994 million (in 2007 dollars). Thirty percent of the projected square footage is attributed to streetcar's influence; if an equivalent share of the projected value is attributed to streetcar the result is $298 million in development associated with streetcar investment.[13]

With an estimated total construction cost of $57 million for the CES portion of the streetcar alignment, the cost to benefit ratio according to this market-based development forecast is over 5:1.

Lloyd District Forecast: Lloyd District development was forecast in March 2008 for an area corresponding to roughly one-quarter mile around the planned alignment, totaling 305 acres within 930 taxlots. The bulk of the Lloyd District area considered is zoned RX, a dense, mixed-use zone dominant in the Central City. Industrial zones are found north of the Broadway bridge and west of I-5, and along the river (corresponding to the rail tracks). The northernmost lots within this geography are in residential zoning.

Lloyd District differs from the Central Eastside portion of the planned streetcar extension as it has seen fairly significant development activity (just over one million square feet) over the past 10 years. In the following table, realized development trends have been projected forward to estimate development within a 20 year horizon in the absence of significant public investment in

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the district such as highway, parks or streetcar infrastructure investment. Total added developed square footage within a future 20 year timeframe is approximately 2.2 million.

Figure 26. Baseline Trend (1997-2007) & Development Projection (2008-2028)

	Development Experienced (1997-2007)					Base Projection (07-27)	
Building Type	Buildings	SF per Building	Total SF	Development % of Total	# of Units	Buildings In 20 Years	SF in 20 Years
Low-rise commercial	8	6,300	50,600	5%		16	101,200
Apartments	2	168,800	337,500	31%	150	4	675,000
Hotel	1	147,300	147,300	14%		2	294,600
Office	2	226,900	453,700	42%		4	907,400
Condos	2	46,400	92,800	5%	50	4	185,600
Total	15	72,127	1,081,900	100%	200	30	2,163,800

Source: Multnomah County Tax Assessor, E.D. Hovee & Company, LLC.

As with the Central Eastside, projects in planning phase were then profiled, providing some detail on future development such as approximate size and use. Eight projects were profiled, totaling 2.5 million square feet as described by development representatives.

Because development planning is not always realized, or realized at the pace or to the scale initially conceived, two versions of each project are suggested: an 'as described' version and a revised version, which reflects a more conservative build out. For projects without public sector involvement, a 50% reduction in size has been applied. For projects with public sector involvement – such as land ownership or anticipated project subsidy – a 25% reduction in size has been applied, reflecting the greater likelihood that projects with public backing and involvement come to fruition on the scale realized.

Figure 27. Known Lloyd District Planned Development Projects

Project Name & Address	Square Feet	Est. Value	Use	Timing	Streetcar Dependence	Public – Private	Revised SF Estimate	Revised Value Estimate
Blanchard Building 501 N Dickson St	348,000	$70 m	Office / Retail	2010+	High	Yes	261,000	$52 m
Bee Car Rental NE 1st Ave & Weidler Blvd	125,000	$36 m	Residential	2010+	High	Yes	93,750	$27 m
Old Rosary Housing Site NE Wasco & 2nd Ave	50,000	$15 m	Residential	2010+	High	Yes	37,500	$11 m
Schlesinger Holdings Blocks 47-49	530,000 (Phase I)	$120 m	Office / Retail	2010	Medium	No	265,000	$60 m
Cosmopolitan Tower NE Grand & Holladay St	274,000	$82 m	Residential	2009	High	No	137,000	$41 m
Urban Village NE 7th/9th/Holladay/Mult	750,000	$300 m	Office or Office/Res	market	High	No	375,000	$150 m
Westin Convention Center Hotel NE MLK & Holladay St	400,000 (Phase I)	$180 m	Hotel	2010+	High	Yes	300,000	$135 m
Rich's Deli 430 NE Lloyd St	35,000	$11 m	Office / Residential	2010	High	No	17,500	$5 m
Total	2,512,000	$814 m					1,486,750	$157 m
Housing	841,500	$288 m					464,500	$190 m
Commercial	1,270,500	$345 m					722,250	$135 m
Hotel	400,000	$180 m					300,000	$482 m

Note: Square footage for the Urban Village and Rich's Deli projects have been split between housing and commercial categories.

Source: Development contacts, E.D. Hovee & Company, LLC.

Not all of these planned projects – half of which are anticipated to occur beyond 2010 – may be realized, but they are considered representative of projects that may be undertaken in this district even if the responsibility is ultimately transferred to a different developer. The conservative version of these known projects has thus been considered as *part of* the base trend projection (from which 2.1 million square feet of development is anticipated over a 20 year period).

How does anticipated district development projection change with the introduction of streetcar? The difference between the revised (conservative) and 'as described' version of known projects is considered the 'streetcar premium,' which brings development to a density that the market may not deliver to this area in the absence of streetcar investment. This streetcar premium is roughly 1 million square feet, an increase of 69% over the 1.49 million square feet of development encompassed within the more conservative outline of known projects.

When this premium – 69% – is applied to the baseline trend (2.1 million square feet), total expected development increases to 3.65 million square feet. This translates into an annual square footage increase within the district of 1.9%, 0.8% of which is attributed to streetcar.

Figure 28. Lloyd District Rate of Development With & Without Streetcar

1	Baseline trend continuation over 20 years	2,163,800
2	Full version of known projects	2,512,000
3	Reduced version of known projects	1,486,800
4	Difference: known projects SF attributed to streetcar	1,025,300
5	Percentage of SF attributed to streetcar	69%
5	Total 20 year trend development + streetcar premium (69% increase)	3,650,600
7	Streetcar portion of total projected development	1,486,800
8	Existing district SF	9,800,700
9	Annual Increase in SF	1.9%
10	Annual Increase attributable to Streetcar	0.8%
11	Full value of known projects	$814 m
12	Reduced version of known projects	$482 m
13	Difference: known projects value attributed to streetcar	$331 m
14	Streetcar value extrapolated to total district development (45% increase)	$480 m

Source: E.D. Hovee & Company, LLC.

In effect, 40% of the composite Lloyd District market based development can be attributed to extension of the Portland Streetcar Loop with this forecast methodology. This composite 1.9% annual rate of development projected for the Lloyd District with streetcar is slightly below the 2.0% rate actually experienced on Portland's westside from 1997-2004.

Likewise, a portion of the dollar value of new development the district experienced can be attributed to the extension of the Portland Streetcar Loop. For known projects alone, the streetcar-associated portion of development value is over $331 million. If this amount is increased by 45% (the difference between line 4 and line 7 in the above table), the total value of projected streetcar-associated development increases to $480 million. With an estimated project cost of $38 million, the development that this investment could leverage is over 13 times this amount.

Figure 29. Cost:Value Estimates for Eastside Extension

District	Cost	Development Value*	Cost: Value Ratio
Central Eastside	$57,000,000	$298,000,000	5
Lloyd District	$38,000,000	$480,480,000	13
All	$95,000,000	$778,480,000	8

Source: E.D. Hovee & Company, LLC.

D. PUBLIC INCENTIVES BEYOND TRANSIT ARE AVAILABLE

Portland's westside experience demonstrates the importance of public commitment to urban development through a myriad of approaches that reinforce and compliment streetcar investment. The tools available to encourage high density development along the proposed eastside alignment are summarized below.

1. Public-Private Development Agreements. Development agreements were crucial to high density development along the westside alignment. For the Hoyt Street Properties' original 40 acres at the northern end of the westside alignment, density minimums were increased incrementally for three separate public investments: 1) removal of an overhead ramp that bisected the property, 2) choosing and constructing a streetcar alignment adjacent to Hoyt Street property, and 3) development of a park on land donated by Hoyt Street Properties. Hoyt Street Properties has stated that without the streetcar and the accessibility it provides, the densities achieved would not have been possible.

On Portland's eastside, there are currently two specific projects underway in which development agreements play a key role – the Burnside Bridgehead project (four acres) and the Convention Center Headquarters Hotel (two city blocks). These projects are detailed on page 28.

Further development agreements are anticipated for at least a portion of properties within the Significant Development Areas depicted in Figure 10. In total, these areas represent *close to 250 acres* that are either in consolidated ownership, public ownership or for which interest in high density development has been expressed by private property owners.

2. Streetscape Investments. The City of Portland is committed to creating the pedestrian oriented environment along the alignment that best supports mixed use development at urban densities. Key to this is traffic calming measures which ensure frequent opportunities for pedestrian crossings. The Portland Streetcar Loop Project includes 41 new signalized crossings along the proposed 3.35 mile eastside alignment.

Figure 30. New Signals Included in Streetcar Funding

Streetcar Segment	New Signals
Pearl District (NW)	6
Broadway Bridge to NE 1st	2
NE 3rd - NE 7th	7
NE Wasco - I-84	7
NE Davis - SE Ankeny	8
SE Stark - SE Clay	10
SE Clay - OMSI	1
Total	41

Source: *Portland Streetcar Loop Transportation Management Plan Draft*, November 19 2007; E. D. Hovee & Company, LLC.

Additional priority streetscape investments include sidewalk improvements throughout the corridor (including street trees and eliminating driveways where possible), discouraging future auto oriented land uses, increasing pedestrian connections to the river and riverfront esplanade along four east-west streets, ensuring connections to the region's bike networks, and improving trail systems within a greenspace that intersects the alignment.

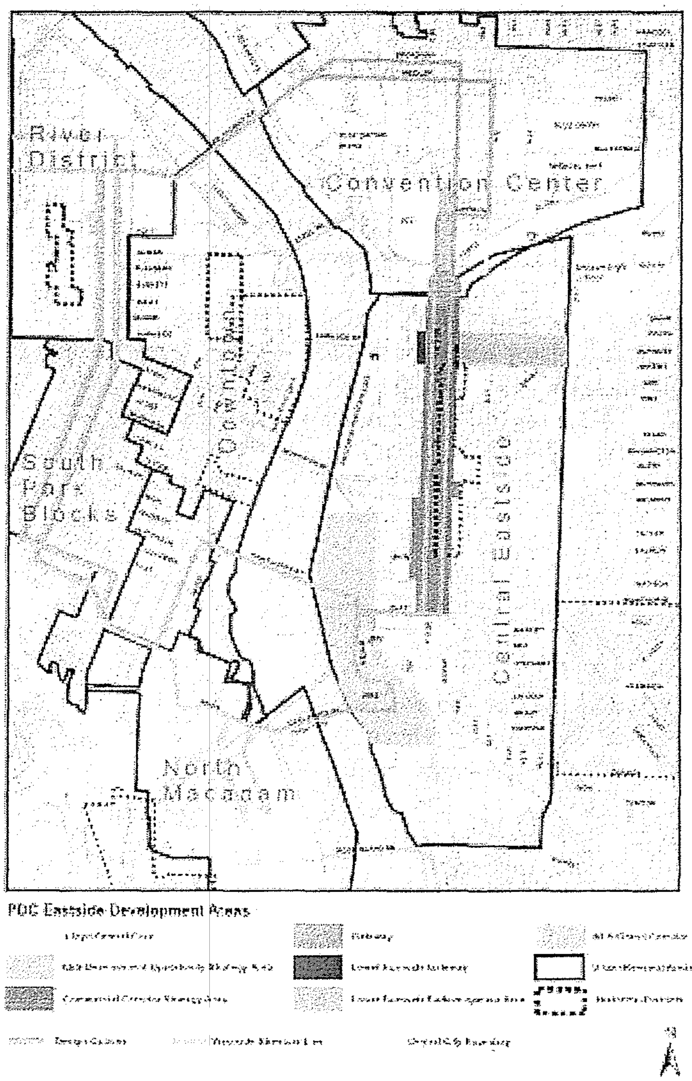
More significant aspirational streetscape investments include an additional I-84 auto crossing to reduce traffic congestion on the existing MLK and Grand north-south bridges and a park bridge across I-5 within the Lloyd District to connect residents with the river.

3. Urban Renewal Districts. In Portland's westside, Urban Renewal has been proven as a powerful tool in generating up-front funds for infrastructure investment, including park development and road improvements. The planned eastside alignment is also encompassed entirely by in-place Urban Renewal Districts, the most successful tool identified to date in generating redevelopment funds.[14] (As is true elsewhere in the U.S., tax increment districts freeze collected tax revenue and direct future revenue growth to redevelopment projects for the lifetime of the district.)

In Portland, tax increment funds can be used to support both streetcar construction and adjacent catalyst development projects. Three districts encompass the proposed completion of the Portland Streetcar Loop:

- **River District (Westside):** The streetcar extension proposed at NW 10th and Lovejoy is in the middle of this westside district, which extends from the existing Portland Streetcar alignment to the proposed Willamette River streetcar crossing on the Broadway Bridge.
- **Convention Center (Eastside):** This Urban Renewal District encompasses the proposed new alignment from the eastside of the Broadway Bridge, through the Lloyd District to the streetcar's crossing of the I-84 freeway. Tax increment funds are planned for acquiring properties and supporting additional housing development, in addition to supporting streetcar construction.
- **Central Eastside:** The time frame for this district was recently extended to allow support of the Burnside Bridgehead project and the Burnside Couch couplet (each further described below). District funding will also support streetcar construction. This district encompasses the remainder of the proposed eastside extension through its southern Willamette River crossing on the planned light rail bridge (north of the Ross Island Bridge), connecting back to the South Waterfront area on Portland's westside.

Figure 31. Urban Renewal Areas



Source: City of Portland.

4. Burnside Street Investments. The Burnside Bridgehead project has been previously described in this report. This four-acre project can accommodate significant jobs and housing; current Phase I plans center on office and retail uses. Urban Renewal funds are currently allocated to incent maximium density at this pivotal site.

The eastside Burnside-Couch couplet is a second project that will impact the Burnside vicinity, roughly the mid-point of the eastside alignment. The project will transform Burnside, a major traffic arterial, into a one-way street eastbound, while Couch (one block to the north) will carry westbound traffic.

Anticipated project benefits include:

- A significantly improved pedestrian environment by providing curb extensions to narrow pedestrian crossing distances across Burnside Street, wider sidewalks, and traffic signals at all intersections;
- A significantly improved biking environment, and reduced traffic conflicts between autos and bicycles, due to a striped bike lane; and
- Enhanced vehicle and transit access and traffic flow through the realignment of Burnside and Couch Streets into a one-way couplet system between the Burnside Bridgehead project and E. 14th Avenue.

Engineering for the couplet is underway as of January 2008. Construction is anticipated to begin in spring 2009 and be completed by summer 2010.

IV. STREETCAR-DEVELOPMENT BENEFIT METRICS

Based on this updated documentation of the streetcar-development nexus, the following *benefit metrics* are offered against which future Small Starts projects might be assessed. While drawn largely from Portland experience and projection, the metrics have broader national applicability as well:

1. **Density of New Development:** Development experienced on Portland's *westside* (between 1997 and 2004) has produced residential plus job densities estimated at YY persons per acre. Market based forecasts for the *eastside* indicate potential for ZZ persons per acre with streetcar extension.

2. **Return on Investment:** Portland's *westside* has captured a *total redevelopment* investment more than 24 times streetcar cost (through 2005). Market-based development projections have been prepared for the *eastside,* encompassing both the Central Eastside Urban Renewal Area and the portion of the Lloyd District within three blocks of the planned alignment. Anticipated value of added *development attributed to streetcar investment* is projected at $778 million versus streetcar project cost of $95 million, for an ROI of 8:1.

3. **Redevelopment Potential:** On Portland's *westside*, approximately 37% of land area within three blocks of the streetcar alignment had improvements to land valuation ratio (pre-streetcar construction) of less than 0.5:1. For Portland's *eastside*, a similar 37% of the proposed corridor extension is associated with a less than 0.5:1 ratio (as of 2007).

4. **Zoned Development Capacity:** *Westside* development experienced post-streetcar to 2004 within three block of the installed Portland Streetcar system has been three times the previously zoned capacity of development. For the proposed *eastside* extension, estimated development capacity within three blocks of the proposed alignment is more than six times existing square footage.

5. **VMT Reduction:** As the regional planning agency for the Portland metropolitan area, Metro has calculated that areas with *good transit and mixed use* experience 9.8 vehicle miles per day of travel per capita – compared with 21.8 miles per day for areas of the region without either good transit or mixed use. The per capita VMT reduction with streetcar-related development (both westside and eastside) is estimated at 55% compared with the suburban greenfield development alternative.

6. **Reduced Carbon Footprint:** Preliminary evaluation consistent with VMT reduction and urban building efficiencies indicates an approximately 65% savings in transportation and development footprint for urban residential use and a 45% reduction for employment use compared to the suburban greenfield development alternative (both westside and eastside).

APPENDIX A. PREPARERS PROFILE

E. D. Hovee & Company, LLC has served public, non-profit and private development clients both in and outside the Pacific Northwest since 1984. The firm has considerable experience in evaluating the nexus between transit and economic development. Within the Portland metro area, E. D. Hovee & Company has conducted transit-economic development assessments including:

- Central Eastside URA development projections with and without streetcar for the Portland Development Commission (2007)
- Portland Streetcar development impact analysis for Portland Streetcar Inc. (2005)
- Evaluation of effects on business and property values of Portland Transit Mall refurbishment and light rail extension – including both long-term valuation and shorter term construction impact assessments (2004-2005)

Both in and outside Portland's Central City, E. D. Hovee & Company, LLC has been involved in a wide range of transit and economic development assessments including light rail impact and station area planning (east, north, west and south MAX/LRT corridors), associated smaller city development (at Gresham and Hillsboro LRT termini). Central City development assessments have been conducted in the Pearl, Old Town, Downtown core, West End, University, South Waterfront, Lloyd and Central Eastside Districts over the last 20+ years.

Outside the Portland metro area, E. D. Hovee & Company, LLC has experience with urban redevelopment throughout the U.S. on behalf of cities, private firms and non-profit organizations such as the National Main Street Center and National Trust for Historic Preservation. The firm has conducted transit-economic development assignments in communities as diverse as West Orange (NJ), Santa Cruz (CA), SeaTac (WA), and Ketchikan (AK).

This streetcar-development report has been prepared by Tess Jordan, Senior Economic Planner and Eric Hovee, Principal.

END NOTES

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1 2005. *Portland Streetcar Development Impacts*, E. D. Hovee & Company, LLC.

2 An FAR of 6.0:1 indicates that building square footage is six times land area of the site occupied.

3 2005. *The Cost of Congestion to the Economy of the Portland Region*. Economic Development Research Group.

4 2002. *The Rise of the Creative Class: And how it's Transforming Work, Leisure, Community and Everyday Life.* Richard Florida.

5 2004. *The Young and the Restless: How Portland Competes for Talent.* Joe Cortright and Carol Coletta. www.Restlessyoung.com/public/pdf/Portland.pdf

6 A floor area ratio (FAR) is defined as building square footage *divided by* square footage of land (or site) area.

7 Larger scale maps for each station and vicinity are available; see City of Portland Comprehensive Plan Designations.

8 Data for improvements to land valuation is available in most communities using tax assessor data. While not all tax assessments reflect 100% of market value, the analysis is useful so long as land and improvements are assessed in a similar ratio to market, or if varying ratios can be adjusted to a similar proportion of market.

9 Excluded from the analysis are lots identified as having individual condominium units (an estimated 6,753 tax lots) as full assessor's information pre- and post-development is not available. Analysis is preliminary and subject to refinement based on further evaluation of pre-1997 and 2004 data sets.

10 2005. *Portland Streetcar Development Impacts*, E. D. Hovee & Company, LLC.

11 2007. *Central Eastside Development Scenarios, May 27, 2007*, E. D. Hovee & Company, LLC.

12 Development projections were itemized and isolate the impact of the Burnside Bridgehead project, the remaining planned projects (in May this included only six projects, versus the 20 identified for this report) and streetcar investment. For the conservative scenario, the density of development assumed for the Burnside Bridgehead and planned projects was decreased from developer reports by 25-50%.

In the aggressive scenario, projects are assumed to move forward at the full density envisioned by developers. The increase in density – the difference between the conservative and aggressive scenarios – has been attributed to streetcar (and accompanying traffic calming measures) as the catalyst that will propel the Central Eastside District to densities beyond what the market is currently delivering.

13 Investment values are estimated in nominal (current) dollars rather than future inflated and/or discounted dollars.

14 The two eastside urban renewal areas are Central Eastside and Oregon Convention Center (OCC). As OCC is being sunsetted, it currently does not have the ability to participate in or benefit from the stimulus of added private investment.

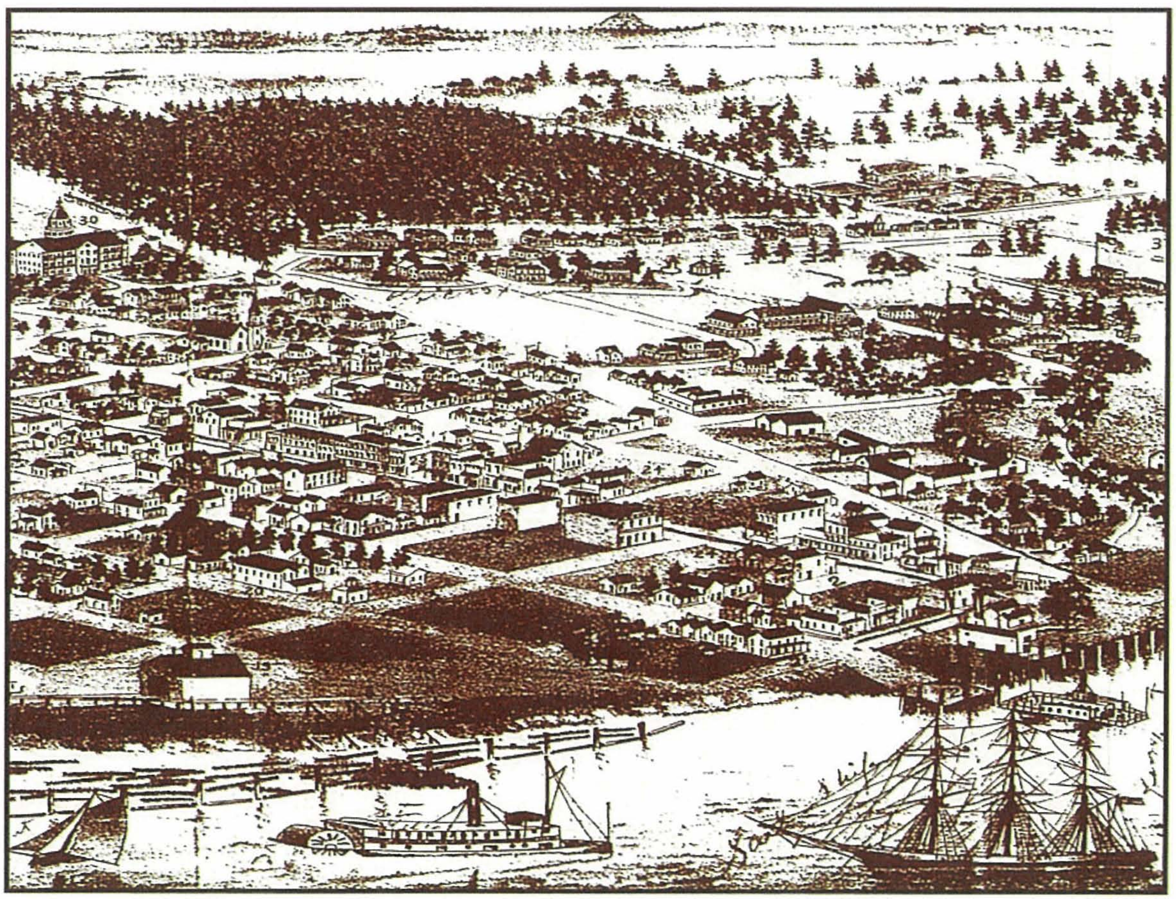
PRELIMINARY

INTERSTATE 5 COLUMBIA RIVER CROSSING SECTION 106 ARCHAEOLOGY TECHNICAL REPORT

Appendix 1A

Cultural Background

Rick Minor
Kathryn Anne Toepel
Stephen Dow Beckham



Heritage Research Associates Report No. 343

PRELIMINARY

INTERSTATE 5 COLUMBIA RIVER CROSSING SECTION 106 ARCHAEOLOGY TECHNICAL REPORT

Appendix 1A

Cultural Background

Rick Minor
Kathryn Anne Toepel
Stephen Dow Beckham

Report to
Washington State Department of Transportation
Oregon Department of Transportation

Submitted to David Evans and Associates, Inc.
Under Agreement No. Y-9245

Rick Minor
Principal Investigator
Heritage Research Associates, Inc.

2007

Heritage Research Associates Report No. 343

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1. INTRODUCTION

The CRC project area extends across the Lower Columbia River Valley, a region known to be rich in prehistoric archaeological resources (Figure 1). At the time of historic contact, the abundant natural resources in the valley supported one of the densest Native American populations in North America. This dense population is reflected in the large number of former camps and villages of the native peoples of the valley that have been recorded as archaeological sites. Previous archaeological research has demonstrated the presence of Native American settlements in the CRC vicinity spanning the last 3,000 years of prehistory, and the potential exists for encountering even earlier evidence of prehistoric occupation during archaeological investigations for the CRC project.

The CRC project area contains an extensive historical archaeological record associated with Euroamerican settlement that begins with the Hudson's Bay Company's (HBC) Fort Vancouver founded on the north bank of the Columbia River in 1829. Kanaka Village, the multi-cultural settlement where the majority of the HBC employees lived, emerged along the southwest side of the fort. Vancouver Barracks, established by the U.S. Army in 1849 adjacent to the HBC stockade, expanded over the years to become one of the most important military installations in the Pacific Northwest. The City of Vancouver developed in the 1850s and 1860s on the north bank of the Columbia River immediately west of the U.S. Military Reserve.

PROJECT AREA

Two segments comprise the CRC project area. Segment A (Delta Park to Mill Plain District) contains lands within both Oregon and Washington while Segment B (Mill Plain District to North Vancouver) is located entirely within Washington. Review of the geomorphology and existing archaeological record of the project area indicates that there is a greater likelihood of encountering prehistoric archaeological sites on the south shore and historical archaeological sites on the north shore of the Columbia River.

Oregon Shore

Segment A: Delta Park to Mill Plain District

Research at SHPO indicates that no archaeological resources have been previously recorded within the CRC APE on the Oregon shore.

Previous archaeological research along the south shore floodplain has sought to explain archaeological site locations in relation to five factors: (1) elevation; (2) distance to water; (3) wetland type; (4) landform (e.g., slough, levee, terrace, riverbank; and (5) habitat. A site prediction model developed for the Columbia South Shore project for the City of Portland Bureau of Planning (Minor et al. 1994) defined four zones for further archaeological testing. Zones 3 and

4 were later combined into a single grassland/woodland zone for elevations above 20 feet due to difficulty in distinguishing them in the field.

A review of the zone definitions in light of the distribution of nine confirmed archaeological sites in the Columbia South Shore project area indicated that Zone 2, marsh/meadow, has the greatest likelihood of containing sites. Zones 3/4, grassland/woodland, are the next most likely, and Zone 1, slough/pond, is the least likely.

The known distribution of sites on the south shore floodplain of the Columbia River indicates that prehistoric settlements were clustered in particular areas. One cluster was east of the project area, around or near two of the largest intermittent water features. This cluster of sites, which encompasses intermittent occupation over the past 2500 or more years, is associated not only with a concentration of waterways, but also with a series of ridges at the extreme eastern end of the project area. This site concentration appears to be part of an activity pattern, perhaps related to the Blue and Fairview lakes vicinity a mile or more to the east.

The other cluster of prehistoric settlements was at the west end of the south shore floodplain around Smith and Bybee lakes and the confluence of Columbia Slough with the Willamette River. With the exception of the St. Johns Site (35MU46) on Columbia Slough (Woodward and Associates 1990), at the time of the CSS project the existence of this western cluster of settlements was known primarily from site record forms. In the decade since the CSS project, investigations have been conducted at a number of sites in this area.

This recent work has included excavations at the Columbia Slough Site (35MU105) (Ellis 1996), excavations at 35MU117 on Bybee Lake (Ellis 1999), and further excavations at the St. Johns Site (Pettigrew 2003, 2005). Radiocarbon dating indicates that occupation at most sites at the west end of the south shore floodplain date within the last 500 years or so. Significantly, excavations at 35MU117 recovered cultural materials in association with charcoal from which radiocarbon dates of 2970 ± 80 BP, 2850 ± 30 BP, and 2800 ± 100 BP were obtained. These dates are the earliest reported for prehistoric occupation on the south shore floodplain, being slightly older than the previously earliest date of 2420 ± 70 BP from the Hemlock Site (35MU84) in the CSS project area (Musil 1992).

Based on this previous work, the following areas have been identified as containing a moderate to high likelihood of containing evidence of buried prehistoric archaeological deposits:

Areas within 100 feet (30 meters) of a historic slough bank

Areas within 100 feet (30 meters) of Marine Drive

Areas within 15–20 feet elevation

Using the above criteria, much of the APE on the Oregon shore can be considered to have a moderate likelihood for archaeological deposits. An archaeological reconnaissance of the existing right-of-way within the project APE was conducted to inform the identification of methodologies for discovery probing. On the Oregon side of the river, probes could be placed within the broad areas at the interchange with Victory Boulevard and on the east side of the interstate in or next to East Delta Park.

In particular, the banks of an abandoned slough in the park appear to be high probability areas. The presence of developed properties and houseboat moorings along the north and south banks of Oregon Slough prohibits probing along those shorelines. The upper end of Hayden Island is relatively recent in age and has been subject to centuries of flooding by Columbia River freshets,

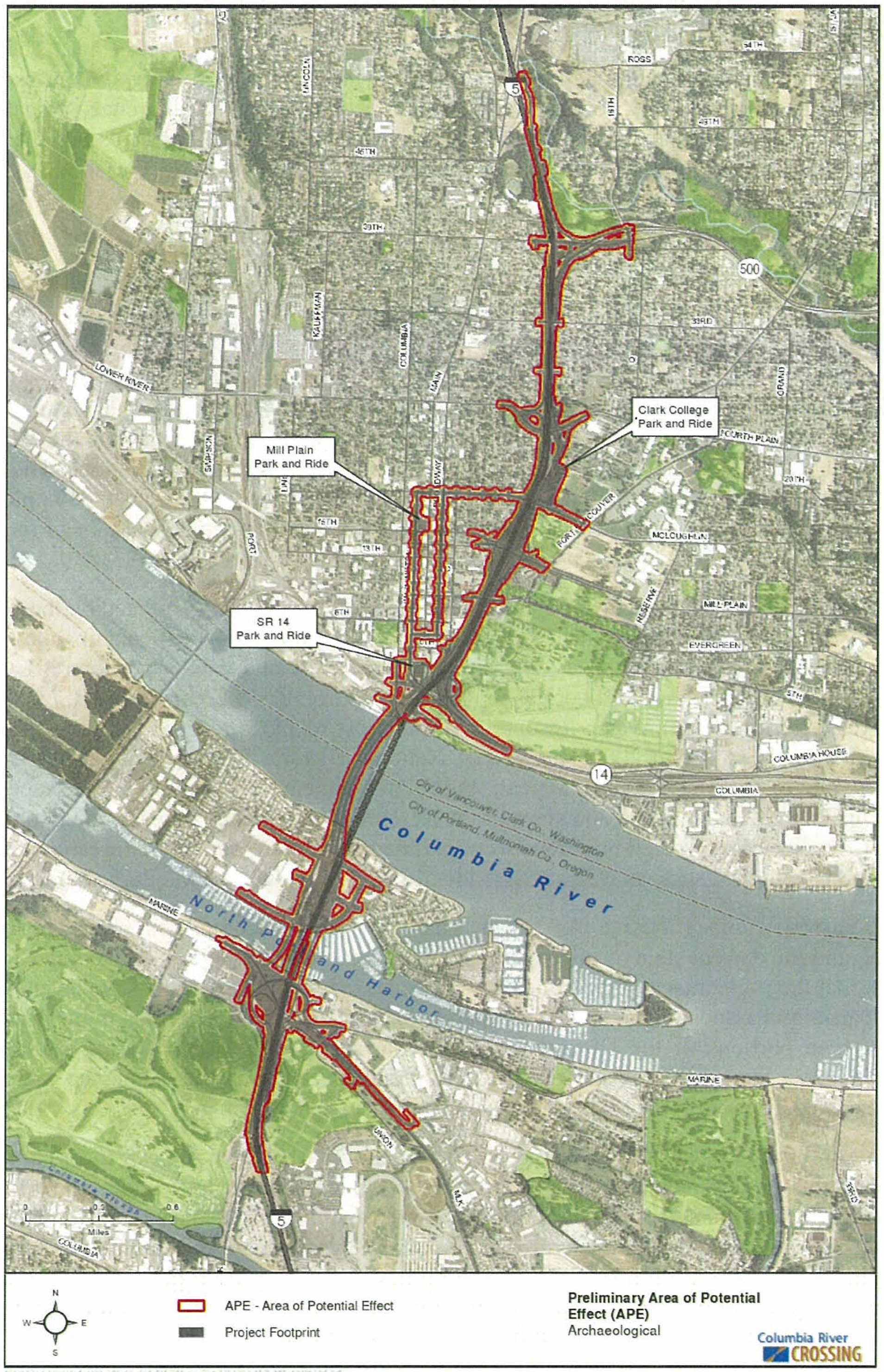

Figure 1. Map of study area including CRC and APE (boxed) where I-5 crosses the Lower Columbia River Valley between Washington and Oregon.

greatly reducing the likelihood that archaeological deposits could survive, even without subsequent roadway and commercial development.

The high degree of commercial development, along with a century of roadway construction and improvement within the APE, contributes to a low potential for historical archaeological features and deposits on the Oregon shore. There is no specific information suggesting that historic features may survive beneath the fill and construction of the APE on the south side of the Columbia River.

Washington Shore

Segment A: Delta Park to Mill Plain District

On the Washington shore, 11 archaeological sites, including one landscape feature (with an underlying archaeological component), have been previously recorded within the CRC APE. Three of these sites—Vancouver Barracks (45CL162H), Fort Vancouver National Historic Site (45CL163H), and Kanaka Village (45CL300H)—encompass extensive overlapping areas containing multiple archaeological features and activity areas that could have been recorded as separate archaeological sites.

As previously noted, the Vancouver National Historic Reserve (VNHR) created by the "Omnibus Parks and Public Lands Management Act of 1996" (Public Law 104-333) contains the following cultural resources: (1) Fort Vancouver National Historic Site and Adjacent Cultural Landscape; (2) Vancouver Barracks and Officers Row; (3) Parade Ground; (4) Pearson Field; (5) Columbia River Waterfront; and (6) Water Resources Area. Most of these resources fall to some extent within the project APE. In 2007, the VNHR National Historic District was established, which includes the overlapping archaeological, built environment, and cultural landscapes within approximately 252 acres of the 366 acres of the Reserve. Four character areas were defined in this District, and specific research questions were outlined to help determine the research potential of known archaeological sites, as well as those identified in the future, within each character area.

The Prehistoric/Contact Native American Character Area encompasses basically the entire District, and the current state of information on prehistoric/contact-period archaeological remains suggest that the pre-contact period components of sites are significant at the state level. Sites tend to be sparser and associated with shorter duration habitation and use activities in the northern and more upland portions of the District (i.e., East Barracks, West Barracks, and parade ground areas). Sites in the southern and more lowland portions that lie in the floodplain and riverside environments appear to reflect longer-duration settlement and activities.

The portion of the Hudson Bay Company Fort Vancouver Character Area of most concern with respect to this project includes the HBC (Kanaka) Village, historic agricultural, riverfront/pond and St. James Mission areas. The current state of information on the archaeological remains from this era indicates that the known archaeological resources, and those with potential to be encountered, are of national significance. Portions of the proposed project closest to and/or encompassing the Village and riverfront/pond would likely have greater potential to impact significant archaeological remains than the historical agricultural areas.

During this era, outbreaks of disease, especially malaria, greatly reduced the Native American population residing in the area, particularly those living in the Village. Native Americans, among others, were treated at the HBC hospital in the riverfront/pond area. People who died during this period may have been buried in this general area, in both dispersed and possibly concentrated patterns. Because so many people died, relatively few people were available to handle the dead, and less care may have been rendered than in normal burial practices. Many parties are very concerned about the potential of the project, regardless of Alternative, to impact single or concentrated burials in this general area.

The U.S. Army, Vancouver Barracks Character Area, abuts I-5 generally north of the FHWA Western Federal Lands building, including Officers Row and vicinity. The current state of information on the archaeological remains from this era indicates that the known archaeological resources, and those that may potentially be encountered, are of national significance. Documentation suggests an historical "military cemetery," was generally located in and/or west of the west end of Officers Row, and may have contained Native American as well as Euroamerican remains (some of which may have been reinterred at this cemetery from an earlier cemetery located elsewhere on the Reserve). While records indicate burials within the cemetery were exhumed and reinterred elsewhere, other records suggest that some burials, the exact locations of which are unknown, may still remain.

The Mission 66 Character Area is associated with the U.S. Army Vancouver Arsenal/Ordinance Depot Site dating to 1855–1885. NPS archaeologists tested this area in 2005–2006; a report on this work is not yet available (Robert Cromwell, personal communication, 2008).

Most previous archaeological research has been conducted on the east side of the APE within the confines of the Vancouver National Historic Reserve. In recent years, archaeology has begun to be conducted on the west side of the APE, which corresponds to the oldest part of the City of Vancouver. Historic Sanborn insurance maps dating between 1884 and 1949 indicate that this portion of the APE south of 20th Street was heavily developed and contained a range of residential and commercial sites. Several projects conducted within the past decade confirm the high likelihood of extant historical archaeological deposits in the historic area of the City of Vancouver. Although few comprehensive reports have been filed on archaeological excavations in the historic downtown portion of Vancouver, the information so far available suggests that the historic "urban archaeology" resources in this area minimally may be of statewide significance, especially in view of their likely contemporaneous character and socioeconomic and cultural (material) affiliations with the U.S. Army presence in the abutting Reserve area.

Consequently, between the potential for historical archaeology relating to the settlement of the City of Vancouver on the west side of the project corridor and the known historical archaeological resources in the Vancouver National Historic Reserve on the east side of the project corridor, virtually this entire segment of the APE is considered to have a high potential area for archaeological resources. In addition, the Clark County Archaeological Probability Model indicates that a broad margin along the Columbia River, both below and above the riverbank, is a high probability area because of its proximity to the river and its resources.

During an archaeological reconnaissance along this segment undertaken to identify locations where subsurface probing might be feasible, opportunities appeared to be severely restricted due to the extensive construction, which includes broad expanses of concrete within roadway rights-of-way. The most likely locations for subsurface access are within the interchange loops at the junction of I-5 with SR 14 that are not covered by deep fill. On the southeast side of the I-5/SR 14 junction is old Apple Tree Park, the location of an historic apple tree (45CL164H) and an area in which archaeological deposits are known to be present. Other possibilities, depending on the depth of fill, are the gravel-covered lots just north of the river between the interstate and

Columbia Street on the west side of the interstate and the gravel-covered lot on the east side south of the railroad tracks. Additional areas for possible probing include certain non-fill areas at and adjacent to the I-5 interchange with Mill Plain Boulevard.

Segment B: Mill Plain District to North Vancouver

Review of records on file at DAHP indicates that no prehistoric or historical archaeological sites have been previously recorded within this segment of the APE north of 20th Street.

The Clark County Archaeological Predictive Model indicates that only the area in the vicinity of Burnt Bridge Creek has a high potential for containing prehistoric archaeological resources. An archaeological reconnaissance indicates that possible areas for discovery probing would be feasible in non-fill areas at and adjacent to the interchange of Fourth Plain Boulevard and at the 39th Street interchange. There also appear to be some unaltered landforms at the interchange with Main Street at the north end of the APE where probing may be possible in the vicinity of Burnt Bridge Creek.

Historic Sanborn insurance maps indicate that the City of Vancouver began to spread north of 20th Street by 1907 and had reached 41st Street by 1949, indicating that there is a moderate likelihood of encountering buried historical archaeological deposits associated with residences and businesses dating to the early 20th Century settlement of Clark County.

2. GEOLOGY AND GEOMORPHOLOGY

The I-5 bridge within the CRC project area is located at River Mile 106.4 in the Portland–Vancouver basin of the Lower Columbia River Valley. The Portland–Vancouver basin was formed early in the Pliocene by a gentle syncline or downwarp of flows of volcanic rock known collectively as Columbia River Basalt. The Pliocene compression or folding produced a regional north–south trend of highlands and basins. The Willamette and Puget valleys were formed between the Cascade and Coast ranges. Near the end of the Pliocene the Columbia River flow appears to have been slowed or impounded, leading to deposition of 1,500 feet of fine-grained Sandy River Mudstone (Trimble 1963). The Columbia River Basalt and Sandy River Mudstone are not exposed in the CRC project area.

Before the end of the Pliocene, a change in deposition occurred as a sand and gravel delta emanating from the west end of the Columbia Gorge formed in the Portland Basin. These deposits are referred to as either Troutdale (cemented) or Pleistocene (uncemented) fluvial gravels. The upper member of the Troutdale Formation, which includes sand, cobbles, and boulders, ranges from 5 million to 2 million years in age (Trimble 1963; Beeson and Tolan 1993). The younger Pleistocene gravel deposits could range from 2 million years in age to the last ice age (e.g., the late Wisconsin). The younger Pleistocene gravels occur well above the present grade of the Columbia River, indicating changing base levels in late-Pleistocene times.

Uncemented naturally stratified sand and silt deposits at elevations higher than historic flood heights or latest Holocene floods (~35 feet NGVD29) represent cataclysmic flood deposits from glacial Lake Missoula. Multiple dam bursts from this glacially dammed, ice-age lake produced numerous sequences of fining-up beds called rhythmites, which were locally remobilized to form interbeds of loess (Lentz 1983). The youngest glacial flood deposits from Lake Missoula that inundated the Lower Columbia Valley are dated to about 12,000 years ago (Benito and O'Connor 2003). The upland terraces adjacent to the north and south sides of the Columbia River in the CRC project area are covered by the glacial flood rhythmites and loess, representing the latest-Pleistocene peri-glacial deposits (Beeson et al. 1991).

The Columbia River is presently tidally controlled from the mouth upstream to Bonneville Dam. Tidal range in the CRC project area is about 1.8 feet. As sea level rose from a depth of –360 feet at 16,000 years ago, the ancestral Columbia River Valley was submerged. Sea level extended upslope (landward) in the ancestral Columbia River Valley to an elevation of –230 feet relative to modern sea level at 12,000 years ago (Gates 1994). At the time of the deposition of Mazama ash from the eruption of Mount Mazama at present-day Crater Lake 7,000 years ago (Bacon 1983), sea level in the Lower Columbia Valley would have reached –41 feet. The declining rate of sea level rise after 7000 years ago resulted in sea level approaching its present elevation by several thousand years ago. Sea level, and corresponding river level, in the CRC project area has risen only 3 meters (9.8 feet) in the last 3,000 years, a rate of about 1 mm/year (Peterson et al. 2007).

The earliest bathymetric and shoreline map available (1841) indicates that the Columbia River channel in the CRC project area averaged 24–30 feet depth. A U.S. Army Corps of Engineers map from 1933 provides another record of main channel depths prior to Columbia River and tributary impoundments ranging from 15 to 22 feet, but rarely exceeding 20 feet below the

Columbia River Datum (about mean sea level). A modern bathymetric chart indicates a turning basin between the Port of Vancouver and Hayden Island dredged to about 40 feet, with the channel above the I-5 bridge maintained to –27 feet for barge traffic.

The 1948 flood height in the north Portland area was measured at +32.8 feet (NGVD29). The flood of 1894 is reported to have had a slightly higher elevation. Other flood heights range from 17 feet for 1-year freshets to 32 feet for 20-year floods (Kuper and Lawes 1994). Elevations on the south shore floodplain in the CRC APE range from 0 to 30 feet; thus this area was regularly subject to inundation from seasonal floods. In comparison, the terrain on the north shore floodplain in the CRC APE ascends quickly, so that only a narrow strip of ground adjacent to the river lies at elevations of 30 feet or less and was subject to regular inundation.

The underlying geology and geomorphology have combined with hydrology to form environments on either side of the Columbia River within the CRC project area that contrast in their potential for containing prehistoric archaeological resources. As well, the history of settlement and development on the two shores differs significantly, with the result that prehistoric archaeological resources are the primary concern on the Oregon shore, while historical archaeological resources are the primary (although not exclusive) concern on the Washington shore.

Appendix 1A-I contains detailed information on the geology of the project area, establishing the geological context in which archaeological resources may be found on the Oregon and Washington shores of the Columbia River.

3. PREHISTORY

The Lower Columbia River Valley, within which the CRC project area is located, has long been recognized as a pivotal area in Pacific Northwest prehistory. As used here, the term Lower Columbia refers to that portion of the valley extending downstream from The Dalles to the Pacific Ocean. As a near-sea-level connection between the interior Columbia Plateau and the coastal lowlands of western Oregon and Washington, the Lower Columbia served as a route of transmission for populations, cultural traits, and trade throughout prehistory.

At the time of historic contact, speakers of Chinookan languages occupied the shores of the Lower Columbia River from the Pacific coast upstream to The Dalles. These peoples are often included in the Northwest Coast culture area (e.g., Kroeber 1939; Drucker 1955). More recent assessments in the *Handbook of North American Indians*, however, have clarified the broader culture area relationships of the Chinookan peoples. The Chinookan groups "who lived from the coast to a point above the Willamette River" continue to be considered with the Northwest Coast (Silverstein 1990:533), while the Chinookan groups upstream from the confluence of the Willamette and Columbia Rivers are assigned to the Plateau culture area (French and French 1998).

Early archaeologists often compared prehistoric remains along the Lower Columbia to the archaeological record in The Dalles area upstream on the western edge of the Plateau. The narrowing of the Columbia River at The Dalles created the single most productive area for fishing in the Plateau. In turn, the concentration of subsistence resources enabled native peoples to gather during the fall, making The Dalles area one of the major centers of interregional trade and exchange in the Pacific Northwest (Wood 1972:156; Galm 1994:294; Stern 1998).

The archaeological record in The Dalles area, particularly at Wakemap Mound, contained evidence of a cultural "florescence" (Butler 1959:7) or "efflorescence" (Cressman et al. 1960:70) over the last few thousand years that is reflected in elaborate bone, antler, and stone artifacts as well as rock art. The late prehistoric inhabitants of The Dalles area attained a higher level of cultural complexity than contemporary native peoples elsewhere on the Plateau (Schulting 1995:57; Hayden and Schulting 1997). Aspects of this cultural complexity are apparent in the archaeological record downstream from The Dalles in the Lower Columbia Valley.

The following review of the archaeological literature takes an historical approach, attempting to trace how conceptions of the prehistoric peoples of the Lower Columbia Valley have evolved over time. Because the time span of interest extends into the historic era, the ages of radiocarbon dates (uncalibrated) are presented in terms of calendar dates AD/BC.

CONCEPTIONS OF LOWER COLUMBIA PREHISTORY

While artifacts collected from the region are sometimes mentioned in earlier publications (e.g., Eells 1889, Smith 1906), the first attempts at understanding how the prehistoric cultures of the Lower Columbia Valley fit into the larger picture of Pacific Northwest prehistory date to the 1920s and later, before many archaeological sites had yet been identified, investigated, and reported. Because little archaeological data was actually available, early archaeologists used ethnography as a point of departure, framing their discussions of Lower Columbia prehistory primarily in terms of competing influences from the Northwest Coast and Plateau culture areas.

Rock Art

The first investigations by professional archaeologists in The Dalles–Deschutes area, at the extreme upstream end of the Lower Columbia Valley as defined here, were undertaken from 1924 to 1926 by archaeologists from the University of California (Strong et al. 1930). This work included extensive surveys and test excavations, and large-scale excavations at Wakemap Mound, the most prominent late prehistoric site in The Dalles area, and at several sites on Miller Island at the mouth of the Deschutes River. A related aspect of this research included study of rock art in Petroglyph Canyon on the Washington shore at The Dalles. In drawing comparisons with the rock art in this canyon, Strong and Schenck (1925:87) referred to sites downstream on the Columbia:

> Around the mouth of the Willamette River, on the Washington shore of the Columbia, are a few large boulders with exceedingly crude faces pecked on them. Many others having the surface and face of the rock toward the river are elaborately pecked, often an inch deep. Here some circular designs are observable, but as a rule a series of pits with connecting channels characterized the type.

Strong and Schenck (1925:87) briefly noted the occurrence of this petroglyph style at Fishers Landing in Clark County, and also mentioned two "up-river examples seemingly of this old type." The most noteworthy petroglyph at Fishers Landing is known as the "beaver bowl" (Figure 2), which has been described as a "beaver image pecked using bas-relief to create a shallow three-dimensional animal form with great emphasis on the beaver's anatomical details" occurring on the top of a very large boulder or bedrock outcrop (Poetschat et al. 2003:33). Similar beaver bowls are known to have been found at Wakemap Mound and other sites in The Dalles area (Poetschat et al. 2003:38–39). The petroglyphs characterized by concentric circles and by simple pits or cupules along the Lower Columbia River downstream from The Dalles originally noted by Strong and Schenck (1925) have been referred to as the "Down River Style" to distinguish them from the more elaborate rock art in The Dalles area (Hill and Hill 1974:240–242).

A more recent rock art study has recognized two styles among the petroglyphs along the Columbia River downstream from The Dalles. The curvilinear petroglyphs that make use of circles and smoothly curved connecting lines "noted on deeply carved riverside boulders near Portland" are characteristic of the Basic Conventionalized Rock Art Style, which is widely distributed on the Northwest Coast (Lundy 1982:91). The pits or cupules were assigned to the Abstract Curvilinear Style which, although regularly occurring with the Basic Conventionalized Rock Art Style, "is widely but sparsely distributed along the coast and appears to link up with the pit and groove designs and style of the American Great Basin and Southwestern cultural areas" (Lundy 1982:94–95). The Basic Conventionalized Rock Art Style is thought to be related to the mobile stone sculpture complexes of the Fraser River, Gulf of Georgia, and Columbia River systems (Lundy 1982:91).

Although not directly datable, pit or cupule petroglyphs are thought to be the oldest form of rock art in The Dalles–Deschutes area. As noted by McClure (1984:159), "one pit and groove panel at site 35WS8 is located adjacent to cultural deposits which span at least 10,000 years of prehistory." From The Dalles area, pit petroglyphs on boulders extend downstream along the Washington shore, where they have been identified at three sites in Skamania County and five

Figure 2. Photograph of the beaver bowl petroglyph at Fishers Landing (site 45CL6). Photograph by Mike Taylor.

sites in Clark County, with the site farthest downstream situated about halfway between Camas and Vancouver (McClure 1978).

Mobile Stone Sculpture

In addition to their extensive research in The Dalles–Deschutes area, the University of California archaeologists conducted small-scale investigations on the Columbia River on Sauvie Island, situated just below the confluence of the Willamette and Columbia Rivers (Strong et al. 1930:146–147). Among the noteworthy finds during surface surveys and test excavations at one site near the west end of the island were ground stone artifacts decorated with elaborate carvings that link the prehistoric inhabitants of this area with those farther upstream. In summarizing the information available about elaborately decorated artifacts found in The Dalles–Deschutes area, Strong et al. (1930:143) commented:

> These sculptures of large decorated, or small double-sided mortars, effigy pestles, and the animal or anthropomorphic forms with cup-like containers which we have described from the Dalles–Deschutes region, have also been found on the lower Columbia (notably on Sauvie Island at the Mouth of the Willamette River), and on the coast of Washington and British Columbia. They are often characterized by a clear delineation of ribs suggesting some early widespread ghost cult.

This idea of a "ghost cult" was later elaborated upon by William D. Strong, who linked "anthropomorphic and animalistic effigies which suggest the dead by clearly accentuated ribs" to the catastrophic decline in the native population of the Lower Columbia resulting from epidemics introduced in protohistoric times (Strong 1945:248, 254).

Mobile stone sculpture in the Lower Columbia Valley was dominated by a particular art style in which birds, fish, and human forms were carved as an enrichment on mortars, and as figures in the round and in relief (Wingert 1952:12). This art style appears to have been concentrated on and around Sauvie Island (Wingert 1952:12; Butler 1965a:11; Peterson 1978:192).

An important recent study has pointed out a connection between rock art occurring on boulders and the mobile stone sculptures that occur along the Lower Columbia, noting that a continuum exists "from small mobile pieces, to images on larger boulders, to carved bedrock images, and finally to ordinary petroglyphs" (Poetschat and Keyser 2007:27). This connection is well illustrated by the fact that at least eight examples of "beaver bowls" occurring as mobile stone sculptures similar to the beaver bowl in bedrock at Fishers Landing have been found along the Lower Columbia (Poetschat and Keyser 2007:27–30).

Observing that artistic elaboration in stone sculpture reached its highest development on the Fraser and Lower Columbia Rivers, Smith (1956:291) suggested that the two areas were once connected culturally by a "Foothills Province" that "occurred in the foothill regions of the Cascades and the Coast Range, on both sides of the mountains from the upper Lillooet to the Dalles." Smith (1956:291) envisioned that elaboration in stone sculpture developed earlier in the north, "arriving at the Dalles in the protohistoric period." Subsequent research, however, has established that elaborate stone sculpture on the Lower Columbia has considerable time depth. Specifically, Butler noted similarities between the mobile stone sculpture around Sauvie Island and some of the stone sculpture dating to the Middle Period at The Dalles, estimated to date from 4500 BC to AD 500 (Butler 1957:161–165).

Ceramic Complex

Discoveries of decorated ceramic objects in archaeological sites along the Lower Columbia prompted further discussions of the relation of this area to the Plateau and Northwest Coast culture areas (Figure 3). Two fired clay figurine fragments decorated with punctations or incisions found in 1932 in a site near Sara (Ridgefield) in Clark County were reported by Pendergast (1957), and another "truefired potsherd" from a "heavy mortar-shaped vessel" bearing an incised "pine tree" or "fish skeleton" design found at a site near the mouth of Salmon Creek in Clark County was reported by Osborne (1957a). The latter object was from Site 45CL11 recorded in the survey by Warren (1959:15). Noting that "a fair number of fragmentary figurines and other presumably associated clay objects are known in the interior" farther upstream on the Middle Columbia River, Caldwell (1957:56) suggested that the occurrence of decorated clay artifacts on the Lower Columbia "extends a similarity of pattern, categorized perhaps as pre- or incipient Plateau, from the Columbia Basin west to the Coast."

Three more impressed clay objects from a site on the Columbia River near Ridgefield in Clark County were reported by Bryan (1959). According to Bryan (1959:59), "two of these artifacts are pieces of clay figurines, one of which has been fired." The "fired piece" was identified as "a torso of a human figurine" (Bryan 1959:59). One of the unfired pieces was "the head of a human figurine having a decoration impressed and incised prior to hardening, possibly by the sun. The decoration represents a human head wearing a headdress" (Bryan 1959:60). The other unfired piece had "a flattened oval shape with irregular horizontal and vertical rows of punctations on one face" (Bryan 1959:60).

Although recognizing that decorated clay objects had also been found upstream on the Middle Columbia, Bryan (1959:61) viewed these distinctive artifacts as aspects of a "larger complex, which includes decorated stone and antler, as well as clay, [that] is most highly developed in the

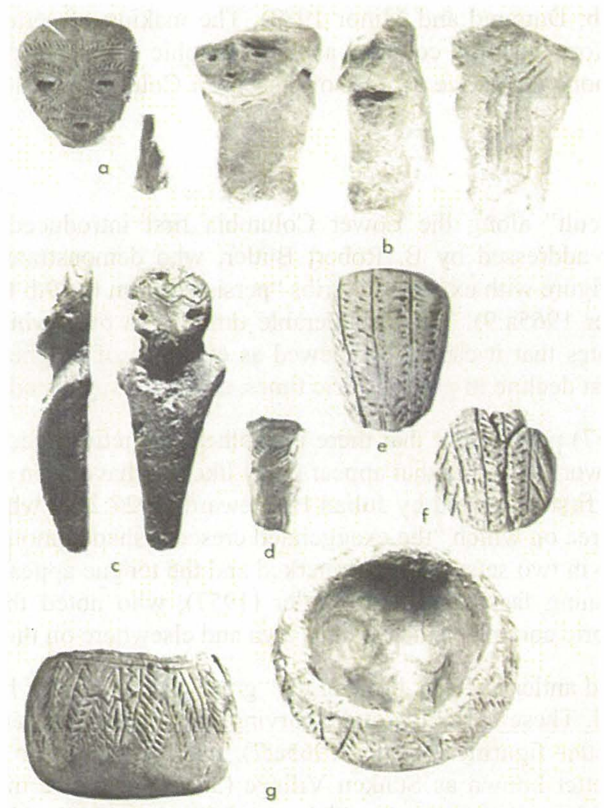

Figure 3. Examples of ceramics from the Lower Columbia Valley: a–c, figurines; d–f, tablets; g, bowls (from Butler 1965a:Figure 2).

area straddling the Cascades from The Dalles to Vancouver and becomes weaker farther up the Columbia in the heart of the 'Plateau.'" Bryan (1959:62) then suggested that

> Perhaps students should reorient their thinking to consider the possibility of a Trans-Cascadian province which is neither Northwest Coast nor arid Plateau (Columbia Basin) in orientation. To me it seems plausible to view this Trans-Cascadian ecological province, especially along the Columbia, as more of a cultural unifier than a cultural barrier.

In the years since ceramics were first described in the area, additional finds have been made, mostly in the Sauvie Island–Lake River area (Butler 1965a; Woodward 1977; Stenger 1990, 1992). The ceramics consist primarily of figurines, but also include vessels, smoking pipes, pendants, and handles (Stenger 1990, 1992). Stenger (1992) drew a distinction between low-fired ceramics and high-fired ceramics. The low-fired ceramics are earlier, having been found at the Lady Island Site (45CL48) from which radiocarbon dates ranging from 60 ± 50 BC to 530 ± 60 BC have been reported (Woodward 1977).

The later high-fired ceramics have been reported from a number of later prehistoric sites in the Sauvie Island–Lake River area. From there, they were apparently traded upriver where they have been found at Wakemap Mound and at sites even farther upstream along the Middle Columbia River (Osborne 1957b; Dumond and Minor 1983). The making of ceramic artifacts apparently ceased sometime before historic contact, as ethnographic and historical accounts make no mention of pottery among the native peoples of the Lower Columbia Valley.

Ghost Cult

The idea of "ghost cult" along the Lower Columbia first introduced by Strong and others (1930:143) was later addressed by B. Robert Butler, who demonstrated that a basic style of depicting the human figure with exaggerated ribs "persisted from the 9th through the 19th century at The Dalles" (Butler 1965a:9). The considerable time depth over which the exaggerated ribs motif occurred indicates that it cannot be viewed as evidence of a "ghost cult" associated with catastrophic population decline in protohistoric times, as earlier suggested by Strong (1945).

However, Bulter (1957) pointed out that there is another distinctive decorative motif that occurs on artifacts on the Lower Columbia that appears very likely to have been associated with a "ghost cult." This motif was first described by Julian H. Steward (1927:256) when he reported carvings found in The Dalles area on which "the exaggerated crescent-shaped mouth is open and grinning, with the teeth, usually in two sets, clearly demarked and the tongue appearing in the center." This was named the "grinning face" motif by Butler (1957), who noted that it tends to occur in protohistoric and historic contexts in The Dalles area and elsewhere on the Lower Columbia.

A number of stone and antler artifacts bearing the "grinning face" motif have been reported from sites on Sauvie Island. These include a stone carving and a stone mortar illustrated by Wingert (1952), as well as antler figurines (Butler 1965a:7). One of the antler figurines was from the Bridge Camp Site, better known as Sunken Village (35MU4), where many perishable artifacts remain well-preserved in sediments in the tidal zone (Newman 1991). Although artifacts bearing the "grinning face" motif appear to have been more common in The Dalles area, Butler (1965a:8) suggested that "there is an indication of an earlier, intermediate, or incipient 'grinning face' style" in the Sauvie Island region, and on that basis he suggested that "the Sauvie Island region **might have been** the center of development for the "grinning face" style (Butler 1965a:11, bold in original).

Trans-Cascadian Tradition

Following the initial investigations in the mid-1920s by Strong, Schenck, and Steward (1930), additional excavations were undertaken in Wakemap Mound at The Dalles in the 1950s by Warren W. Caldwell (1956). In discussing Wakemap Mound in relation to surrounding regions, Caldwell summarized the principal evidence then available from the Lower Columbia, which consisted of brief reports on three sites in the Portland Basin excavated by amateur archaeologists. While recognizing that these three sites "do not provide a complete picture of the archaeology of the area," Caldwell (1956:253) concluded that "the region is characterized by a basic Plateau material culture and has been so from an early time."

Based on experience excavating sites along the Pacific Northwest Gas Pipeline through southwestern Washington, Bryan (1957:9) identified a complex of artifacts found in this area including circular semi-subterranean house depressions, cobble choppers, and small projectile point types as "closely related to the Plateau culture." Bryan added that "although some coastal traits were observed along the Columbia River, such as rectangular house depressions, the preponderance of Plateau-like traits and paucity of typical coastal traits such as ground stone celts and spool-shaped hand mauls," led him "to concur with Caldwell's conclusion" that "a Plateau-like tradition was of long-standing duration" in southwestern Washington (Bryan 1957:9). Bryan proposed the concept of "a widespread Coast–Plateau land-oriented tradition which could be called Trans-Cascadian" to explain the "parallel interrelated development" between southwestern Washington and the Plateau" (also see Tuohy and Bryan 1959:46).

Caldwell's and Bryan's conclusions about the existence and time depth of a "Plateau-like tradition" in southwestern Washington were immediately criticized by Claude N. Warren (1959), who argued that "not only is the 'long-standing duration' of this 'Plateau-like complex' questionable, but...the very presence of such a complex throughout the whole of Southwestern Washington is itself in question" (Warren 1959:10). Warren proceeded to summarize evidence from sites recorded during a survey along the Lower Columbia in 1955 (supplemented by even earlier surveys), dividing the sites into two groups. Sites along the north shore of the Columbia from Skamania downstream to five miles east of Vancouver were included in the "foothills" group, in which

> ...villages are characterized by circular and oval, semi-subterranean house pits scattered about the sites in no discernable pattern, by an abundance of chipped stone, choppers, perforated sinkers, plain and elaborately carved pestles, mauls, mortars and grooved sinkers, and by stone sculpture in the round, as well as elaborate petroglyphs. Most of these traits are found throughout the Plateau. (Warren 1959:14)

In contrast, farther downstream "along the shore of Lake River" and on nearby Sauvie Island were "a number of village sites which are very similar in surface indications and appear to represent a homogeneous group when compared to sites located in the foothills east of Vancouver" (Warren 1959:14).

> Though information is extremely limited from the Lake River area, it appears that the village pattern during the contact and proto-historic period was distinct from that of the Plateau. House pits were rectangular, usually at least twice as long as they were wide and often approaching 100 feet or more in length. They were constructed in a single row parallel to the river and sometimes small, circular pits were located nearby, probably representing huts for specialized purposes. Whether or not these rectangular house pits represent the coastal plank houses is unknown. However, such houses were reported by Lewis and Clark for this area in historic times (Coues 1893). (Warren 1959:18)

Warren (1959:23) concluded that the site data suggest (1) "a late 'Plateau-like' or 'Interior' complex penetrating as far as the western foothills of the Cascades," and (2) "the interior influence appears to be less pronounced as a late overlay in the Sauvie Island and Lake River areas." Warren (1959:24) suggested that both of these patterns dated to the late prehistoric to early historic periods. Accordingly, he concluded that the idea of a "Plateau-like tradition" of "long-standing duration" in southwestern Washington "appears to be premature in light of the information now at hand."

Warren (1960) subsequently sought to clarify what he viewed as distinct differences between housepit and village patterns along the Lower Columbia and in the Plateau.

> The villages in the Lake River–Sauvie Island area are characterized by large rectangular housepits, probably representing plank houses, and in some cases probably subdivided into small apartment-like units. These houses are arranged end to end in a single line parallel to the river... The village pattern for the Plateau appears to be less rigid and is usually only roughly oriented toward the river, with occasional parallel orientation. The house forms are varied and generally of smaller dimensions than those described for the Lake River–Sauvie Island region. (Warren 1960:27)

Donald R. Tuohy and Alan L. Bryan subsequently reported on the sites recorded and tested along the Pacific Northwest Gas Pipeline through southwestern Washington previously referred to by Bryan (1957). Seven sites were in Clark County, with one site each in Klickitat, Cowlitz, Lewis, and Snohomish counties. Although housepits were not identified at any of these sites, Tuohy and Bryan noted that two sites containing housepits occurred nearby.

One site, recorded as 45CL11 by Warren (1959), on the north bank of Lake River contained both rectangular housepits and smaller circular depressions; according to Tuohy and Bryan (1959:37) this site "almost certainly is the Chinook village Lewis and Clark called 'Shoto'". The other site consisted of a series of large circular house depressions on the south bank of Lake River (Tuohy and Bryan 1959:33). Tuohy and Bryan (1959:37) noted that historic trade goods have been recovered from both sites, "both of which contain circular depressions usually regarded as housepits by Plateau archaeologists."

According to Tuohy and Bryan (1959:37), "these data [the occurrence of trade goods] unequivocally demonstrate that circular depressions are features found at historically known Clackamas [Chinookan] villages on the floodplain of the Lower Columbia west of the Cascades." In view of this situation, Tuohy and Bryan (1959:37) suggested "that circular depressions can be considered as much a part of the ethnographically known Chinook (Coastal) cultures of Southwestern Washington as they are part of the ethnographic Plateau cultures (Ray 1939:137–140; Smith 1947:256–264)."

In separate discussions at the end of their article, Tuohy and Bryan both returned to the concept of a Trans-Cascadian Tradition earlier proposed by Bryan (1957) "...to explain the interrelated developments which culminated in the ethnographic 'Coastal' and 'Plateau' cultures in Washington" (Tuohy and Bryan 1959:42). Bryan related this tradition to the sequential Lithic, Archaic, and Formative Stages defined by Willey and Phillips (1958), writing "I view the Lithic and Archaic Stage sites from Western Washington as representatives of a wide-spread Coast–Plateau land-oriented tradition for which I have suggested the term 'Trans-Cascadian'" (Tuohy and Bryan 1959:46).

In Bryan's view, "the area encompassed by this Trans-Cascadian Tradition gradually shrank in size as the Early Maritime Tradition, oriented almost entirely towards the sea, expanded along the sea coasts, and initiated an acculturation process which culminated in a Maritime Cultural Tradition adapted to both land and sea resources" (Tuohy and Bryan 1959:46). Tuohy and Bryan (1959:Table 1) estimated a time range from around 4000 BC to AD 500 for the Trans-Cascadian Tradition, following immediately after the time range of the Old Cordilleran Culture (discussed below).

UNITS OF CULTURE AND UNITS OF TIME

Early archaeologists conducting research along the Lower Columbia River often employed the sequence of broad "historical-developmental" stages outlined by Willey and Phillips (1958) to interpret their findings within the larger context of New World prehistory (e.g., Caldwell 1956; Bryan 1957; Tuohy and Bryan 1959). Archaeological evidence found in the Pacific Northwest is representative of the Paleo-Indian, Archaic, and Formative stages. While some, perhaps most, archaeologists currently working in the Pacific Northwest eschew the Willey and Phillips terminology, characterizations of prehistoric cultures according to these broad cultural stages continue to appear in the archaeological literature because they provide a common interpretive framework understood by most archaeologists.

In contrast to the broad cultural stages outlined by Willey and Phillips, which are atemporal cultural units, chronological units such as phases and traditions have been difficult to distinguish in the Lower Columbia Valley downstream from The Dalles. Aside from the previously discussed Trans-Cascadian Tradition, the first attempt at defining chronological units for the Lower Columbia Valley downstream from The Dalles was made in the mid-1970s by Richard M. Pettigrew (1977, 1981, 1990). Excavations were conducted to recover artifact assemblages from seven sites in the Scappoose–Sauvie Island area, from which more than twenty radiocarbon dates were obtained.

The two-phase "Portland Basin" sequence consisted of the Merrybell Phase, estimated to date from 600 BC to AD 200, and the Multnomah Phase, estimated to date from AD 200 to 1835. The later Multnomah Phase was subdivided into three subphases. The Multnomah 1 (AD 200–1250) and Multnomah 2 (AD 1250–1750) subphases were distinguished primarily by differences in the frequency of particular narrow-necked projectile point types. The division between the two subphases was thought to correlate with the "Cascade Landslide Flood," a flood assumed to have been of catastrophic proportions that followed breaching of a landslide dam near present-day Bonneville Dam in the Columbia River Gorge. The Multnomah 3 Subphase (AD 1750–1835) was indicated by the presence of historic trade goods at Native American settlements.

The sequence of phases and subphases defined by Pettigrew (1977, 1981, 1990) is still often referred to today. A similar sequence, with only slight adjustments in beginning and ending dates, was later proposed for the area around the mouth of the Columbia River (Minor 1983). Both of these sequences are susceptible to criticism on two main grounds. The first criticism focuses on the criteria used to define the projectile point typology, which formed the primary basis on which phases and subphases were distinguished. Aside from measuring neck-width to determine broad-necked from narrow-necked points, the remainder of the criteria for identifying point types were judgmental rather than metric (Dunnell and Beck 1979:86–91). Most classification systems applied to projectile points today employ a metric approach to ensure types are defined on the basis of verifiable attributes (e.g., Thomas 1981; Toepel 1985).

Analysis of projectile points from the excavated sites in the Scappoose–Sauvie Island area indicated that broad-necked (8 mm and greater) points are generally older than narrow-necked (7 mm or less) points. This conclusion is consistent with other studies, which associate broad-necked points with use of the atlatl and dart weapon system, and narrow-necked points with the bow and arrow (e.g., Thomas 1978; Schott 1997). Although chronological patterns in other artifact classes were noted, broad-necked points represent the primary criteria for distinguishing the earlier Merrybell Phase from the later Multnomah Phase, which is primarily indicated by narrow-necked points (Pettigrew 1981:120).

The attempt to break down the pre-contact portion of the Multnomah Phase into shorter chronological units was not as successful. The distinction between the Multnomah 1 and 2 subphases rested primarily on the relative proportions of two narrow-necked point types that were distinguished from each other by diverging (Type 7) versus non-diverging (Type 9) stems. Type 7 was thought to be more frequent during the Multnomah 1 Subphase (AD 200–1250), and Type 9 was thought to be more frequent during the Multnomah 2 Subphase (AD 1250–1750). It is doubtful that these often minute differences occurring on generally very small projectile points actually are temporally significant. These differences probably have more to do with vagaries in the reduction process and the size and shape of the flake blank than differences associated with function or style (Minor and Musil 1997:97–98).

As originally proposed, the "Portland Basin" sequence was thought to be applicable "in the Lower Columbia Valley from the confluence of the Columbia and Sandy rivers east of Portland downstream to the vicinity of Rainier, Oregon, and the Lower Willamette Valley from the confluence of the Willamette and Columbia rivers upstream to Willamette Falls" (Pettigrew 1981:119). Following investigations in the late 1970s upstream in the Columbia Gorge, the geographic range was expanded when it was asserted that the "Portland Basin" sequence "is directly relevant at least as far upstream on the Columbia River as Bonneville Dam" (Pettigrew 1981:iii; 1990:518). According to Pettigrew (1981:137):

> The general impression received from a comparison of the total inventories of the sites excavated, from the earliest to the latest, is that, while changes in individual attributes are apparent through time and allow the cultural chronology to be defined in terms of those changes, a cultural continuum is evident. There is no evidence suggesting cultural replacement, migration, or any basic changes in the way of life of the people. The pattern of culture has apparently existed in the Portland Basin for at least the past 2600 years.

As an alternative to the "Portland Basin" sequence, in recent years some archaeologists have begun to interpret sites in terms of the "Cascadia Sequence" introduced by Kenneth M. Ames (1991a). Adoption of this new sequence has been stimulated in part by the discovery of older sites above the floodplain that antedate the earliest phase in the "Portland Basin" sequence. Borrowed from California (Chartkoff and Chartkoff 1984), the "Cascadia Sequence" was initially applied by Ames to "Cascadia," "a region that essentially encompasses SE Alaska, British Columbia, Washington, northern and central Idaho, most of Oregon and northern California" (Ames 1991a:936). The "Cascadia sequence" was subsequently applied to the Portland Basin (Ames 1994; Ames et al. 1999).

The "Cascadia sequence" begins with a Paleo-Indian Period (to 11,500 BP), followed by an Archaic Period from 11,500 to 5500 BP. Following Chartkoff and Chartkoff (1984), the last 5500 years is referred to as the Pacific Period, which is subdivided into three sub-periods of Early (5500 to 3500/3000 BP), Middle (3500/3000 to 1500 BP), and Late (1500 BP to 250 BP or "Modern") (Ames 1991a:936; 1994:65). Ames (1994:66) was careful to note that "the subdivisions within the Pacific period are not phases in the Willey and Phillips (1958) sense (see Abbott 1971), they are time periods."

In contrast to Pettigrew's attempt to define a cultural sequence using data actually recovered from archaeological sites in the Portland Basin, the "Cascadia sequence" is derived from data obtained almost exclusively from outside the Lower Columbia Valley. Ames (1994:66) notes that "Pettigrew's PB [Portland Basin] sequence fits the Cascadia sequence quite readily." This is not surprising, since the Middle Pacific is more or less equivalent to Pettigrew's Merrybell Phase; the Late Pacific is equivalent to the Multnomah 1 and 2 subphases; and the "Modern" period is equivalent to the Multnomah 3 subphase.

In terms of the Lower Columbia Valley, the primary innovation in the "Cascadia sequence" is simply in splitting the long interval of time during which native peoples practiced lifeways characteristic of the Archaic Stage into two periods: Archaic and Pacific. According to Ames (1991a, 1994), the Pacific Period is distinguished by important social and economic changes, including the evolution from semi- to fully sedentary settlement patterns, appearance of higher population densities, emergence of complex social systems, and elaboration of material culture and development of artistic traditions. These social and economic changes were not unique to

"Cascadia." Elsewhere in North America, social and economic changes of this nature have been interpreted as reflecting the transition from Late Archaic to Formative lifeways (*sensu* Willey and Phillips 1958).

REASSESSMENT OF THE CASCADE LANDSLIDE FLOOD

The "Cascade Landslide Flood of AD 1250" was identified as a "major chronological marker throughout the Lower Columbia Valley," forming the "temporal boundary" between the Multnomah 1 and Multnomah 2 subphases in the Portland Basin culture sequence (Pettigrew 1981:121). The "Cascade Landslide" blocked the Columbia River near present-day Bonneville Dam at the lower end of the Columbia Gorge (Lawrence and Lawrence 1958). The impounded waters drowned a narrow fringe of forest along the banks of the river for 60 km upstream. The river eventually broke through the landslide barrier, and the river channel was reestablished about one kilometer to the south. Wood samples from the stumps of two submerged trees produced radiocarbon dates of AD 1280 ± 300 and AD 1250 ± 200 (Lawrence and Lawrence 1958:41; Crane and Griffin 1959:175–176).

According to Pettigrew (1981:121), the release of the waters impounded behind the landslide resulted in a cataclysmic flood, with catastrophic effects on human populations living in the Lower Columbia Valley downstream.

> When the earthen dam broke, it caused a catastrophic flood downstream that destroyed many aboriginal settlements; it also may have caused major changes in the topography of river channels and land surfaces. As a consequence, villages may have been re-established at new sites, in response to shifted salmon migration routes and alterations in the river and slough channels used for transportation. (Pettigrew 1981:121)

In support of this idea, it was noted that there was a "paucity of known sites which exhibit continuous occupation through the date of the Cascade Landslide Flood" (Pettigrew 1981:122). At the time the idea of a cataclysmic flood was conceived, seven sites in the Portland Basin were known to have been occupied before the landslide, and 10 sites were known to have been occupied afterward (Pettigrew 1981:122).

Only one site in the Portland Basin was identified as containing evidence of occupation before and after the time of the Bonneville Landslide. At the Cholick Site (35MU1) on Sauvie Island, a sterile silt stratum 40 to 70 cm thick interpreted to represent "an episode of major flooding in the valley" separated the two cultural components (Pettigrew 1981:35). A radiocarbon date of AD 1100 ± 180 was obtained from slightly below this sterile silt stratum (Pettigrew 1981:43).

More recent geological studies indicate that the Cascade Landslide was actually a composite of four separate smaller landslides, each of which collapsed at different times (Wise 1962, 1970; Waters 1973). A lobe of the Bonneville Landslide, the most recent in this series, with an area of about 14 km2, extends into the Columbia River, diverting the channel against the Oregon shore (Palmer 1977:75). It is this landslide that most directly correlates with the "Bridge of the Gods" legend and events previously attributed to the Cascade Landslide.

Wood samples collected from Bonneville Landslide deposits during construction of the Second Powerhouse at Bonneville Dam produced radiocarbon dates of AD 1120 ± 60 and AD 1550 ± 70. The older date of AD 1120 ± 60 was statistically indistinguishable from the radiocarbon dates from the two drowned trees reported by Lawrence and Lawrence (1958). Considering its direct association with landslide deposits, as well as its smaller standard deviation, the AD 1120 ± 60 date was assumed to more reliably reflect the age of the Bonneville Landslide (Minor 1984a).

In a subsequent analysis of radiocarbon dates (n=76) from archaeological sites in the Portland Basin downstream from the Cascade Landslide, Ames (1994:24) noted an absence of radiocarbon dates between 1000 and 800 BP, concluding that "there can be no doubt that site distributions in the PB [Portland Basin] shifted abruptly at around 1000 BP." However, after noting evidence of frequent high floods farther upstream along the Middle Columbia River, it was suggested that "it is possible, therefore, that the shift in settlement patterns is the result of a series of floods, of which the Bridge of the Gods event [Cascade Landslide] was only one" (Ames 1994:30).

A more in-depth assessment of evidence for a flood related to the Bonneville Landslide in the Portland Basin was carried out in conjunction with archaeological investigations on the City of Portland Columbia South Shore area in 1994 (Minor et al. 1994:168–171). By 1994 at least eight sites downstream from the landslide were known to have been occupied before and after the estimated time of this event. Of these sites, four contained sterile strata intervening between the early and later occupations. While Pettigrew inferred that the sterile stratum at 35MU1 "represents an episode of major flooding in the valley" (1981:35), other archaeologists concluded that the sterile strata at the sites they investigated were the result of overbank sedimentation associated with regular (non-catastrophic) inundation of the Columbia River floodplain (Ellis and Fagan 1993:167; Wessen 1983:B-24).

The idea that a cataclysmic flood occurred in association with the Bonneville Landslide was based to a large extent on an apparent "gap" corresponding to the date of this event in the distribution of radiocarbon dates from archaeological sites downstream in the Portland Basin (Pettigrew 1981:122; Ames 1994:24–30). Plotting of the distribution of all radiocarbon dates (n=89) available from archaeological sites in the Portland Basin as of 1994 indicated that no "gaps" corresponding to the date of the Bonneville Landslide (ca. AD 1120) continued to exist (Minor et al. 1994:171, Figure 37).

More recently, additional, still unpublished, radiocarbon dates obtained on wood samples from trees drowned behind the landslide dam have been shown to have a wide time span, falling in the interval between AD 1120 ± 60 and AD 1550 ±70 (Alex Bourdeau, personal communication, 2002). The most recent attempt at determining the date of the landslide places this event between AD 1415 and AD 1455 (O'Connor 2004:420fn).

Available evidence does not support the idea that the breaching of the Bonneville Landslide resulted in a cataclysmic flood downstream. Physical evidence of a flood associated with this landslide is not readily apparent in the archaeological record (cf. Bourdeau 2004). The "gap" in the distribution of radiocarbon dates from archaeological sites in the Portland Basin that once seemed to correlate with the timing of the landslide has been closed with the acquisition of additional dates. The absence of direct physical evidence of a "flood episode" correlative with the Bonneville Landslide in the Portland Basin is consistent with the fact that evidence of deposition or erosion attributable to this event has not been reported in any of the available descriptions of the geology of the Lower Columbia Valley (e.g., Trimble 1963; Gates 1994; Rapp 2005). Even if geological evidence of a flood correlative with breaching of the Bonneville Landslide is eventually identified, it is now reasonably certain that any consequences of this event for people living downstream were far less serious than originally imagined.

THE LOWER COLUMBIA CULTURE SEQUENCE

At the present time, chronological units for Lower Columbia Valley archaeology, based on data actually recovered from sites in the region, remain poorly defined. Due to taphonomic factors associated with the floodplain environment, archaeological evidence of occupation along the river margins has limited time depth. The earliest radiocarbon dates associated with prehistoric activity are only about 3500 years old, and evidence of occupation in lowland settings mostly dates within the last 1000 to 1500 years.

Projectile point cross-dating remains the primary means of estimating the ages of sites. As elsewhere in the Pacific Northwest, sites or components may be assigned to broad time periods according to the presence (and perhaps the relative proportions) of lanceolate or leaf-shaped points, stemmed broad-necked atlatl points, stemmed narrow-necked arrow points, or artifacts of Euroamerican (and occasionally Asian) manufacture.

In view of shortcomings in previously proposed chronological schemes, information available about the prehistory of the Lower Columbia Valley downstream from The Dalles is summarized below in terms of the Paleo-Indian, Archaic, and Formative stages previously recognized in the Pacific Northwest (Willey and Phillips 1958). By definition, cultural stages are not chronological units, although certain artifact classes (e.g., projectile points) may be more characteristic of one stage than another.

Paleo-Indian Stage

The origins and broader cultural affiliations of the earliest peoples in the Pacific Northwest have not yet been established in the archaeological record (Carlson 1990; Aikens 2006). It has long been the consensus of opinion that peoples associated with the continent-wide Fluted Point Tradition were the earliest inhabitants of North America. Elsewhere, Paleo-Indian peoples are known to have used Clovis and Folsom fluted points to hunt big game, including extinct megafauna such as mammoths and giant bison. To the east of the Pacific Northwest, on the Great Plains as well as farther south in the Southwest, Clovis dates from about 11,600 to 11,000 years ago, while Folsom dates from about 10,900 to 10,200 years ago (Huckell and Judge 2006:149).

Little evidence of the Fluted Point Tradition has so far been found in the Pacific Northwest. Among the few reported finds of fluted points in the region are a "classic" Clovis point on display at the Clark County Museum found at an unrecorded site in southwest Washington by Harold Koethe, the same individual who collected artifacts from 45CL54 near Lewis River described by Tuohy and Bryan (1959:29–32). Additional isolated finds of single fluted projectile points have been reported in The Dalles–Deschutes area to the east, the Puget lowlands to the north, and western Oregon to the south (Strong et al. 1930:Plate 12; Osborne 1956; Minor 1985).

In contrast to the "Clovis-first" model, other archaeologists believe that the earliest populations in western North America are represented by artifact assemblages containing various forms of stemmed lanceolate projectile points (Bryan 1980). The idea that the earliest manifestations of the Stemmed Point Tradition may be at least as old as the fluted points found in western North America is gradually gaining credibility (Willig and Aikens 1988; Aikens 2006). However, evidence in support of this idea has not come from the Pacific Northwest, as the projectile points from this region that are considered part of the Stemmed Point Tradition, including Lind Coulee, Windust, and Cascade points, are generally associated with radiocarbon dates of less than 10,000 BP.

Whatever the ultimate origin of the earliest inhabitants of the Pacific Northwest, it is almost certain that they were not big game hunters who stalked extinct megafauna like the Clovis and Folsom peoples east of the Rocky Mountains. Instead, the little evidence related to subsistence available suggests that the earliest inhabitants of western North America practiced lifeways more like those of later Archaic peoples. The term "Paleo-Archaic" has been suggested to describe the adaptations of hunters and gatherers who inhabited western North America, including the Pacific Northwest, prior to 10,000 years ago (Willig and Aikens 1988; Aikens 2006).

Archaic Stage

The Archaic Stage is characterized by hunting and gathering cultures that were technologically complex, with a variety of specialized tools, most notably milling stones and fishing equipment, reflecting a broad-spectrum adaptive strategy. The Five Mile Rapids Site near The Dalles, excavated between 1952 and 1956, was one of the first localities in the Pacific Northwest to produce evidence of early Archaic occupation (Cressman et al. 1960). The lowest levels of the cultural deposit in the Roadcut area at the upper end of the Five Mile Rapids Site contained "enormous numbers of salmon vertebrae" as well as leaf-shaped projectile points and at least one shouldered lanceolate point, a variety of bone and antler tools, burins, scrapers, and bola stones. A radiocarbon date of 7835 ± 220 BC was obtained from Stratum I, while later radiocarbon dates of 5725 ± 100 BC and 5925 ± 100 BC were obtained from Strata II and III, respectively. These early radiocarbon dates bracket the interval of intense riverine adaptation characteristic of the Early Stage of occupation at The Dalles (Cressman et al. 1960:59–60).

The results of excavations at Five Mile Rapids formed the basis for the development of the concept of the Old Cordilleran Culture by B. Robert Butler (1961, 1965b), who envisioned it as an unspecialized hunting-gathering culture, identified primarily by the presence of the leaf-shaped "Cascade" projectile point, which was posited to have existed in the Pacific Northwest (and elsewhere) between 13,000 and 7000 years ago (Butler 1961:63–64). The Old Cordilleran Culture concept proved controversial because of the ambiguous nature of its diagnostic elements and the extreme geographic and temporal range proposed for its occurrence. However, leaf-shaped project points and other elements of the Old Cordilleran Culture continue to be widely recognized as indicators of early occupation in the Pacific Northwest.

Stylistically early projectile points comparable to those found in the early components around Five Mile Rapids have been reported at a number of sites in the Lower Columbia Valley downstream from The Dalles. These localities include the Geertz Site in the foothills of the Cascade Range east of Portland (Woodward 1972), the Burnett Site in Lake Oswego (Burnett 1991; Hamilton and Roulette 2005), the Morasch Site near Camas (Woodward and Associates 1996; Roulette et al. 2003), and the Youngs River Complex near the mouth of the Columbia River (Minor 1984b). None of these sites has produced reliable radiocarbon dates. On stylistic grounds, the projectile points compare closely with those from sites elsewhere in the Pacific Northwest dating between 10,000 and 6000 years ago.

A somewhat more diverse assemblage that included leaf-shaped points, girdled stones (bolas or fishing weights?), and pestles and bowls indicative of plant processing, was found at Site 45CL54 on the East Fork of the Lewis River in Washington (Tuohy and Bryan 1959:29–32). Stylistically early artifacts including leaf-shaped points, bola stones, and cobble celts have also been recovered from the surface of sites on Sauvie Island and the adjacent Oregon shore (Pettigrew 1981:93–101). These artifacts co-occur with later stemmed broad-necked projectile points, suggesting occupation not long before the earliest radiocarbon dated sites on the island (cf. Pettigrew 1981:110). The earliest radiocarbon dates from Sauvie Island are from the Merrybell Site (35MU9), where radiocarbon dates of 900 ± 85 BC, 900 ± 95 BC, and 930 ± 155 BC were obtained from cultural deposits 2.7 meters below the surface (Pettigrew 1981:79).

At the present time, a hearth found at 45CL31 on Vancouver Lake that yielded two dates of 1560 ± 100 BC and 1410 ± 70 BC represents the earliest radiocarbon dated evidence of occupation in the Portland Basin (Wessen 1983:99–116). Slightly later radiocarbon dates, essentially coeval with the early dates from the Merrybell Site, of 850 ± 110 BC, 900 ± 30 BC, and 1020 ± 80 BC have been reported from Site 35MU117 on the south shore floodplain near confluence of the Columbia and Willamette Rivers (Ellis 2000). Farther downstream in the Columbia Valley, a radiocarbon date of 850 ± 105 BC has been reported from a cultural stratum exposed in the bank of Lewis River at 45CL117 (Kennedy and Jermann 1978). A slightly younger radiocarbon date of 1180 ± 130 BC has been reported from Eddy Point in the Columbia River estuary (Minor 1983:127).

In the interior portion of the Pacific Northwest a transition toward greater residential stability occurred with the appearance of oval to circular pithouses between 6000 and 4000 BP (Ames 1991b). These small pithouses are similar to those made elsewhere in western North America by Archaic cultures. The earliest circular pithouses in the Lower Columbia River region were documented at the Par-Tee Site (35CLT20) in Seaside on the northern Oregon coast, where radiocarbon dates indicate these features date between AD 200 and AD 950 (Phebus and Drucker 1979). Circular pithouses continued to be the primary winter house type made by the ethnographic peoples of the Plateau culture area upstream on the Columbia River into historic times.

From the Plateau, circular pithouses have been found extending from The Dalles area downstream along the Columbia River. The best documented occurrence of this house type was at the Caples Site (45SA5), on the Washington shore just downstream from Bonneville Dam, where a minimum of 41 pithouses were present (Dunnell and Beck 1979). These features can be characterized as broadly oval pits roughly one meter deep, five to six meters long, and four meters wide. Four radiocarbon dates ranging from AD 1210 ± 100 to AD 1650 ± 110 were reported. The types of projectile points represented, together with the absence of small side-notched points and historic trade materials, indicates that use of this locality ended before the time of historic contact.

Proceeding downstream along the Columbia, a village consisting of 17 oval and circular pithouses (45SA1) near Skamania was described by Warren (1959:10–11). A site with 11 circular pithouses (45CL8) in Washougal was described by both Caldwell (1956:250) and Warren (1959:11–12). Boulders bearing pit or cupule petroglyphs occur at both of these sites. As previously noted, circular pithouses were observed by early archaeologists on the Washington shore as far downstream as Lake River (Tuohy and Bryan 1959:33; Warren (1959:15).

The pithouses at Site 45CL8 in Washougal ranged from 4.5 to 13.5 meters in diameter. Test excavations in one of these pithouses encountered the floor 120 cm below the surface in the center and about 70 cm below surface at the outer edge of the depression. No radiocarbon dates were obtained, but the artifact assemblage included one leaf-shaped and two stemmed broad-necked projectile points (Warren 1959). Relic collectors have recovered collections dominated by stemmed broad-necked points from this site (Burnett et al. 1992). On the basis of projectile point cross-dating, it seems reasonable to suggest that occupation of this site occurred sometime before 2000 BP, and possibly considerably earlier.

To date, the only example of a circular pithouse in the Lower Columbia Valley with associated radiocarbon dates was at the Ede Site (35CO34) on the Oregon shore near Scappoose. Excavations along the bank of Multnomah Channel in 1984 exposed a semi-subterranean house with two floors in the river bank. The profile of this feature suggested a saucer-shaped, circular house floor rather than a steep-sided rectangular housepit of the kind associated with plank houses. Radiocarbon dates of AD 260 ± 60 and AD 490 ± 60 were obtained from the lower and upper house floors, respectively (Minor 1989).

Although circular pithouses were recognized by early archaeologists as an important indicator of broader cultural relationships, later archaeologists have made little effort to obtain information about the occurrence of these features in the Lower Columbia Valley. Pithouses were thought by early archaeologists to have been associated with a "basal cultural stratum" from which the later ethnographic cultures of the Northwest Coast and Plateau developed. Pithouses in the form of earth lodges continued as the primary winter house type among ethnographic Plateau peoples. In areas where the Northwest Coast culture later emerged, including the Lower Columbia Valley, pithouses were replaced by rectangular plank houses, with the custom moving upriver from the coast (Strong et al. 1930:40).

It seems likely that, at least initially, the replacement of circular pithouses by rectangular plank houses was a gradual process. Because plank houses involve considerably more labor to construct, they were probably first built for and inhabited by chiefs and their relatives, with the remainder of the population continuing to reside in pithouses. Some conservative individuals may have persisted in living in pithouses long after the general adoption of the plank house (Barnett 1944). These situations may account for the continued occurrence of pithouses after the introduction of plank houses, as well as the apparent co-occurrence of pithouses and plank houses at the same settlements.

Formative Stage

The Formative Stage is characterized by the appearance of sedentary village life. Elsewhere in North America, Formative Stage village communities were based on agriculture. The Northwest Coast culture area is recognized as an exception to this pattern, as the hunting-gathering-fishing subsistence practices in this region were effectively equivalent to economies based on agriculture (Willey and Phillips 1958:145). Some archaeologists object to application of the Formative Stage concept in the Pacific Northwest, citing the association of this term with agriculture, but this reasoning becomes increasingly moot in light of recent reassessments of the nature and extent of plant cultivation practiced by the native peoples of this region (Deur and Turner 2005). As Willey and Phillips (1958:145) point out, the settlements pattern and other indirect evidence of sedentism, not agriculture, "are the effective criteria for classification" as Formative stage cultures.

Although the rock art, mobile stone sculpture, and ceramics found in the Lower Columbia Valley almost certainly represent manifestations of Formative-level cultures, little chronological information is available regarding the emergence of these traditions. At the present time, the emergence of Formative lifeways in the Lower Columbia Valley can be correlated with the widespread occurrence of rectangular plank houses in the region, as cross-cultural studies indicate that rectilinear houses are a strong indicator of sedentary lifestyles (Whiting and Ayres 1968; Hunter-Anderson 1977).

The transition from circular to oval pithouses to rectangular plank houses in the Lower Columbia Valley appears to be analogous to the patterns observed by Flannery (2002) in villages in Mesoamerica and the Near East where two types of societies appear to be represented. One type lived in encampments of circular structures, many of which appeared too small to house an entire family, and with most of the storage units out in the open as if stored items were to be shared communally. These types of settlements, which appeared to represent a large extended family, are found in "Archaic Mesoamerica" (Flannery 2002:417). The second type of society lived in villages of rectangular houses, with each house large enough for a nuclear family. The houses in Early Formative Mesoamerican villages were divided into rooms, some of which were used for storage. Flannery (2002:418) observed that "in both Mesoamerica and the Near East, villages of rectangular, nuclear family houses tended to replace settlements of small, circular huts over time."

Flannery proceeded to emphasize that the geometric shape of the residence is not the crucial variable. Instead, "my main distinction was between (1) societies where small huts are occupied by individuals and storage is shared, and (2) societies where larger houses are occupied by whole nuclear families, and storage is private" (Flannery 2002:421). Little is presently known about the internal arrangement of circular to oval pithouses on the Lower Columbia, as few of these structures have been excavated. Storage pits beneath the floors are known to have been a common feature in rectangular plank houses (Ames et al. 1992).

The earliest radiocarbon dated rectangular plank house in the Lower Columbia Valley vicinity was found at the Palmrose Site (35CLT47) in Seaside on the northern Oregon coast. This feature appeared to have been similar in many respects to the Northwest Coast style plank house made by Chinookan peoples at the time of historic contact. Estimated to measure 6 by 12 meters, this house had a well-defined bench along the north side, a graded ramp on the west end (probably the entrance), and a centrally situated firehearth that appeared to continue through most of the length of the house. Charcoal from this firehearth produced a radiocarbon date of 615 ± 70 BC (Phebus and Drucker 1979; Connolly 1992).

Available evidence indicates that Formative lifeways were established upstream on the Lower Columbia as far as the Portland Basin by around 2000 years ago. At the Kersting Site (45CL21) on Lake River, "rectangular pithouses were found which were associated with [the] earliest units and are nearly identical to those of nearby late sites" (Dunnell et al. 1973:6). A radiocarbon date of 165 ± 100 BC was obtained for the earlier material, apparently including the rectangular house remains (Dunnell et al. 1973:6). Radiocarbon dates of 120 ± 85 BC and AD 61 ± 100 were also obtained from this site, but the relationship of these dates to the rectangular houses was not reported (Jermann et al. 1975:50).

The most detailed report of the excavation of a Chinookan-style semi-subterranean plank house is from the Meier Site (35CO5) near Scappoose (Ames et al. 1992). Two phases of construction and rebuilding were identified. During the later, better understood phase this house is estimated to have measured "14 m x 35 m, with sidewalls 2.4 m high, and to have had a 6.1-m-high ridge beam and a single 2-m-wide sleeping platform along each side wall" (Ames et al. 1992:286). This house is estimated to have required 40,000 (without a plank floor) to 55,000 (with a plank floor) board feet of lumber. Radiocarbon dates from the Meier Site range from AD 1230 ± 70 to AD 1820 ± 60. Some trade goods were recovered, but the site was apparently abandoned before sustained contact with Euroamericans began.

Across the Columbia River on the Washington shore, six large rectangular depressions from semi-subterranean plank houses were identified along a ridge top at the site of the Chinookan village of Cathlapotle (45CL1). Lewis and Clark observed 14 houses at this village on November 5, 1805 (Moulton 1990:21–24) and visited this settlement on March 29, 1806 (Moulton 1991:26–31). The house depressions varied between 20 and 70 meters in length, between 8 and 12 meters in width, and averaged 1 to 2 meters deep (Ames et al 1999:26). The depressions were arranged in two rows of three depressions each, with the long axis of each depression aligned parallel with the present course of Lake River (Ames et al. 1999:36–37). Other house depressions at the site are apparently buried under debris fields, midden accumulations, and flood deposits.

Excavations at Cathlapotle from 1992 to 1996 sampled the six house depressions visible on the surface to various degrees as well as other areas of the site, establishing the presence of cultural deposits in excess of two meters deep in some areas. Depression 1, the largest at the site at 63 meters long and 10 meters wide, was found to be subdivided into four sub-depressions interpreted as compartments within the larger dwelling (Ames et al. 1999:37–39). Twenty-nine radiocarbon dates establish a span of occupation beginning ca. AD 1000, while historical artifacts and historical accounts document continued use perhaps into the 1860s (Ames et al. 1999:63–65, 86).

The largest house depression at Cathlapotle appears to be similar to, but somewhat larger than, those observed by Warren (1959:15) at 45CL11 on Lake River, which he described as "housepits 125 feet long, with a high outer lip and lower walls running across the width of the floor. These lower walls appear to represent separate units within the larger house." Some Formative plank houses apparently were even larger. A second large housepit on Lake River was described as a single depression 300 feet long and 25 feet wide (Warren 1960:27). These long housepits suggest large houses with smaller subdivisions, such as the one described by William Clark at the Nechacolee village on the Oregon shore opposite Government Island that consisted of seven square houses in a line, separated by passageways, but under a single roof (Moulton 1991:64). This trend toward the construction of "row houses" is thought to reflect population growth and an accompanying increase in the range of activities carried out within houses (Hunter-Anderson 1977:306–307).

Farther upstream on the Columbia River, rectangular plank houses have been excavated at 45SA11 at North Bonneville in the Cascades area near the downstream end of the Columbia Gorge (Minor et al. 1989). Located on the north shore of the Columbia River across from Bradford Island, later the location of Bonneville Dam, 45SA11 corresponds to the Chinookan Clahclellah "village of four large houses" visited by Lewis and Clark on October 31, 1805 (Moulton 1988:358–369), and noted again on April 10, 1806 (Moulton 1991:99–104). The plank houses overlie a component containing at least 11 oval house depressions interpreted as the remains of mat lodges like those built by the native peoples of the Plateau. The stratigraphic context of these features below the plank houses, the types of artifacts recovered from them, and the absence of historical materials, indicates that occupation of the mat lodges occurred in late prehistoric times immediately preceding the plank house occupation.

The seven plank houses documented during the excavations were arranged in two rows, with five in front facing the river and two in back. All of the plank houses were roughly square in shape; six of the seven contained evidence of more than one floor indicating multiple occupations. Radiocarbon dates of AD 1700 ± 55, AD 1730 ± 55, and AD 1720 ± 95 were obtained from one of the plank houses. Although available information is somewhat contradictory, it appears that some of the occupations in these structures were entirely prehistoric in age, but that all contained historical materials in their latest occupations.

From the Cascades upstream to The Dalles, both circular pithouses and rectangular plank houses were observed by Lewis and Clark in the early historic period (Moulton 1988:333–335; 1991:119–121). At The Dalles, Chinookan settlements were restricted to the vicinity of Fivemile Rapids; the greater portion of The Dalles–Deschutes area was occupied by Sahaptin-speaking peoples of the Plateau. Although Wakemap Mound is known primarily for containing the remains of mat lodge dwellings like those made by ethnographic Plateau peoples, the latest occupation represented by houses with shallow, vertically walled pits (Butler 1960:85, 94), probably corresponds to the Chinookan settlement observed by Lewis and Clark on their journey down the Columbia River on October 24, 1805 (Moulton 1988:328–336). An oral tradition links the Chinookan Wishram to both Wakemap Mound and the nearby village of Nixluidix (Sapir 1909:201). Judging from the archaeological evidence, Wishram use of Wakemap Mound was rather sparse, an inference which is supported by ethnographic information indicating that Nixluidix rather than Wakemap was the principal Wishram village in the area (Spier and Sapir 1930:164).

Protohistoric Era

The protohistoric era in the Lower Columbia River region commenced when one or more shipwrecks of Spanish vessels occurred along the northern Oregon coast (Beals and Steele 1981; Stenger 2005). A century or more may have elapsed between the time of these first unrecorded encounters and the earliest historically documented contacts between Chinookans and Euroamericans in 1792.

For the native peoples of the Lower Columbia Valley, the most critical event of the protohistoric era was the introduction of infectious disease. Direct evidence of catastrophic population decline in protohistoric times is represented by the use of burial vaults to dispose of large numbers of the dead. These features were already in use in the Columbia River Valley when Lewis and Clark passed through the region, as they were observed by these explorers near Blalock Island (Moulton 1988:311), on an island downstream from Celilo Falls (Moulton 1988:325) that may correspond to Upper Memaloose Island, on Lower Memaloose Island near Lyle, Washington (Moulton 1988:349), and in the Cascades area (Moulton 1988:361; 1991:107–108). Descriptions of burial vault sites by Euroamericans consistently relate that the vaults were packed to the ceiling with human skeletal remains. On Upper Memaloose Island alone, the remains of 2500–3000 individuals were removed and reburied elsewhere before the completion of The Dalles Dam (Cole 1958:10).

Robert Boyd, the leading researcher of epidemics in the Pacific Northwest, favors the idea that smallpox was first introduced by a Spanish expedition to the Northwest Coast in 1775, although alternative sources, including introduction from the Northern Plains, "cannot be ruled out" (Boyd 1990:138). Significant population decline from infectious diseases is believed to have occurred in the late sixteenth century or early seventeenth century in the Middle Missouri region east of the Plateau (Ramenofsky 1987:133–134). A later smallpox outbreak in 1800–1801 definitely originated on the Northern Plains and then spread westward across the Rocky Mountains into the Columbia Plateau (Boyd 1985:105). If the smallpox outbreak of 1800–1801 is any precedent, infectious disease may have spread westward from the Northern Plains and into the Columbia River Valley by the early to middle 1600s.

Based on distinctive motifs in the Lower Columbia Art Style, Strong (1945) suggested that catastrophic population decline might have led to the emergence of a "ghost cult" on the Columbia River. Butler (1965a:11) identified the distinctive "grinning face motif" as likely to have been associated with the ghost cult. Although Butler broached the idea that this motif may have originated in the Portland Basin, this motif seems to have been much more common in The Dalles area, where it has often been found on artifacts associated with cremations. The association of this motif with mortuary remains dating to the 1700s and early 1800s lends support to the idea that a "cult of the dead" arose as a reaction to rapid population decline (Butler 1965a:8–11). This cult may have provided the basis for the emergence of the Prophet Dance, a revitalization movement that prophesied a return to conditions before the arrival of Euroamericans that spread among Plateau peoples in the early historic period (Spier 1935; Strong 1945:253–254).

Although further research is necessary to resolve this matter, the archaeological record in the Lower Columbia Valley, especially The Dalles area, is consistent with the idea of significant population decline some time before the first documented epidemic in the 1770s (cf. Boyd 1985:95; 1990:137). Although generally thought of as a Chinookan trait (Strong et al. 1930:41–42), burial vault sites appear to have been more common within the territories of Sahaptin peoples farther upstream on the Columbia River, and were only found within areas occupied by the easternmost Chinookan groups at the time of historic contact. The fact that burial vault sites were more common in The Dalles area is consistent with an observation by Dobyns (1983) that the inhabitants of large trading centers were particularly susceptible to infectious disease and suffered far higher mortality rates than native peoples in more dispersed settlements.

Historic Period

The Historic Period in the Lower Columbia Valley began with the first recorded contacts between Chinookans and Euroamericans by Robert Gray and William Broughton in 1792 and by Lewis and Clark in 1805–1806. In terms of the archaeological record, Historic Period occupation is indicated by the presence of artifacts of non-Indian manufacture. Glass trade beads are by far the most common, but other items frequently found include rolled copper tubes and bracelets, iron axes and chisels, metal buttons, bells and thimbles, kaolin pipes, and earthenware and porcelain vessels.

Elsewhere in North America, archaeologists have often subdivided the Historic Period into smaller chronological units (e.g., protohistoric, contact, frontier, post-contact, reservation) based on the nature of the contacts between native peoples and Euroamericans and associated artifact assemblages. This has not been attempted in any systematic way on the Lower Columbia, in part because of the catastrophic collapse of the native population from the introduction of infectious diseases, and the relatively brief span of time between the first contacts and assignment of the few survivors to reservations.

Archaeological investigations have been conducted at a number of Native American settlements along the Columbia River occupied during the Historic Period that are mentioned in historical accounts. From downstream to upstream on the Columbia River these include the Kathlamet village of *hlilusqahih* at Knappa (Minor 1983); the *Whill Wetz* village at Oak Point (Reese and Fagan 1990); the *Cathlapotle* village near present-day Ridgefield, Washington (Ames et al. 1999); the *Nechacolee* village in present-day east Portland (Minor et al. 1997); the *Clahclellah* village (Minor et al. 1989) and the *Skamanyak* village (Minor and Musil 1997) at the Cascades; and the Wasco village of *wotsaqs* or lone pine near The Dalles (Minor 1997).

A recent study of faunal remains from eight archaeological sites on Sauvie Island and the adjacent Oregon shore "provides empirical support for the view that Native subsistence systems underwent significant *change* as a result of European contact" (Butler 2000:659, original italics). High-ranked resources like large mammals and large fish (sturgeon and salmon) were observed to decline, and low-ranked resources (small mammals and fish) to increase, in faunal assemblages from late prehistoric components, a pattern interpreted to reflect human-induced resource depression from overexploitation of these animals. Conversely, high-ranked resources were observed to increase and low-ranked resources decrease in faunal assemblages from historic components, a pattern interpreted to reflect reduced foraging and rebound in prey abundance following the decline in the human population after historic contact. The results of this study raise serious questions about the extent to which descriptions of subsistence practices in ethnographic and historical accounts can be taken to reflect conditions and practices in prehistoric times (Butler 2000:659–660).

CULTURAL DYNAMICS IN THE LOWER COLUMBIA VALLEY

As suggested long ago by Alan Bryan, Donald Tuohy, and Claude Warren, multiple lines of evidence point to the former existence of a "Plateau-like" complex extending from the western edge of the Plateau culture area at The Dalles downstream along the Columbia River to the area around the confluence with the Willamette River in prehistoric times. These lines of evidence support Bryan's concept of a Trans-Cascadian Tradition proposed as an explanation for the "parallel interrelated development" observed in The Dalles area and sites downstream at least as far as the Willamette–Columbia confluence (Bryan 1957:9).

The first line of evidence in support of this idea is the close similarities in rock art around the Willamette–Columbia confluence to rock art at The Dalles. In particular, cupules or pit-style petroglyphs have a nearly continuous distribution from The Dalles downstream to just east of Vancouver. Along this section of the river pit petroglyphs often occur at villages composed of circular to oval pithouses. There are no recorded occurrences of rock art downstream from Vancouver to the coast. Although petroglyphs cannot be directly dated, the rock art around the Willamette–Columbia confluence is generally thought to be old, antedating later rock art styles in The Dalles area.

The second line of evidence is the close stylistic relationship between the elaborate mobile stone sculptures found at sites around the Willamette–Columbia confluence with the mobile stone sculpture found around The Dalles. Because most known examples were ripped out of context by relic collectors, little is known about the distribution of mobile stone sculpture around the Willamette–Columbia confluence, but examples are often attributed to the Sauvie Island–Lake River area, slightly downstream from the maximum downstream occurrence of rock art. Few finds of mobile stone sculpture have been reported farther downstream on the Columbia River (Peterson 1978).

The third line of evidence is the continuous distribution of circular to oval pithouses from The Dalles on the western edge of the Plateau downstream on the Columbia at least as far as the Sauvie Island–Lake River area. It is worth noting that the occurrence of circular to oval pithouses characteristic of the Plateau in an area where rectangular plank houses were the ethnographic house type is not unique to the Lower Columbia Valley. Circular to oval pit houses were similarly present along the Fraser River far downstream from the historic boundary between the Northwest Coast and Plateau culture areas in British Columbia (Smith 1947).

Based on very little actual data, the Trans-Cascadian Tradition was originally estimated to have a time range from 4000 BC to AD 500 (Tuohy and Bryan 1959: Table 1). Examples of mobile stone sculpture from around the Willamette–Columbia confluence are stylistically similar to pieces of stone sculpture found in The Dalles area estimated to date from approximately 4500 BC to AD 500 (Butler 1957:161–165). Some settlements with circular to oval pithouses, like Site 45CL8 at Washougal, apparently were relatively old, judging from the predominance of broad-necked projectile points recovered from these features (Burnett et al. 1992).

On the other hand, the Trans-Cascadian Tradition may have persisted relatively late in prehistory. Excavations at sites around the Cascades documented a shift from an earlier "Plateau" settlement pattern before the Bonneville Landslide, as exemplified by circular to oval pithouses at the Caples Site (Dunnell and Beck 1979), to a "Northwest Coast" settlement pattern featuring rectangular plank houses after the landslide, as represented at the Clahclellah village and other settlements in the area (Minor et al. 1989; Minor and Musil 1997).

Who were the people of the Trans-Cascadian Tradition? Were they the easternmost group(s) of Chinookan speakers, who occupied the banks of the Columbia River from the Willamette River confluence upstream to The Dalles at the time of historic contact? Or were they speakers of a Sahaptin language, like the ethnographic peoples of the western portion of the Plateau culture area with whom they apparently shared close ties?

The answers to these questions may be found in the history of the Chinookan languages, as there appears to be a strong congruence between the late prehistoric archaeological record in the Lower Columbia Valley and movements by Chinookan peoples as reconstructed by linguists (Rigsby 1965:245–250; Silverstein 1974:S98–99; Hymes 1981:17–19; Thompson and Kinkade 1990:45–47). The upstream movement of Chinookan peoples indicated by the internal relationships between the two main Chinookan languages (Lower and Upper Chinookan) and Upper Chinookan dialects (Kathlamet, Multnomah, Kiksht) may correlate with the spread of rectangular plank house from the Pacific Coast upstream into the Portland Basin around 2000 years ago. Likewise, as "the Upper Chinookan speech community expanded its boundaries eastward up the Columbia river to the Dalles region in recent centuries" (Rigsby 1965:250), the late divergence of the two upstream dialects of Upper Chinookan (Multnomah and Kiksht) from one another may correlate with the late appearance of rectangular plank houses in the Cascades area and The Dalles area shortly before historic contact.

The late Chinookan expansion from the Cascades upstream to The Dalles may have been facilitated by an early introduction of infectious disease into the Columbia Plateau from the Plains, resulting in catastrophic population decline among Sahaptin peoples along the Middle Columbia River. As the largest and densest populations typically disappeared first (Dobyns 1983), The Dalles area, where Plateau peoples gathered each year at the falls for salmon fishing and trade, may have been an especially fertile setting for infectious disease. Separated from the Plateau by the Columbia Gorge and Cascade Range, Chinookan peoples living downstream on the Columbia may have been less affected by this initial epidemic. The late Chinookan expansion up the Columbia River, then, may have involved filling a partial vacuum created by the early depopulation of Plateau peoples upstream in the Middle Columbia River region (Minor and Walker 1993).

As recognized by Bryan, Tuohy, Warren, and other early archaeologists, the archaeological record in the Lower Columbia Valley is complex, reflecting the interplay over thousands of years of peoples and cultures from the interior and coastal regions of the Pacific Northwest. Subsequently proposed cultural and chronological sequences, which view the archaeological record in terms of region-wide phases (Pettigrew 1977, 1981, 1990) or periods (Ames 1994), obscure significant intra-regional differences, and convey an impression of cultural uniformity that is not consistent with archaeological evidence from the Lower Columbia Valley.

Within the last 3,000 years, peoples representative of two relatively distinctive cultures lived in the Lower Columbia Valley. The people in the eastern (upstream) portion of the valley lived in circular to oval pithouses characteristically made by Archaic cultures. This house type, and rock art consisting largely of pit or cupule style petroglyphs, link these people to the Plateau culture area upstream on the Columbia River. The people in the western (downstream) portion of the valley lived in rectangular houses, in this case made of planks, characteristically made by Formative cultures. The rectangular plank houses link these people to the Northwest Coast culture area, which was represented in the Lower Columbia Valley by the western Chinookan groups at the time of historic contact.

The existence of a separate culture with ties to the Plateau, distinguished by the construction of pithouses and a distinctive rock art tradition, supports the idea proposed by Bryan more than a half century ago of a Trans-Cascadian Tradition in the eastern portion of the Lower Columbia Valley. There does not appear to have been a firm boundary between the people of this tradition and people associated with the emerging Northwest Coast tradition downstream. The distinctive rock art tradition is found only upstream from present-day Vancouver, but circular to oval pithouses have been reported farther downstream in the Lake River and Scappoose areas.

In general, it appears that the two cultures overlapped in the area around the confluence of the Columbia and Willamette rivers, and it was in this milieu that the rich artistic tradition expressed in mobile stone sculpture, and to a lesser extent in the local ceramic complex, emerged sometime within the last 2000 years. The Trans-Cascadian Tradition likely persisted until late in prehistory when the Bonneville Landslide, and later the introduction of infectious diseases, apparently provided opportunities for the Chinookan peoples to expand up the Columbia to The Dalles area to the full extent of their ethnographic territory at the time of historic contact.

4. ETHNOGRAPHY

At the time of historic contact the shores of the Lower Columbia River were occupied by Chinookan peoples, whose territory extended from the Pacific Coast more than 200 miles up the Columbia River to The Dalles. In terms of ethnographic lifeways, the Chinookan peoples traditionally have been placed in the Northwest Coast culture area (Kroeber 1939). A more recent assessment has revised this classification. The Chinookan groups living in the area from the Pacific coast upstream to near the Cascades are still included within the Northwest Coast culture area (Silverstein 1990). The Chinookan groups farthest upriver, from the Cascades to The Dalles, are assigned to the interior Plateau cultural area (French and French 1998).

This discussion is based on ethnographic and historical accounts of Native American peoples and groups. Names of groups appearing in the following discussion refer to language groups or cultural groups as they occur in the ethnographic and ethnohistoric records, and no correlation is intended with contemporary tribal governments.

SOURCES

The first recorded contact between Chinookans and Euroamericans occurred in May 1792 when Robert Gray sailed into the Columbia River estuary. In October of that same year, Lieutenant William Broughton explored up the Lower Columbia to a point above present Vancouver, Washington. In the autumn of 1805, Lewis and Clark descended the Lower Columbia and wintered at Fort Clatsop near its mouth before journeying back upriver in the spring of 1806 on their return trip. These explorers drafted the earliest map available of the CRC project area.

As shown on one of these maps (Figure 4), Lewis and Clark camped in the vicinity of the CRC project area on their passage down the Columbia River in 1805, and again on their return journey up the Columbia in 1806. Clark's account for November 4, 1805 relates that they "passed the upper point of a large Island nearest the Lard Side, a Small Prairie in which there is a pond opposite on the Stard. here I landed and walked on Shore..." (Moulton 1990:17, original spelling). Lewis' account for March 30, 1806, relates that "we continued our rout along the N. E. shore of the river to the place we had halted to dine on the 4th of Novembr opposite to the center of Immage canoe island where the Indians stole Capt. Clarks tomahawk. here we encamped a little before sunset in a beautiful prarie above a large pond having traveled 23 M." (Moulton 1991:33, original spelling). The "large island" labeled "Image Canoe Island" on their map corresponds to present Hayden Island The reference by Lewis to the camp's location "opposite to the center of Immage canoe island" suggests that this camp was downstream from the CRC project area.

More than a century passed after the first recorded contact before the first formal ethnographic studies began among the Chinookans. Initial fieldwork by Franz Boas in the early 1890s involved the collection of Lower Chinook and Kathlamet myths (Boas 1894, 1901), and Edward Sapir conducted linguistic research among the Wishram Chinook at The Dalles in 1905. Ethnographic studies intended to document pre-contact lifeways were not undertaken among Chinookan

Figure 4. Map by Lewis and Clark, who were on this section of the Lower Columbia River on November 3–5, 1805 and March 29–April 6, 1806 (from Moulton 1983: composite of maps 79 and 80).

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peoples until the 1920s and 1930s, and these involved only two Chinookan groups: the Wishram Chinook at The Dalles (Spier and Sapir 1930) and the Lower Chinook around the mouth of the Columbia River (Ray 1938). An extensive body of Clackamas Chinook myths was collected in 1929 and 1930 by Melville Jacobs (1958, 1959a, 1959b, 1960).

Much of what is known about the Chinookan peoples is from the accounts of early explorers, fur traders, missionaries, and military personnel who traveled along the Columbia River in the early historic period (Ruby and Brown 1976). In evaluating the ethnographic and ethnohistoric literature it must be remembered that these accounts relate to societies that were in the process of collapse as a result of extreme population losses from disease, dislocation from traditional territories by Euroamerican settlers, and acculturation to Euroamerican culture. As a result, ethnographic and ethnohistoric accounts may not accurately reflect pre-contact lifeways practiced in the Lower Columbia Valley.

Although little specific information is available about the particular groups that lived in the CRC project area vicinity, a general picture of Chinookan lifeways can be reconstructed from information contained in ethnographic studies and ethnohistoric sources pertaining to other Chinookan groups. The Lewis and Clark journals are particularly important in this regard, as they contain some of the earliest accounts of Indian peoples in the Lower Columbia Valley. Although necessarily lacking in detail, this reconstruction provides a cultural context for interpreting archaeological evidence associated with Native American use of the CRC project area within the last several centuries.

LANGUAGES

The Chinookan language, which is classified as an independent branch of the Penutian phylum, is commonly considered to consist of two languages, referred to as Lower Chinook and Upper Chinook by Boas (1894:5–6; 1901:6) and as Lower Chinookan and Upper Chinookan by Silverstein (1990:533). The two groups at the mouth of the Columbia River spoke two dialects that were very similar and which together compose the Lower Chinook or Lower Chinookan language. These dialects were distinct from the related, but mutually unintelligible, languages of the other Chinookan peoples upstream.

The Upper Chinookan language, in turn, has been classified into the following dialect clusters: Kathlamet, spoken from Tongue Point upstream to Kalama; Multnomah, spoken from the mouth of Lewis River upstream to Government Island (including Sauvie Island and the mouth of the Willamette River); and Kiksht, spoken by the Clackamas at Willamette Falls and along the Clackamas River, as well as by Chinookans farther upstream around the Cascades and at The Dalles (Silverstein 1990:533–535; Thompson and Kinkade 1990:41).

It has recently been suggested that Kathlamet has sufficiently different pronunciation, grammar, and lexical items for it to be considered a third language, standing between Lower and Upper Chinook, and the name Middle Chinook has been proposed (Hymes 1981:16). The name Middle Chinook was previously used long ago by Gatschet (1877), as well as more recently by Wuerch (1979), to refer to the Chinookan groups occupying the central portion of the Lower Columbia Valley.

The existence of language and dialect boundaries among the Chinookans implies some degree of separation of the various groups over time. Based on the location of the boundary between the

Lower and Upper Chinookan languages, linguists recognize that the Chinookan "homeland," the point of greatest internal linguistic divergence, was in the Columbia River estuary (Hymes 1981:19). The chain of dialects extending upstream from the estuary indicates that the Chinookans spread up the Columbia, eventually as far upstream as The Dalles (Rigsby 1965:245–250; Silverstein 1974:S98–99; Hymes 1981:17–19; Thompson and Kinkade 1990:45–47). In its latest movement, "the Upper Chinookan speech community expanded its boundaries eastward up the Columbia River to the Dalles region in recent centuries" (Rigsby 1965:250).

SOCIOPOLITICAL ORGANIZATION

The principal social and political unit among the Chinookan peoples was the village, or in some cases a small cluster of villages. In certain cases, a local village name came to be applied to a larger cultural entity, as when the name of the Chinook village at the mouth of the Columbia River came to refer to all Indian groups who spoke dialects of the Lower or Upper Chinookan language. Specific "tribes" or "nations" referred to in historical records were often artificial groupings created by Euroamericans, often during the treaty-making process (Hajda 1984:7–15), and may not accurately reflect traditional social groupings.

Each Chinookan village was led by its own chief, who held judicial and advisory power, and who had the power to appropriate the property of others for personal purposes (Ray 1938:55–56; Silverstein 1990:541). The village was composed of a variable number of households. The most frequent estimate of household size was three or four families. These household units apparently consisted of extended families that were usually related patrilineally (Hajda 1984:169). As families grew, members might occasionally split off, forming small groups of related villages or village clusters (Hajda 1984:165–168; Silverstein 1990:536).

As with other Northwest Coast peoples, Chinookan society was ranked. The chief, along with shamans, warriors, and traders, formed the small upper class. The bulk of the population was composed of commoners or lower class, and at the bottom of the status hierarchy were slaves (Ray 1938:48–49; Hajda 1984:183–203; Silverstein 1990:541–543). Class, status, and rank were based for the most part on wealth, as great chiefs were usually described as men of great wealth (cf. Spier and Sapir 1930:211). However, as the office of chief tended to be limited to certain families, it was basically only commoners who could elevate themselves through wealth accumulation and personal achievements (Silverstein 1990:541).

A man and his wife or wives, together with their children and slaves, lived together in the same house (Hajda 1984:170). Ideally, marriages occurred between members of different villages (village exogamy) (Hajda 1984:178–183). While residence was usually patrilocal (with a married couple residing in the same house or village as the husband's family), kinship ties were traced bilaterally (Hajda 1984:176–178). Polygyny (the practice of having more than one wife) apparently increased after historic contact (Hajda 1984:170), and as a result kin ties were widely ramified (Hajda 1984:176–177). Wives generally came from areas where head-flattening was practiced, while slaves were obtained from areas where it was not (Hajda 1984:178).

The Chinookans have been viewed as the central society within the "Greater Lower Columbia," a concept that emphasizes the regional connections of local groups through intermarriage, exchange, conflicts, slave raids, visits, and resource utilization (Hajda 1984:275–286). This social region, it is believed, cut across linguistic, cultural, and ecological zones because the members were multicultural and multilingual (Hajda 1984:278). The characteristic Chinookan practice of flattening the heads of all freeborn peoples is believed to have symbolized identity within this social system (Hajda 1984:276–277).

HOUSE TYPES AND SETTLEMENT PATTERNS

Like the Lower Chinookans at the mouth of the Columbia River, most if not all of the upriver peoples shifted the location of their settlements biseasonally. Chinookan winter villages involved patrilocal residence in theory, but summer residences might be found anywhere that people related through women lived (Hajda 1984:172). Seasonal movements were regulated primarily by the timing of salmon runs, but the availability of other resources, such as smelt, sturgeon, or wapato may have also affected these moves (Hajda 1984:91–95; Boyd and Hajda 1987:318–320).

Ethnographic and ethnohistoric information about Chinookan houses in the Wappato Valley (the portion of the Columbia River Valley roughly between the Sandy and Cowlitz Rivers) has been synthesized by Hajda (1994). The permanent or winter houses constructed by these peoples were variants of the wooden houses characteristically found throughout the Northwest Coast culture area. With some variations, these houses were rectangular structures, often placed over pits excavated one to six feet below ground, with wall planks placed vertically in the ground, a small oval doorway cut into an end or side, and a gable-roof (Figure 5). The temporary or summer house, often built of boards taken from the permanent house where the framework was left standing, were usually unexcavated and smaller than a permanent house (Hajda 1994:180).

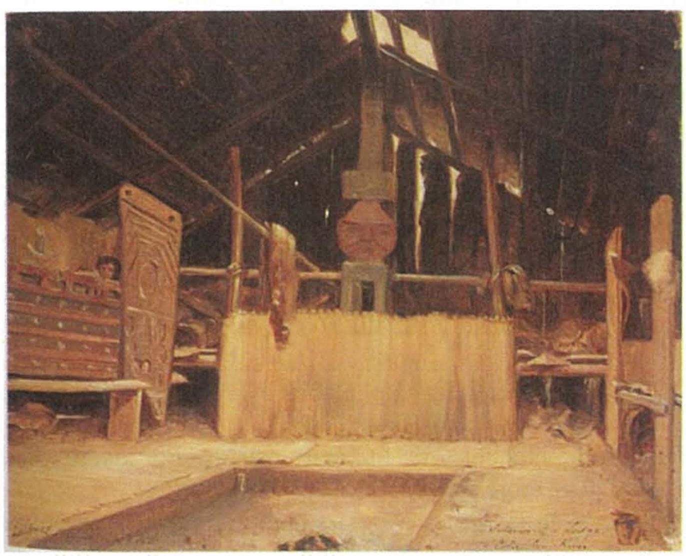

Figure 5. Paul Kane's painting of the interior of a Chinookan plank house in the Lower Columbia Valley (from Eaton and Urbanek 1996:81).

As noted by Hajda (1994:184), a distinctive aspect of Chinookan houses in the Wappato Valley was the connection of these rectangular houses into a long row. Various historical sources described "row houses" ranging from 200 to 471 feet in length. Row houses and separate individual houses sometimes occurred at the same settlement, as the Whill Wetz village at Oak

Point was described in 1814 as consisting of a "range" of eight houses 120 paces long, with eight "detached" houses each of 15 paces (Coues 1897[2]:795, 832). Row houses were only constructed in the central portion of the Lower Columbia Valley, as "nowhere upstream from the Cascades or downstream from Oak Point is such construction mentioned or suggested, nor is any reference found for adjacent areas" (Hajda 1994:184).

The construction of both permanent (winter) and temporary (summer) houses is consistent with the idea that the native population engaged in biseasonal movements. It has been argued by Saleeby, however, that the dense concentration of subsistence resources may have made seasonal movements in the Portland Basin unnecessary (Saleeby 1983; Saleeby and Pettigrew 1983). As villages were usually located in proximity to concentrations of subsistence resources, in some cases these settlements may have been occupied year-round. Under these circumstances, villages would have been abandoned temporarily only when high water levels during the seasonal freshets reached flood stage (Saleeby 1983:224–228).

Boyd and Hajda (Hajda 1984:91–93; Boyd and Hajda 1987:318–320) have countered this argument by noting the numerous references to seasonal movements contained in ethnohistoric accounts. They also cite differences in the two sets of population estimates provided by Lewis and Clark as evidence of seasonal population movements in the Portland Basin.

As Saleeby's argument for greater residential stability in the Portland Basin is based in large measure on evidence from late prehistoric archaeological sites, it is possible that before historic contact some villages in this area may have been occupied on a year-round basis. The seasonal movements documented in the historical record may represent a recent settlement pattern that emerged as an outgrowth of extreme population decline in the early historic period.

Unlike the Chinookan groups downstream, the Wishram and Wasco at The Dalles constructed houses similar to those of Plateau peoples. As described by Spier and Sapir (1930:202), two types of houses were made: the semi-subterranean earth lodge built over a circular pit for winter use, and a mat lodge which was rectangular in plan and wholly above ground. One informant "described a plank house," an apparent reference to the introduction of rectangular plank houses characteristic of Chinookan peoples downstream, but these, apparently, were not traditional.

SUBSISTENCE RESOURCES

The resource base of foods potentially exploitable by Indian groups in the Lower Columbia Valley has been assessed by Boyd and Hajda (1987). In their study, the frequency with which foods were mentioned in the ethnohistoric literature was used to identify "staples" or Class One resources (cited as food 30 or more times) and "secondary" or Class Two resources (cited 6 to 15 times). Foods cited fewer than six times were assumed to rank low as preferred foods and were not considered further. Boyd and Hajda's resource base compilation is reproduced in Table 1.

Unlike the Lower Chinookans at the mouth of the Columbia River who were maritime hunter-gatherers with a heavy reliance on marine resources, including shellfish, fish, mammals, and birds available in the offshore and estuarine environments, the Upper Chinookans were adapted to resources upstream in the riverine environment of the Lower Columbia Valley (Saleeby 1983). Accordingly, marine clams, whales, and perhaps certain botanical species (e.g., *Lupinus littoralis*) were not directly accessible to these upriver peoples. Once these marine-estuarine resources are excluded, the results of Boyd and Hajda's analysis suggest that the staple (Class One) foods of the

Table 1. Foods of the Lower Columbia Indians Noted in Ethnohistoric Sources (from Boyd and Hajda 1987).

Common Name	Scientific Name	Habitat	Harvest Months
A. AQUATIC FOODS			
Class One: Staples			
1. Salmon	*Oncorhynchus*	main trunk of Columbia	March–August
Chinook	*O. tschawytscha*	and	March–April (spring)
		lower middle tributaries	June–July (summer)
Coho	*O. kisutch*	lower tributaries	August–October (fall)
2. White sturgeon	*Acipenser transmontanus*	main trunk of Columbia,	January–March
		deep water	August–September
3. Eulachon	*Thaleichthys pacificus*	spawns in lower Cowlitz, Lewis, Sandy, Gray's and Kalama rivers	February–March
Class Two: Secondary Resources			
4. Trout	*Salmo gairdneri*	Streams	
5. Steelhead	*(anadromous trout)*	major waterways	July–September
6. Lamprey Eel	*Lampetra tridentate*	taken at falls	Summer
7. Clams		seashore, bays	
8. Salmon	*Oncorhynchus*		
Sockeye	*O. nerka*	main trunk of Columbia	June–July
Chum	*O. keta*	main trunk, a few minor Tributaries	October
B. ANIMAL FOODS			
Class One: Staples			
1. Elk	*Cervus Canadensis*	cosmopolitan, open forests	Winter
2. Deer	*Odocoileus*		Fall
Blacktail	*O. hemionus*	cosmopolitan, forests	
Whitetail	*O. virginianus*	river bottoms, prairies	
Class Two: Secondary Resources			
3. Harbor seal	*Phoca vitulina*	Columbia and Willamette below falls	Spring–Summer
4. Grey whale	*Eschrichtius glaucus*	Coast	April
C. BULBS, ROOTS AND GREENS			
Class One: Staples			
1. Wapato	*Sagittaria latifolia*	middle river swamps	Year-round; best in Fall
2. Camas	*Camassia quamash*	middle river damp prairies	May–July
3. Thistle	*Cirsium edule*	coast, moist ground	
4. Lupine	*Lupinus littoralis*	coast (esp.), beaches	
5. Bracken	*Pteridium aquilinum*	coast (esp.), burns	
6. Horsetail	*Equisetum telmateia*	coast (esp.), moist ground	

Table 1. Foods of the Lower Columbia Indians Noted in Ethnohistoric Sources (cont.) (from Boyd and Hajda 1987).

Common Name	Common Name	Common Name	Common Name
7. Shappelel	*Lomatium* spp.	dry rocky soil above cascades	April–August
		D. BERRIES	
Class Two: Secondary Resources			
1. Huckleberry	*Vaccinium*		August–October
Evergreen	*V. ovatum*	coast clearings	
Mountain	*V. macrophyllum*	mountain clearings	
Oval-Leaf	*V. ovalifolium*	mid-latitude woods	
2. Blackberry	*Rubus macropetolus*	middle river clearings	August
3. Bearberry	*Arcostaphylos uva-ursi*	dry banks	Fall
4. Salal	*Gaultheria shallon*	Woods	August

Note: See Boyd and Hajda (1987) for supporting documentation.

native peoples inhabiting the Lower Columbia Valley above the estuary consisted of (1) fish, especially salmon, sturgeon, and eulachon; (2) animals, especially elk, deer, and possibly harbor seal; and (3) bulbs, roots, and greens, especially wapato and camas.

In terms of specific resources available in the CRC project area vicinity, Lewis and Clark's description of the Neerchokioo village notes that 100 canoes of the type used by women to gather wapato and roots "in the Slashes" [lakes and sloughs] were scattered nearby (Moulton 1991:57). In another journal entry, made on April 5, 1806 while encamped on the north side of the Columbia across from the mouth of Sandy River, Clark noted that "The Country on either Side is fertile, the bottom on the South Side is wide and inter sperced with Small ponds in which the nativs gather their Wappato" (Moulton 1991:77, original spelling).

As noted by Boyd and Hajda (1987:314), their compilation of subsistence resources does not include some foods that are well represented in assemblages of faunal remains from prehistoric archaeological sites. Among these animals are freshwater fish and shellfish, waterfowl, bear, and a variety of small mammals such as dog, bobcat, beaver, raccoon, sea and river otters, porcupine, muskrat, mink, marten, rabbit, and tortoise (Saleeby 1983:126–145). In addition, botanical species not included on Boyd and Hajda's list that have been recovered from archaeological contexts include acorns and hazelnuts (Saleeby 1983:146–147). This situation suggests, then, that while ethnohistoric sources may provide an indication of the "preferred foods" (Boyd and Hajda 1987:314), under conditions of favorable preservation archaeological contexts will significantly supplement the ethnohistoric record of foods that were actually eaten.

VARIATION IN RESOURCE AVAILABILITY

The abundance and availability of subsistence resources exploited by the Indian peoples of the Lower Columbia Valley varied geographically and seasonally (Saleeby 1983; Hajda 1984; Boyd and Hajda 1987). This variation is reflected in the data on habitat and harvest months provided in Table 2.

In terms of intra-regional variation, it has previously been noted that most species of marine mammals, birds, and shellfish important in the subsistence practices of coastal peoples were not available to the inhabitants of the Lower Columbia Valley upstream from the estuary. Fruits also may have been relatively more important among coastal peoples, as suggested by Swan (1857:88), who observed that among the Lower Chinook on Willapa Bay "as the season advances and the fruits ripen, great quantities are used as food, to the exclusion of fish and meats."

On the other hand, the riverine environment upstream from the estuary provided important resources not readily available to coastal peoples. The largest runs of eulachon, for example, occur in the Cowlitz and other rivers upstream from the estuary (Gray's River at the upstream end of the estuary is the farthest river downstream with a significant eulachon run).

Of greater significance, however, was the higher density of key plant foods in the riverine environment upstream from the estuary. The most important of these resources was wapato, a name in Chinook jargon referring to the tubers of *Sagittaria latifolia* which grew prolifically in the wetlands of the Lower Columbia (Darby 1996). Wapato was apparently not found along the coast (Moulton 1990:154), "except [perhaps] in very small quantities" (Swan 1857:90), and apparently did not grow above the rapids at the Cascades (Cox 1831:76). Camas, while present in the coastal zone, was almost certainly more widespread in the wet prairies of the interior.

Although acorns were described as "fairly extensively used" by the Lower Chinook (Ray 1938:123), they were almost certainly more available upstream in oak woodlands associated with the riverine environment. Hazelnuts, known to have been eaten by the Wishram Chinook at The Dalles (Spier and Sapir 1930:184), are not mentioned among the plants utilized by the Lower Chinook, suggesting that hazelnuts were primarily an upriver resource.

Besides intra-regional variation, there was also a seasonal aspect to the abundance and availability of subsistence resources (Saleeby 1983:148–152; Boyd and Hajda 1987:314–316). As indicated in Table 2, eulachon, white sturgeon, and spring Chinook salmon were the most important subsistence resources available in the spring. The broadest range of resources was available during the summer months; these included summer Chinook and Coho salmon, steelhead, lamprey eels, and most of the bulbs, roots, and greens. Autumn resources included Chum salmon, deer, and berries. Although Lewis noted that wapato "is abundant and appears to never be out of season at any time of the year" (Moulton 1991:38), it was probably harvested mostly in fall (Boyd and Hajda 1987:316). Although potentially available throughout the year, elk may have been most important during the winter when fewer other resources were available.

Seasonal variation in the availability of subsistence resources was offset by the development of preservation and storage technology (Saleeby 1983:27–28). Salmon were preserved by drying, pounding, and storage in baskets as well as by smoke-drying (Spier and Sapir 1930:178–179). Berries were preserved by mixing them with salmon or seal oil, drying them in the sun, and storing them in boxes or baskets. Roots were pounded into cakes that when dried were easily preserved (Spier and Sapir 1930:182–185). Despite the fact that the Lower Columbia Valley provided an especially favorable setting for settlement, references to occasional starvation are found in the ethnographic and ethnohistoric literature (e.g., Boas 1894:230; Coues 1897[2]:912).

POPULATION

Lewis and Clark's population estimates have been used by Boyd and Hajda (Hajda 1984:67–75; Boyd 1985:272–286; Boyd and Hajda 1987; Boyd 1999:233–237) to reconstruct the size of the Indian population in the Lower Columbia Valley. Lewis and Clark submitted two sets of figures, an earlier set that was lower compiled during the winter at Fort Clatsop, and a later set that was higher compiled following the return trip upstream in April. As noted by Hajda (1984:71), "while Clark might have revised the figures upwards anyway after greater familiarity with the people, the later figures quite possibly reflect seasonal shifts in population." Boyd and Hajda (1987:321) explore this line of reasoning further, and conclude that the lower estimate of 9,800 represents the permanent winter population of the Lower Columbia, while the larger figure of 17,840 includes spring visitors to the river as well as the resident population. Lewis and Clark's population estimates for the various native groups are presented in Table 2.

The Wapato Valley had a combined total population of 2,210 in the manuscript estimate and 5,390 in the printed estimate (Boyd and Hajda 1987:313n). Considered together, the Wapato Indians formed the densest population cluster in the Lower Columbia Valley. This high population density was apparently made possible by the concentration of vegetal resources in the marsh areas in and around Sauvie Island (Hajda 1984:89). The existence of this unusually dense population could be inferred as support for the idea that settlement in this portion of the Lower Columbia Valley involved year-round villages, as suggested by Saleeby (1983).

Although Lewis and Clark's estimates are the earliest available, it should be noted that these explorers arrived in the region after smallpox epidemics in the 1770s and 1801 had already ravaged the population (Hajda 1984:71; Boyd 1985:80–81, 99, 102–103; 1999:29, 40–41). The first epidemic, which was probably especially devastating as it presumably took hold upon populations previously unaffected by this disease, resulted in the estimated loss of 33 percent of the Indian population of the Pacific Northwest (Boyd 1985:95). Smallpox was then reintroduced in 1800–1801, as indicated by a comment by Lewis and Clark in their journal entries for February 7, 1806 (Moulton 1990:285–286). As a result, Lewis and Clark's population estimates are almost certainly low (Boyd 1985:286).

The introduction of infectious diseases during the early historic period led to rapid decline in the Indian population. As their territory coincided with the main route of travel and communication along the Columbia River, the Chinookans were especially devastated by these diseases (Boyd 1985:267–323; 1999:231–258). Aside from the early smallpox epidemics, the "fever and ague" of the 1830s, most likely malaria, was a major factor in the decline in the population (Boyd 1985:112–144).

Overall, infectious diseases occurring as epidemics between the 1770s and 1850s resulted in the death of 90 percent or more of the Indian population in the Lower Columbia Valley (Boyd 1985:520; 1999:263). The decline in the numbers of Chinookans led to the depopulation of certain areas of their territory, which were quickly claimed by other peoples, including bands of the Salish-speaking Chehalis and Cowlitz as well as Sahaptin-speakers (including Klickitat) from the Plateau (Ray 1974:249; Boyd 1985:286, 313–319; 1999:257; Hajda 1990:514).

Table 2. Lower Columbia Village Populations in the Two Versions of Lewis and Clark's "Estimate of the Western Indians" (from Boyd and Hajda 1987).

Villages and Village Clusters	Manuscript Estimate		Printed Estimate	
1. Columbia mouth	**700**		**700**	
Killaxthokle		100		100
Chinook		400		400
Clatsop		200		200
2. "Marshy Islands"	**300**		**500**	
Cathlahmah		200		300
Wackkiacum		100		200
3. "Marshy Islands" to Cowlitz (Skillute)	**1,500**		**2,500**	
4. Kalama (Callamak)	**200**		**200**	
5. Lower Sauvie Island/Lewis River	**1,080**		**2,830**	
Quathlahpohtle		300		900
Clackstar		350		1,200
Cathlahcumup		150		450
Clannarminnamon		280		280
6. Lake River/Vancouver Lake (Shoto)	**180**		**460**	
7. Sauvie Island, Columbia side	**330**		**930**	
Clannaqueh		130		130
Multnomah		200		800
8. Multnomah Channel	**420**		**970**	
Clanninata		100		200
Cathlahnahquiah		150		400
Cathlahcommahtup		70		170
Nemalquinner		100		200
9. Willamette Falls/Clackamas	**1,250**		**2,650**	
Clarkamus		800		1,800
Charcowah		200		200
Cushhook		250		650
10. Wappato Valley, east end	**140**		**200**	
Neerchokioo		40		100
Nechacokee		100		100
11. The Cascades (Shahala)	**1,300**		**2,700**	
12. The Cascades to The Dalles	**1,800**		**2,200**	
Smackshop		800		800
Chilluckkittequaw		1,000		1,400
13. The Dalles (Echelute)	**600**		**1,000**	
Totals		**9,800**		**17,840**

TRADE

The Chinookan peoples of the Lower Columbia Valley were well known for their abilities as traders. The most detailed study of this important activity has been undertaken by Hajda (1984:205–262). Euroamerican observers used the term "trade" to encompass several kinds of exchange (Hajda 1984:228). Among the Chinookans and neighboring peoples, a wide array of goods was exchanged in various ways, including through "intervillage conflicts, 'trade' of valuables and of locally specialized items, especially food; gambling; marriage; visiting; hospitality; shamans' activities; and funerals" (Hajda 1984:206).

Trading activity apparently took place more or less throughout the year. Lewis and Clark, for example, observed Indians in canoes loaded with goods on trading expeditions during the winter of 1805–1806 (Moulton 1990:27, 144). More well known, however, are the trading centers that emerged where fish were taken in quantity during the summer months, most notably at The Dalles, at the Cascades, and at Willamette Falls (Hajda 1984:229).

The most often mentioned item of trade was wapato, which was traded by people in the Wapato Valley, especially the Sauvie Island area, to neighboring peoples farther upstream on the Columbia as well as peoples downstream on the coast, including the Tillamooks (Hajda 1984:233). From coastal peoples, the Wapato Indians received blubber and oil in return. From upriver peoples, they received dried pounded salmon, shapallel (bread or biscuit made from cous), beargrass (probably for basket-making), acorns, and dried berries. Other items of trade included smelt and sturgeon obtained by the Clatsops from the Skillute; camas obtained by the Yamhill Kalapuya in exchange for dried salmon at Willamette Falls; and meat and roots obtained by the Clatskanie from the Skillute in exchange for salmon (Hajda 1984:332–333).

As a result of her analysis, Hajda (1984:250) identified two spheres of exchange among the Columbia River peoples. The first sphere involved food and raw materials, such as wapato, fish, acorns, berries, shapallel, whale blubber and oil, and beargrass. Acquisition of these resources involved little risk, was primarily undertaken during the warmer months by women, and exchanges were made primarily among related groups most frequently during the winter. The second sphere involved dentalia, slaves, furs and skins, horses, and possibly canoes. These resources were relatively scarce, were acquired at some distance, often with some risk, by men, and were exchanged in summer as well as winter, among strangers as well as relatives, sometimes across regional boundaries.

Economic exchanges in the second sphere were facilitated by the use of dentalium shells as a form of currency. After their introduction by Euroamericans, glass beads were used in a similar way. Blue beads were generally preferred. In conjunction with the fur trade, beaver skins and blankets also became a standard form of currency (Hajda 1984:230–232; Silverstein 1990:537).

CHINOOKAN GROUPS IN THE CRC PROJECT AREA VICINITY

Lewis and Clark recognized two divisions among the Chinookan villages along the Lower Columbia River in the CRC project area vicinity: (1) the Wapato Indians, sometimes referred to by others as Multnomahs, and (2) the Shahala Nation. These two divisions corresponded closely with dialects of the Upper Chinookan language, with the Wapato Indians speaking what has come be referred to as the Multnomah dialect and the Shahala Nation speaking the Kiksht dialect. In addition to the map on which the expedition's routes are indicated (Figure 4), villages associated with these two divisions of Chinookans are shown on a second map, referred to by the editor of the Lewis and Clark journals as "Confluence of Willamette and Columbia Rivers and Environs, April 3, 1806" (Figure 6).

In their "Estimate of Western Indians," Lewis and Clark refer to the Wapato Indians as encompassing 13 "tribes" concentrated in the vicinity of Sauvie Island. The "tribe" farthest upriver was the Ne-cha-co-kee "on the S. Side of the Columbia a fiew miles below quick Sand river [Sandy River]" (Moulton 1990:484, original spelling). The "tribe" farthest downriver was the Cal-la-maks, who "reside on a creek which falls into the Columbia on the N. Side at the lower part of the Columbia Valley N. Side" (Moulton 1990:484). The Cal-la-maks have been identified as the group that lived at the mouth of the Kalama River (Hajda 1984:111–112).

One of the "tribes" on Sauvie Island subsumed under the name Wapato Indians was the Mult-no-mah who "reside on Wap-pa-tow Island in the Mouth of the Multnomah [Willamette River], the remains of a large nation" (Moulton 1990:484; also see Moulton 1991:32–34). Four other "tribes"—Clannahqueh, Cathlahcommahtup, and Cathlahnahquiah on Sauvie Island and Nemalquinner on the Oregon mainland—were listed as "Tribes of Multnomah" (Moulton 1990:484). The locations of most of these groups appear on both Lewis and Clark maps, with the exception of the Nemalquinner, who only appear on the Willamette–Columbia confluence map (Figure 6).

The term Multnomah is derived from *malnumax* meaning "those towards the water" ("those closer to the Columbia River") (Silverstein 1990:545). As Alexander Ross, one of the fur traders at Fort Astoria, also later subsumed most of people on Sauvie Island under the name "Moltnomas" (Ross 1849:87), this term apparently gradually came to refer to most, if not all, of the Indians in the Wapato Valley (Hajda 1984:66).

As indicated in Lewis and Clark's "Estimate of Western Indians," the "Shahala Nation reside at the Grand rapids and extend down in different Villages as low as the Multnomah river" (Moulton 1990:483). The village farthest downstream assigned to the Shahala was *"Ne-er-cho-ki-oo* 1 House 100 sole on the S. side a few miles above the Multnomah R." (Moulton 1990:483). This settlement is identified as "Shahala N[ation]" on the route map (Figure 4), and as "Neerchokioo Tribe of Shahala Nation" on the Willamette–Columbia confluence map (Figure 6). Lewis and Clark were apparently the only early Euroamericans to use the term "Shahala" (Hajda 1984:67). This term was derived from saxlatks meaning "those upriver" and was a term used to refer to Chinookan peoples upstream at the Cascades (Hajda 1984:67; Silverstein 1990:535).

CHINOOKAN VILLAGES IN THE CRC PROJECT AREA VICINITY

Two studies, both doctoral dissertations in anthropology, have previously combed the ethnographic and historical literature for references to Chinookan villages in the Lower Columbia Valley (Saleeby 1983; Hajda 1984). Neither study identifies any Chinookan villages within the CRC project area. The results of these studies are consistent with the most recent map of Chinookan villages, published in the *Handbook of North American Indians* (Silverstein 1990:534), which does not identity any Native American settlements in the CRC project area vicinity.

Figure 6. Southern portion of Lewis and Clark map prepared April 3, 1806, showing the area around the confluence of the Willamette and Columbia rivers (from Moulton 1991:69).

South Shore Villages

On the south (Oregon) shore of the Columbia River, the closest identified village upstream from the CRC project area is *Neerchokioo* just below the last island in the Government Island chain. The closest identified village downstream from the CRC project area is *Waksin* at the mouth of the Willamette River.

Neerchokioo Village

This settlement was apparently first viewed in November 1792 by Broughton (n.d.:24), who referred to it as the "Old chief's village." It is better known as the village of *Neerchokioo* described at some length in William Clark's journal entry of November 4, 1805:

> On the Main Lard Shore a Short distance below the last Island we landed at a village of 25 *Houses*: 24 of those houses we[re] thached with Straw, and covered with bark, the

> other House is built of boards in the form of those above, except that it is above ground and about 50 feet in length and covered with broad Split boards This village contains about 200 men of the *Skil-loot* nation I counted 52 canoes on the bank in front of this village maney of them verry large and raised in bow. we recognised the man who over took us last night, he invited us to a lodge in which he had Some part and gave us a roundish roots about the Size of a Small Irish potato which they roasted in the embers until they became Soft, This root they call *Wap-pa-to* which the *Bulb* of the *Chinese* cultivate in great quantities called the *Sa-git ti folia* or common arrow head. it has an agreeable taste and answers verry well in place of bread. we purchased about 4 bushels of this root and divided it to our party. (Moulton 1990:17, original spelling)

As noted by Hajda (1994:183), "the houses of 'straw' at Neerchokioo were evidently mat lodges. These may have been of the kind made by Sahapatin speakers living above The Dalles (though the visitors at Neerchokioo were apparently from the Cascades)." The "Skilloot nation" referred to in the passage quoted above is probably a reference to the Echelute or Wishram Chinookans at The Dalles (Hajda 1984:65–66). The initial identification of Neerchokioo as a Skil-loot village was later changed to reflect affiliation of this village with the Shahala at the Cascades (Moulton 1990:20n, 483). This village is designated "Sha-hala N." on the route map (Figure 4).

On their return upriver the following spring, Lewis and Clark camped on the night of April 1, 1806 on the north side of the Columbia opposite the mouth of Sandy River. The next day William Clark conducted a reconnaissance back downstream to examine the mouth of the Willamette River. On his way to the Willamette he revisited the Neerchokio village on April 2, 1806, at which time he described the village and its inhabitants in some detail:

> At 3 P.M. I landed at a large double house of the *Ne-er-cho-ki-oo* Tribe of the *Shah-ha-la* Nation. at this place we had Seen 24 additional Straw Huts as we passed down last fall and whome as I have before mentioned reside at the Great rapids of the Columbia. on the bank at different places I observed Small Canoes which the women make use of to gather Wappato & roots in the Slashes. those Canoes are from 10 to 14 feet long and from 18 to 23 inches wide in the widest part tapering from the center to both ends in this form and about 9 inches deep and So light that a woman may with one hand haul them with ease, and they are Sufficient to Carry a woman an Some loading. I think 100 of those canoes were piled up and Scattered in different directions about in the Woods in the vecinity of this house, the pilot informed that those Canoes were the property of the inhabitents of the Grand rapids who used them occasionally to gather roots. I entered one of the rooms of this house and offered Several articles to the nativs in exchange for Wappato. they were Sulkey and they positively refused to Sell any. (Moulton 1991:57, original spelling)

On his way back after examining the mouth of the Willamette River, Clark stopped again at the Neerchokio village:

> We arived at the Ne er cho ki oo house in which the nativs were So illy disposed yesterday at 11 A.M. I entered the house with a view to Smoke with those people who Consisted of about 8 families, finding my presence alarmed them So much that the children hid themselves, womin got behind their men, and the men hung their heads, I detained but a fiew minits and returned on board the canoe. (Moulton 1991:64, original spelling)

As previously noted, this settlement is identified as "Shahala N[ation]" on the route map (Figure 4), and as "Neerchokioo Tribe of Shahala Nation" on the Willamette–Columbia confluence map (Figure 6). Neerchokio village is not mapped or mentioned in the discussion of Chinookan groups in the Northwest Coast volume of the *Handbook of North American Indians* (Silverstein 1990).

Instead, it is identified as a "Cascades village" within an "area of overlap with Multnomahs" in the Plateau volume of the *Handbook of North American Indians* (French and French 1998:362).

Waksin Village

In comparison with Neechokio, little is known about the village of *Waksin*. It was not mentioned or mapped by Lewis and Clark. It is listed as *Waksin* by Silverstein (1990:534) and as *Wakshin* by Curtis (1911:181). Both writers interpret this name to mean "Dam." This village was located "at the mouth of the Willamette River" (Curtis 1911:181). Although Curtis did not identify which side of the Willamette River the village was on, Silverstein (1990:534) places it on the west bank, within the territory of Chinookans who spoke the Multnomah dialect.

North Shore Villages

The primary ethnographic sources seem to indicate the existence of a long gap in the distribution of villages on the north (Washington) shore of the Columbia River in the CRC project area vicinity (e.g., Hajda 1984:85; Silverstein 1990:534). The closest identified village upstream from the CRC project area is *Washuhwal* at present-day Washougal. The closest identified village downstream from the CRC project area is *Wakanasisi* nearly opposite the mouth of the Willamette River below Vancouver.

Washuhwal Village

Curtis (1911:181) identified the "Gahlawashuhwal, a tribe closely related to the Cascades, and occupying the village of Washuhwal, now Washougal, Washington. The name refers to the sound of rushing water." Spier (1936:24) notes "Washoughally" as a "settlement or tribe in 1811 near Quicksand [Washougal?] river which enters the Columbia on the left" (brackets in original). Spier was apparently unaware that Quicksand River was the name given by Lewis and Clark to present Sandy River on the Oregon shore. The source of Spier's information was Alexander Ross, who "stayed at a Washoug-ally Camp, near Quicksand River," on July 24, 1811 (Ross 1849:106). This village was not mentioned by Lewis and Clark, probably because it was situated a short distance up the Washougal River and was not easily visible from the main channel of the Columbia River. *Wasuxwal* is shown as the farthest downstream settlement of the "easterly Chinookan groups" by French and French (1998:362).

Wakanasisi Village

The most complete description of this village is by Livingston Farrand in the *Handbook of American Indians North of Mexico*:

> A locality on the N. Side of Columbia r., Wash., nearly opposite the mouth of the Willamette; also the name of the Chinookan Tribe, strictly called Galakanasisi ("those of the woodpecker"), formerly living at that point and in its vicinity. Before moving to this place they lived at Lakstak, on the s. side of the Columbia, a little below Nakoaik, and were then called Gatqstax (Boas). About 1840 their chief was Kiesno, whose name is sometimes given to their main village. After the epidemic of 1829 the Wakanasisi were greatly reduced in numbers and included the remnants of several neighboring tribes. In 1849 they numbered fewer than 100, and are now extinct. (Farrand 1910:894)

Using information collected by Edward Sapir, Leslie Spier repeated much the same information in *Tribal Distribution in Washington*, including that "the tribal name is Gal!ak!anasisa, 'those of the woodpecker.'– Boas" (Spier 1936:24) However, in a footnote Spier added "but Boas' original entry in Sapir's manuscript gives ak!anasisi, 'diver,' i.e., the butter-ball duck" (Spier 1936:24, fn 36).

Curtis (1911:181) refers to the inhabitants as the "Gahlakanashishi, whose village Wakanashishi, 'Butterball Ducks,' was about eight miles below the site of Vancouver, Washington." Likewise, Silverstein (1990:534) lists "galakanasisi 'those of butterball ducks'" as the name of the inhabitants. This village is not mapped or mentioned by Lewis and Clark. Its location "nearly opposite the mouth of the Willamette" (Spier 1936:24) places it within the territory of Chinookans who spoke the Multnomah dialect (Silverstein 1990:534).

Sketcu'txat Village

Although not mentioned in the primary ethnographic sources for the downriver Chinookans, and also not listed in the compilations of Chinookan villages referred to above (cf. Saleeby 1983; Hajda 1984), an obscure reference has been found to one more village in the CRC project area vicinity. The single reference so far found to this settlement is in *Wishram Ethnography*, which contains an account of a Shasta youth who was captured by the Klickitat and "taken to Sketcu'txat, now Vancouver, Washington" (Spier and Sapir 1930:222). The only other reference found to this site is in *Stone Age on the Columbia*, by amateur archaeologist Emory Strong, where he wrote that "The Vancouver Shipyard at Vancouver is built on a large village site that was called Sketcu'txat" (Strong 1959:34).

SUMMARY

The shores of the Lower Columbia River were occupied at the time of historic contact by Chinookan peoples. A review of linguistic and ethnographic information indicates that the CRC project area falls along the boundary between groups that spoke different dialects of the Upper Chinookan language. The groups downstream, notably in the concentration of villages on Sauvie Island and the adjacent mainland on both sides of the Columbia, spoke the Multnomah dialect. The groups upstream on the Columbia around the Cascades and at The Dalles, as well as those at Willamette Falls on the Willamette River, spoke the Kiksht dialect.

Like other Chinookan peoples downstream on the Columbia, the Chinookan groups who spoke the Multnomah dialect practiced lifeways similar to those of peoples in the Northwest Coast culture area. The broader culture area affiliation of the Kiksht speakers is more difficult to characterize. While some speakers of the Kiksht dialect, notably the Clackamas, appear to have been more like Northwest Coast peoples, the lifeways of the Chinookan groups farthest up the Columbia River, at the Cascades and in The Dalles area, are described by ethnographers as more similar to those of people in the Plateau culture area.

Previous compilations of references to Chinookan villages do not list any settlements in the close vicinity of the CRC project area. However, an obscure reference has been found to a village at the later location of the Vancouver shipyards. While obviously not very precise, this village is estimated to have been one mile or more upstream from the I-5 bridge over the Columbia River.

At the time of historic contact, the Chinookans were the central society within the "Greater Lower Columbia," in which local groups were connected through intermarriage, exchange, conflicts, slave raids, visits, and resource utilization (Hajda 1984:275–286). As the early historic period was a time of extreme upheaval, the extent to which the "Greater Lower Columbia" existed before historic contact remains uncertain. The multilingualism evident in the early historic period, accomplished to a large extent by the emergence of Chinook jargon as a *lingua franca*, was undoubtedly stimulated to a large extent by the 90 percent decline in the population and consequent amalgamation of survivors from different groups. In this respect, the "Greater Lower Columbia" represents, at least in part, an example of the adjustments made by native peoples to the catastrophic population decline that ensued as a result of the destructive effects of contact with Euroamericans (Dobyns 1983:310–311).

5. ETHNOHISTORY

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The following narrative addresses the relations of the Indians in the vicinity of the CRC project area in the historic period. The primary source information is inadequate, a consequence, in part, of the decimation of these peoples in the 1830s by pandemic diseases. This discussion is based on written historical accounts of Native American peoples and groups. Names of groups appearing in the following discussion refer to language groups or cultural groups as they occur in the ethnohistoric record, and no correlation is intended with contemporary tribal governments.

ENCOUNTERS WITH EARLY EXPLORERS

In 1792 Captain Robert Gray, an American from Massachusetts, entered the lower estuary on the *Columbia Rediviva* and named the river for his ship. An American sailing under a sea letter granted by George Washington, Gray's voyage became the foundation of the assertion of the "discovery rights" to the Pacific Northwest for the United States. Gray informed Captain George Vancouver of his success in crossing the perilous Columbia bar and that fall William Robert Broughton, sailing with Vancouver, entered the estuary and anchored in the lower river. With two small boats he and part of his crew explored the estuary as far east as the Columbia Gorge, ascertaining that the stream was a river, not the fabled Northwest Passage (Nokes 1991:179–192).

Crewmen serving with Broughton recorded accounts of the Indians of the Columbia estuary. While anchored about six miles from the mouth of the river during Broughton's reconnaissance, Thomas Manby wrote:

> A party of Natives of both sexes, took up their residence under a Tree, abreast the Vessel, the men supplied us with fish, and the good natured females, came daily on board, to get themselves adorned with Beads and Buttons, altho' the weather was cold, they wore scarce any covering, most of the men and boys were naked, the Women cover their Shoulders with a small skin, and wear twisted grass about their middle, The hair of most of them is long coarse and black with features not very inviting, both Men and Women assist in paddling the Canoe, the Men hunt, and the cooking part, falls to the lot of the Ladies–broiling half through is all the preparation either Fish or flesh goes thro', to prepare it for Eating.
>
> The Men never move without their Quivers filled with Arrows, all of which are stained with various Colors, and pointed with flint made exceedingly sharp, they seldom miss a mark at twenty yards, and will often kill a bird at forty. long Lances they use with great skill in killing Seals and Sea otters, these animals are in great plenty and whales came frequently as high up as the Chatham lays Sea fowl were in the greatest abundance, but I could not go after them, as the Vessel was without a boat. While walking the Deck, I always kept my Gun by me, being sure of three or four shots in an hour, at Pelicans Shaggs and Gulls. (Manby 1792)

These brief accounts by Thomas Manby initiated description of the Chinookan peoples. During his explorations over nearly 110 miles of the Columbia's tidal area, Broughton sighted seven Indian villages. All of his relations with the Indians were peaceable (Manby 1792).

The first recorded contact between American explorers and the Indians in the vicinity of the CRC project area occurred in 1805 and 1806 during the explorations of the expedition led by Meriwether Lewis and William Clark. The Corps of Discovery was dispatched by President Thomas Jefferson to explore the Louisiana Territory and lands west to the Pacific in order to find a practical route for shipment of commerce by water. Lewis and Clark noted the presence of numerous large villages of Indians along the Columbia River, from its confluence with the Snake to the Pacific Ocean. Although the explorers found a number of villages between the Cascades and the mouth of the Willamette as well as on Multnomah Slough on the south side of Sauvie Island, they did not identify any villages in the vicinity of the future Columbia River Crossing–either on the south shore, Hayden Island, or the north shore at Vancouver (Moulton 1990, 1991).

William Clark's "Fort Clatsop Miscellany" noted tribal distribution between the Sandy and Cowlitz rivers. The numerous villages confirmed, in spite of Clark's comments about "the remains of a large nation" and signs of smallpox or other demographic calamities, that the confluence of the Willamette and Columbia rivers was the setting of a large Indian population:

> *Ne-cha-co-kee* Tribe reside on the S. side of the Columbia a fiew miles below quick Sand [Sandy] river & opposite the dimond Island–(remains)
>
> *Shoto* Tribe resides on the N. Side of the Columbia back of a pond and nearly opposit the enterance of the multnomah [Willamette] river
>
> *Mult-no-mah* Tribe reside on Wap-pa-two Island in the Mouth of the Multnomah, the remains of a large nation
>
> *Clan-nah-quehs* Tribe of Multnomah's on Wappato Island below the Multnomars
>
> Ne-mal-quin-ner's a Tribe of Multnom's reside on the N E Side of the Multnomah River 2 ms. above its mouth
>
> *Cath-lah-com-mah-tup's* a Tribe of Multnoms South Side of the Wappato Island on a slew of the Miltnr
>
> *Cath-lah-nah-qui-ah's* Tribe of Multnomies reside on the S W. side of Wappato Island
>
> *Cath-lah-nah-qui-ah's* Tribe of Multnomies reside on the S W. side of Wappato Island
>
> Clack Star N. resides on a Small river which discharges itself on the S W. Side of Wappato Island
>
> *Clan-in-na-ta's* resides on the S W. Side of Wappato Island
>
> *Cath-lah-cum-ups* on the main Shore South West of Wappato Island
>
> *Clan-nar-min-na-mun's* on the S. W. side of the Wappato Island
>
> *Quath-lah-pho-tle's* N. reside on the S W. of the Columbia above the Enterance of Cah-wah-na-hi-ooks river opposit the Low pt. of Wappato Isd.

> *Cal-la-maks* reside on a creek which falls into the Columbia on the N. Side at the lower part of the Columbia Valley N. Side
>
> *Skil-lute* Nation resides on the Columbia on each sides in different Villages from the lower part of the Columbia Vally as low as the Sturgeon Island and on either Side of the *Coweliskee* River. (Moulton 1990:484, original spelling)

The relationships of the Corps of Discovery and the Indians of the Lower Columbia River were peaceful, though marred by petty thefts by the Indians and the stealing of a valuable dugout canoe by the American party on its departure from Fort Clatsop (Moulton 1990:427–428; 1991:10). During the return from the Pacific Coast the expedition camped for a week at the mouth of the Washougal River, hunted for game, and Clark with a patrol mounted a reconnaissance of the lower Willamette River (Moulton 1991:32–69). The bands and villages identified in the vicinity of the confluence of the Willamette and Columbia rivers were speakers of the Upper Chinookan language. By signing and listening, the explorers did the best they could to secure names and village locations.

Lewis and Clark also recorded information about some non-Chinookan peoples in the area. On his map of the confluence of the Willamette and Columbia Rivers, William Clark identified the village of the Quath-lah-potle Nation at the mouth of the "Cah-wah-na-hi-ooks R." [Lewis River] (Moulton 1991:69, original spelling). Above this Chinookan group, Lewis and Clark noted "a Tribe called the Hul-lu-et-tell reside on this river above it's entr[ance]" (Moulton 1991:26, original spelling).

Scholars have consistently identified the Hul-lu-et-tell as the Cowlitz Tribe. In 1910 Frederick Webb Hodge, editor of the Bureau of American Ethnology's *Handbook of American Indians North of Mexico* noted that the Hul-lu-et-tell were "a numerous nation living N. Of Columbia r., on Coweliskee (Cowlitz) r., above the Skilloot, and on Chahwahnahiooks (Lewis) r., in 1806. It was either a Chinookan or a Salishan Tribe (Hodge 1910[1]:577). The identification of the Hul-lu-et-tell as Cowlitz was used most recently by Dr. Gary Moulton (as buttressed by his editorial review committee) in the definitive edition of the journals of Lewis and Clark (Moulton 1990; 1991).

Lewis and Clark identified the Skillutes as living at the mouth of the "Cow-e-lis'-kee river" [Cowlitz] and noted: "above the Skillutes on this river another nation by the name of Hul-loo-et-tell reside, who are said also to be numerous" (Moulton 1991:18, original spelling).

In 1827 Philippe Marie Guillaume Vandermaelen, a Belgian publisher, issued in Brussels a map of the Pacific Northwest extending from the 42nd parallel northward to the mid-portion of Vancouver Island and eastward to the Rocky Mountains. The map was derivative from the maritime charts of James Cook and George Vancouver and the Samuel Lewis engraving of William Clark's map of the American West published in 1814 (Biddle and Allen 1814).

The map of 1827 provided generalized information on tribal distribution and populations–all presumably gleaned from the accounts of Lewis and Clark (Figure 7). The map identified the following tribes and populations on the north bank of the Columbia River upstream from Wahkiakum County, Washington:

Indiens Cowlitzick	3,100	[living upstream along the Columbia River from the mouth of the Cow-clis-ket River]
d'Hellewits [Hul-lu-e-tell]	1,200	[next tribe east along Columbia River]
Inds. Shoto	460	
Inds. Cathlapootle	1,100	[living on the Chah-wah-n-aha-oohs River]
Inds. Mathlanobs	500	
Inds. Clanimates	200	
Cathlanaquians	400	
Indiens Skilloot	2,500	[living on Seal (the Washougal) River]

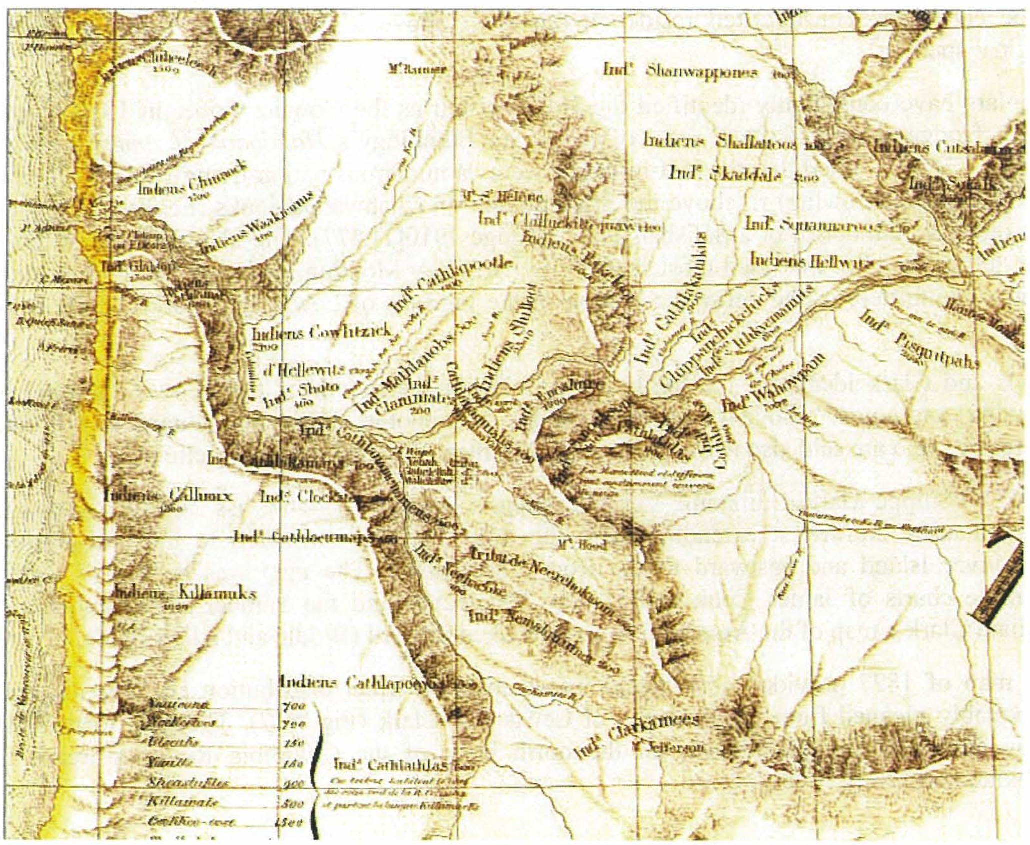

Figure 7. Map of Indian distribution based on data collected by Lewis and Clark and possibly others (Vandermaelen 1827).

The tribal data–location and population–was drawn in part from the accounts of Lewis and Clark, but is not a verbatim transcription of their information. The source for new information, if any, tapped by Vandermaelen is unknown (Moulton 1991).

TRADE WITH THE HUDSON'S BAY COMPANY

In 1825 dramatic changes occurred for the Indians residing near the confluence of the Willamette and Columbia rivers. Executives administering the Hudson's Bay Company concluded that they needed a site better suited to their economic objectives than Fort George (formerly Fort Astoria) at the mouth of the river. Under the leadership of Dr. John McLoughlin, Chief Factor, the company initiated construction of Fort Vancouver. The fort soon became a commercial depot at the crossroads of the Pacific Northwest and the site of disparate enterprises. Between 1825 and 1846 the Hudson's Bay Company tested many of the region's natural resources. It planted gardens, an orchard, and seed crops, imported livestock, established a salmon fishery and salting enterprise, opened a retail store, traded for furs from Native Americans and dispatched brigades to trap for pelts, founded a shipyard, constructed and operated a sawmill to produce lumber, and built a grist mill to process grain. The setting on the north bank of the Columbia–in the midst of a Native American population–underwent rapid transformation (Rich 1959:606–655).

Construction and operation of Fort Vancouver inaugurated a little more than twenty years of trade opportunities for the Indians of southwestern Washington and northwestern Oregon. The company constructed and operated an "Indian Trade Shop" inside the fort's stockade. This facility received furs from visiting Indians and exchanged a variety of material goods: beads, clothing, blankets, tools, foods, and other items. The building, as identified in 1845, measured 80 by 32 feet, confirmation that trade relations with regional tribes were an important part of the company's enterprise (Hussey 1957:189–190).

In 1839 Thomas Jefferson Farnham described the variety of trade goods imported by the Hudson's Bay Company to Fort Vancouver:

> One of these ships arrives at Fort Vancouver in the spring of each year, laden with coarse woolens, cloths, baizes, and blankets; hardware and cutlery; cotton cloths, calicoes, and cotton handkerchiefs; tea, sugar, coffee and cocoa; rice, tobacco, soap, beads, guns, powder, lead, rum, wine, brandy, gin, and playing cards; boots, shoes, and ready-made clothing, &c.; also, every description of sea stores, canvas, cordage, paints, oils, chains and chain cables, anchors, &c. (Farnham 1906:60)

Duflot de Mofras, a French explorer, commented briefly on the Indians living in the vicinity of Fort Vancouver at the time of his 1841 visit:

> Like all Indians in this territory, Chinooks can distinguish at a glance the nationality of a white man. They refer to the Spanish Californians as *Spagnols*, the English as *Kinjor* (a corruption of the words King George), the Americans, as *Bostons*, probably because so many came from that particular port, and the French Canadians as *Fransé* or *Pasayouk*, meaning pale-faces, for undoubtedly they were the first white men to cross the Rocky Mountains. With the latter settlers the Indians have established relations of a most friendly nature. (De Mofras 1937[2]:99)

Fort Vancouver became a major depot of trade with Indian tribes of the region. De Mofras noted:

> About 15 clerks spend their time trading with the Indians, selling goods, or keeping books. They arrive at their offices punctually at seven o'clock and work until nine at night, except for time required for meals which are served in a common dining room, presided over by the head agent. (De Mofras 1937[2]:99)

The Hudson's Bay Company sold a large variety of articles to the Indians. De Mofras noted the inventory included: "heavy clothe, articles of clothing, common prints, woolens, India prints, pottery, glassware, cooking utensils, plain cutlery, glass beads, cooper ornaments for the Indians, and carpenters' and cabinet makers' tools. Although the company may act unwisely in selling firearms and powder to the natives, up to the present they have abstained from introducing spiritous liquors" (De Mofras 1937[2]:207).

Several tribes engaged in the trade at Fort Vancouver. The local Upper Chinookans, Cowlitz, and Kalapuyans of the Willamette Valley were important customers. The Klikitats, outfitted with horses and eager to travel via a trail through the Western Cascades into the Lewis River watershed, were another important trade partner. A number of Klikitats by the 1830s settled in the vicinity of Fort Vancouver, an event documented in Catholic sacramental registers and in enrollment of Klikitat children in the post school. Emphasizing the volatility of this time period for the region, the pandemic diseases that wiped out entire villages residing along the Columbia River created an opportunity for a significant Klickitat incursion into southwestern Washington and the Willamette and Umpqua valleys of western Oregon. In September, 1854, Washington Governor Isaac I. Stevens wrote about the Klikitats:

> It was not, however, until about 1839 that they crossed the Columbia, when they overran the Willamette valley, attracted by the game with which it abounded, and which they destroyed in defiance of the weak and indolent Callapooyas. They still boast that they taught the latter to ride and hunt. They manifest a peculiar aptitude for trading, and have become to the neighboring tribes what the Yankees were to the once western States, the travelling retailers of notions, purchasing from the whites feathers, beads, cloth, and other articles prized by Indians, and exchanging them for horses, which, in turn, they sell in the settlements. (Stevens 1855:225)

Trade with the Hudson's Bay Company had significant impact on the region's tribes. George Gibbs traveled through Klickitat country on a trail from Fort Vancouver through the Lewis River watershed to the Yakima Valley in 1853. Primary author of Governor Stevens' report on the Indians of Washington Territory, he wrote:

> Very few characteristic features remain among these people. Their long intercourse with the Hudson's Bay Company, and, of late years, with the American, has obliterated what peculiarities they may have had; nor is there any essential difference in their habits or manners from those of the Indians adjoining them. They use, for the most part, the arms and utensils of the whites, and the gun has superseded the bow. The pails and baskets constructed from the bark of the cedar, saddles and fishing apparatus, are the principal articles of domestic manufacture; and even of such things it is almost as common to find the imported substitutes. (Stevens 1855:227)

PANDEMIC DISEASES OF THE 1830s

Between 1830 and 1841 a demographic calamity swept through the Native American communities of the Lower Columbia Valley and the Willamette Valley. These events were not new. They had proceeded inexorably since the European incursion into the Western Hemisphere at the end of the fifteenth century. Disease, dislocation, and warfare were three events that changed forever the tenure of native peoples in the Americas. On the Lower Columbia River the initial disease event proved so calamitous that dislocation and warfare were but footnotes. Prior to the arrival of the Lewis and Clark Expedition, smallpox had begun its inexorable ravages among the Native Americans, but the pandemics accelerated in ensuing years (Crosby 1972; Stannard 1992).

During the summer of 1830 and recurring for more than a decade, a virulent "fever and ague," "intermittent fever," or "bloody flux" ravaged the Native American populations of the Columbia River and the Willamette Valley. Robert Boyd's assessment of these events, founded on dozens of fragmentary primary sources, presented a compelling account of this epidemic:

> From a total population something under the 15,545 estimated by Lewis and Clark and the Hudson's Bay Company in the early decades of the 1800s, numbers for these two groups [Chinookan and Kalapuyan] dropped to around 1,932 by 1841, a decline of 88%. By 1850, the population of the region had rebounded to what it had been in 1829, but its composition was radically different: English-speaking Americans had almost totally supplanted the Native Americans who had occupied the area a mere 20 years earlier. The fever and ague epidemics probably constituted the single most important epidemiological event in the recorded history of what would eventually become the state of Oregon. (Boyd 1999:84)

Boyd's study of epidemics and population decline in the Columbia watershed describes in detail the outbreak of a fever in July, 1830. The "intermittent fever," so termed by the Hudson's Bay Company officials, struck both Indians and Euroamericans. Among the former, however, it was almost always fatal. Peter Skene Ogden, a company brigade leader, wrote about its impact on nearby Sauvie Island: "In close contiguity with our clearances was a village containing sixty families of Indians; a few miles lower down was a second, of at least equal population… A short month had passed away.… All, all was changed. Silence reigned where erst the din of population resounded loud and lively" (Ogden in Boyd 1999:86).

The diseases (probably malaria, but also smallpox, tuberculosis, and dysentery) swept through the villages at the confluence of the Willamette and Columbia rivers. Families and entire villages died, leaving no one to tend to the ill or bury the dead. John Kirk Townsend, a naturalist visiting Fort Vancouver in 1834–1835, observed:

> A disease of a very fatal character is prevalent among these Indians; many of them have died of it; even some of those in the neighborhood of the fort, where medical assistance was always at hand. The symptoms are a general coldness, soreness and stiffness of the limbs and body with violent tertian ague. Its fatal termination is attributable to its tendency to attack the liver, which is generally affected in a few days after the first symptoms are developed. (Townsend 1839:178)

Samuel Parker, a minister scouting the prospects for Indian missions in the Pacific Northwest, noted in 1835 at Fort Vancouver:

> Since the year 1829, probably seven eights if not, as Doct. McLaughlin believes, nine-tenths, have been swept away by disease, principally by the fever and ague. The malignancy of this disease may have been increased by predisposing causes, such as intemperance, and the general spread of venereal.… So many and so sudden were the deaths which occurred, that the shores were strewed with the unburied dead. Whole and large villages were depopulated; and some entire tribes have disappeared, the few

> remaining persons, if there were any, uniting themselves with other tribes. (Parker 1838:178)

The pandemic was recurrent. It spread during the 1830s and reached from the Columbia River to the Sacramento Valley by 1834. With antigens in their systems and some medical assistance, the non-Indian population was more likely to survive, though enduring weeks of illness. Boyd, the ethnohistorian who has most rigorously explored the epidemiology of this event, has concluded that the malaise was malaria. It became rampant in a setting hospitable to *Anopheles freeborni*, a mosquito carrying malaria (Boyd 1999:106–109).

Boyd assessed the death rate for the Columbia River and Willamette Valley in the first four decades of the nineteenth century:

> The most likely loss figures are Wappato, 2,210 to 37, or 98% of the premalaria total; Willamette Valley Kalapuya 7,785 to 600, a loss of 7,185 or 92%; Cascades 1,500 to 150, or 90%; Cathlamet cluster, 1,800 to 300, or 83%; Clackamas, 1,150 to 345, or 70%; and Chinook, 1,100 to 500, or 55%. Cumulated loss figures for all the above peoples are 15,545 to 1,932, or 88% of the total population between circa 1805 and 1840. (Boyd 1999:244)

The consequences of the pandemic of 1830–1841 were immense. Entire villages of Upper Chinookans disappeared. Survivors found refuge with other bands and linguistic groups. The densely populated confluence of the Willamette and Columbia rivers–with its abundance of fish, bulbs, and game–no longer sustained one of the major population concentrations of the Pacific Northwest. Collapsing cedar-plank houses, whitening bones, and silence were the legacies of disease and dislocation that came with the Euroamerican incursion into the region.

CHRISTIAN MISSIONS

In 1834 Rev. Jason Lee, an American Methodist missionary, arrived overland with a small delegation of assistants with the stated purpose to try to convert the Indians of the region to Christianity. Within the context of increasing strains between British and U.S. western frontier interests, Lee took the counsel of Dr. McLoughlin and settled at Mission Bottom near French Prairie in the northern Willamette Valley. The site included rich farmlands, proximity to a small community of retired, former fur company employees, and nearby villages of Kalapuyan Indians who were coping with the calamitous diseases decimating their villages. Lee was an ardent evangelical. He tried to convert the Indians both to a sedentary, Euroamerican lifeway as well as to Methodism. Although he secured reinforcements and finances to increase the missions to additional locations—Clatsop Plains, Wascopam (The Dalles), Oregon City, and Nisqually, his programs singularly failed to win converts. Lee returned east in 1843, was dismissed from responsibilities though he continued to raise funds for the Oregon Institute (Indian school), and died in 1845 (Brosnan 1932:164–186; Loewenberg 1976:65–66, 76–77, 113–117).

The Hudson's Bay Company gained exclusive trading privileges in western Canada under its charter revised in 1821 by the British parliament. Its responsibilities were multiple: to sustain peaceful relations with the Indian tribes, to administer justice and settle disputes among its employees, and to serve as a British presence in lands contested by other nations, especially the United States. In an effort to improve conditions for its employees, the company in 1836 dispatched Rev. Herbert Beaver and his wife from London to establish an Anglican presence at Fort Vancouver. While the reverend's name was right, his choice proved wrong in almost every detail (Jessett 1959: xi–xxiii).

Rev. Beaver was an ardent, narrow protestant who settled into prolonged conflict with the officials at the fort. He despised the Catholics among the French-Canadians; he considered the "marriages" of fur company employees to native women unlawful and unsanctified and inveighed against them. He complained about his housing, his allocation of wine and sherry, his offer to serve as a teacher, indeed almost everything. He fought a determined and losing battle to persuade the company to dismiss McLoughlin, the Chief Factor. Beaver's tenure was short and miserable (Jessett 1959). On June 17, 1837, Reverend Beaver wrote at Fort Vancouver:

> Nearly two hundred of the Klickatack Tribe of Indians have congregated for agricultural purposes, on a large plain about fourteen miles distant from the Fort, during the last summer, when I have paid them several visits, on one of which, with the assistance of a youth, who accompanied me, I vaccinated about an hundred and twenty of them, the rest having undergone the operation at the hands of your medical officer. Their language is different from the Chinook, and, I think, of easier acquisition, being less guttural, and more harmonious. Neither are their habits, in consequence of their not dwelling on the banks of the River, so depraved as those of the other tribe [namely, the Chinookans]. They live principally by hunting, and on wild roots, their first attempt at cultivation being made, this year, with potatoes, Indian corn, peas, furnished them by Chief Factor McLoughlin. (Jessett 1959:58–59)

In 1836 Dr. Marcus and Narcissa Whitman and Rev. Henry H. and Eliza Spalding arrived overland at Fort Vancouver. Sent out by the American Board of Commissioners for Foreign Missions (ABCFM), they too planned to convert the Indians of the Pacific Northwest. Outfitted with supplies purchased at the fort, they returned east to establish missions on the Walla Walla and Clearwater rivers among the Cayuse and Nez Perce. Similar to the Methodists, the ABCFM missionaries also insisted on a dualistic conversion: agriculture and Christianity. Their efforts were frustrated by their inability to master the native languages but also by their attitudes and actions. Whitman encouraged overland pioneers to cross the Blue Mountains and pass by his mission. Annually the settlers brought new diseases and the portent of larger scale invasion. In 1847 the Cayuse murdered the Whitmans and nine others at their station. The ABCFM efforts collapsed with this event, followed by the equally tragic Cayuse Indian War of 1847–1848 (Drury 1937).

In 1838 Fathers Francis N. Blanchet and Modest Demers arrived overland, having traversed the continent with a Hudson's Bay Company supply party. These Catholic fathers brought far different talents, methods, and expectations to the Pacific Northwest. College educated with multiple language skills, they had the ability to gain some mastery of native languages. Supported by the bishop of Quebec and the extensive resources of the Catholic Church, they were prepared to endure and sustain a ministry over a long period of time. At Fort Vancouver they encountered a French-Canadian population reared in Catholicism and, in many instances, eager for religious services, sacramental rites, and education for the children. The priests did not demand that the Indians change their lifeways to a sedentary agrarian economy nor that they master English. They wore distinctive robes, burned candles, rang bells, and engaged in interesting religious rites that caught native attention.

With strong support from Hudson's Bay Company officials at Fort Vancouver, the Catholic missionaries established St. James Mission at the fort, St. Francis Xavier at Cowlitz Landing, St. Paul's in the Willamette Valley, and Stellamaris at the mouth of the Columbia. Their registers began recording sacramental acts on December 1, 1838. Over the next several decades, they tallied an impressive success of their missions to Indians, fur trappers, European immigrants, and others.

The registers at Fort Vancouver document the diverse origins of the native population that worked for the company or came to trade at the Indian store. The priests recorded "Pend D'oreille, Kawitchin [Cowichan], Moatwas, 'nation of the Indians of the Cascades,' Tlikatat, Tichinouk, Tchihelis, Okanagan, Clacalam, Clatsoppe, 'Indians of Colville,' Souchouabe [Shuswsap] and others. Some were wives and children of Hudson's Bay Company employees; others were Indians who responded to the priests and decided to be baptized or married by Catholic rites (Munnick and Warner 1972).

The mission registers at Fort Vancouver are a mirror to the presence of Indians at the fort. Numerous Cowlitz, for example, were baptized, married, or buried by the resident priests:

> B[aptized] On the 8[t] ["18th" crossed out] day of July 1854, we missionary priest baptized, in danger of death, Mary (a girl 7 years old) daughter of Humptux an Indian who lives at the mouth of Lewis River Washington Territory. James Croke, Priest (Munnick and Warner 1972:147).

Umptux or Umtuchs was a Cowlitz chief who resided with his band at the mouth of the Cathlapootle (Lewis) River. He was murdered at Battle Ground in Clark County during the Indian War of 1855–1856 (Strong 1930:111–128).

The registers confirm that in addition to the English and French-Canadian community, Fort Vancouver was truly a multi-racial, multi-tribal, and multi-linguistic community in the 1830s to the 1850s. The following are examples with emphasis supplied:

> B[aptized] This 30 September, 1839, we priest undersigned have baptized Pierre, aged 18 years, of the **nation of Kliketates**, being in danger of death. Godfather Jean Baptiste Jeaudoin undersigned with us. F.N. Blanchet, priest, V.g. (Munnick and Warner 1972:52).

> B[aptized] This 14 January, 1843, we priest undersigned have baptized Betsy aged 18 years, Indian of the Tribe of Tchinouks. Godfather… [Laurent] Sauvé, godmother Emélie wife of Pierre Guilbeau. F. N. Blanchet, priest (Munnick and Warner 1972:15).

> S[epulchre, i.e., burial] The 12 October, 1843, we Priest undersigned have buried in the Catholic cemetery of this place, the body of Monsieur John McLoughlin, Surgeon, assassinated at the Establishment of the Honble. Company of Hudson's Bay, at Stikene [British Columbia], of which he was Officer in Charge, in the night of the 20 or 21 of the month of April of last year, about midnight, aged 29 years, 8 months and 3 days, son of John McLoughlin, Esquire, Superintendent for the Honble. Company of Hudson's Bay, at Fort Vancouver… A. Langlois, priest (Munnick and Warner 1972:25).

> B[aptized] This 28 January, 1844, we priest undersigned have baptized Betsy aged about 24 years, daughter of infidel parents, **Kilimaux [Tillamook] Indians**. Godfather Joseph Brunel, godmother Emelie Guilbeau. F.N. Blanchet, priest (Munnick and Warner 1972:33).

> S[epulchre, i.e., burial] The 30 of November of the year 1845, has been buried in the cemetery of fort, Louis Kataranka **(Iroquois)** engagé of the Company of Hudson, deceased the 27 of the same month. P DeVos SJ. (Munnick and Warner 1972:67).

B[aptized] The 24 of September of the year 1846, we undersigned priest miss. of the Company of Jesus have baptized Marie Marguerite, daughter of a **father of the Cascades nation and of a Tchinouk mother**, aged 7 months about. Her godmother has been Marie Marguerite [Tomwata] wife of Francois Laframoise (Munnick and Warner 1972:75).

S[epulchre, i.e. burial] The year 1847, the 14 December, died, and the following day has been buried Marie daughter of **infidel Umpquois parents**, aged about 17 years. Delévaud, priest (Munnick and Warner 1972:86).

B[aptized] The year 1848, the 2 January, I undersigned priest misse. to the Fort Vancouver have baptized in danger of death, Etienne, **Indian of the Cascades** aged about 20 years (Munnick and Warner 1972:89).

B[aptized] The 1st of July of the year 1848, I undersigned priest misse. To the Fort Vancouver, have baptized Marie daughter of **Kaharro Oahi [Owyhee, or Hawaiian] and of an Indian woman of the Grande Dalles** [of the Columbia], born the 13 June last. Godfather Rev. Léon Achille Lebas priest misse. Apostolic. Delévaud priest (Munnick and Warner 1972:97).

Sacramental activity at the Catholic mission often increased during the winter months with the migration of Upper Chinookans from the Gorge to the more temperate area lying east of Fort Vancouver. Those who came and went included Tchinouks (Upper Chinookans) and Tumwatas (Cascades). The St. James Mission registers recorded numerous burials in the cemetery located north of the church. The cemetery site subsequently lay between the Quartermaster Department and the parade ground of the U.S. Army barracks before it was obliterated by development of the military post (Munnick and Warner 1972).

TREATY RELATIONS WITH THE TRIBES

In 1851 Anson Dart, Superintendent of Indian Affairs for Oregon Territory, secured treaty-making powers by Act of Congress, February 27, 1851. On that date, Congress revoked the authority of the Willamette Valley Treaty Commission to negotiate land cessions and transferred authority to Dart. Brother-in-law to George Catlin, documentary painter of Native Americans since the 1820s, Dart traveled from Wisconsin to Oregon, established his headquarters at Elk Rock on the lower Willamette River opposite Milwaukie, and proceeded with treaty councils. He held major meetings at Tansy Point (Point Adams at the mouth of the Columbia) for ten treaties, and two more in southwestern Oregon in councils at Port Orford and the mouth of Rogue River, and a third at Oregon City (Dart 1851a).

Dart negotiated agreements with several bands of Chinookans and Athapaskan speakers of the Lower Columbia River:

Nuc-que-clah-we-muck Tribe	7 August 1851
Waukikum Band of Chinook Tribe	8 August 1851
Konnaac Band of Chinook Tribe	8 August 1851
Lower Band of Chinook Tribe	9 August 1851
Kathlamet Band of Chinook Tribe	9 August 1851
Klatsaknia Band of Chinook Tribe	9 August 1851
[Athapaskans, not Chinookans]	
Clackamas Tribe of Indians	6 November 1851

The treaties ceded lands and reserved a variety of rights: occupancy of old villages, fishing, hunting, cutting timber, picking cranberries, cultivating land to meet needs, and passing freely to fishing grounds (Dart 1851a, 1851b).

Dart held the Clackamas treaty council in Oregon City. Initially the chiefs and headmen wanted to reserve a large, undescribed tract of land that included several donation land claims. Dart countered with his own proposal of reserving scattered small tracts of land, subsistence rights, plus annuity payments of clothing and provisions. The proposed Clackamas cession ran north from the Molalla cession of May 6, 1851, down the Willamette River to its confluence with the Columbia, then east to the summit of the Cascade Mountains in the Columbia Gorge, then south along the dividing ridge to the Molalla cession. The draft treaty enumerated several rights:

> [Occupancy of the lands] at the ferry of the Clackamas river, during the natural lives of the signers of this treaty.
>
> Privilege of fishing, without molestation, at all their former fishing grounds on the Clackamas river, together with the privilege of passing freely from one to the other along the river.
>
> [The grounds] now occupied by said Clackamas Indians, and upon which they now reside, are not to be encroached upon by white persons during the time for which they are reserved by said Indians, except in passing to and from the ferry across the Clackamas river, in building a bridge or bridges, and in making necessary roads and highways through said grounds.

Dart offered $500 in cash and $2,000 in goods for ten years (United States Senate 1852: Item 58).

Nicholas Du Bois and David McLaughlin served as interpreters, presumably negotiating the agreement through the Chinook Jargon. McLoughlin (1821–1903) was a son of Dr. John McLoughlin and Marguerite Wadin. He grew up at Fort Vancouver before studying in Europe (Munnick and Warner 1972:A-55). The tribal leaders who signed the treaty, each with an "X," were Watchano, Washkai, Wallahpicah, Lomus, Whyna, Kachumult, Joe, and Tummachus. A few historical traces provide a bit more information on these men. In 1905, for example, John Wacheno (1857–ca. 1935) testified that he was a Clackamas Indian and that his father "was head chief of our tribe when we came to the [Grand Ronde] reservation" (Munnick and Beckham 1987:A-9).

In spite of the council and signatures, the Senate rejected this treaty, all of the Dart treaties from the Tansy Point and Port Orford councils, and the treaties forwarded by the Willamette Valley Treaty Commission. Samuel Thurston, territorial delegate from Oregon, expressed opposition to the treaties because they permitted Indians to remain in the areas of pioneer settlement. He and others envisioned removing all Indians in Oregon and Washington to east of the Cascades, a philosophy never transacted.

The Clackamas treaty was drafted in reference to the Molalla treaty negotiated in the spring of 1851 by the Willamette Valley Treaty Commission. The Senate Committee on Indian Affairs tabled all of the treaties negotiated in 1851 in Oregon Territory. As unratified agreements, the treaties were little more than interesting historical documents, but were a dead end in the development of federal Indian policy. The treaties were then hidden from view when published and closely held in *Senate Confidential Document No.39* (United States Senate 1852). Public access to the treaty texts and, ultimately, to the manuscript minutes of the Willamette Valley Treaty councils did not occur until the twentieth century.

In January, 1855, Joel Palmer, Oregon Superintendent of Indian Affairs, secured agreements to a treaty discussed with various tribes and bands in the watershed of the Willamette River. This treaty ceded all of the Willamette Valley to the United States from the summit of the Coast Range on the west to the summit of the Cascade Mountains on the east, and along the Columbia River from the Cascades in the Columbia Gorge west to Oak Point. By this agreement the lands at the future Columbia River Crossing on the south shore of the Columbia River and Hayden Island were formally ceded to the United States. Palmer's treaty provided for no reserved rights and for only a temporary reservation "until a suitable district of country shall be designated for their permanent home" (Kappler 1904b[2]:665).

Palmer secured signatures of seventeen chiefs at Dayton on January 4; then on January 8 at Dayton agreement by five chiefs of the Molalla band of Mollallas and the Calapooia Band of Calapooias; on January 10 at Dayton agreement by twelve chiefs of the Ninefelly [Winnefella], Mohawk, Chapen [Chafan], To-co-pa, Wal-lal-lah [Wat-lal-lah] Band of Tumwaters [Cascades], Clockamus [Clackamas]; on January 19 at Linn City the agreement of two chiefs of the Clow-we-wal-la, or Willamette Tum-water Band; and on January 22 at Dayton, agreement of ten chiefs of the Sant[i]am Bands of Calapooia (Kappler 1904b[2]:668–669).

The treaty contained a provision that referenced lands on the north bank of the Columbia in Washington Territory: "*And, provided*, Any of the bands becoming parties to this treaty establish a legitimate claim to any portion of the country north of the Columbia River, that the amount to which they may be entitled as a consideration for such country, in any treaties hereafter entered into with the United States, shall be added to the annuities herein provided for" (Kappler 1904b[2]:666). Subsequent to this treaty the United States did not enter into any ratified treaty negotiations with the Indians of southwestern Washington. This provision was thus moot.

TRIBAL RELATIONS WITH THE OREGON AND WASHINGTON SUPERINTENDENCIES OF INDIAN AFFAIRS

For several years the officials of the Office of Indian Affairs in Oregon Territory suffered from incomplete knowledge of tribal distribution and populations. The lack of language skills, challenges of the terrain, and rudimentary transportation systems compounded the problems of gaining information. Joseph Lane arrived in Oregon Territory in March, 1849, to assume duties as territorial governor and ex-officio superintendent of Indian affairs. He commenced his duties by collecting general data on the Indians in the Pacific Northwest. In the fall of 1849 he wrote to the Commissioner of Indian Affairs and identified some of the tribes and bands living near the confluence of the Willamette and Columbia rivers:

> The *Clackamas* Indians live upon a river of that name, which empties into the Willammette, one mile below Oregon city. They number about 60, and are considered industrious. They have but few arms, and are friendly. They live on fish and roots.
>
> The *Willammette* Indians live upon a river of that name, which empties into the Columbia, one mile below Oregon city. They number about 70, and are considered industrious. They have but few arms, and are friendly. They live on fish and roots.

> The *Wakamucks, Namanamin*, and *Namoit* are bands and parts of bands that claim the country from Oak Point to the mouth of the Willammette, including Wyath's [Wyeth's or Sauvie] Island. They have become so reduced that they have united, and now live together or near each other. Number not known. (Lane 1850:129–130)

In 1851, Anson Dart, the next Superintendent of Indian Affairs, wrote terse comments about some of the tribes in his jurisdiction. These included some living near Vancouver, Washington:

> For a distance of about eighty miles from the Cowlitz river to the Cascades, there are now no real owners of the land living. It is occupied by the Vancouver Indians, of whom it will have to be purchased. Their band numbers in all, sixty.
>
> The Clackamas band, living upon the Clackamas river, near Oregon city, were formerly a part of the Chinook Tribe, and still speak their language. They claim the country on the east side of the Willamette river, from a few miles above its mouth nearly to Oregon city, and extending east to the Cascade mountains. They refuse to sell their land without immediate payment. Their whole number is eighty-eight. They own a valuable tract of country.
>
> The Tum-water [Clowewalla] band, also a remnant of Chinooks, residing at the fall of the Willamette, opposite Oregon City, claim a strip of land some twenty miles in length, on the west side of the Willamette, extending from Souvies island, at the mouth of the river, up to Twality river, and west to Twality plains. They also refuse to sell their land without pay down; giving, as a reason, the probability of their living but a very few years. Their number is thirteen.
>
> The Clickatats claim a district of country north of the Columbia, but they are a roving tribe, and are scattered about in different parts of the Territory. Their number is four hundred and ninety-two (Dart 1852:214–215).

During the summer of 1853 George Gibbs participated as geologist and ethnologist for the McClellan surveys of passes in the Cascade Mountains for the proposed Pacific Railroad. During the time he was at Fort Vancouver he interviewed Butler Ives, a contractor surveyor for the General Land Office. Ives had worked in helping establish the Willamette Meridian and baseline and was acquainted with the Indian villages of the Columbia River. Based on his interview with Ives, Gibbs noted seven Upper Chinookan villages. Ives estimated the surviving population at 150 people (Gibbs 1853–1854). The data recorded by Gibbs in 1853 did not identify any villages at Sauvie Island or Multnomah Channel.

Congress created Washington Territory in 1853 by carving out Oregon and setting the stage for its statehood in 1859. The new administrative unit reached from the Pacific to South Pass in Wyoming. Isaac Ingalls Stevens, a West Point graduate and veteran of the Mexican War gained appointment as the new governor, as superintendent of Indian Affairs, and as head of the Northern Division of the Pacific Railroad Surveys. In his initial assessment of Indian tribes in his jurisdiction, Governor Isaac I. Stevens of Washington Territory reported to George W. Manypenny, Commissioner of Indian Affairs, in September, 1854:

> The tribes of the Klik-a-tats and Yakamas inhabit properly the valleys lying between Mount St. Helens and Adams; but they have spread over districts belonging to other tribes, and a band of them is now located as far south as the Umpqua. Their nomadic habits render a census very difficult, though their number is not large. Dr. Dart stated them at 492, since when there has been certain a great decrease. The number of the two principal bands, as obtained during the summer, was at Chequoss 138, and at the Kamas plain 84. These must have constituted the chief part, as it was the season of berries when