Final
Environmental Impact Statement

Tacoma-Cascade Pipeline

Cascade Water Alliance
Cascade Regional Water Supply System

April 26, 2007
Fact Sheet

Project Title
Cascade Water Alliance, Cascade Regional Water Supply System, Tacoma–Cascade Pipeline

Description of the Proponent
The proponent of the Tacoma-Cascade Pipeline Project is Cascade Water Alliance (Cascade). Cascade was formed by a group of cities and special districts that own and operate public water systems in King County to jointly plan, develop, and operate a water supply system for its members. Each of these water systems is authorized to provide water within its designated service area. The members of Cascade have entered into an Interlocal Agreement to enhance their ability to supply water to their respective service areas and the region by developing, owning, and operating regional water supply assets. The members of Cascade are:

- City of Bellevue
- City of Tukwila
- City of Issaquah
- Covington Water District
- City of Kirkland
- Skyway Water and Sewer District
- City of Redmond
- Sammamish Plateau Water and Sewer District

Description of the Proposed Action
The Proposed Action involves constructing and operating a buried water supply pipeline, the Tacoma–Cascade Pipeline (TCP) and ancillary features, to connect the existing Tacoma Water Second Supply Pipeline (SSP) to the existing Bellevue–Issaquah Pipeline (BIP). The pipeline would be approximately 20 miles long and 42 inches in diameter and would bring water purchased from Tacoma Water to Cascade’s members.

Two action alternatives for the pipeline route (the Preferred Alternative and the Green Route Alternative) are being considered in addition to the No-Action Alternative. The action alternatives are located in King County within the following jurisdictions:

- City of Bellevue
- City of Newcastle
- City of Covington
- City of Renton
- City of Issaquah
- Unincorporated King County
- City of Redmond
- City of Kent

The majority of the pipeline would be constructed within public road rights-of-way. However, the pipeline would also cross private property and undeveloped lands.
Description of the Alternatives

This Environmental Impact Statement (EIS) examines the following three alternatives:

1. **No-Action Alternative.** Under the No-Action Alternative, Cascade would not construct a new water transmission pipeline. Water would continue to be supplied through members’ independent supplies, through wholesale water purchased by members from non-member water purveyors, and through a declining block contract with Seattle Public Utilities (SPU). Forecasted demands would not be met. Increased demand as a result of population growth, in combination with the declining SPU contract, would result in inadequate water supplies for Cascade members.

2. **Preferred Alternative.** The Preferred Alternative (see Figures 2-2 and 2-3) would be approximately 19.1 miles long. It would begin at the SSP, generally follow 160th Avenue SE or 164th Avenue SE north, and cross SR 18. There is also an option for the Preferred Alternative to continue on 164th Place SE, turn northwest on Covington Way SE, cross SR 18, and turn west on SE 272nd Street to 156th Place SE. It would then follow 156th Place SE, 156th Avenue SE, SE 224th Street, 148th Avenue SE, SE 192nd Street, and 140th Avenue SE to the SR 169 crossing. There is also an option in this area that would run cross-country on private property from near the intersection of 140th Way SE and SE 156th Street north to the SR 169 crossing.

The Preferred Alternative would continue east on the paved Cedar River Trail. North of SR 169, the pipeline would travel north along 149th Avenue SE, Jones Road, and along 154th Place SE, then cross-country through a King County-owned parcel, along 156th Avenue SE, SE 144th Street, and 160th Avenue SE to SE 128th Street. The pipeline would then run east on SE 128th Street and then north on 176th Avenue SE to SR 900 in the May Valley area. From the May Valley area, the pipeline route would follow SR 900 northeast to the BIP. In south Issaquah, there are options along SR 900 to run cross-country, roughly parallel to a Puget Sound Energy (PSE) right-of-way. The jurisdictions along the Preferred Alternative include the cities of Covington, Renton, and Issaquah, and unincorporated King County.

3. **Green Route Alternative.** The Green Route Alternative (see Figures 2-2 and 2-3) would be approximately 21.9 miles long. It would begin at the SSP and continue north on 132nd Avenue SE. It would then turn east on SE 208th Street and north on 140th Avenue SE. The Green Route Alternative would follow the same route as the Preferred Alternative between SE 192nd Street and 156th Avenue SE. It would continue north on 156th Avenue SE, generally following SE 128th Street, 148th Avenue SE, SE May Valley Road, Coal Creek Parkway, and SE Newport Way to the BIP. The jurisdictions along the Green Route Alternative include the cities of Kent, Renton, Newcastle, and Bellevue, and unincorporated King County.

Proposed/Tentative Implementation Date

A decision will not be made about the Proposed Action until at least 7 days after issuance of the Final EIS. However, a proposed date for implementation would be the latter half of 2007.

SEPA Lead Agency

Cascade Water Alliance is the lead agency for this proposal.
### SEPA Responsible Official/Project Information Contact Person

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Cascade Water Alliance  
11400 SE 8th Street, Suite 440  
Bellevue, WA 98004  
(425) 453-0930

### Permits and Approvals that May Be Required for an Action Alternative

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**Notes:**
1 – This table lists the key permits/approvals known at the current time. Ongoing agency consultation may determine that additional approvals would be required.
2 – May not be needed; need would be determined during ongoing consultation.
3 – Because of the linear nature of the proposed project, more than one permit may be required.
4 – Would be obtained by the contractor.
5 – The City of Renton advises that approvals may be required from the Interagency Committee on Outdoor Recreation and from the Washington State Department of Transportation. This would be confirmed in ongoing agency consultation.

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## Principal Contributors to the EIS

The individuals listed below were principal contributors to the preparation of the EIS. For more detailed information about the education and experience of the principal contributors, see Appendix C.

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**Draft EIS**

The Draft EIS was issued on December 21, 2006. The comment period for the Draft EIS ended on February 2, 2007. Cascade received written comments on the Draft EIS from federal, state, and local agencies; from the tribes; from non-governmental organizations; and from private citizens. The comments received on the Draft EIS are addressed in this Final EIS.

**Final EIS Date of Issuance**

April 26, 2007

**Locations to Obtain Copies of the Final EIS**

The Final EIS is available to the public online at [www.cascadewater.org](http://www.cascadewater.org).

The Final EIS is also available on compact disc for a cost of $2, or hard copy for $40, from the following address:

Cascade Water Alliance  
11400 SE 8th Street, Suite 440  
Bellevue, WA 98004  
(425) 453-0930

Copies of the Final EIS are available for review at the following libraries:

- King County Library System
  - Fairwood Branch
  - Maple Valley Branch
  - Covington Branch
  - Kent Regional Branch
  - Issaquah Branch
  - Newport Way Branch
  - Bellevue Regional Library
- Renton Public Library
- University of Washington Suzzallo Library

**Subsequent Environmental Review**

The following studies may be performed and plans developed once an alternative is selected:

- Erosion and Sedimentation Control (ESC) Plan
- Wetland Mitigation/Restoration Plan
- Biological Assessment (to meet Endangered Species Act requirements)
• Critical Areas Study
• Stormwater Pollution Prevention Plan (SWPPP)
• Spill Prevention Control and Countermeasures (SPCC) Plan
• Traffic Control Plan
• Phase I Environmental Site Assessment
• Phase II Environmental Site Assessment
• Compliance with Section 106 of the National Historic Preservation Act

**Background Documents**

Technical reports, background data, adopted documents, and materials incorporated by reference for this EIS are available for public review at the following address:

Cascade Water Alliance  
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# Acronyms and Abbreviations

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<thead>
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<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac</td>
<td>acre</td>
</tr>
<tr>
<td>ADD</td>
<td>average day demand</td>
</tr>
<tr>
<td>ADT</td>
<td>average daily traffic</td>
</tr>
<tr>
<td>AICP</td>
<td>American Institute of Certified Planners</td>
</tr>
<tr>
<td>AQI</td>
<td>Air Quality Index</td>
</tr>
<tr>
<td>BA</td>
<td>Biological Assessment</td>
</tr>
<tr>
<td>BIP</td>
<td>Bellevue–Issaquah Pipeline</td>
</tr>
<tr>
<td>BMP</td>
<td>Best Management Practice</td>
</tr>
<tr>
<td>BP</td>
<td>before present</td>
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<td>BPA</td>
<td>Bonneville Power Administration</td>
</tr>
<tr>
<td>C</td>
<td>commercial</td>
</tr>
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<td>CAA</td>
<td>Clean Air Act</td>
</tr>
<tr>
<td>CARA</td>
<td>Critical Aquifer Recharge Area</td>
</tr>
<tr>
<td>Cascade</td>
<td>Cascade Water Alliance</td>
</tr>
<tr>
<td>CB</td>
<td>community business</td>
</tr>
<tr>
<td>CC</td>
<td>community commercial</td>
</tr>
<tr>
<td>CC-MU</td>
<td>community commercial/mixed use</td>
</tr>
<tr>
<td>CDF</td>
<td>control density fill</td>
</tr>
<tr>
<td>cfm</td>
<td>cubic feet per minute</td>
</tr>
<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
</tr>
<tr>
<td>cfs</td>
<td>cubic feet per second</td>
</tr>
<tr>
<td>CFU</td>
<td>colony forming unit</td>
</tr>
<tr>
<td>CIP</td>
<td>Capital Improvement Project</td>
</tr>
<tr>
<td>CMP</td>
<td>corrugated metal pipe</td>
</tr>
<tr>
<td>CO</td>
<td>carbon monoxide</td>
</tr>
<tr>
<td>CPEP</td>
<td>corrugated polyethylene pipe</td>
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<tr>
<td>CRWSS</td>
<td>Cascade Regional Water Supply System</td>
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<td>CWA</td>
<td>Clean Water Act</td>
</tr>
<tr>
<td>DAHP</td>
<td>Department of Archaeology and Historic Preservation</td>
</tr>
<tr>
<td>dBA</td>
<td>decibel (A-weight)</td>
</tr>
<tr>
<td>DBP</td>
<td>disinfection byproduct</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
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<tr>
<td>---------</td>
<td>------------</td>
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<tr>
<td>DO</td>
<td>dissolved oxygen</td>
</tr>
<tr>
<td>DOH</td>
<td>Department of Health (Washington State)</td>
</tr>
<tr>
<td>DS</td>
<td>Determination of Significance</td>
</tr>
<tr>
<td>du</td>
<td>dwelling unit</td>
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<tr>
<td>Ecology</td>
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<td>EDR</td>
<td>Environmental Data Resources, Inc.</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
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<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
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<tr>
<td>ESC</td>
<td>erosion and sedimentation control</td>
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<tr>
<td>ESSL</td>
<td>Eastside Supply Line</td>
</tr>
<tr>
<td>FHWCA</td>
<td>fish habitat and wildlife conservation area</td>
</tr>
<tr>
<td>FR</td>
<td>Federal Register</td>
</tr>
<tr>
<td>ft</td>
<td>feet</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GLO</td>
<td>Government Land Office</td>
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<td>GMA</td>
<td>Growth Management Act</td>
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<tr>
<td>HDR</td>
<td>HDR Engineering, Inc.</td>
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<td>HGM</td>
<td>hydrogeomorphic</td>
</tr>
<tr>
<td>hp</td>
<td>horsepower</td>
</tr>
<tr>
<td>I-90</td>
<td>Interstate 90</td>
</tr>
<tr>
<td>IAC</td>
<td>Interagency Committee for Outdoor Recreation</td>
</tr>
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<td>KCWWTD</td>
<td>King County Department of Natural Resources, Wastewater Treatment Division</td>
</tr>
<tr>
<td>kV</td>
<td>kilovolt</td>
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<tr>
<td>LDMF</td>
<td>low density multi-family residential</td>
</tr>
<tr>
<td>LEG</td>
<td>Licensed Engineering Geologist</td>
</tr>
<tr>
<td>LG</td>
<td>Licensed Geologist</td>
</tr>
<tr>
<td>LOS</td>
<td>level of service</td>
</tr>
<tr>
<td>m</td>
<td>meter</td>
</tr>
<tr>
<td>MDD</td>
<td>maximum dry density</td>
</tr>
<tr>
<td>MDMF</td>
<td>medium density multi-family residential</td>
</tr>
<tr>
<td>mgd</td>
<td>million gallons per day</td>
</tr>
<tr>
<td>MHP</td>
<td>mobile home park</td>
</tr>
<tr>
<td>μg/L</td>
<td>micrograms per liter</td>
</tr>
<tr>
<td>μg/m³</td>
<td>micrograms per cubic meter</td>
</tr>
<tr>
<td>MG</td>
<td>million gallons</td>
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<td><strong>Acronym</strong></td>
<td><strong>Description</strong></td>
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<td>------------</td>
<td>------------------------------------</td>
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<tr>
<td>mg/L</td>
<td>milligrams per liter</td>
</tr>
<tr>
<td>mg/m³</td>
<td>milligrams per cubic meter</td>
</tr>
<tr>
<td>MHP</td>
<td>mobile home park</td>
</tr>
<tr>
<td>ml</td>
<td>milliliter</td>
</tr>
<tr>
<td>mph</td>
<td>miles per hour</td>
</tr>
<tr>
<td>MR-D</td>
<td>duplex multi-family</td>
</tr>
<tr>
<td>MR-G</td>
<td>garden density multi-family</td>
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<tr>
<td>MSE</td>
<td>mechanically stabilized earth</td>
</tr>
<tr>
<td>MSL</td>
<td>mean sea level</td>
</tr>
<tr>
<td>MTBM</td>
<td>microtunnel boring machine</td>
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<tr>
<td>MUTCD</td>
<td>Manual on Uniform Traffic Control Devices</td>
</tr>
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<td>MWD</td>
<td>maximum week demand</td>
</tr>
<tr>
<td>N</td>
<td>nitrogen</td>
</tr>
<tr>
<td>NA</td>
<td>not available</td>
</tr>
<tr>
<td>NAAQS</td>
<td>National Ambient Air Quality Standards</td>
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<tr>
<td>NaOCl</td>
<td>sodium hypochlorite</td>
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<td>National Environmental Policy Act</td>
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<tr>
<td>NHPA</td>
<td>National Historic Preservation Act</td>
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<tr>
<td>NO₂</td>
<td>nitrogen dioxide</td>
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<tr>
<td>NOₓ</td>
<td>nitrogen oxides</td>
</tr>
<tr>
<td>NOAA Fisheries</td>
<td>National Marine Fisheries Service</td>
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<tr>
<td>NPDES</td>
<td>National Pollutant Discharge Elimination System</td>
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<tr>
<td>NTU</td>
<td>nephelometric turbidity unit</td>
</tr>
<tr>
<td>O₃</td>
<td>ozone</td>
</tr>
<tr>
<td>OHWM</td>
<td>ordinary high water mark</td>
</tr>
<tr>
<td>OS</td>
<td>open space</td>
</tr>
<tr>
<td>P</td>
<td>total phosphorus</td>
</tr>
<tr>
<td>PAA</td>
<td>Potential Annexation Area</td>
</tr>
<tr>
<td>PE</td>
<td>Professional Engineer</td>
</tr>
<tr>
<td>PEM</td>
<td>palustrine, emergent wetland</td>
</tr>
<tr>
<td>PFO</td>
<td>palustrine, forested wetland</td>
</tr>
<tr>
<td>Pb</td>
<td>lead</td>
</tr>
<tr>
<td>PM</td>
<td>particulate matter</td>
</tr>
<tr>
<td>POW</td>
<td>palustrine, open water wetland</td>
</tr>
<tr>
<td>ppm</td>
<td>parts per million</td>
</tr>
<tr>
<td>Acronym</td>
<td>Abbreviation</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------</td>
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<tr>
<td>PS Clean Air</td>
<td>Puget Sound Clean Air Agency</td>
</tr>
<tr>
<td>PSE</td>
<td>Puget Sound Energy</td>
</tr>
<tr>
<td>psi</td>
<td>pounds per square inch</td>
</tr>
<tr>
<td>psig</td>
<td>pounds per square inch (gauge)</td>
</tr>
<tr>
<td>PSS</td>
<td>palustrine, scrub/shrub wetland</td>
</tr>
<tr>
<td>PTOE</td>
<td>Professional Traffic Operations Engineer</td>
</tr>
<tr>
<td>PWS</td>
<td>Professional Wetland Scientist</td>
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<tr>
<td>RCW</td>
<td>Revised Code of Washington</td>
</tr>
<tr>
<td>RM</td>
<td>River Mile</td>
</tr>
<tr>
<td>ROG</td>
<td>reactive organic gases</td>
</tr>
<tr>
<td>ROW</td>
<td>right-of-way</td>
</tr>
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<td>RSR</td>
<td>Route Study Report</td>
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<td>SDWA</td>
<td>Safe Drinking Water Act</td>
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<tr>
<td>SEPA</td>
<td>State Environmental Policy Act</td>
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<td>SF</td>
<td>single family</td>
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<td>SMA</td>
<td>Shoreline Management Act</td>
</tr>
<tr>
<td>SMP</td>
<td>Shoreline Management Program</td>
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<tr>
<td>SO₂</td>
<td>sulfur dioxide</td>
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<tr>
<td>SPCC</td>
<td>Spill Prevention Control and Countermeasures (Plan)</td>
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<td>SPU</td>
<td>Seattle Public Utilities</td>
</tr>
<tr>
<td>SPU</td>
<td>Seattle Public Utilities</td>
</tr>
<tr>
<td>SR</td>
<td>State Route</td>
</tr>
<tr>
<td>SSP</td>
<td>Second Supply Pipeline (Tacoma Water)</td>
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<td>SWPPP</td>
<td>Stormwater Pollution Prevention Plan</td>
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<tr>
<td>TCP</td>
<td>Tacoma–Cascade Pipeline</td>
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<td>TMDL</td>
<td>total maximum daily load</td>
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<td>TRB</td>
<td>Transportation Research Board</td>
</tr>
<tr>
<td>TSS</td>
<td>total suspended solids</td>
</tr>
<tr>
<td>UR</td>
<td>urban reserve</td>
</tr>
<tr>
<td>US</td>
<td>urban separator</td>
</tr>
<tr>
<td>USACE</td>
<td>United States Army Corps of Engineers</td>
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<td>USEPA</td>
<td>United States Environmental Protection Agency</td>
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<tr>
<td>USFWS</td>
<td>United States Fish and Wildlife Service</td>
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<td>USGS</td>
<td>United States Geological Survey</td>
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<td>vpd</td>
<td>vehicles per day</td>
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<td>WAC</td>
<td>Washington Administrative Code</td>
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<tr>
<td>Acronym</td>
<td>Definition</td>
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<td>---------</td>
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<tr>
<td>WDFW</td>
<td>Washington Department of Fish and Wildlife</td>
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<td>WDNR</td>
<td>Washington State Department of Natural Resources</td>
</tr>
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<td>WPA</td>
<td>Wellhead Protection Area</td>
</tr>
<tr>
<td>WRIA</td>
<td>Water Resource Inventory Area</td>
</tr>
<tr>
<td>WSDOT</td>
<td>Washington State Department of Transportation</td>
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</table>
## Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>10-year floodplain</td>
<td>The area adjacent to a watercourse that has a 10% chance of flooding in a given year.</td>
</tr>
<tr>
<td>100-year floodplain</td>
<td>The area adjacent to a watercourse that has a 1% chance of flooding in a given year.</td>
</tr>
<tr>
<td>action alternatives</td>
<td>The Preferred Alternative and the Green Route Alternative.</td>
</tr>
<tr>
<td>ablation drift</td>
<td>Soils that were directly deposited by the melting ice of a glacier.</td>
</tr>
<tr>
<td>advance outwash</td>
<td>A very dense stratified deposit of sand and gravel deposited at the front of advancing glaciers.</td>
</tr>
<tr>
<td>alluvium</td>
<td>Sediment deposited by water.</td>
</tr>
<tr>
<td>anadromous fish</td>
<td>Fish that hatch in fresh water, migrate to the ocean to grow and mature, then return to fresh water to spawn.</td>
</tr>
<tr>
<td>anthropogenic</td>
<td>Originating from the activity of humans.</td>
</tr>
<tr>
<td>arithmetic mean</td>
<td>The sum of all the members of a set divided by the number of items in a set; for example, $\frac{x_1 + x_2 + \ldots + x_n}{n}$.</td>
</tr>
<tr>
<td>A-weighted decibels (dBA)</td>
<td>A-weighting refers to the emphasis given to certain frequencies within the range of sound levels, typically where the human ear is most sensitive.</td>
</tr>
<tr>
<td>beneficial use</td>
<td>A use of a water resource, such as supporting aquatic life or providing recreational opportunities, that is protected by state water quality standards.</td>
</tr>
<tr>
<td>Best Management Practices (BMPs)</td>
<td>Construction practices that help reduce the impacts of construction on the environment.</td>
</tr>
<tr>
<td>biochemical oxygen demand</td>
<td>The amount of oxygen consumed by microorganisms in the decomposition of organic matter. Measurements are made to assess the amount of organic matter present in water.</td>
</tr>
<tr>
<td>channelization</td>
<td>The process of artificially changing and straightening the natural path of a waterway.</td>
</tr>
<tr>
<td>chlorophyll-a</td>
<td>A green pigment present in all green plants, including algae. Its measured concentration in a water sample is used to indicate the total amount of algae.</td>
</tr>
</tbody>
</table>
cofferdam A temporary, waterproof barrier built around a construction area; it is designed to allow for dry conditions below the ordinary high water line of a stream or water body.

colluvium Soil deposited by gravity on and near the bottom of slopes.

criteria pollutants The six pollutants that the U.S. Environmental Protection Agency uses as indicators of air quality and has established for each of them a maximum concentration above which adverse effects on human health may occur. These six pollutants are: ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter, and lead (Pb).

cumulative impacts Project impacts, in combination with impacts from past, present, and reasonably foreseeable future actions.

dewatering The process of removing water.

disinfection byproduct Substances that can form by the reaction of a disinfectant (such as chlorine) with organic matter present in water.

dissolved oxygen The amount of air that is entrained in water. When the organic load in water is high (due to sewage, detritus stirred up by dredging, etc.), nearly all the dissolved oxygen can be used up by bacteria, leading to anaerobic conditions that may be detrimental to aquatic species.

effect The impact or consequences of actions.

emergent vegetation Consists of erect, rooted, herbaceous plants adapted to living in saturated soils, usually dominated by perennial plants.

erosion A natural, ongoing physical process by which sediment is removed from topographic high points and transported down-gradient by a variety of geomorphic processes.

erosion hazard areas Areas with soils that may experience severe to very severe erosion.

fecal coliform Bacteria that are considered indicators of fecal contamination.

forested vegetation Consists of woody plants that are 20 feet or taller.

gabion A galvanized wire box filled with stones, used to form retaining walls.

headway The time interval between the passage of successive buses going by a fixed point.

hoe pac A vibratory compactor mounted on a backhoe excavator.

hydrologic connectivity Water that is connected between two features, such as a stream and a groundwater source.
hydroseed  A mixture of grass seed, fertilizer, lime, and wood fiber mulch designed to rapidly re-vegetate cleared areas once construction has been completed.

impact  The effects or consequences of actions.

impervious surface  A surface that water cannot penetrate.

jack-and-bore  A construction method that involves jacking a casing through the earth from within a pit while simultaneously removing the spoil inside the encasement. The casing supports the soil around it as the spoil is removed.

lacustrine deposits  Fine sediment deposited in lakes.

landsliding  The slow to rapid downslope movement of a mass that includes rock, soil, or vegetative cover.

lateral spreading  The lateral displacement of gently sloping ground as a result of pore pressure buildup or liquefaction in a shallow, underlying soil during seismic shaking.

liquefaction  The loss of shear strength by loose, saturated soil when subjected to vibration or shaking.

mass wasting  The process of mass slope movement, e.g., landslides. Where deposits of mass wasting occur, past slope movement has taken place and the area should be considered a hazard for possible future movement.

mesotrophic  Waters that have moderate levels of nutrients and that can support moderate levels of plant life.

microtunneling  A construction method that uses a closed face boring machine to excavate the tunnel; the pipe casing is installed by jacking. Used instead of jack-and-bore if groundwater is present.

mine hazard areas  Areas directly underlain by, adjacent to, or affected by abandoned or operative coal mine workings such as adits, tunnels, or air shafts.

mitigation measures  Actions taken to reduce adverse impacts on the environment.

non-point source  Pollution that originates from various sources, such as runoff from impervious surfaces.

oligotrophic  Waters that are relatively low in nutrients that cannot support much plant life.

palustrine wetlands  Non-tidal wetlands dominated by trees, shrubs, emergent vegetation, mosses, or lichens.
particulate matter  Tiny particles of solid or liquid suspended in the air, including dust, dirt, soot, smoke and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, fires, and natural windblown dust.  PM$_{2.5}$ is particulate matter in which the particle size is smaller than 2.5 micrometers; particles this size can penetrate directly into the lungs.  PM$_{10}$ is particulate matter in which the particle size is smaller than 10 micrometers; particles this size can settle in the lungs.

Phase I Environmental Assessment  Involves a review of federal, state, and local information sources; a review of historical aerial photographs and topographic maps; and a visual assessment of the project area to identify whether potentially contaminated sites are present.

Phase II Environmental Assessment  May include analyzing groundwater and soil samples to confirm the presence/absence of any contamination.  The objective is to determine whether existing site conditions require further environmental action, such as monitoring or remediation.

pisciverous fish  Predatory fish that prey on other fish.

project area  Areas located within 750 feet of the centerline of the action alternatives (the Preferred Alternative and Green Route Alternative).

raceway  A channel for water.

reach  A portion of a stream’s length.

recessional outwash  Stratified sand and gravel deposited at the front of retreating glaciers; and post-glacial deposits, including alluvial sand and gravel, and silt and peat/wetland deposits.

recharge rate  The rate at which water replenishes a groundwater source.

residence time  The amount of time that water remains in the pipeline.

resident fish  Fish that do not migrate to the ocean, but remain in fresh water.

rill  A small brook; rivulet.

riparian  Of or relating to the banks of a watercourse.

road prism  The area of a roadway containing the road surface, cut slope, and fill slope.

salmonids  Members of the fish family *Salmonidae*, including salmon, trout, and char.

scour  Erosion of a streambed caused by rapid flow of water.

scrub/shrub vegetation  Consists of woody plants less than 60 feet tall, including shrubs, tree saplings, or stunted trees or shrubs.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>seismic hazard areas</td>
<td>Areas subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction.</td>
</tr>
<tr>
<td>study area</td>
<td>For the plants analysis, areas that extend 100 feet on either side of the centerline of each action alternative (the Preferred Alternative and the Green Route Alternative).</td>
</tr>
<tr>
<td>till</td>
<td>A dense, non-sorted, non-stratified deposit of silt, sand, gravel, and occasional boulders deposited by the last glacier to occupy an area.</td>
</tr>
<tr>
<td>total phosphorus</td>
<td>The total amount of phosphorus; phosphorus is a nutrient essential to the growth of organisms present in water.</td>
</tr>
<tr>
<td>toxic metals</td>
<td>Metals and metal compounds, such as mercury, cadmium, lead, and chromium, which can have negative effects on the health of plants and animals.</td>
</tr>
<tr>
<td>trench dam</td>
<td>An impoundment placed in an excavated trench to prevent the flow of groundwater into or out of the trench.</td>
</tr>
<tr>
<td>trenchless construction</td>
<td>A construction method that utilizes jack-and-bore, horizontal directional drilling (HDD), or microtunneling techniques for crossing streams, roadways, wetlands, etc.</td>
</tr>
<tr>
<td>turbidity</td>
<td>A measure of water cloudiness, indicating that sediment is suspended in the water.</td>
</tr>
<tr>
<td>turnout</td>
<td>A branch or tee in the main transmission pipeline where water is fed into a distribution system. At turnouts, there are typically pressure-reducing valves and a flow meter to control and measure the flow to the distribution system.</td>
</tr>
<tr>
<td>unconfined alluvial aquifer</td>
<td>A groundwater source associated with a stream or river that does not have an upper confining layer of impermeable soil or rock. The upper boundary of an unconfined aquifer is the water table.</td>
</tr>
<tr>
<td>watercourse</td>
<td>A natural or artificial channel for flowing water.</td>
</tr>
<tr>
<td>wellhead protection area</td>
<td>A surface or subsurface area surrounding a well or well field that is protected to prevent contaminants from reaching the well water.</td>
</tr>
<tr>
<td>windthrow</td>
<td>Trees uprooted by excessive wind.</td>
</tr>
</tbody>
</table>
Chapter 1: Summary

This Environmental Impact Statement (EIS) provides information about the environmental impacts that could be associated with the proposed Tacoma–Cascade Pipeline Project in King County, Washington. An EIS describes the existing environment that would be affected by the proposed action, analyzes significant adverse environmental impacts of each alternative, and discusses reasonable mitigation measures.

This Final EIS includes:

- The comments received on the Draft EIS and Cascade’s responses to those comments (see Appendix F). The Draft EIS was issued on December 21, 2006; the comment period for the Draft EIS ended on February 2, 2007. Cascade received written comments on the Draft EIS from federal, state, and local agencies; from the tribes; from non-governmental organizations; and from private citizens.
- Updates to the design information presented in the Draft EIS.
- The text included in the Draft EIS, except where information was superseded and replaced by more current information, or modified in response to comments. The Final EIS is a standalone document.

1.1 Proposed Action

The Proposed Action involves constructing and operating a buried water supply pipeline, the Tacoma–Cascade Pipeline (TCP) and ancillary features, to connect the existing Tacoma Water Second Supply Pipeline (SSP) to the existing Bellevue–Issaquah Pipeline (BIP). The pipeline would be approximately 20 miles long and 42 inches in diameter and would bring water purchased from Tacoma Water to Cascade’s members.

Two action alternatives for the pipeline route (the Preferred Alternative and the Green Route Alternative) are being considered in addition to the No-Action Alternative. The action alternatives are located in King County within the following jurisdictions:

- City of Bellevue
- City of Covington
- City of Issaquah
- City of Kent
- City of Newcastle
- City of Renton
- Unincorporated King County

The majority of the pipeline would be constructed within public road rights-of-way. However, the pipeline would also cross private property and undeveloped lands. For environmentally sensitive crossings such as streams, trenchless construction methods (see Appendix D) would be used in many cases.
**Pipeline Appurtenances and Ancillary Features**

The pipeline would be constructed of welded steel pipe, and would have a liner and coating to protect the pipe from corrosion. A cathodic protection system would provide additional corrosion protection. The cathodic protection system would require drilling two to four deep wells (200 to 400 feet deep) within the pipeline right-of-way. The wells would act as sacrificial anodes; that is, corrosion would occur at the anode location rather than along the pipeline.

A flow control facility would be located in the pipeline right-of-way near the SSP. The facility would be installed in an underground vault and would consist of electrically-operated valves and an emergency generator.

Other pipeline appurtenances would include flow meters, flow control valves, pressure reducing valves, blowoffs or drains, air release and air release/vacuum combination valves, in-line valves, turnouts to Cascade members, and manways for accessing the pipe.

In general, the pipe and appurtenances would be buried, with access through manholes or hatches in the lids of vaults. The blowoffs or drains would have small-diameter pipes extending above ground to create air gaps; these pipes would drain into nearby sanitary sewers or to storm drains after treatment. Similarly, the air release and combination air/vacuum relief valves would have air vents extending above ground. For the 20-mile-long TCP, it is estimated that there could be up to 65 blowoffs or drains, 85 air release or air/vacuum relief valves, 10 in-line valves, 100 manways, and 5 flow meters. At meter, cathode rectifier, and some valve locations, there could be a small, electrical cabinet above ground to house power and control equipment. There would be two turnouts to Covington that would provide a backup water supply in case of emergency. A turnout to Kent is under discussion.

Flow rates within the TCP would range from 2 million gallons per day (mgd) to 33 mgd. The TCP would be designed to facilitate maximum flow under peak demand conditions. During low flow conditions, however, water would remain for a longer period in the pipeline (that is, it would have a longer “residence time”) before it was conveyed to the members’ distribution systems. A long residence time would reduce the chlorine concentration in the water due to decay. Therefore, a rechlorination facility would be required to boost the chlorine concentration of the water in the pipeline. The facility would be an aboveground enclosed structure (about 30 feet by 30 feet) equipped with metering pumps, storage tanks, chlorine analyzer and sensor, telemetry units, and power supply.

For rechlorination, sodium hypochlorite solution would be added to the water in the pipeline. Sodium hypochlorite would be generated onsite, as needed. Onsite generation would require periodic delivery of salt. Once generated, the solution would be stored onsite in a tank within a contained area.

The facility would require backup power that would be provided with an onsite diesel-powered generator (about 50 kilowatts) in an enclosure with noise attenuation appurtenances. Secondary containment would be provided for the diesel fuel.

The size of the site to accommodate this building, routine maintenance vehicles, and scheduled chemical deliveries would be approximately one-half acre. For the Preferred Alternative, a proposed site for the rechlorination facility is located east of SR 900 along SE 82nd Street.
Right-of-way near SE 282nd Street

Soosette Creek

United Nations Creek

approximately 1 mile south of the BIP (see Figure 2-2 and Figure 2-3, Sheet 2). A preliminary field investigation of this property found no evidence of onsite wetlands. Soil indications suggest that the site was previously leveled and filled for construction of a building. The final design of the proposed facility would take into account any seismic or erosion hazards, and the proximity of any Wellhead Protection Areas (WPAs). Additional field reconnaissance at this site would be required per the permitting requirements of the affected agency. A proposed site for a rechlorination facility has not been identified along the Green Route Alternative. Cascade anticipates that the environmental impacts associated with a rechlorination facility located along the Green Route Alternative would be similar to those of a rechlorination facility located along the Preferred Alternative.

1.2 Purpose and Need

The purpose of the TCP is to provide Cascade members with an immediately available water supply acquired from Tacoma Water. This water supply would help meet the current and shorter-term needs of Cascade’s members. Current projections indicate that under extreme conditions, Cascade members could experience peak day demand shortages by as early as 2010, and additional maximum day demand shortages after 2016 (HDR, 2005a).

The TCP is a component of the Cascade Regional Water Supply System. The TCP would be operated independently of any other planned components. The TCP is not dependent upon construction of any other pipeline or acquisition of any other water resource to accomplish its intended purpose.
1.3 Public Involvement/Scoping

Following review of an Environmental Checklist, Cascade’s Responsible Official under the State Environmental Policy Act (SEPA) determined that the TCP was likely to have a significant adverse impact on the environment and that an EIS would be required. Cascade issued a Determination of Significance (DS) and Request for Comments on Scope of EIS on July 21, 2006 (Cascade, 2006). To invite public comment on the proposed project and its environmental impacts, Cascade completed the following:

- Published the DS in the Daily Journal of Commerce, the Seattle Times, the King County Journal, and the Issaquah Press.
- Posted three notice boards concerning the project along the Preferred Alternative route.
- Mailed notices to over 32,000 addresses in the project area and published notices in the Seattle Times, the King County Journal, and the Issaquah Press concerning public scoping meetings. These meetings were held on September 13 and 14, 2006.
- Held an agency/stakeholder SEPA scoping meeting on September 14, 2006.

Concerns raised at the scoping meetings were addressed during the meetings. Written comments and the associated responses as well as summaries of the scoping meetings and the entire scoping process are documented in a Scoping Report (HDR, 2006d).

1.4 Alternatives

The alternative pipeline routes evaluated as described in this EIS are:

- **No-Action Alternative.** Under the No-Action Alternative, Cascade would not construct a new water transmission pipeline.

- **Preferred Alternative.** The staff has identified a preferred alternative (the Preferred Alternative) (see Figures 2-2 and 2-3) that would begin at the SSP, generally follow 160th Avenue SE or 164th Avenue SE north, and cross State Route (SR) 18. There is also an option for the Preferred Alternative to continue on 164th Place SE, turn northwest on Covington Way SE, cross SR 18, and turn west on SE 272nd Street to 156th Place SE. It would then follow 156th Place SE, 156th Avenue SE, SE 224th Street, 148th Avenue SE, SE 192nd Street, and 140th Avenue SE to the SR 169 crossing. There is also an option in this area that would run cross-country on private property from near the intersection of 140th Way SE and SE 156th Street north to the SR 169 crossing.

  The Preferred Alternative would continue east on the paved Cedar River Trail. North of SR 169, the pipeline would travel north along 149th Avenue SE, Jones Road, and along 154th Place SE, then cross-country through a King County-owned parcel, along 156th Avenue SE, SE 144th Street, and 160th Avenue SE to SE 128th Street. The pipeline would then run east on SE 128th Street and then north on 176th Avenue SE to SR 900 in the May Valley area. From the May Valley area, the pipeline route would follow SR 900 northeast to the BIP. In south Issaquah, there are options along SR 900 to run cross-country, roughly parallel to a Puget Sound Energy (PSE) right-of-way. The Preferred Alternative would be approximately 19.1 miles long. The jurisdictions along the Preferred Alternative include the cities of Covington, Renton, and Issaquah, and unincorporated King County.
**Green Route Alternative.** The Green Route Alternative (see Figures 2-2 and 2-3) would begin at the SSP and continue north on 132nd Avenue SE. It would then turn east on SE 208th Street and north on 140th Avenue SE. The Green Route Alternative would follow the same route as the Preferred Alternative between SE 192nd Street and 156th Avenue SE. It would continue north on 156th Avenue SE, generally following SE 128th Street, 148th Avenue SE, SE May Valley Road, Coal Creek Parkway, and SE Newport Way to the BIP. The Green Route Alternative would be approximately 21.9 miles long. The jurisdictions along the Green Route Alternative include the cities of Kent, Renton, Newcastle, and Bellevue, and unincorporated King County.

**1.5 Potential Environmental Impacts and Mitigation Measures**

Table 1-1 summarizes the environmental impacts that could occur as a result of constructing and operating the TCP, and the measures that would be employed to mitigate these impacts.
### Table 1-1. Summary of Potential Environmental Impacts and Mitigation Measures

<table>
<thead>
<tr>
<th>Environmental Element</th>
<th>Potential Impact</th>
<th>Mitigation Measures – Preferred and Green Route Alternatives</th>
</tr>
</thead>
</table>
| Earth                 | Project construction would displace a significant quantity of material, including soils, rocks, and asphalt. Crushed rock, gravel, and sand would be imported for trench backfill, pipe bedding, and surface restoration. Excavation would be required for constructing the rechlorination facility, and up to a half-acre of impervious area could be added. Erosion of stockpiled soils or soils adjacent to the construction site could occur. Vibrations associated with construction could have structural impacts to nearby structures. | • Restoring surface to original conditions and drainage patterns to the greatest extent possible.  
• Minimizing corridor width as much as practical to reduce areas of soil disturbance.  
• Following proper earthwork and construction site preparation techniques.  
  - Using imported, clean, well-graded granular fill soil for structural fill, where appropriate.  
  - Compacting trench backfill to at least 95% of the maximum dry density (MDD).  
  - Applying appropriate steep slope setbacks.  
  - Applying proper diligence to identify areas with soils susceptible to liquefaction.  
• Completing construction site preparation, excavations, and fill placement during the drier summer and early fall months, where practical.  
• Employing temporary and permanent cover measures to protect disturbed areas.  
• Restricting the length of time soils would be allowed to remain unprotected.  
• Installing barriers prior to upslope grading to prevent sediment from leaving the construction site.  
• Stabilizing construction site entrances, roads, and parking areas used by construction traffic.  
• Constructing ditches or dikes to intercept and divert surface water runoff to a sediment trap or pond.  
• Designating practices to be used for disposal of unsuitable soils or any other materials that cannot be re-used at the construction site. Hauling off excavated material that is not needed for backfill.  
• Implementing preventive measures during summer months to minimize wind transport of soils.  
• Conducting weekly and monthly reviews of all on-site erosion and sediment control measures.  
• Incorporating provisions allowing temporary cessation of work under certain limited circumstances.  
• Identifying potential mine hazards.  
• Performing a precondition survey of adjacent structures and implementing a vibration monitoring program, if needed and where practical.  
• Modifying construction techniques and selecting appropriate earthwork equipment to minimize vibration, where practical.  
• Avoiding or relocating existing utilities.  
• Protecting or replacing culverts. |
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| **Air**               | During construction, temporary, localized impacts to air quality could occur due to: (a) dust generated by clearing, excavating, uncovering stockpiles, and other construction activities; and (b) exhaust emissions from construction equipment. | - Spraying exposed soil and storage areas with water during dry periods.  
- Covering loads of excavated material being transported.  
- Sweeping and/or washing dirt/mud from vehicles prior to leaving the construction area.  
- Installing and maintaining rock-lined pads at construction area entrances and exits.  
- Removing soil and mud deposited on public roads.  
- Using flaggers at roadways to reduce queuing time.  
- Requiring contractors to use best available control technologies.  
- Performing proper vehicle maintenance.  
- Developing specific detour routes and closures in close consultation with local jurisdictions as part of the permitting process. Preparing a Traffic Control Plan to provide advance notification to the public about the approved road closures and detours to reduce vehicle run time and emissions. |
| **Water**             | Water quality could be affected when construction activities remove vegetation, thus reducing soil stability and increasing the velocity, volume, and suspended sediment levels in runoff from disturbed areas. The pipeline route would cross environmentally sensitive streams and could encounter shallow groundwater in lowland areas. Blowoff valves installed on the proposed pipeline could be used to drain water from the pipeline to allow maintenance; as a result, pipeline drainage to storm drains or water bodies could increase flows within receiving waters. | - Developing, implementing, and maintaining an Erosion and Sedimentation Control (ESC) Plan, a Stormwater Pollution Prevention Plan (SWPPP), and a Spill Prevention Control and Countermeasures (SPCC) Plan in accordance with regulatory requirements.  
- Using trenchless construction methods when crossing certain waterways.  
- Installing trench dams to prevent groundwater from flowing along the pipeline trench and altering groundwater hydrology.  
- Discharging chlorinated water from blowoff valve operation into local sanitary sewers, where available; dechlorinating the water and controlling discharge rates if discharge to surface drainage or the stormwater system is unavoidable.  
- Installing the well casings of deep water wells to prevent surface water intrusion into the groundwater (e.g., aquifers). |
| **Animals**           | During construction, fish and wildlife species and their habitat could be affected by vegetation removal and construction noise. In some areas, trees would not be replanted to preserve a tree-free corridor for ongoing pipeline access and maintenance. Urban wildlife and bird species disturbed by noise might migrate to adjacent habitats during construction. In the unlikely event of a pipeline breach, increased flows could impact the Big Soos Creek State Fish Hatchery. | - Minimizing the area of clearing and grading.  
- Avoiding wetlands and riparian zones, where possible.  
- Restoring disturbed vegetation corridors with plantings of shrubs and herb species.  
- Avoiding in-water work, water withdrawals, or diversions, where possible.  
- Crossing some streams using trenchless construction methods; or, crossing above or below the culvert; or, when open-cutting, crossing streams during dry channel conditions and during agency-approved work windows.  
- Implementing BMPs to minimize erosion and sedimentation.  
- Ensuring the adequacy of the pipeline design by specifying the use of good quality construction materials. |
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| Plants               | The pipeline route would cross wetlands and uplands areas. Vegetation cleared during construction would include deciduous and coniferous trees, native and non-native shrubs, native herbs, landscape plants, and mowed or grazed lawns. Trees would be removed within the pipeline maintenance corridor, but native shrubs and herbaceous species would be allowed to grow. Construction runoff could convey sediments or toxins, such as petroleum products, into wetlands or upland communities, causing plant mortality. | • Avoiding most in-water work in streams.  
• Limiting disturbance to the minimum practical for construction of the project in order to limit impacts to nearby wetlands.  
• Stabilizing exposed soils to control erosion, and implementing an ESC Plan, SWPPP, and SPCC Plan during construction.  
• Discharging water from blowoff valves to sanitary sewers, or, if sewers are unavailable, dechlorinating water prior to discharge.  
• Restoring temporarily disturbed wetland buffers to pre-construction grades and replanting with appropriate native species.  
• Restoring temporary impact areas in wetlands to pre-construction grades and replanting with native wetland species.  
• Providing compensatory mitigation in accordance with federal, state, and local guidelines and regulations.  
• Restoring any planting strips and landscaped areas along the road that were damaged during construction with new roadside plantings or hydroseeding, as appropriate.  
• Replacing trees cut in riparian areas at a 2:1 ratio.  
• Leaving trees felled in riparian areas to provide large woody debris in the affected areas. |
| Transportation       | Pipeline construction could have temporary impacts on existing traffic patterns. Lane closures and traffic detours would temporarily affect commuters, local residents, bicyclists, pedestrians, and transit passengers. Lane closures could temporarily affect the movement of police, fire, and emergency vehicles. | • Notifying the police, fire, ambulance, and transit agencies of lane encroachments. Providing a flagger or other traffic controls to maintain safe public access and emergency vehicle access routes. Hiring off-duty police, if necessary, to direct traffic near the construction site.  
• Preparing complete and carefully considered Traffic Control Plans, including detours and standard plans.  
• Scheduling work at night, if approved by the local jurisdiction, when construction was not near residential areas.  
• Providing necessary traffic control at all affected locations, including temporary signing, striping, and traffic signals, as required; all temporary Traffic Control Plans would be subject to permitting jurisdiction review and approval.  
• Providing safe access for bicyclists and pedestrians during construction. Constructing temporary or permanent facilities for non-motorized traffic, if practical.  
• Establishing specific mitigation plans and potential detour routes with permitting agencies during the permit application process. Plans would be presented to permitting agencies and permits received prior to bidding.  
• Carefully monitoring and managing the construction schedule to minimize duration of impact.  
• Employing flaggers to perform several functions, including, but not limited to:  
  ◦ Alternately stopping and releasing traffic when both directions of traffic used one lane.  
  ◦ Stopping all traffic for short periods of time to accommodate moving of equipment, unloading of materials, placing of apparatus over the roadway, etc.  
  ◦ Maintaining traffic through work areas at reduced speed and for construction during dark hours.  
• Using steel plates to cover open trench areas for overnight conditions. |
### Environmental Element

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<tbody>
<tr>
<td><strong>Historic and Cultural Preservation</strong></td>
<td>Construction and operation of the pipeline would not impact historic houses or structures. However, ground disturbance associated with construction has the potential to directly or indirectly affect archaeological resources in the subsurface affected environment.</td>
<td>• Conducting historic and archaeological resource surveys and appropriate subsurface testing.&lt;br&gt;• Halting work immediately and notifying the appropriate tribal, local, and state authorities if anything of cultural significance was encountered during construction.</td>
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<tr>
<td><strong>Energy and Natural Resources</strong></td>
<td>The rechlorination facility, flow control facility, and cathodic protection system would use some electrical energy. The energy that would be used during maintenance and operation would be very minor. With the exception of chlorine and sodium hypochlorite, no natural resources would be required for operation.</td>
<td>• Because impacts to energy and natural resources would be minimal, mitigation measures would not be required.</td>
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<tr>
<td><strong>Environmental Health</strong></td>
<td>Operation of construction equipment (e.g., jackhammers, trucks, cranes, trenching machines, and backhoes) would temporarily generate noise higher than ambient noise levels. During construction, hazardous materials could be encountered, including contaminated sites and buried asbestos cement water pipes. Hazardous materials such as fuels, solvents, and asphalt products used during construction could spill.</td>
<td>• Encouraging the adequacy of mufflers on all engines.&lt;br&gt;• Minimizing the idling time of equipment and vehicle operation.&lt;br&gt;• Operating equipment only during hours approved by each jurisdiction.&lt;br&gt;• Requiring the contractor to provide an emergency response plan to address spills; requiring the contractor to demonstrate knowledge of proper hazardous material storage and handling.&lt;br&gt;• Adhering to BMPs.&lt;br&gt;• Conducting a Phase I and Phase II Environmental Site Assessment, if necessary.</td>
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<td><strong>Land and Shoreline Use</strong></td>
<td>During construction, current land uses would continue; however, there would be short-term, temporary impacts to land uses, particularly to transportation. Both action alternatives would cross waterways, some of which are identified as shorelines of state-wide significance.</td>
<td>• Using low-impact construction techniques (e.g., trenchless construction methods), where feasible.&lt;br&gt;• Restoring disturbed overland areas and paved road rights-of-way to local jurisdictions’ standards.&lt;br&gt;• Minimizing corridor width.&lt;br&gt;• Maximizing use of existing rights-of-way.</td>
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1.6 Significant Unavoidable Adverse Impacts

Table 1-2 summarizes the potential significant unavoidable adverse impacts associated with constructing and operating the TCP along the Preferred Alternative or along the Green Route Alternative.

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<tr>
<th>Environmental Element</th>
<th>Preferred Alternative</th>
<th>Green Route Alternative</th>
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<tr>
<td>Earth</td>
<td>Approximately 303,000 cubic yards of material would be excavated for construction of the pipeline trench.</td>
<td>Approximately 347,000 cubic yards of material would be excavated for construction of the pipeline trench.</td>
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<td>The pipeline would displace approximately 36,000 cubic yards of material and pipe bedding would displace approximately 81,000 cubic yards of material.</td>
<td>The pipeline would displace approximately 42,000 cubic yards of material and pipe bedding would displace approximately 93,000 cubic yards of material.</td>
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<td>Approximately 7,000 cubic yards of native soil would be reused for trench backfill.</td>
<td>Approximately 162,000 cubic yards of material would be imported to the site as trench backfill for construction in road rights-of-way.</td>
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<td>Approximately 134,000 cubic yards of material would be imported to the site as trench backfill for construction in road rights-of-way.</td>
<td>Up to 46,000 cubic yards of crushed rock might need to be imported for surface restoration and paving along road rights-of-way.</td>
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<td>Up to 38,000 cubic yards of crushed rock might need to be imported for surface restoration and paving along road rights-of-way.</td>
<td>Up to 46,000 cubic yards of crushed rock might need to be imported for surface restoration and paving along road rights-of-way.</td>
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<tr>
<td>Environmental Element</td>
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<td>Green Route Alternative</td>
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| Plants                | • Approximately 18 acres of upland vegetation would be removed. The type of vegetation would include deciduous and coniferous trees, native and non-native upland shrubs, native herbs, landscape plants, and mowed or grazed lawns.  
  • Approximately 2.7 acres of wetland would be affected. The majority of this area would require clearing only, but approximately 0.9 acre of wetland excavation would also be required.  
  • A portion of the cleared wetland area (1 acre) would be maintained as a permanent maintenance area. Trees would be removed from this area, but shrubs and emergent species would be allowed to grow.  
|                       | • Approximately 2.5 acres of upland vegetation would be cleared, and 0.9 acre of this area would be permanently maintained free of trees. Approximately 0.9 acre of temporary upland excavation would also be required.  
  • Approximately 1.3 acres of wetland vegetation would be cleared for a permanent maintenance easement. |
| Transportation        | There would be the potential for temporary, short-term, but significant unavoidable delays in traffic movement and circulation in work zone areas during construction. Potential detour routes could be required for the following key segments along the Preferred Alternative:  
  • Along 160th Avenue SE or 164th Avenue SE from the southern terminus at the SSP to SE 292nd Street  
  • Kent-Kangley Road to SE 224th Street  
  • SE 224th Street/156th Avenue SE Intersection to SE 192nd Street/148th Avenue SE  
  • 140th Avenue SE from SE 192nd Street to SE 171st Way  
  • SE 171st Way to SE Fairwood Boulevard  
  • SE Fairwood Boulevard to SR 169  
  • SR 169 to 154th Place SE  
  • SE Jones Road to SE 144th Street  
  • 156th Avenue SE to 160th Avenue SE  
  • SE 144th Street to SE 128th Street  
  • SE 128th Street to SE May Valley Road  
  • SR 900 from SE May Valley Road to Issaquah |
|                       | There would be the potential for temporary, short-term, but significant unavoidable delays in traffic movement and circulation in work zone areas during construction. Potential detour routes could be required for the following key segments along the Green Route Alternative:  
  • Southern terminus at the SSP to SE 272nd Street  
  • 132nd Avenue SE from SE 272nd Street to SE 256th Street  
  • 132nd Avenue SE from SE 256th Street to SE 240th Street  
  • 132nd Avenue SE from SE 240th Street to SE 208th Street  
  • 132nd Avenue SE/SE 208th Street intersection to SE 204th Way/140th Avenue SE intersection  
  • SE 204th Way/140th Avenue SE intersection to SE 192nd Street  
  • 156th Avenue SE from SE 144th Street to SE 128th Street  
  • 148th Avenue SE from SE 128th Street to SE May Valley Road  
  • SE May Valley Road from 148th Avenue SE to Coal Creek Parkway SE  
  • Coal Creek Parkway from SE May Valley Road to SE 84th Way  
  • SE Newport Way from Factoria Boulevard SE to west of 148th Avenue SE |
| Public Services and Utilities | Access restrictions or temporary road detours during construction could result in moderate to significant short-term changes to law enforcement, fire and life safety incident response times, and/or school bus accessibility. | Access restrictions or temporary road detours during construction could result in moderate to significant short-term changes to law enforcement, fire and life safety incident response times, and/or school bus accessibility. |
1.7 Decisions to be Made

Cascade must decide whether or not to construct the TCP to meet the needs of its members while properly addressing the environmental impacts of the project. In addition, Cascade must decide whether or not to authorize construction if one of the action alternatives under consideration is selected.

1.8 Design Changes between the Draft EIS and Final EIS

The Final EIS includes updates to the design information contained in the Draft EIS. The primary areas of change are:

- The Preferred Alternative alignment was modified to run cross-country through a King County-owned parcel between 154th Place SE and 156th Avenue SE. The road right-of-way option in this area was excluded from further consideration because it would add unnecessary length and additional impacts to traffic.

- A proposed location was identified along the Preferred Alternative for a rechlorination facility (see Section 1.1). At the proposed rechlorination facility, sodium hypochlorite solution would be generated onsite, as needed. It would not be delivered to the site.

- Two pipeline appurtenances that would be constructed within the pipeline right-of-way were added to the design: a cathodic protection system and a flow control facility (see Section 1.1).

None of these design changes would result in significant unavoidable adverse impacts.
Chapter 2: Alternatives

This chapter describes the process that Cascade used to identify reasonable alternatives for the Tacoma–Cascade Pipeline (TCP) route. It provides details about each alternative and presents maps showing the locations of the action alternatives.

2.1 Background

Cascade’s 2004 Transmission and Supply Plan (Cascade, 2005) identified the infrastructure needs required to deliver water from Tacoma Water’s SSP to Cascade members. Among the facilities identified were a Central Segment pipeline and a North Segment pipeline. Note that the Central Segment and the North Segment have been combined to form the proposed TCP.

Initial Screening of Alternatives

As an initial step, Cascade evaluated potential pipeline routes by considering route length, construction impacts, environmental impacts, the potential for a protracted permitting process, and by holding public meetings in which stakeholder input was obtained (HDR, 2005a; HDR, 2006b). This initial step helped reduce the number of potential alternatives.

Scoring of Alternatives

Cascade then conducted reconnaissance-level studies to identify potential routes for the proposed transmission pipeline (see Figure 2-1). These studies are described in two route study reports (RSRs):

- **Overall and Central Segment Route Study Report** (HDR, 2005a)
- **North Segment Route Study Report** (HDR, 2006b)

The potential routes were evaluated through a matrix-scoring process. This process considered three major route-related categories – environmental, community, and engineering – and assigned a total score to each route based on how these categories affected the project. Table 2-1 lists the criteria considered within each category. In addition to considering the score achieved by each alternative, the total capital cost and project schedule were considered.
Table 2-1. Categories and Criteria Used for Alternatives Scoring

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<tr>
<th>Environmental</th>
<th>Community</th>
<th>Engineering</th>
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</thead>
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<tr>
<td>• Wetlands</td>
<td>• Noise</td>
<td>• Topography</td>
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<tr>
<td>• Endangered Species Act Listed Species</td>
<td>• Traffic</td>
<td>• Right-of-Way (ROW) Acquisition</td>
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<tr>
<td>• Archaeological and Cultural Resources</td>
<td>• Air Quality</td>
<td>• Special Crossing (Major Road, Railroad, and Waterways)</td>
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<tr>
<td>• Contamination</td>
<td>• Recreation</td>
<td>• Surface Characteristics of Pipeline Route</td>
</tr>
<tr>
<td>• Water Quality</td>
<td>• Private Landscaping in Public Right-of-Way</td>
<td>• Existing/Proposed Utilities</td>
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<tr>
<td>• High Quality Upland Habitat</td>
<td>• Businesses</td>
<td>• Subsurface Soil Characteristics</td>
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<tr>
<td>• Fisheries Habitat</td>
<td>• Schools</td>
<td>• Groundwater</td>
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<tr>
<td>• Access</td>
<td>• Safety</td>
<td>• Seismic/Landslide /Erosion Hazard Potential</td>
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<td>• Operational Requirement</td>
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<td>• Traffic Management</td>
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<td>• Future Expansion Possibility</td>
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Overall and Central Segment Route Study Report
The Overall and Central Segment Route Study Report (HDR, 2005a) describes the reasons for eliminating two of the four alternative routes for the Central Segment:

- The Black Route was eliminated because it would require securing a high number of easements, and because of the potential for significant environmental impacts. This route would follow a largely overland alignment, crossing high-quality wetlands and requiring large amounts of vegetation removal.

- The Blue Route was eliminated because of the higher number of required stream crossings, the potential impact to arterial roads with heavy traffic volumes, and because of its longer length.

The report also describes the reasons for conducting further studies of two of the four alternative routes for the Central Segment:

- The Red Route was advanced for further study because it was considered to have the least potential for significant environmental impacts. The majority of the Red Route would be constructed in road rights-of-way.

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1 The Central Segment and North Segment have been combined to form the proposed TCP.
• The Green\textsuperscript{2} Route was advanced for further study because of its favorable score in relation to environmental, community, and engineering criteria.

**North Segment Route Study Report**

The *North Segment Route Study Report* (HDR, 2006b) describes the reasons for eliminating one of the alternative route combinations in the North Segment\textsuperscript{3}:

• The Rose plus Orange Route would locate two regional water sources of supply to Cascade members (both the Green River and Cedar River supplies) in pipelines that would literally run "side by side" for about 8 miles, introducing a greater level of risk in the event of an earthquake or other failure mechanism.

The report also describes the reasons for conducting further studies of the following alternative routes for the North Segment:

• The Red plus Lime Route was advanced for further study because it was considered to have the least potential for significant environmental impacts. The majority of the route would be constructed in road rights-of-way.

• The Red plus Plum Route was advanced for further study because it was also considered to have less potential for significant environmental impacts. The majority of the route would be constructed in road rights-of-way.

After the RSRs were completed, Cascade moved forward with two reasonable action alternatives for the Draft EIS: the Preferred Alternative and the Green Route Alternative.

### 2.2 Alternatives Description

Each action alternative would involve constructing and operating a buried water supply pipeline to connect the Tacoma Water SSP to the BIP. The pipeline would be approximately 20 miles long and 42 inches in diameter. The two action alternatives (the Preferred Alternative and the Green Route Alternative) are for the route that the pipeline would follow.

#### 2.2.1 No-Action Alternative

Under the No-Action Alternative, Cascade would not construct a new water transmission pipeline. Water would continue to be supplied through members' independent supplies, through wholesale water purchased by members from non-member water purveyors, and through the declining SPU Block Contract.\textsuperscript{4} Forecasted demands would not be met. Increased demand as a result of population growth, in combination with the declining SPU contract, would result in inadequate water supplies for Cascade members.

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\textsuperscript{2} The term “Green Route” was used in the *Overall and Central Segment Route Study Report* (HDR, 2005a) when referring to a route alternative located only in the Central Segment area. In this EIS, the term "Green Route Alternative" refers to a route that would extend the entire length of the TCP (through both the Central and North Segments).

\textsuperscript{3} See Footnote 1.

\textsuperscript{4} The “50-Year Declining Block Water Supply Agreement Between the City of Seattle and the Cascade Water Alliance” states that SPU will sell, and Cascade will purchase wholesale water and the transmission capacity sufficient to deliver water to Cascade. The term of the agreement is for 50 years, with an effective date of January 1, 2004 and a termination date of December 31, 2053 (Cascade, 2005).
2.2.2 Preferred Alternative

The Preferred Alternative (see Figures 2-2 and 2-3) would be approximately 19.1 miles long. It would begin at the SSP, generally follow 160th Avenue SE or 164th Avenue SE north, and cross SR 18. There is also an option for the Preferred Alternative to continue on 164th Place SE, turn northwest on Covington Way SE, cross SR 18, and turn west on SE 272nd Street to 156th Place SE. It would then follow 156th Place SE, 156th Avenue SE, SE 224th Street, 148th Avenue SE, SE 192nd Street, and 140th Avenue SE to the SR 169 crossing. There is also an option in this area that would run cross-country on private property from near the intersection of 140th Way SE and SE 156th Street north to the SR 169 crossing.

The Preferred Alternative would continue east on the paved Cedar River Trail. North of SR 169, the pipeline would travel north along 149th Avenue SE, Jones Road, and along 154th Place SE, then cross-country through a King County-owned parcel, along 156th Avenue SE, SE 144th Street, and 160th Avenue SE to SE 128th Street. The pipeline would then run east on SE 128th Street and then north on 176th Avenue SE to SR 900 in the May Valley area. From the May Valley area, the pipeline route would follow SR 900 northeast to the BIP. In south Issaquah, there are options along SR 900 to run cross-country, roughly parallel to a Puget Sound Energy (PSE) right-of-way. The jurisdictions along the Preferred Alternative include the cities of Covington, Renton, and Issaquah, and unincorporated King County.

2.2.3 Green Route Alternative

The Green Route Alternative (see Figures 2-2 and 2-3) would be approximately 21.9 miles long. It would begin at the SSP and continue north on 132nd Avenue SE. It would then turn east on SE 208th Street and north on 140th Avenue SE. The Green Route Alternative would follow the same route as the Preferred Alternative between SE 192nd Street and 156th Avenue SE. It would continue north on 156th Avenue SE, generally following SE 128th Street, 148th Avenue SE, SE May Valley Road, Coal Creek Parkway, and SE Newport Way to the BIP. The jurisdictions along the Green Route Alternative include the cities of Kent, Renton, Newcastle, and Bellevue, and unincorporated King County.

2.3 Discussion of Benefits/Disadvantages of Delaying Implementation of the Proposed Action

If Cascade does not construct the TCP, the water purchased from Tacoma Water would not be transmitted to Cascade’s members. Water would continue to be supplied through members’ independent supplies, through wholesale water purchased by members from non-member water purveyors, and through the declining SPU Block Contract. Forecasted demands would not be met. Increased demand as a result of population growth, in combination with the declining SPU contract, would result in inadequate water supplies for Cascade members. Current projections indicate that under extreme conditions, Cascade members could experience peak day demand shortages by as early as 2010, and additional maximum day demand shortages after 2016.

Not constructing the TCP would make the water purchased from Tacoma Water available for other uses unless an alternative means of transmission were developed. The natural resources utilized to construct and operate the TCP would be available for other purposes.
Figure 2-1. Route Alternatives Described in the Route Study Reports
Figure 2-2. Preferred and Green Route Alternatives
Figure 2-3. Preferred and Green Route Alternatives (Aerial Photo)
Figure 2-3. Preferred and Green Route Alternatives (Aerial Photo)
Chapter 3: Earth

3.1 Affected Environment

3.1.1 Geologic Setting and Topography

The Tacoma–Cascade Pipeline (TCP) would be situated within the Puget Lowlands, a glacially formed trough generally located between the Cascade and Olympic Mountains. The trough was carved by several regional glaciations, which flowed southward out of British Columbia. Geology in the area consists of sedimentary and volcaniclastic bedrock deposited as marine and non-marine sediments at the time the Puget Lowlands were part of the continental shelf, 26 to 37 million years ago.

Bedrock within the project area consists of volcanic and volcaniclastic rocks including andesitic sandstone, tuff, and lava flows and sedimentary rocks generally consisting of marine and non-marine sandstone, siltstone, claystone, and conglomerate (Tukwila, Renton, and Blakely Formations). The bedrock is generally overlain by glacial sediments deposited during the most recent glaciation, the Vashon Stade (12,000 to 15,000 years before present [BP]) of the Fraser Glaciation, which spanned a period of about 11,000 to 25,000 years BP.

Deposits associated with the Vashon Stade include advance outwash, glacial till, and recessional drift. Advance outwash was deposited by meltwater streams flowing off of the approaching glacier, and consists mostly of dense stratified fine to medium sand with occasional gravel and lenses of clay and silt. The Vashon till is a dense, nonsorted, nonstratified deposit of silt, sand, gravel, and cobbles that has been compacted by the weight of several thousand feet of glacial ice.

Recessional outwash includes soils that were directly deposited by the melting ice (ablation drift) and soils that were deposited by meltwater streams either in direct contact with the ice (ice contact stratified drift) or in low-lying areas freshly exposed by ice melting (recessional outwash). Recessional drift mantles the glacial till in some areas and is thicker in local broad channels or swales. The ablation drift is similar in composition to glacial till but is less dense, while the recessional outwash generally consists of sand with variable silt and gravel content. The composition of ice contact stratified drift is variable, and transitional between ablation drift and outwash.

The majority of the closed depressions and swales that exist in the area are the result of glacial erosion and deposition and have served as accumulation areas for loose and soft sediments, which may include some organic matter. The soils with the highest concentrations of organic matter occur in closed depressions that contain standing water during most of the year.

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**The most recent glaciation, the Vashon Stade, deposited sediments in the project area about 12,000 to 15,000 years ago. These sediments include:**

- **Advance outwash**, or sand and gravel deposited at the front of an advancing glacier by meltwater streams. Advance outwash deposits are dense and stratified.
- **Till**, consisting of nonsorted and nonstratified silt, sand, gravel, and occasional boulders. Till is material directly deposited by a glacier.
- **Recessional outwash**, or stratified sand and gravel deposited at the front of a retreating glacier by melting ice or by meltwater streams.
Other post-glacial deposits include colluvium (soil deposited by gravity on and near the bottom of slopes) in moderately to steeply sloping areas, alluvium (sediment deposited by water) within drainage courses, and fill for road embankments.

Topography and landforms in the area are primarily the result of the glacial occupation discussed above, postglacial erosion and redeposition, deposition of recent alluvium, and anthropogenic (originating from the activity of humans) development. The combination of all these processes has shaped the land surface to its present condition.

The southern portion of the project area is generally located between the Duwamish Valley and Lake Youngs, which is characterized by a broad plateau (glacial drift plain). The plateau includes relatively low northwest–southeast trending hills and swales and stream drainages (e.g., Big Soos, Little Soos, and Molasses Creeks), small lakes, and associated lowland areas. Elevations in this area range from approximately 350 feet mean sea level (MSL) near Little Soos Creek to approximately 600 feet MSL south of the 148th Avenue SE and SE 192nd Street intersection.

Portions of the project area further north are characterized by relatively deep drainage valleys (e.g., Cedar River, May Creek, and Tibbetts Creek), which are flanked by the glacial deposits discussed above. These drainage valleys are associated with Newport Hills and the bedrock promontories of Squak and Cougar mountains. Elevations in this area range from approximately 90 feet MSL within the Cedar River Valley to approximately 470 feet MSL near the Tibbetts divide.

### 3.1.2 Soil Characteristics

The soil survey of King County, Washington, (Snyder et al., 1973) indicates that the primary soil types along the Preferred and Green Route Alternatives are: Alderwood and Kitsap soils; Alderwood gravelly sandy loam; Arents, Alderwood material; Beausite gravelly sandy loam; Bellingham silt loam; Everett gravelly sandy loam; Indianola loamy fine sand; Mixed alluvial land; Newberg silt loam; Norma sandy loam; Ovall gravelly loam; Pilchuck loamy fine sand; Pits; Puyallup fine sandy loam; Riverwash; Seattle muck; and Urban land. Additionally, the Preferred Alternative would cross Sammamish silt loam and Tukwila muck soil types, and the Green Route Alternative would cross the Ragnar-Indianola association soil type.

When action alternatives are constructed within existing road rights-of-way, it is often the case that surface soils have been removed or covered with fill soils from construction of the existing roads. Subsurface materials expected within the limits of the pipeline excavations would include fill soils overlying glacial till, advance outwash, recessional outwash, and silt or peat. Areas of bedrock may also be encountered near the project’s northern terminus. Fill soils would be expected to be of variable gradation and density depending on the construction methods used for placement (i.e., engineered versus non-engineered fill). Fill soils could also include wood debris and organic material. Alluvial soils (deposited by streams and rivers) typically consist of relatively unconsolidated sand, gravel, cobbles, and boulders, which can include logs and other wood debris. Silt or peat/wetland deposits consist of poorly drained fibrous peat, organic silt, and alluvium that are intermittently wet annually. These deposits are typically located in closed depressions or adjacent to rivers and streams. General characteristics of advance outwash, glacial till, and recessional outwash are discussed in Section 3.1.1.
3.1.3 Geologic Hazards

Seismic Hazards

The Puget Lowland area is a seismically active region that has experienced thousands of earthquakes. Seismic hazards resulting directly from earthquakes represent risk of human injury/death and damage to property. Seismic hazard mechanisms include surface fault rupture, ground shaking, and associated ground failure such as liquefaction and lateral spreading. Liquefaction is the loss of strength by loose, saturated granular soil when subjected to vibration or shaking. Lateral spreading is the lateral displacement of gently sloping ground (usually toward an unsupported embankment) as a result of pore pressure buildup or liquefaction in a shallow, underlying soil during seismic shaking.

King County defines seismic hazard areas as those areas subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction. In general, areas prone to seismic hazards include areas underlain by alluvial soils, lacustrine deposits (fine sediment deposited in lakes), or colluvial soils. Within the project area, these areas are typically associated with the alluvial valleys of Big Soos Creek and the Cedar River. Smaller drainages such as May and Coal Creeks and limited areas of peat/wetland deposits located in closed depressions may also experience liquefaction during seismic shaking.

Portions of the project area are also located within the Seattle Fault Zone, an area of potential ground rupture during a seismic event. Figure 3-1 shows the seismic hazard areas along the Preferred and Green Route Alternatives per King County’s maps.

Landslide Hazards and Steep Slopes

Landsliding is the slow to rapid downslope movement of a mass that includes rock, soil, or vegetative cover. Slope failures can occur as planar slides, block slides, rotational slumps, debris avalanches, or mudflows. Landsliding usually occurs on steep slopes and is commonly initiated during periods of intense or prolonged rainfall when the water table is high. Landsliding can also be initiated by removing lateral support from the toe of a slope or by overloading the slope with fill material or water.

King County defines landslide hazard areas as:

- Any areas with slopes greater than 15% that are underlain by impermeable soils and that include springs or groundwater seepage.
- Landslides that have moved during the last 10,000 years.
- Areas that are potentially unstable as a result of rapid stream incision, stream bank erosion, or undercutting by wave action.
- Areas which show evidence of or are at risk from snow avalanches.
- Areas located on alluvial fans that are presently or potentially subject to inundation by debris flows or deposition of stream-transported sediments.

Steep slope hazard areas are typically defined as those areas on slopes 40% or steeper with a vertical elevation change of at least 10 feet.
Figure 3-2 shows the landslide hazard areas along the Preferred and Green Route Alternatives per King County’s maps. These slopes are generally associated with the larger drainages such as the Big Soos Creek Valley, Cedar River Valley, Coal Creek Valley, and Tibbetts Creek Valley. Steep slope/landslide hazard areas specific to the Preferred and Green Route Alternatives are discussed in Section 3.2.

**Erosion Hazards**

Soil erosion is a natural, ongoing physical process by which sediment is removed from topographic high points and transported down-gradient by a variety of geomorphic processes. The erosional processes most commonly encountered along the Preferred Alternative and Green Route Alternative include sheet wash, slope ravel, and rill and gully erosion. Erosional processes could be accelerated during construction by removing vegetation and exposing native soils. Removal of vegetation, modification of topography, and unmanaged stormwater runoff commonly contribute to increased erosion rates. Some soils are particularly susceptible to erosion because of particle size gradation or density. The rates of various erosion processes can be significantly decreased during and after construction by implementing conventional construction practices designed to reduce erosion effects.

King County defines erosion hazard areas as those areas with soils that may experience severe to very severe erosion. Figure 3-3 shows the erosion hazard areas along the Preferred and Green Route Alternatives per King County’s maps. Erosion hazards could also be present where the proposed pipeline crosses underneath streams (special crossings); streams have the potential to downcut or migrate laterally and expose the pipeline. Erosion hazard areas specific to the Preferred and Green Route Alternatives are discussed in Section 3.2.

**Coal Mine Hazards**

Historic coal mining has occurred in areas along the Preferred and Green Route Alternatives. The principal issues regarding public safety and property damage related to abandoned coal mines include sinkholes, gas emissions or concentrations, regional trough subsidence, and coal spoils.

King County defines mine hazard areas as those areas directly underlain by, adjacent to, or affected by abandoned or operative coal mine workings such as adits, tunnels, or air shafts. According to King County information, the route would cross areas underlain by abandoned coal mine workings in the vicinity of SR 900 near Issaquah. Figure 3-4 shows the King County coal mine hazards along the Preferred and Green Route Alternatives per King County’s maps.
3.2 Environmental Impacts

3.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts.

3.2.2 Preferred Alternative

Direct Impacts - Construction

Topography
The vertical alignment of the Preferred Alternative would generally follow the contour of the existing topography. Temporary, construction-related impacts to topography would include trench excavation and stockpiling, grading, and trench backfilling for the pipeline. Following trench backfilling, the ground surface or roadway surface would be restored to pre-existing conditions.

Soils and Geology
The potential impacts of site development to the existing soil and geologic conditions generally fall into one of two categories: (1) settlement due to placing new loads (structures or fill embankments) over potentially compressible materials such as organic material, silt or clay, and non-engineered, existing fill; and (2) earthwork activities, including excavating, hauling, placing, and compacting site soils.

In general, it is anticipated that geologic materials in the overland portion of the Preferred Alternative between Jenkins Creek and SR 516 would consist of recessional outwash sand and gravel. With the exception of minor overland portions in the vicinity of the Cedar River Valley, the remainder of the Preferred Alternative would be constructed within existing road rights-of-way and would be expected to encounter variable depths of fill soil associated with construction of the existing roads. The road fill would be expected to overlie areas of glacial till, advance and recessional outwash, and possibly limited zones of silt or peat. Shallow bedrock could also be encountered along SR 900 in the Tibbetts Creek Valley.

Estimates indicate that approximately 303,000 cubic yards of material would be excavated for construction of the pipeline trench. The pipeline would displace about 36,000 cubic yards of material and pipe bedding would displace approximately 81,000 cubic yards of material. Approximately 7,000 cubic yards of native soil would be used for trench backfill. Approximately 134,000 cubic yards of material would be imported to the site as trench backfill for construction in road rights-of-way. The pipe bedding and backfill materials would be supplied by the contractor.
from commercial gravel pits. Excess soil would be disposed of by the contractor at approved sites. Up to 38,000 cubic yards of crushed rock might need to be imported for surface restoration and paving along road rights-of-way.

Temporary significant adverse impacts to soils or geology along the Preferred Alternative would include excavation, hauling, placing, and compacting. Other temporary impacts to soils or geology would include:

- Grading
- Stockpiling
- Trench backfilling for the pipeline
- Vibrations from construction equipment
- Erosion of stockpiled soils or soils adjacent to the alignment by discharge water generated by storms or during trench dewatering activities
- Settlement from dewatering activities

Nearby residential and commercial structures exist intermittently along the Preferred Alternative. Construction activities such as excavating dense glacial material, compacting fill soils, or operating trucks and construction equipment could result in vibrations that could permanently damage nearby structures, depending on their proximity to construction. Vibrations associated with construction activities can cause cracks in nearby structures and settlement if those structures are founded over loose soils.

**Geologic Hazards**

According to King County maps, the Preferred Alternative would cross seismic hazard areas within the Cedar River Valley and near the mouth of Tibbetts Creek south of the intersection of SR 900 and Newport Way NW near Issaquah (see Figure 3-1). According to the Washington State Department of Natural Resources (WDNR) (Magsino et al., 2004), the Cedar River Valley is mapped as a seismic hazard area with moderate to high susceptibility for liquefaction, and May Creek is mapped as a seismic hazard area with low to moderate susceptibility. Additionally, the Preferred Alternative would border the east edge of the Big Soos Creek Valley in the area between SR 18 and SR 516, which is identified on King County maps as a seismic hazard area. Lacustrine/wetland deposits generally located near Molasses Creek and near SE 240th Street could also present a seismic hazard to the Preferred Alternative. No direct impacts to seismic hazard areas would be expected due to pipeline construction.

According to King County, the Preferred Alternative would cross mapped landslide hazard areas (see Figure 3-2), which include the ravine slopes of the Cedar River Valley. Landslide and steep slope hazards could also be expected in May Valley and in some areas within the Tibbetts Creek Valley. A steep slope area is generally located between the northwest side of the SR 18 crossing and Little Soos Creek. At this location, the Preferred Alternative would be situated

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**Liquefaction** is the loss of shear strength by loose or saturated soils when subjected to vibration or shaking – soils may become fluid mud unable to support structures. Liquefaction can occur during earthquakes.

**Landslides** occur when gravity acts on steep slopes. Erosion, loss of vegetation, and water saturation are factors that affect slope stability.
adjacent, northeast, and roughly parallel to the Big Soos Creek Valley. The west-facing slopes in this area are inclined at about 50%. The potential for landslides at this location is considered low. However, to mitigate potential adverse impacts from landslide hazards, an appropriate slope setback (in case the alignment crossed parallel to the top of the slope), or specialized construction method (in case the alignment crossed perpendicular to slope contour), would be used.

According to King County, erosion hazard areas exist at various locations along the Preferred Alternative (see Figure 3-3). Along the Preferred Alternative, the erosion hazard has typically been mitigated by construction of the existing road. Best management practices (BMPs) for sediment and erosion control would be implemented during and after construction to reduce the potential for soil erosion and transport.

Erosion hazards could also be present where the proposed pipeline crosses underneath streams; streams have the potential to scour the streambed and downcut or migrate laterally and expose the pipeline. With the exception of Jenkins, Little Soos, May, and Tibbetts Creeks, and the Cedar River, the Preferred Alternative would cross generally low-gradient streams, generally considered low risk for scour. The larger waterways mentioned above would be crossed using trenchless construction methods (see Appendix D) or constructed outside potential migration zones and below potential scour depths, which would mitigate the erosion hazard potential.

According to King County information, the Preferred Alternative would cross areas underlain by abandoned coal mine workings in the vicinity of SR 900 near Issaquah (see Figure 3-4). Other published literature (Walsh, 1993; Skelly and Loy Consultants, 1985; and Goodson and Associates, 1984) indicates the presence of surface features related to the coal mine workings such as caved portals and areas of subsidence west and east of SR 900 near the area shown on the King County maps. Potential construction-related impacts could include excavating into shallow, abandoned mine portals or shafts and post-construction impacts such as sinkhole formation or regional subsidence. Additional research would be completed during design to identify potentially shallow workings, if present. Analysis would be performed to characterize the potential for sinkholes or regional subsidence, and appropriate mitigation would be implemented during construction. Mitigation could include using block valves or use of flexible joints within the hazard area.

The potential impact of construction to the steep slope areas located between the northwest side of the SR 18 crossing, Little Soos Creek, and on the ravine slopes of the Cedar River and May Creek Valleys would be mitigated by using appropriate slope setbacks, and by using steep slope design and construction practices at locations where the alignment crossed these areas. No permanent construction-related impacts to geologic hazards would be anticipated for the Preferred Alternative.

Other Geotechnical Issues

The majority of the Preferred Alternative would be constructed within existing road rights-of-way. Portions of these roads are constructed as fill embankments. In some cases, the embankments are unsupported; in a few cases, the embankments are supported by MSE (mechanically stabilized earth) retaining structures, which typically incorporate synthetic reinforcement grids. The roads also include culverts to convey stream flow, although construction would avoid these by trenching above or below them. The specific locations of these areas are discussed below.

- Immediately north of the intersection with SE 272nd Street, 160th Avenue SE is constructed on an old fill embankment, which descends approximately 12 feet from road grade down to a
Various areas of minor fill are present in low-lying areas, and several small wet areas are present on the east side of 156th Avenue SE.

- A tributary to Big Soos Creek crosses 160th Avenue SE north of SR 516 in a culvert.
- Two tributaries to Big Soos Creek cross 156th Avenue SE south of SE 260th Street in culverts.
- Two tributaries to Big Soos Creek cross 156th Avenue SE in culverts near SE 240th Street.
- United Nations Creek crosses 148th Avenue SE through an approximately 36-inch-diameter corrugated metal pipe (CMP) culvert buried immediately below road grade. The culvert was approximately three-quarters filled with sediment in 2005.
- The east side of 148th Avenue SE is constructed on an earth fill embankment reinforced with geogrid, south of SE 216th Street. The embankment is roughly 500 feet long.
- 148th Avenue SE is situated on a small fill embankment near Lake Youngs Park.
- Molasses Creek flows below 140th Avenue SE through a 60-inch-diameter CMP culvert. At this location, 140th Avenue SE is constructed on an earth fill embankment approximately 6 to 8 feet above the creek and associated wetlands.
- North of the intersection with SE 187th Street, 140th Avenue SE is constructed on an earth fill embankment approximately 12 feet high. The east side of the embankment is supported by a gabion-type retaining structure. The structure appears to be relatively new construction. The gabion structure may have metallic strips or geotextile reinforcement extending below the roadway.
- Northwest of the intersection with SE 192nd Street, 140th Avenue SE is constructed on a small fill embankment.
- 140th Way SE descends the south valley slopes of the Cedar River Valley. Portions of road are constructed on MSE embankments, which, in places, are 20 feet or more high.
- A recreational trail is present along SR 169 and the Cedar River Valley floor. At some locations, the trail is located on embankments varying in height from 5 to 10 feet. The Preferred Alternative would cross Madsen Creek either above or below a culvert approximately 3 feet in diameter, which conveys flows beneath 149th Avenue SE to the Cedar River.
- The Cedar River channel at the 149th Avenue SE bridge crossing is on the order of 50 feet wide.
• Stewart Creek crosses SE Jones Road in a concrete box culvert.

• 154th Place NE ascends the north slopes of the Cedar River Valley through a relatively narrow ravine. The ravine walls adjacent to 154th Place NE include slopes typically inclined steeper than about 55%.

• A north-south oriented culvert drains to a May Creek tributary through a 3-foot-diameter culvert below SE 128th Street.

• An unnamed tributary to May Creek and Wilderness Creek cross SR 900 in culverts.

• The Preferred Alternative would require crossing Tibbetts Creek and three tributaries to Tibbetts Creek south of the Issaquah municipal boundary. The hillside slopes adjacent to the Preferred Alternative in this area include gradients that are generally inclined from 10 to 50% with localized areas up to 70%.

• North of the Issaquah municipal boundary, the Preferred Alternative would cross Tibbetts Creek (Tibbetts Creek crosses SR 900 via a culvert). The creek includes steep stream banks locally inclined at gradients up to 80% for a slope distance of approximately 15 feet. The creek is approximately 12 feet wide and 2 feet deep. This area also includes mass wasting deposits mapped to the west of the proposed alignment. The Preferred Alternative would also require crossing a tributary to Tibbetts Creek that flows west below SR 900 through an 18-inch dimension concrete box culvert. The tributary is approximately 1.5 feet wide and less than 1 foot deep.

• North of the second Tibbetts Creek crossing, the northern cut slope of SR 900 includes a steep cut of approximately 75% for a slope distance of approximately 10 feet. The cut slope also includes outcrops of Renton Formation Sandstone. The segment also includes areas adjacent to the Preferred Alternative with localized slopes inclined from 10 to 50%. This area includes mass wasting deposits mapped to the west of the proposed alignment.

• Four tributaries to Tibbetts Creek (Clay Pit Creek, West Fork Tibbetts Creek, North Tributary, and an unnamed tributary) cross SR 900 through culverts, in the northernmost mile of the Preferred Alternative.

• Tibbetts Creek crosses below SR 900 and Newport Way NW at the intersection of the two roads, flowing northwest toward Lake Sammamish.

Although unlikely, the potential exists to encounter unsuitable fill soils or excavate through or otherwise damage reinforcing grids or culverts when excavating the pipeline trench through these areas. Temporary adverse impacts could include unstable embankment slopes, settlement of adjacent roadway from movement of the sides of the trench excavation, and settlement from dewatering activities.

**Direct Impacts - Operation**

**Topography**

Following trench backfilling, the ground surface or roadway surface would be restored to pre-existing conditions. No permanent impacts to topography would be anticipated by operation of the Preferred Alternative.
Soils and Geology
The completed project would consist of a buried pipeline. Operation of the Preferred Alternative would not affect soils or geology.

Geologic Hazards
The potential temporary construction-related impact to the steep slope/landslide hazard areas located generally between the northwest side of the SR 18 crossing and Little Soos Creek and the Cedar River and May Creek Valleys would be mitigated by appropriate steep slope design and construction methods. No operational impacts to geologic hazards would be anticipated for the Preferred Alternative.

Other Geotechnical Issues
Because sound design and construction practices would be used, no operational impacts to existing infrastructure would be anticipated.

Indirect Impacts - Construction
Earthwork activities, including excavating, stockpiling, grading, and backfilling have the potential to cause soil erosion. Erosion of soils could result in sedimentation, which could temporarily affect water quality by increasing turbidity levels, thereby degrading salmonid habitat. Erosion would be mitigated by use of appropriate erosion and sediment control measures.

Indirect Impacts - Operation
Temporary indirect impacts could be expected during construction. However, no permanent indirect impacts would be expected from operation of the Preferred Alternative.

Cumulative Impacts
Construction and operation of the pipeline would not significantly affect the geology along the Preferred Alternative; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Preferred Alternative, short-term cumulative impacts to geology could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

3.2.3 Green Route Alternative

Direct Impacts - Construction

Topography
Construction-related impacts to topography for the Green Route Alternative would be similar to those associated with construction of the Preferred Alternative.

Soils and Geology
In general, geologic materials along the southern portion of the Green Route Alternative would be expected to consist of glacial till except within the Big Soos Creek Valley, where recessional outwash sand and gravel would be expected. In swales, the glacial till could be overlain by thin deposits of sand, clay, or peat. Alluvial sand and gravel and areas of silt or peat/wetland deposits associated with lowland areas of these drainages would be expected to occur in the immediate vicinity of Big Soos and United Nations Creeks. The geology of the northern portion of the Green Route Alternative would be variable and would be expected to consist of alluvial
soils (Cedar River Valley), recessional outwash, glacial till, and advance outwash. Areas of shallow bedrock of the Renton, Tukwila, and Blakely Geologic Formations could be occasionally encountered.

The rock and soils discussed above would typically be overlain by variable depths of fill soil associated with construction of existing roads. The majority of the Green Route Alternative would be constructed within existing road rights-of-way.

Estimates indicate that approximately 347,000 cubic yards of material would be excavated for construction of the pipeline trench. The pipeline would displace about 42,000 cubic yards of material and pipe bedding would displace approximately 93,000 cubic yards of material. Approximately 162,000 cubic yards would be imported to the site as trench backfill for construction in road rights-of-way. The pipe bedding and backfill materials would be supplied by the contractor from commercial gravel pits. Excess soil would be disposed of by the contractor at approved sites. Up to 46,000 cubic yards of crushed rock might need to be imported for surface restoration and paving along road rights-of-way.

In general, it would be expected that construction-related adverse impacts to soils and geology would be similar to those associated with the Preferred Alternative.

Geologic Hazards

According to King County maps, the Green Route Alternative crosses seismic hazard areas within the Big Soos Creek and Cedar River Valleys (see Figure 3-1). Additionally, lacustrine/wetland deposits generally located in the southern portion of the alignment near Molasses Creek could also present a seismic hazard to the proposed pipeline. It is likely, however, that these soils were removed or covered by artificial fill during construction of the roadways.

According to mapping by WDNR, the northern portion of the Green Route Alternative would cross areas southeast of Lake Boren that are mapped as having low to moderate susceptibility for liquefaction. Additionally, the critical areas ordinance maps for the City of Bellevue indicate that the portion of the route located north of SE 66th Street would be within the Seattle Fault Zone, an area of potential ground rupture during a seismic event.

According to King County information, landslide hazards areas similar to those for the Preferred Alternative are mapped within the Cedar River Valley (see Figure 3-2). Steep slope areas are also mapped at the intersection of SE May Valley Road and Coal Creek Parkway SE and along Coal Creek near Coal Creek Parkway SE. However, these segments would be constructed within road rights-of-way. At these locations, the steep slope/landslide hazards have typically been mitigated by construction of the road.

According to King County, erosion hazard areas exist at various locations along the Green Route Alternative (see Figure 3-3). The erosion hazards have typically been mitigated by construction of the existing roadways. BMPs for erosion and sediment control would be implemented during and after construction to reduce the potential for soil erosion and transport.

Erosion hazards could also be present where the pipeline would cross streams; streams have the potential to scour the streambed, downcut or migrate laterally, and expose the pipeline. With the exception of Big Soos Creek, May Creek, Coal Creek, and the Cedar River, the streams that the Green Route Alternative would cross are relatively low-gradient streams, and are considered low risk for scour or lateral migration. The Green Route Alternative would be constructed...
primarily within the road rights-of-way. At the locations where the pipeline would cross, the streams are conveyed below the roadways via culverts, which would protect the pipeline from potential scour. Where feasible, larger waterways would be crossed using trenchless construction methods, which would mitigate the erosion hazard potential.

According to King County information, no mine hazard areas are present along the Green Route Alternative (see Figure 3-4).

Because trenchless construction methods would be used at most crossings, and other geologic hazards have been addressed by construction of existing roads, no permanent impacts to geologic hazards would be anticipated for the Green Route Alternative.

**Other Geotechnical Issues**

Similar to the Preferred Route, the Green Route Alternative would be constructed primarily within existing road rights-of-way. In some cases, the embankments are unsupported; in other cases, the embankments are supported by MSE retaining structures, which typically incorporate synthetic reinforcement grids. The roads also include culverts to convey stream flows, although construction would avoid these by trenching above or below them. The specific locations of these areas are discussed below.

- A wet area on the west side of 132nd Avenue drains east below 132nd Avenue through a 12-inch-diameter CMP culvert.
- Westside Soos Creek and a tributary to Soosette Creek cross 132nd Avenue SE in culverts.
- Soosette Creek crosses 132nd Avenue SE south of the intersection with SE 276th Street through a concrete box culvert.
- Near the intersection of SE 256th Street and 132nd Avenue SE, stream flow to Lake Meridian appears to cross diagonally through a 24-inch-diameter, smooth-wall steel culvert, which has been jacked through concrete pipe.
- Meridian Valley Creek and a tributary cross 132nd Avenue SE north of the intersection with SE 240th Street. Meridian Valley Creek crosses below 132nd Avenue SE through a box culvert. The tributary crosses below 132nd Avenue SE through a 6-foot-diameter CMP. The stream areas east of 132nd Avenue SE have undergone significant stream rehabilitation and habitat enhancement.
- A tributary to Meridian Valley Creek crosses 132nd Avenue SE in a culvert south of SE 224th Street.
- A wetland area is located near the intersection of SE 216th Street and 132nd Avenue SE. 132nd Avenue SE is constructed on an older fill embankment approximately 6 to 7 feet high above the wetland area. Longitudinal pavement cracks in the southbound lane indicate pavement failure, possibly related to soft embankment soils.
- Big Soos Creek crosses SE 208th Street through a concrete box culvert. A large wetland area is associated with Big Soos Creek at this location.
- It is likely that shallow groundwater is present in the area north of the intersection of SE 208th Street and 140th Avenue SE. The ground surface rises to the north and the likelihood of shallow groundwater decreases.
• United Nations Creek crosses 140th Avenue SE in culvert.

• Molasses Creek flows below 140th Avenue SE through a 60-inch-diameter CMP culvert. At this location, 140th Avenue SE is constructed on an earth fill embankment approximately 6 to 8 feet above the creek and associated wetlands.

• North of the intersection with SE 187th Street, 140th Avenue SE is constructed on an earth fill embankment approximately 12 feet high. The east side of the embankment is supported by a gabion-type retaining structure. The structure appears to be relatively new construction. The gabion structure may have metallic strips or geotextile reinforcement extending below the roadway.

• Northwest of the intersection with SE 192nd Street, 140th Avenue SE is constructed on a small fill embankment.

• 140th Way SE descends the south valley slopes of the Cedar River Valley. Portions of road are constructed on MSE embankments, which, in places, are 20 feet or more high.

• A recreational trail is present along SR 169 and the Cedar River Valley floor. At some locations, the trail is located on embankments varying in height from 5 to 10 feet. The Green Route Alternative would cross Madsen Creek either above or below a culvert approximately 3 feet in diameter, which conveys flows beneath 149th Avenue SE to the Cedar River.

• The Cedar River channel at the 149th Avenue SE bridge crossing is on the order of 50 feet wide.

• Stewart Creek crosses SE Jones Road in a concrete box culvert.

• 154th Place NE ascends the north slopes of the Cedar River Valley through a relatively narrow ravine. The ravine walls adjacent to 154th Place NE include slopes typically inclined steeper than about 55%.

• A tributary to May Creek crosses SE May Valley Road near the 148th Avenue SE intersection in a culvert.

• Coal Creek Parkway SE is constructed on a fill embankment beginning approximately 50 feet north of its intersection with SE 91st Street and continuing north, ending at its intersection with SE 89th Place. The fill embankment extends 10 to 15 feet downslope, west to an unnamed tributary to May Creek.

• Coal Creek Parkway SE is constructed as a through-cut beginning approximately 50 feet south of its intersection with SE 84th Way. A rock cut (Renton Formation) is present and ranges from 4 to 10 feet high along the east and west sides of Coal Creek Parkway SE.
• The east side of Coal Creek Parkway SE, beginning north of its intersection with SE 84th Way and ending approximately 100 feet south of its intersection with 133rd Avenue SE, includes an exposed rock cut (Renton Formation). The height of the cut varies from about 5 to 20 feet.

• The west side of Coal Creek Parkway SE, beginning north of its intersection with SE 84th Way and ending approximately 100 feet north of its intersection with 133rd Avenue SE, includes a gabion retaining wall that ranges from about 5 to 12 feet high.

• A culvert crosses Coal Creek Parkway SE immediately south of the intersection with SE 84th Way. The culvert conveys flow from east to west into an unnamed May Creek tributary. The culvert is approximately 18 inches in diameter.

• A tributary to Lake Boren crosses Coal Creek Parkway SE in a culvert near SE 79th Street.

• A culvert conveys China Creek across Coal Creek Parkway SE near Newcastle Golf Club Road.

• A stormwater culvert crossing is present below Coal Creek Parkway SE immediately south of its intersection with SE 69th Way. The culvert conveys stormwater flows from the east to the west.

• A gabion retaining wall is present along the east side of Coal Creek Parkway SE beginning approximately 300 feet north of its intersection with SE 60th Street and continuing to the approximate location where Coal Creek crosses under the road. The retaining wall is situated adjacent to a Coal Creek tributary and ranges from 6 to 15 feet high.

• A culvert approximately 5 feet in diameter conveys flows for Coal Creek to the northwest, below Coal Creek Parkway SE.

• A tributary to Coal Creek crosses Coal Creek Parkway SE in a culvert south of 128th Avenue SE.

As noted for the Preferred Alternative, the potential exists to encounter unsuitable fill soils or excavate through or otherwise damage reinforcing grids or culverts when excavating the pipeline trench through these areas. Temporary adverse impacts could include unstable embankment slopes, settlement of adjacent roadway from movement of the sides of the trench excavation, and settlement from dewatering activities.

**Direct Impacts - Operation**

**Topography**
Construction-related impacts to topography along the Green Route Alternative would be similar to those associated with construction of the Preferred Alternative.

**Soils and Geology**
The completed project would consist of a buried pipeline. Operation of the Green Route Alternative would not affect soils or geology.

**Geologic Hazards**
Steep slopes/landslide areas generally located in the vicinities of the Cedar River and May and Coal Creek Valleys would be mitigated by appropriate steep slope design and construction
methods. Because the use of trenchless construction methods at crossings would avoid in-water work, and other geologic hazards have been addressed by construction of existing roads, no operational impacts to geologic hazards would be anticipated for the Green Route Alternative.

**Other Geotechnical Issues**
Because sound design and construction practices would be used, no operational impacts to existing infrastructure would be anticipated for the Green Route Alternative.

**Indirect Impacts - Construction**
In general, construction-related indirect impacts associated with the Green Route Alternative would be similar to those of the Preferred Alternative.

**Indirect Impacts - Operation**
No indirect impacts would be expected from operation of the Green Route Alternative.

**Cumulative Impacts**
Construction and operation of the pipeline would not significantly affect the geology along the Green Route Alternative; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Green Route Alternative, short-term cumulative impacts to geology could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

### 3.3 Mitigation Measures

#### 3.3.1 No-Action Alternative
Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

#### 3.3.2 Preferred Alternative
Mitigation measures for the Preferred Alternative are provided below.

**Topography**
The construction area would be graded and restored to original conditions and drainage patterns to the greatest extent possible immediately following pipe installation and backfilling.

**Soils and Geology**
The potential adverse impacts to soils and geology can be mitigated by using the methods listed below.

- Minimizing corridor width as much as practical to reduce areas of soil disturbance.
- Following proper earthwork and construction site preparation techniques, including removal of soft organic soils, if practical, and using similar density materials for trench backfilling at locations where organic soils are excessively deep.
  - Using imported, clean, well-graded granular fill soil for structural fill, where appropriate.
Compacting trench backfill to at least 95% of the maximum dry density (MDD), as determined in accordance with ASTM D-1557.

**Landslide and Steep Slopes**

Appropriate steep slope setbacks and buffers would be applied. Generally, buffers and building setbacks from the edges of steep slope and landslide hazard areas are defined as 50 feet and 15 feet, respectively, based on the King County Code. However, specifically recommended buffers and setbacks could be provided once the specific locations and designs of the pipeline were determined. Buffers and setbacks based on site-specific studies and designs could be less than those indicated above.

Other methods could include orienting the pipeline perpendicular to the slope contour; using select compacted backfill; installing trench dams (seepage barriers) and subsurface drains to control subsurface flow; reconstructing the slope at a contour that would reduce the potential for collection or diversion of surface runoff; collecting off-site stormwater entering the upper portion of the construction site and discharging it at an appropriate location at the toe of the slope; and placing erosion control mats and revegetation to help stabilize surface soils.

**Seismic Hazards**

Proper diligence would be applied during construction to identify areas with soils that were susceptible to liquefaction. These soils are typically found in areas with high groundwater tables and relatively thick deposits of clean, poorly graded sand. If these soils were encountered, specific conditions would be evaluated to determine the best method to preserve the pipeline integrity. This might include adding weights to the pipeline to reduce the potential for floating due to the buoyant forces generated by the liquefied soil, or piling to support and anchor the pipe.

**Erosion Hazards**

The following mitigation measures would be applied to minimize or avoid the impacts of erosion:

- Completing construction site preparation, excavations, and fill placement during the drier summer and early fall months, where practical.

- Employing temporary (e.g., straw mulch, plastic sheeting, and erosion control blankets) and permanent (e.g., hydroseeding) cover measures to protect disturbed areas.

- Restricting the length of time soils would be allowed to remain unprotected (2 days from October 1 to April 30 and 7 days from May 1 to September 30).

- Installing barriers (e.g., silt fences, straw bale barriers, and sediment ponds or basins) prior to upslope grading to prevent sediment from leaving the construction site and entering downstream waterways via runoff.

- Stabilizing construction site entrances, roads, and parking areas used by construction traffic with rock pads to minimize erosion and tracking of sediment off-site.

- Constructing ditches or dikes to intercept and divert surface water runoff to a sediment trap or pond away from exposed soils in construction areas.
- Designating practices to be used for disposal of unsuitable soils or any other materials that cannot be re-used at the construction site. Hauling off excavated material that is not needed for backfill.

- Implementing preventive measures (e.g., watering or covering exposed or unprotected soils) during summer months to minimize wind transport of soils.

- Conducting weekly reviews of all on-site erosion and sediment control measures every 6 to 8 calendar days during the wet season. Conducting monthly reviews within 3 days of the calendar day for the last inspection during the dry season. Reviews should also take place within 24 hours of any storm event that produces more than 0.5 inches of rain in 24 hours or less. Maintenance should occur as soon as a problem is noted.

- Grading and restoring the construction area to original grades and drainage patterns to the greatest extent possible immediately following pipe installation and backfilling. Seeding, planting, and mulching as soon as possible after grading to prevent erosion. A re-vegetation plan, part of the Erosion and Sedimentation Control (ESC) Plan, should specify the seed mixture for upland, wetland buffer, and riparian habitats.

- Incorporating provisions allowing temporary cessation of work under certain limited circumstances, if weather conditions warrant.

**Mine Hazards**

Potential mine hazards such as adits, shafts, sinkholes, regional subsidence etc. should be identified to the extent practical relative to the Preferred Alternative. Proper diligence would be applied during the project design phase to research potential mine workings and field verify by reconnaissance. If workings were discovered that would impact construction or operation, appropriate mitigation would be implemented to address the hazard.

**Existing Infrastructure**

Impacts to existing infrastructure would be mitigated by the following measures:

- Performing a precondition survey of adjacent structures and implementing a vibration monitoring program, if needed and where practical.

- Modifying construction techniques and selecting appropriate earthwork equipment to minimize vibration, where practical.

- Avoiding or relocating existing utilities.

- Avoiding road infrastructure such as geogrid reinforcement and MSE retaining walls or sensitive structures, where practical.

- Protecting or replacing culverts.

**3.3.3 Green Route Alternative**

Mitigation measures for the Green Route Alternative would be similar to those for the Preferred Alternative.
3.4 Significant Unavoidable Adverse Impacts

3.4.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no significant unavoidable adverse impacts.

3.4.2 Preferred Alternative

Development changes soil conditions through soil removal, profile mixing, compaction, and erosion. Temporary significant unavoidable adverse impacts to earth would include soil excavating, hauling, placing, and compacting.

Estimates of the area of soil disturbance indicate that approximately 303,000 cubic yards of materials would be excavated for construction of the pipeline trench. The pipeline would displace about 36,000 cubic yards of material, and pipe bedding would displace approximately 81,000 cubic yards of material. Approximately 7,000 cubic yards of native soil would be used for trench backfill. Approximately 134,000 cubic yards would be imported to the site as trench backfill for construction in road rights-of-way. The pipe bedding and backfill materials would be supplied by the contractor from commercial gravel pits. Excess soil would be disposed of by the contractor at approved sites. Up to 78,000 cubic yards of crushed rock might need to be imported for surface restoration along road rights-of-way.

3.4.3 Green Route Alternative

The significant unavoidable adverse impacts to earth from constructing and operation the Green Route Alternative would be similar to those discussed in Section 3.4.2 for the Preferred Alternative. The notable differences relate to the estimated areas of soil disturbance. Approximately 347,000 cubic yards of material would be excavated for construction of the pipeline trench. The pipeline would displace approximately 42,000 cubic yards of material and pipe bedding would displace approximately 93,000 cubic yard of material. Approximately 162,000 cubic yards would be imported to the site as trench backfill for construction in road rights-of-way. Up to 46,000 cubic yards of crushed rock might need to be imported for surface restoration along road rights-of-way.

Based on the smaller volume of materials for excavation, displacement, imported backfill, and surface restoration, the significant unavoidable adverse impacts to earth would be less for the Preferred Alternative compared with those of the Green Route Alternative.
Figure 3-1. Seismic Hazards
Figure 3-2. Landslide Hazards
Figure 3-3. Erosion Hazards
Figure 3-4. Coal Mine Hazards
Chapter 4: Air

4.1 Affected Environment

4.1.1 Air Quality Standards

The Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (USEPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The CAA established two types of national air quality standards:

1. **Primary standards** set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.

2. **Secondary standards** set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (USEPA, 2005).

Three agencies have jurisdiction over the ambient air quality in the project area: the USEPA, the Washington State Department of Ecology (Ecology), and the Puget Sound Clean Air Agency (PS Clean Air). PS Clean Air was specifically established by state law to provide Puget Sound residents with clean air by enforcing federal, state, and local air quality laws and regulations.

As part of the CAA, the USEPA established ambient air quality standards for six pollutants. These regulated air pollutants are among those commonly referred to as **criteria pollutants**. These criteria pollutants are listed in Table 4-1. NAAQS identify criteria pollutant concentrations that must not be exceeded over specified time periods. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter (mg/m³) of air, and micrograms per cubic meter (µg/m³) of air (USEPA, 2005).

Of the criteria pollutants identified in Table 4-1, ozone, carbon monoxide, and particulate matter (PM₂.₅) are the primary pollutants monitored throughout Puget Sound. For ozone and carbon monoxide, the Puget Sound area currently complies with the federal NAAQS (PS Clean Air, 2004). Regarding particulate matter (PM₂.₅), PS Clean Air data indicate that the Puget Sound area will meet the 24-hour standard for PM₂.₅; and by a narrow margin, it will also conform to the annual standard. Because the large primary sources of sulfur dioxide (SO₂) in the Puget Sound area no longer exist, PS Clean Air has not monitored SO₂ since the end of 1999. Similarly, due to the phase-out of leaded fuels and the closure of Seattle’s lead smelter in 1998, PS Clean Air no longer monitors for airborne lead. Nitrogen dioxide is not a major concern in the Puget Sound region, and as a result, it is only measured at one Beacon Hill location (PS Clean Air, 2004).

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**Particulate matter** includes dust, dirt, soot, smoke, and liquid droplets directly emitted into the air by sources such as factories, power plants, cars, construction activity, fires, and natural windblown dust. The particle size of **PM₂.₅** is smaller than 2.₅ micrometers; particles this size can penetrate directly into the lungs. The particle size of **PM₁₀** is smaller than 10 micrometers; particles this size can settle in the lungs.
Table 4-1. National Ambient Air Quality Standards

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Primary Standards</th>
<th>Averaging Times</th>
<th>Secondary Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Monoxide</td>
<td>9 ppm (10 mg/m³)</td>
<td>8-hour¹</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>35 ppm (40 mg/m³)</td>
<td>1-hour¹</td>
<td>None</td>
</tr>
<tr>
<td>Lead</td>
<td>1.5 µg/m³</td>
<td>Quarterly Average</td>
<td>Same as Primary</td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>0.053 ppm (100 µg/m³)</td>
<td>Annual (Arithmetic Mean)</td>
<td>Same as Primary</td>
</tr>
<tr>
<td>Particulate Matter (PM₁₀)</td>
<td>50 µg/m³</td>
<td>Annual² (Arith. Mean)</td>
<td>Same as Primary</td>
</tr>
<tr>
<td></td>
<td>150 µg/m³</td>
<td>24-hour¹</td>
<td></td>
</tr>
<tr>
<td>Particulate Matter (PM₂.₅)</td>
<td>15.0 µg/m³</td>
<td>Annual³ (Arith. Mean)</td>
<td>Same as Primary</td>
</tr>
<tr>
<td></td>
<td>65 µg/m³</td>
<td>24-hour⁴</td>
<td></td>
</tr>
<tr>
<td>Ozone</td>
<td>0.08 ppm</td>
<td>8-hour⁵</td>
<td>Same as Primary</td>
</tr>
<tr>
<td>Sulfur Oxides</td>
<td>0.03 ppm</td>
<td>Annual (Arith. Mean)</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>0.14 ppm</td>
<td>24-hour¹</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>-------</td>
<td>3-hour¹</td>
<td>0.5 ppm (1300 µg/m³)</td>
</tr>
</tbody>
</table>

Source: USEPA, 2005

¹ Not to be exceeded more than once per year.
² To attain this standard, the 3-year average of the weighted annual mean PM₁₀ concentration at each monitor within an area must not exceed 50 µg/m³.
³ To attain this standard, the 3-year average of the weighted annual mean PM₂.₅ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m³.
⁴ To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 µg/m³.
⁵ To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

4.1.2 Air Quality Monitoring

PS Clean Air maintains a network of air quality monitoring stations in the Puget Sound region. The monitoring stations nearest to the project area are located in the City of Kent at James Street and Central Avenue, and in the City of Bellevue at 305 Bellevue Way NE. Air quality conditions at these sites are presumed to be indicative of air quality in the project area. These locations are part of the PS Clean Air monitoring network, which is used to measure the air quality index (AQI).

The AQI is a nation-wide standard developed by the USEPA for the NAAQS criteria pollutants, and is used to report daily air quality (PS Clean Air, 2004). The greatest pollutant level determines the AQI. PM₂.₅ typically determines the AQI in the Puget Sound area on days considered unhealthy for sensitive groups (PS Clean Air, 2004). The AQI is reported according to a 500-point scale for five of the six major criteria air pollutants. For example, a score of 0 to 50 equates to a “good” AQI rating. The definition for “good” states that this condition will result in satisfactory air quality with little or no risk from pollution. A score of 51 to 100 equates to a “moderate” AQI rating. The definition of “moderate” states that this condition will result in acceptable air quality with potential moderate health concerns for a very small number of people (PS Clean Air, 2004).
In the Puget Sound region, the number days with a “good” AQI rating exceeded the number of days with all other ratings in 2004. For example, the King County 2004 AQI was estimated to be “good” approximately 70% of the time, “moderate” for about 28% of the time, and “unhealthy” for approximately 2% of the time. In Kent, the “Air Quality Right Now” 5-day AQI trend chart forecasts for the week of October 19 to 24, 2006 showed AQI scores of 15 to 60 (PS Clean Air, 2006). As noted above, these scores fit within the “good” to “moderate” AQI rating. Similarly, in Bellevue, the “Air Quality Right Now” 5-day AQI trend chart forecasts for the same time period showed AQI scores of 15 to 45. These scores fit within the “good” AQI rating (PS Clean Air, 2006).

At the Kent monitoring station, the annual mean data for PM$_{2.5}$ was measured at 13 $\mu$g/m$^3$ or less from 1999 to 2004. The results for the Bellevue monitoring station show the annual mean PM$_{2.5}$ data to be at 9 $\mu$g/m$^3$ or less from 1999 to 2004. These statistics are below the federal PM$_{2.5}$ NAAQS of 15.0 $\mu$g/m$^3$ (PS Clean Air, 2004).

### 4.2 Environmental Impacts

#### 4.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to air quality.

#### 4.2.2 Preferred Alternative

**Direct Impacts - Construction and Operation**

Air quality impacts would be limited to the construction phase of the proposed pipeline. These temporary impacts would occur from fugitive dust emissions caused by clearing, excavating, uncovering stockpiles, and other construction activities. Fugitive dust has the potential to be of greater concern during dry, warm weather conditions when wind and construction equipment create more dust. Dust generation would be potentially greater in overland portions of the alignment, where larger areas of soil disturbance would occur, compared with portions located within road rights-of-way, where construction activities and soil movement would occur primarily on paved surfaces (Cascade, 2006).

There would also be short-term, localized increases in exhaust emissions from construction equipment and vehicles (dump trucks, excavators, and other heavy equipment), and from local vehicle traffic impacted by road detours and/or closures. Typical exhaust emissions of internal combustion engines – nitrogen oxides (NO$_x$), reactive organic gases (ROG), carbon monoxide (CO), sulfur dioxide (SO$_2$), and PM$_{10}$ – would occur during construction. However, with the mitigation measures described in Section 4.3, it is unlikely that exhaust emissions would be high enough to noticeably affect air quality in excess of the NAAQS.
Operation of the completed project would not affect air quality.

**Indirect Impacts - Construction and Operation**

Direct impacts would be short-term and limited to construction; therefore, there would be no indirect impacts resulting from the direct impacts to air quality.

**Cumulative Impacts**

The Preferred Alternative would not alter long-term air quality; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Preferred Alternative, short-term cumulative impacts to air quality could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

### 4.2.3 Green Route Alternative

**Direct Impacts - Construction and Operation**

Localized, short-term air quality impacts could occur during pipeline construction along the Green Route Alternative due to fugitive dust and emissions from construction equipment and vehicles. These impacts would be similar to those described in Section 4.2.2 for the Preferred Alternative. These impacts would be addressed by the mitigation measures described in Section 4.3.

Operation of the completed project would not affect air quality.

**Indirect Impacts - Construction and Operation**

Direct impacts would be short-term and limited to construction; therefore, there would be no indirect impacts resulting from the direct impacts to air quality.

**Cumulative Impacts**

The Green Route Alternative would not alter long-term air quality; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Green Route Alternative, short-term cumulative impacts to air quality could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

### 4.3 Mitigation Measures

#### 4.3.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

#### 4.3.2 Preferred Alternative

PS Clean Air governs activities affecting air quality along the Preferred Alternative. As required by PS Clean Air regulations, emissions would be controlled by using reasonably available control technologies (PS Clean Air, 2004).

Significant fugitive dust impacts associated with project construction would not be anticipated. Construction contractors would be required to comply with regulatory requirements and to
implement appropriate dust control measures. Measures to minimize fugitive dust emissions from construction would include:

- Spraying exposed soil and storage areas with water during dry periods.
- Covering loads of excavated material being transported.
- Sweeping and/or washing dirt/mud from vehicles prior to leaving the construction area.
- Installing and maintaining rock-lined pads at construction area entrances and exits.
- Removing soil and mud deposited on public roads.

Vehicle emissions associated with project construction would be short-term. Measures to minimize vehicular emissions would include:

- Using flaggers at roadways to reduce queuing time.
- Requiring contractors to use best available control technologies.
- Performing proper vehicle maintenance.
- Developing specific detour routes and closures in close consultation with local jurisdictions as part of the permitting process. Preparing a Traffic Control Plan to provide advance notification to the public about the approved road closures and detours to reduce vehicle run time and emissions.

4.3.3 Green Route Alternative

The mitigation measures for the Green Route Alternative would be similar to those described in Section 4.3.2 for the Preferred Alternative.

4.4 Significant Unavoidable Adverse Impacts

Of the potential project-related impacts to air quality, none are considered to be significant unavoidable adverse impacts.
Chapter 5: Water

5.1 Affected Environment

The project area for both action alternatives is located within the Soos Creek, Lower Cedar River, May Creek, Coal Creek, Tibbetts Creek, and Mercer Slough basins. The Soos Creek basin is part of the approximately 556-square-mile Water Resource Inventory Area (WRIA) 09, the Duwamish-Green Watershed, as defined by the Washington State Department of Ecology (Ecology). The Lower Cedar River, May Creek, Coal Creek, Tibbetts Creek, and Mercer Slough basins are part of the approximately 692-square-mile WRIA 08, the Cedar-Sammamish Watershed. Runoff in the project area ultimately drains to these watersheds. The southern sections of both alternative routes are located within the Soos Creek basin. The northern sections of both alternative routes are located within the WRIA 08 basins. Figure 5-1 shows drainage basins and sub-basins within the project area.

5.1.1 Soos Creek Basin

Surface Waters

Basin Characteristics

The Soos Creek basin is comprised of about 70 square miles, consisting of mostly residential and rural land uses, but also containing commercial, open space, and forest lands. Land uses are becoming increasingly urbanized, particularly in the western regions of the basin. Located in the southern end of King County, the Soos Creek basin extends south from the Fairwood neighborhood near Renton, through unincorporated King County and the cities of Kent and Covington, to the Green River at River Mile (RM) 33.6 (Williams et al., 1975). The hydrology of the Soos Creek basin is complex, with many lakes (such as Lake Youngs and Lake Meridian), wetlands, and surface-groundwater interactions (King County, 1990b). These features help to attenuate peak stream flows within the basin.

Approximately 25 identified tributaries comprise the Soos Creek basin. The major drainages are Covington Creek, Jenkins Creek, Little Soos Creek, Soosette Creek, Lake Meridian, and Meridian Valley Creek. Of these major drainages:

- The Preferred Alternative would cross the Big Soos Creek, Jenkins Creek, and Little Soos Creek sub-basins.
- The Green Route Alternative would cross the Big Soos Creek, Soosette Creek, and Meridian Valley Creek sub-basins and the Lake Meridian sub-basin.

These drainages are described in more detail below.

Big Soos Creek

Big Soos Creek, the basin’s main watercourse, originates in a rolling glacial outwash plain near the southern limits of the City of Renton, and flows through several wetland complexes before entering a narrow, steep-sided ravine. About 2 miles upstream from the mouth, Big Soos Creek
occupies the floodplain channel in a steep-sided valley (Kerwin and Nelson, 2000). Big Soos Creek is approximately 14.5 miles long.

The U.S. Geological Survey (USGS) maintains a stream gage (#12112600) located about 0.9 mile upstream from the mouth of Big Soos Creek, downstream of the TCP project area. Daily average flows at this gage ranged from a low of 24 cubic feet per second (cfs) in late September to a high of 486 cfs in January during the 2005 water year. The median discharge for 2005 was 81 cfs (USGS, 2006b).

Historically old-growth forest, land uses within the basin have changed from commercial timber production, then to agricultural uses, and now to hobby farms and urban uses.

Concentrations of commercial and residential development are mostly contained within the northern and western portions of the basin, although the remaining rural areas are becoming increasingly urbanized. Urbanization within the basin has resulted in a large net increase in impervious area (Kerwin and Nelson, 2000).

**Jenkins Creek**

Jenkins Creek originates from the outlets of Lake Wilderness, Lake Lucerne, and Shadow Lake, flowing about 6.5 miles southwest to its confluence with Big Soos Creek at RM 4.2 (Williams et al., 1975). This sub-basin drains approximately 15.9 square miles. Land uses transition from mostly rural residential and farmland in the upper sub-basin to more single-family suburban in the middle reaches, then back to rural residential in the lower sub-basin. Water from Jenkins Creek is pumped downstream of Lake Wilderness to irrigate a golf course, often leading to low flows in the upper reaches (King County, 1990b).

**Little Soos Creek**

Little Soos Creek drains from the southern end of Lake Youngs, flowing about 4.8 miles through rural residential and commercial land to its confluence with Big Soos Creek at RM 5.6 (Williams et al., 1975). The sub-basin covers approximately 3.7 square miles. Because Lake Youngs serves as a reservoir for water diverted from the Cedar River, Little Soos Creek base flows are supplemented by out-of-basin hydrology (Kerwin and Nelson, 2000).

**Soosette Creek**

Soosette Creek, a tributary of Big Soos Creek, originates from springs and runoff on the plateau between Lake Meridian and the City of Kent. It flows approximately 5 miles, connecting with Big Soos Creek at RM 1.4. The last mile of the stream runs through a steep gulch and a ravine. Land use practices within this drainage area are representative of the Soos Creek basin (Williams et al., 1975; Kerwin and Nelson, 2000). The sub-basin drains about 5.5 square miles of suburban and urban land.
Lake Meridian
Lake Meridian, an oligotrophic lake (i.e., a lake relatively low in nutrients that cannot support much plant life) located in Kent, Washington, is fed by an inlet at the northwestern end of the lake and by subsurface springs. The inlet discharges an average of 0.3 cfs during most of the year and a peak volume of 3.8 cfs during periods of high precipitation. Surface water flows out of the lake through a stream located at the southeastern side of the lake. The lake is surrounded by residential development and is a local source of recreation (Verhey and Mueller, 2001). The sub-basin covers approximately 1.6 square miles of mostly single-family residential, urban land. Land use analysis showed that about 80 percent of the Lake Meridian sub-basin has been developed for uses other than agriculture (King County, 2005a).

Meridian Valley Creek
Meridian Valley Creek originates in unincorporated King County from a wetland, flowing southeasterly through North Meridian Park and the Meridian Valley Golf and Country Club to its confluence with Big Soos Creek at RM 7.2 in the City of Kent. The Meridian Valley Creek sub-basin drains approximately 3.0 square miles. Land uses within the sub-basin consist mostly of single-family residential with some park lands. Urbanization has significantly altered land uses within this sub-basin. The lower reach of the creek has been diverted through a 6-foot-wide concrete raceway with vertical sides (USACE, 2004).

Floodplains
King County Geographic Information System (GIS) data for best available 100-year floodplain and floodway boundaries were reviewed to determine floodplains in the project area. Mapped 100-year floodplains are located along Big Soos, Little Soos, and Jenkins Creeks within the project area (Figure 5-2). Floodways are mapped along the fringes of a majority of Big Soos Creek (King County, 2006g).

Flooding problems are limited in the upper reaches of the Soos Creek basin because flows are attenuated by wetlands and mostly contained within channelized drainages.

Water Quality
Effective December 21, 2006, Ecology adopted new state water quality standards (2006 rule), setting more stringent requirements for water temperature and dissolved oxygen than the previous standards. Ecology will implement the 2006 rule to the fullest extent possible under existing state authority (Ecology, 2006b). At this time, Ecology’s 2006 rule cannot be used as the federal water quality standards under the Clean Water Act (CWA); the U.S. Environmental Protection Agency (USEPA) must approve these standards. The 2006 rule standards are based on the designated uses of the water body. Ecology established numeric criteria to support the designated uses. The criteria of each water body do not indicate that these uses have been met, only that they must be met to support the designated uses.

Parameters that are used as measures of water quality include:

- **Dissolved oxygen**, or the amount of air that is entrained in water. When the organic load in water is high (due to sewage, detritus stirred up by dredging, etc.), nearly all the dissolved oxygen can be used up by bacteria, leading to conditions that may be harmful to aquatic species.

- **Temperature and pH**, relatively small changes in water temperature and pH can have a negative effect on aquatic species.

- The presence of **fecal coliform** is considered an indicator of fecal contamination.

- **Turbidity** is measure of water cloudiness, indicating that sediment is suspended in the water.

- **Toxic material**, including toxic metals such as mercury, cadmium, lead, and chromium, can have negative effects on the health of plants and animals.
Big Soos Creek and its tributaries are to be protected for the following designated uses: salmon spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WAC 173-210A-600). Furthermore, all surface waters that are tributaries to waters designated as core summer salmonid habitat or extraordinary primary contact recreation are to be protected for the designated uses of core summer salmonid habitat and extraordinary primary contact recreation (WAC 173-201A-600). Because Big Soos Creek drains to the Green River, which is designated core summer salmonid habitat, all streams in the Soos Creek basin are also to be protected for core summer salmonid habitat.

Table 5-1 summarizes the water quality criteria of water bodies within the project area. These criteria were established by Ecology to support the designated uses.

**Table 5-1. Summary of Washington State Water Quality Criteria and Standards for Uses Present in the Project Area**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Core Summer Salmonid Habitat</th>
<th>Salmonid Spawning, Rearing, and Migration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>Shall not exceed 16°C highest 7-DADMax due to human activities, with no increases greater than 0.3°C when natural conditions are greater than or within 0.3°C of 16°C.</td>
<td>Shall not exceed 17.5°C highest 7-DADMax due to human activities, with no increases greater than 0.3°C when natural conditions are greater than or within 0.3°C of 17.5°C.</td>
</tr>
<tr>
<td><strong>Dissolved Oxygen</strong></td>
<td>Shall exceed 9.5 mg/L lowest 1-day minimum; if dissolved oxygen is less than or within 0.2 mg/L of 9.5 mg/L due to natural conditions, then human activities shall not cause dissolved oxygen to decrease by more than 0.2 mg/L.</td>
<td>Shall exceed 8.0 mg/L lowest 1-day minimum; if dissolved oxygen is less than or within 0.2 mg/L of 8.0 mg/L due to natural conditions, then human activities shall not cause dissolved oxygen to decrease by more than 0.2 mg/L.</td>
</tr>
<tr>
<td><strong>Turbidity</strong></td>
<td>Turbidity shall not exceed 5 nephelometric turbidity units (NTU) over background turbidity when background turbidity is 50 NTU or less, or have more than a 10% increase when background turbidity is more than 50 NTU.</td>
<td>Same as Core Summer Salmonid Habitat</td>
</tr>
<tr>
<td><strong>Total Dissolved Gas</strong></td>
<td>Shall not exceed 110% of saturation, except during the 7-day, 10-year frequency flood.</td>
<td>Same as Core Summer Salmonid Habitat</td>
</tr>
<tr>
<td><strong>pH</strong></td>
<td>Shall be between 6.5 and 8.5, with a human-caused variation of less than 0.2 units</td>
<td>Shall be between 6.5 and 8.5, with a human-caused variation of less than 0.5 units</td>
</tr>
</tbody>
</table>
Recreational Uses

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Extraordinary Primary Contact Recreation</th>
<th>Primary Contact Recreation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal coliform</td>
<td>Fecal coliform organism shall not exceed a geometric mean value of 50 colonies per 100 milliliters (mL) and shall not have more than 10% of all samples obtained for calculating the geometric mean value exceed 100 colonies/100 mL.</td>
<td>Fecal coliform organisms shall not exceed a geometric mean value of 100 colonies per 100 mL and shall not have more than 10% of all samples obtained for calculating the geometric mean value exceed 200 colonies/100 mL.</td>
</tr>
</tbody>
</table>

All Freshwater Uses

<table>
<thead>
<tr>
<th>Parameter</th>
<th>General Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxic, radioactive, or deleterious material</td>
<td>Toxic, radioactive, or deleterious material concentrations shall be below those of significance to public health, or which may cause acute or chronic toxic conditions to the aquatic biota, or which may adversely affect any water use.</td>
</tr>
<tr>
<td>Aesthetic values</td>
<td>Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.</td>
</tr>
</tbody>
</table>

Sources: WAC 173-201A-200; WAC 173-201A-260

Section 303(d) of the federal CWA and the USEPA’s implementing regulations (40 CFR 130) require states to prepare a list of water body segments that do not meet surface water quality standards. The list is used to prioritize water bodies for protection. The Washington State Integrated Report 2002/2004 (303(d) List and 305(b) Report) (Ecology, 2005b) indicates that Big Soos, Little Soos, Jenkins, and Soosette Creeks and Lake Meridian are classified as “water quality-limited” within the project area. Table 5-2 shows the parameters listed for each of these water bodies. Water bodies on the 303(d) list do not meet state water quality standards for one or more parameters. Further, technology-based controls (such as stormwater Best Management Practices [BMPs]) are not sufficient in these cases to achieve water quality standards.

Table 5-2. Soos Creek Basin 2004 303(d) Listed Water Bodies in the Project Area

<table>
<thead>
<tr>
<th>Water Body</th>
<th>303(d) Listed Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Soos Creek</td>
<td>Dissolved oxygen; fecal coliform</td>
</tr>
<tr>
<td>Little Soos Creek</td>
<td>Dissolved oxygen; temperature; fecal coliform</td>
</tr>
<tr>
<td>Jenkins Creek</td>
<td>Fecal coliform</td>
</tr>
<tr>
<td>Soosette Creek</td>
<td>Dissolved oxygen; fecal coliform</td>
</tr>
<tr>
<td>Lake Meridian</td>
<td>Total phosphorus; fecal coliform</td>
</tr>
</tbody>
</table>

Source: Ecology, 2005b
Water bodies on the 303(d) list are required to undergo a study that determines how water quality standards can be achieved. The results of these studies are termed total maximum daily loads (TMDLs). A TMDL study documents existing water quality conditions, quantifies the sources of pollution, develops procedures to improve water quality, and allocates pollutant loads among the sources. Following the results of the TMDL analysis, increased controls could be required for pollution sources within a watershed to meet water quality standards.

Ecology is currently planning a Soos Creek basin TMDL study for temperature and dissolved oxygen. Information about specific locations that will be examined for the TMDL study is not yet available (Ecology, 2007).

**Big Soos, Little Soos, and Jenkins Creeks.** King County’s Water and Land Resources Division maintains water quality stations on Big Soos, Little Soos, and Jenkins Creeks. The Little Soos Creek and Jenkins Creek stations are located near the mouths of streams in the vicinity of the Preferred Alternative. The Big Soos Creek monitoring station is located near the mouth, approximately 4.2 miles downstream of the southern project limits. Sampling data from the 2002, 2003, 2004, and 2005 water years are summarized in Table 5-3. No water quality data were obtained for Soosette or Meridian Valley Creeks.

### Table 5-3. Summary of Water Quality Data Collected at King County Monitoring Stations in the Soos Creek Basin

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Big Soos Creek (Soos Creek Site A320)</th>
<th>Little Soos Creek (Soos Creek Site G320)</th>
<th>Jenkins Creek (Soos Creek Site D320)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>Range</td>
<td>Median</td>
<td>Range</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>9.3</td>
<td>11.8</td>
<td>10.4</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>11.3</td>
<td>10.9</td>
<td>10.5</td>
</tr>
<tr>
<td>pH</td>
<td>7.4</td>
<td>7.4</td>
<td>7.3</td>
</tr>
<tr>
<td>Fecal Coliform (CFU/100 mL)</td>
<td>56</td>
<td>89</td>
<td>34</td>
</tr>
<tr>
<td>Total Suspended Solids (mg/L)</td>
<td>3.44</td>
<td>2.8</td>
<td>2.2</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>1.6</td>
<td>2.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Total Phosphorus (μg/L)</td>
<td>0.0309</td>
<td>0.0216</td>
<td>0.0263</td>
</tr>
<tr>
<td>Total Nitrogen (mg/L)</td>
<td>1.2</td>
<td>0.41</td>
<td>1.41</td>
</tr>
</tbody>
</table>

Source: King County, 2006c

**Soosette Creek.** King County’s Green-Duwamish Watershed Water Quality Assessment includes a monitoring site on Soosette Creek near the where the Green Route Alternative would cross. The *Year 2003 Water Quality Data Report* (King County, 2005a) describes dissolved oxygen and fecal coliform concentrations that did not meet state criteria in at least one of the samples from the Soosette Creek site. Aluminum levels were high during base flow and storm flow sampling. Sample data indicate a moderate concern with regard to beneficial uses being supported in Soosette Creek.
Meridian Valley Creek. Water quality data from Meridian Valley Creek are limited. A brief water quality study was performed on Meridian Valley Creek from 1999 to 2000 and baseline and storm event samples were collected (Taylor, 2000 in USACE, 2004). During baseline conditions, temperature exceeded state standards at a site near 144th Avenue SE, and fecal coliform exceeded state standards at a site near 132nd Avenue SE. Throughout the study, baseline conditions showed dissolved oxygen levels, turbidity, and pH meeting state water quality standards. Metals concentrations were all below minimum detectable levels except for two measurements taken downstream of where the Green Route Alternative would cross, which showed zinc concentrations of 0.007 mg/L and 0.013 mg/L. Storm event samples showed elevated fecal coliform concentrations, fluctuating dissolved oxygen levels, and an increase in metals. Copper levels exceeded state water quality standards in the storm event samples.

Lake Meridian. Volunteers with King County’s Water and Land Resources Division regularly monitor the water quality of Lake Meridian. Data from 2003 show total phosphorus (P) and total nitrogen (N) to be in relatively constant proportion, with a N:P ratio ranging from 24 to 52. Generally, lakes with an N:P ratio of less than 20 may be nitrogen and phosphorus limited at times during the growing season. Except for a small peak in June, chlorophyll-a concentrations remained low throughout the year (King County, 2005c). Table 5-4 summarizes this measured water quality monitoring data from Lake Meridian based on 14 sample periods during 2003.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Temperature (°C)</th>
<th>Secchi (m)</th>
<th>Chlorophyll-a (μg/L)</th>
<th>Total Phosphorus (μg/L)</th>
<th>Total Nitrogen (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>13.0 to 25.0</td>
<td>3.5 to 6.5</td>
<td>0.6 to 5.7</td>
<td>5.7 to 12.1</td>
<td>266.0 to 374.0</td>
</tr>
<tr>
<td>Median</td>
<td>20.3</td>
<td>5.0</td>
<td>2.1</td>
<td>8.3</td>
<td>298.5</td>
</tr>
</tbody>
</table>

Source: King County, 2005c

Groundwater

Vashon till forms a low permeability layer throughout most of the Soos Creek basin. Breaching of this layer is infrequent, resulting in low recharge rates to underlying aquifers. The till in the west and central regions of the basin is underlain by granular deposits, likely from the Vashon-age advance outwash, which allows for locally valuable water sources due to their shallow depth, moderate thickness, and high permeability. Clays in the southwestern region of the basin form a low-permeability layer, which extends below the lowest surface elevation in the basin and serves as a barrier to groundwater (King County, 1990b). Groundwater recharge rates are displayed in Figure 5-4.

Vashon-age recessional outwash within the Jenkins Creek drainage creates a thick, unconfined aquifer with direct hydrologic connectivity to surface water. This aquifer is susceptible to groundwater contamination due to the lack of overlying low-permeability soils (Metropolitan King County Council, 1998).

Drinking water wells are present throughout the project area. Several Group A and B supply wells exist throughout the basin (see Figure 5-5). Group A water systems are those systems that serve more than 14 households, or more than 25 people per day at commercial establishments and gathering places such as schools and parks. Group B water systems are generally smaller and serve between 2 and 14 households, or are commercial establishments that serve less than 25 people per day.
Wellhead protection areas (WPA) located within the project area have been established for the following water purveyors: King County Water District 111 (Wells 1, 2, 3, 4, 5, 6, and 9); Welch’s Water Association (Wells 1 and 2); Lake Meridian Estates (Well 1); Sunset Park Water Company (Well 1); City of Renton (Spring Brook Springs) (Ecology, 2006a). Well names, capacities, and susceptibility ratings based on the Susceptibility Assessment as defined by the Washington Department of Health (DOH) (DOH, 2005) are listed in Table 5-5. Six-month, 1-year, 5-year, and 10-year radius WPAs are displayed in Figure 5-5. Activities within WPAs could affect the quality of water supplies within a given zone.

<table>
<thead>
<tr>
<th>Public Water System</th>
<th>Source Name</th>
<th>Capacity (gallon/minute)</th>
<th>Susceptibility Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>King County Water District 111</td>
<td>Well No. 1</td>
<td>150</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Well No. 2</td>
<td>150</td>
<td>Not Rated</td>
</tr>
<tr>
<td></td>
<td>Well No. 3</td>
<td>400</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Well No. 4</td>
<td>300</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Well No. 5</td>
<td>129</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Well No. 6</td>
<td>750</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Well No. 9</td>
<td>800</td>
<td>Low</td>
</tr>
<tr>
<td>Welch’s Water Association</td>
<td>Well #1</td>
<td>75</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Well #2</td>
<td>25</td>
<td>High</td>
</tr>
<tr>
<td>Lake Meridian Estates (mobile home park)</td>
<td>Well #1</td>
<td>137</td>
<td>Low</td>
</tr>
<tr>
<td>Sunset Park Water Company</td>
<td>Well #1</td>
<td>0</td>
<td>Moderate</td>
</tr>
<tr>
<td>City of Renton</td>
<td>Spring Brook Springs</td>
<td>1600</td>
<td>High</td>
</tr>
</tbody>
</table>

Source: Ecology, 2006a

Critical Aquifer Recharge Areas (CARAs) are located at the outflow of Lake Youngs and along the following: Jenkins Creek, the lower reaches of Soosette Creek, United Nations Creek, and Big Soos Creek in the upper and lower sections of the project area. King County’s Critical Areas Ordinance limits certain land uses within different categories of CARAs. Within Kent, CARAs also include WPAs (Kent City Code 11.06.210). Therefore, the following WPAs are also considered CARAs by the City of Kent: King County Water District 111 (Wells 1, 2, 3, 4, 5, 6, and 9); Lake Meridian Estates (Well 1); and Sunset Park Water Company (Well 1). The City of Kent regulates certain activities with CARAs.

The Preferred Alternative would cross a Category 1 and 2 CARA near Jenkins Creek, and a Category 1 Critical Aquifer Area near United Nations Creek. The Green Route Alternative would cross a Category 1 and 2 CARA near Big Soos Creek and the WPAs listed above that are regulated by the City of Kent (see Figures 5-4 and 5-5).
5.1.2 Lower Cedar River Basin

Surface Waters

Basin Characteristics

This reach of the Cedar River extends more than 24 miles upstream from the mouth at Lake Washington. The Cedar River basin drains approximately 188 square miles (King County, 1993). The eastern portion of the Lower Cedar River basin consists mainly of rural and scattered suburban residential land uses. As the basin moves west toward the City of Renton, land uses become more densely residential, urbanized commercial, and industrial (Williams et al., 1975).

The entire Cedar River watershed is mostly forested, with some low to medium density development. High-density development comprises less than 1% of the watershed (King County, 2006c).

Anthropogenic activities have dramatically altered the hydrology of the Lower Cedar River over the last century. The Cedar River historically discharged to the Black River in Renton, which drained Lake Washington from the south. The Black River was a tributary to the Duwamish Waterway and ultimately Elliott Bay. Between 1910 and 1920, the Lake Washington Ship Canal and Hiram M. Chittenden Locks were constructed, resulting in a new outlet for Lake Washington, a 9-foot drop in water surface level of the lake, and the abandonment of most of the Black River. Further hydraulic alteration resulted in the redirection of the Lower Cedar River to act as an inlet to Lake Washington in the southern end. The redirection of the Cedar River was constructed with the initial expectation of creating a major freshwater industrial port in Renton. As a result, current land uses near the mouth of the Cedar River are comprised of mostly industrial uses. The Cedar River currently supplies approximately 57% of the inflow to Lake Washington (Kerwin, 2001).

The Upper Cedar River basin originates from Meadow Mountain near Cascade Crest, draining east to the Landsburg Diversion Dam. This dam was built in 1901 by the City of Seattle to divert a portion of its drinking water supply (King County, 2006c). Approximately 78% of the water in the Cedar River continues downstream past the Landsburg Diversion Dam. The Cedar River provides approximately 70% of the drinking water supply to about 1.3 million people in the greater Seattle area (SPU, 2006). The Masonry Dam, located upstream from the Landsburg Diversion Dam, was built in 1914 for water supply, flood control, and hydroelectric power generation. The City of Seattle owns 79,452 acres of the approximate 79,951-acre Upper Cedar River basin, most of which is forested (King County, 2006c). Management of the Upper Cedar River basin by SPU greatly affects both high and low main stem flows in the Lower Cedar River basin (King County, 1993).

The Lower Cedar River basin is comprised of approximately 12 small tributaries, including the Orting Hills, Cedar Grove, Cedar Hills, and Webster Lake tributaries, and Maplewood, Ginger, Molasses, Madsen, Summerfield, Peterson, Taylor, and Rock Creeks (Metropolitan King County Council, 1998). Both the Preferred Alternative and the Green Route Alternative would be located within the Molasses Creek, Madsen Creek, Cedar Main Urban, and Orting Hills sub-basins. Additionally, a short section of the Preferred Alternative would be located within the Cedar Grove sub-basin, and the Green Route Alternative would cross the Maplewood Creek sub-basin.
Lower Cedar River (Cedar Main Urban Sub-basin)
The Lower Cedar River begins at the Landsburg Diversion Dam, continuing west to its mouth at Lake Washington in Renton. This reach of the Cedar River is approximately 21.7 miles long (King County, 2006c).

A USGS stream gage (#12119000) is located in Renton, approximately 1.5 miles upstream of the mouth of the Cedar River, downstream of the TCP project area. During the 2005 water year, daily average flows ranged from a low of 132 cfs in August to a high of 1,980 cfs in January. The median discharge was 385 cfs (USGS, 2006b).

Molasses Creek
The Molasses Creek sub-basin consists of approximately 1.9 square miles, and drains northerly from south of the Renton city limits to the Cedar River at RM 4.05. This sub-basin originates from two large wetland complexes bordered by residential developments. Molasses Creek flows through a 37-acre wetland, then an area surrounded by residences before entering a culvert over 0.25-mile long. The creek enters a steep ravine with a wide forested riparian zone at RM 0.8, continuing to the mouth (Kerwin, 2001).

Land uses in the sub-basin consist of mostly single-family residential. However, multi-family residential, forest, and commercial lands are present to a lesser extent. The sub-basin has become increasingly urbanized over time, resulting in land use changes progressing from forest to residential and commercial.

Madsen Creek
The Madsen Creek sub-basin originates in a residential neighborhood on the south side of the Cedar River Valley, just north of Lake Youngs. Several small tributaries converge with the main stem channel before descending north down the undeveloped valley slope toward the Cedar River. The lower reaches flow through artificial channels such as drainage ditches, entering the Cedar River at RM 4.50 (Kerwin, 2001).

Recent significant residential development in the upper sub-basin has introduced impervious surfaces and artificial drainage systems, resulting in increased downstream incision, erosion, and sedimentation. Channel relocation and bank hardening associated with the installation of sewer pipes and other utility lines have further disturbed Madsen Creek. Erosive processes have exposed some of the pipes, sometimes causing them to break and spill raw sewage into the creek (Kerwin, 2001; King County, 1993).

Orting Hills (Stewart Creek)
Stewart Creek is the only stream crossed by the project within the Orting Hills sub-basin. This watercourse originates on the north side of the Cedar River Valley, flowing south through residential lands before dropping into a steep, wooded ravine on the north slope of the Cedar River Valley. It parallels 154th Place SE to its confluence with the Cedar River at RM 4.84. Recent restoration work has been done near the mouth of Stewart Creek.
Cedar Grove
This sub-basin is fed by four major tributaries that originate on the gently sloping plateau north of the Cedar River Valley, dropping through a steep ravine along the valley slope, and then draining through the low-gradient valley floor to the Cedar River.

Land uses are generally suburban residential in the upper reaches, with undeveloped areas located in the steep slope and valley bottom areas of the middle and lower reaches.

Maplewood Creek
Maplewood Creek flows south from two tributaries on the north side of the Cedar River Valley in Renton. The tributaries converge downstream of residential properties, flowing down a wooded, steep walled ravine to the valley bottom. The lower reach of Maplewood Creek flows through the City of Renton’s Maplewood Golf Course in a channelized ditch, then through approximately 800 feet of 72-inch-diameter culvert under a railroad grade and SR 169 before its confluence with the Cedar River at RM 3.4 (Kerwin, 2001).

Land uses in the upper reaches of this sub-basin consist primarily of residential uses, with some commercial uses. The lower reaches contain a wooded, steep valley slope and a large golf course. Increased urban development in the upper reaches has resulted in sedimentation, channel scour, and lateral bank sliding (Kerwin, 2001).

Floodplains
King County GIS data for best available 100-year floodplain and floodway boundaries were reviewed to determine floodplains in the project area. Floodplains are mapped along the Cedar River within the project area (Figure 5-2). Mapped floodways are located along the fringes of most of the Cedar River (King County, 2006g).

Flooding problems along the Cedar River main stem have been greatly affected by development within the floodplain. Areas unprotected by levees have been flooded. Flood flows have damaged or destroyed levees, roads, and residences in the lower reaches. Homes built within the 10-year floodplain, including near where the Preferred Alternative would cross the Cedar River, are subject to fast, deep flood flows. King County’s Cedar River Current and Future Conditions Report (1993) classified flooding in these areas as “Extremely Significant Problems”. A total of 300 homes are located within the Cedar River 100-year floodplain. Flooding near the mouth of the Cedar River has also been problematic due to sediment deposition within the channel. These problems have resulted in severe social and economic impacts (King County, 1993).

Urban and suburban development in most of the tributary sub-basins has caused increased stormwater runoff volumes, which have resulted in increased flooding. Flooding problems in these tributary sub-basins also results from inadequately operating drainage ditches or culverts, reduced channel capacity, or from structures being built in areas with poor surface drainage. Filling of wetlands or other natural detention features have intensified these problems. Specific flooding problems in the Maplewood Creek sub-basin have been noted in association with housing developments and undersized culverts. These areas have experienced several flooding episodes, resulting in damage to homes, roads, and septic systems (King County, 1993). Recent installation of large woody debris in Madsen Creek has protected communities historically impacted by flooding by reducing sedimentation and discharge rates.
Most of the flooding problems in the Molasses Creek sub-basin are involved with seepage in the slope areas overlooking the Cedar River and with runoff from the SPU right-of-way in the Fairwood neighborhood (King County, 1993). The upper reaches of Molasses Creek have experienced a majority of the flooding within the sub-basin. Flooding problems have increased in the uplands of Molasses Creek as a result of increasing flows and inadequate drainage facilities (Metropolitan King County Council, 1998).

**Water Quality**

Downstream of RM 4.1, the Cedar River is designated core summer salmonid habitat; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values. Upstream of RM 4.1, the Cedar River has the same uses except it is designated extraordinary primary contact recreation instead of primary contact recreation.

Streams within the Molasses Creek, Madsen Creek, Orting Hills, Cedar Grove, and Maplewood Creek sub-basins are to be protected for the following designated uses: salmon spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WAC 173-210A-600). Furthermore, all surface waters that are tributaries to waters designated as core summer salmonid habitat or extraordinary primary contact recreation are to be protected for the designated uses of core summer salmonid habitat and extraordinary primary contact recreation (WAC 173-201A-600). Because all the project area tributaries in this basin drain to the Cedar River, which is designated core summer salmonid habitat, all of these tributaries are also to be protected for core summer salmonid habitat.

The Cedar River is listed on Ecology’s 303(d) list of impaired water bodies for elevated levels of fecal coliform and temperature for a short reach near the mouth, downstream of the project area. An additional reach, upstream of the project area, is listed for fecal coliform (Ecology, 2005b). None of the project area tributary streams in the Lower Cedar River basin are listed on Ecology’s 303(d) list of impaired water bodies for any water quality parameters, possibly due to a lack of adequate data (Ecology, 2005b). Furthermore, no TMDL studies have been performed on the Cedar River or its tributary streams within the project area.

**Cedar River.** Ecology’s Water Quality Index rates the Cedar River as being of “moderate concern”. Trends in water temperature have shown significant increases over the past 25 years. Total phosphorus levels and pH have also increased over this period; however, concentrations of TSS, ortho-phosphorus, ammonia, and nitrate-nitrogen have shown significant declines (King County, 2006c).

A water quality monitoring station maintained by King County is located on the Cedar River near the mouth, downstream of the project area. Sampling data from the 2002, 2003, 2004, and 2005 water years are summarized in Table 5-6. No water quality data were obtained for Molasses, Madsen, Stewart, or Maplewood Creeks, or tributaries within the Cedar Grove sub-basin.
Table 5-6. Summary of Water Quality Data Collected at the King County Monitoring Station near the Mouth of the Cedar River

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>9.3</td>
<td>4.3 to 17.5</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>10.9</td>
<td>6.2 to 12.8</td>
</tr>
<tr>
<td>pH</td>
<td>7.3</td>
<td>6.3 to 7.9</td>
</tr>
<tr>
<td>Fecal Coliform (CFU/100 mL)</td>
<td>92</td>
<td>8 to 1500</td>
</tr>
<tr>
<td>Total Suspended Solids (mg/L)</td>
<td>3</td>
<td>0.8 to 308</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>1.5</td>
<td>0.57 to 141</td>
</tr>
<tr>
<td>Total Phosphorus (μg/L)</td>
<td>0.0196</td>
<td>0.0102 to 0.253</td>
</tr>
<tr>
<td>Total Nitrogen (mg/L)</td>
<td>0.359</td>
<td>0.177 to 1.82</td>
</tr>
</tbody>
</table>

Source: King County, 2006a

Molasses Creek and Madsen Creek. Available water quality data, although sparse, indicate that substantial water quality problems likely exist in the Molasses and Madsen Creek sub-basins. These problems can be attributed to automobile usage, stormwater runoff from impervious surfaces, and other non-point sources within the sub-basins. High flows have resulted in stream channel erosion, likely raising turbidity and total suspended solid (TSS) levels through some of the middle and lower reaches of these creeks. These erosive processes have caused the exposure and leaking of sewer lines near Madsen Creek, resulting in the direct discharge of sewage into the stream (Metropolitan King County Council, 1998). However, recent improvements have been made to prevent downcutting and leaking of sewer lines. Also, the herbicide 2,4-D has been detected in Madsen Creek downstream of the Fairwood Golf Course. Relative to all other Cedar River tributaries, Madsen Creek has the highest measured load of TSS and phosphorus (Kerwin, 2001). Water quality data sets for these sub-basins were not obtainable for inclusion in this EIS.

Orting Hills (Stewart Creek), Cedar Grove, and Maplewood Creek. Water quality data were not obtainable for Maplewood Creek or the Cedar Grove tributaries. Stewart Creek water temperature was monitored by King County in the upstream reaches from July 2006 to December 2006. Temperatures ranged from 3.74 °C (38.73 °F) in November and December to 16.38 °C (61.48 °F) in late August, with a median value of 10.60 °C (51.08 °F) (King County, 2007). However, information sources indicate that water quality has been impacted by development and urbanization within these basins. High stream flows likely associated with urbanization have resulted in increased turbidity and TSS in Maplewood Creek (Kerwin, 2001). Various sediment sources have also been identified in the Orting Hills sub-basin (O’Rollins, 1997). In addition, high occurrences of septic system failures within the Maplewood Creek sub-basin have likely increased fecal coliform and nutrient concentrations. In addition, urbanization has resulted in increased pollutant loads associated with road drainage, household hazardous wastes, pesticides, and herbicides within all three of these sub-basins (Metropolitan King County Council, 1998).
Groundwater

Groundwater in the Cedar River basin serves as a potable water supply source for the City of Renton, City of Kent, many small private purveyors, and numerous private wells (Metropolitan King County Council, 1998). Groundwater movement through the basin varies depending on characteristics of glacial deposits. The sands and gravels that comprise outwash deposits provide high infiltration and subsurface flow rates, while till soils, which consist mostly of silts and clays, resist flow. The largest aquifer in the basin consists of outwash soils underlying glacial till, which allows for high water yields with good water quality due to the slow infiltration rates of the overlying till. Groundwater underlying parts of the City of Renton consists of thick deposits of sand and gravel with limited areas of overlying till, creating high water yields but having a high susceptibility to groundwater contamination from surface sources (King County, 1993).

Several Group A and Group B supply wells exist throughout the basin (see Figure 5-5). WPAs in the Lower Cedar River basin have been established within the project area for the City of Renton (Wells 11, 12, and 17) and the Maplewood Addition Water Co-op (Wells 1 and 2) (Ecology, 2006a). Well names, capacities, and DOH susceptibility ratings (DOH, 2005) are listed in Table 5-7. Figure 5-5 shows the locations of 6-month, 1-year, 5-year, and 10-year radius WPAs near the project.

<table>
<thead>
<tr>
<th>Public Water System</th>
<th>Source Name</th>
<th>Capacity (gallon/minute)</th>
<th>Susceptibility Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Renton</td>
<td>Well #11</td>
<td>2,500</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Well #12</td>
<td>1,500</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Well #17</td>
<td>1,500</td>
<td>Low</td>
</tr>
<tr>
<td>Maplewood Addition Water Co-op</td>
<td>Well #1</td>
<td>200</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Well #2</td>
<td>200</td>
<td>High</td>
</tr>
</tbody>
</table>

Source: Ecology, 2006a

CARAs are located at the headwaters of Molasses Creek and along the Cedar River within the project area. The Preferred Alternative and the Green Route Alternative would cross Category 1 and 2 CARAs near Molasses Creek and the Cedar River (see Figure 5-4).

The Cedar Valley Aquifer, a narrow strip of groundwater supply along the Cedar River, provides a majority of the water supply for the City of Renton. It lies relatively close to the surface and has a maximum thickness of about 80 feet. This aquifer is located within the project area in the vicinity of the Cedar River.

The USEPA has designated the Cedar Valley Aquifer as a “sole source aquifer” (Office of the Federal Register, 1988) (see Figure 5-5). Sole source aquifers must supply at least 50% of the drinking water to persons living over the aquifer, with no feasible alternate source of drinking water. This designation protects groundwater resources by requiring the USEPA to review any proposed projects within the sole source area that receive federal financial assistance.
5.1.3 May Creek Basin

Surface Waters

**Basin Characteristics**
The May Creek basin is located in WRIA 08, draining west from Squak Mountain to Lake Washington. The basin consists of approximately 14 square miles, and includes 26 miles of mapped streams and over 400 acres of wetlands. Several small drainages in the eastern basin converge in the May Creek floodplain, which becomes a naturally broad floodplain with numerous wetland complexes. Land uses generally transition from forest and rural in the east end of the basin to residential and commercial in the west end. Land use in the basin has become increasingly urbanized, progressing from undisturbed forest to logging, mining, and farming uses. Currently, the basin is mostly single and multifamily residential with some commercial use in the western portion, and rural residences, small farms, and some forest land in the east (King County and City of Renton, 2001).

May Creek is the primary watercourse in the basin. Several major tributaries, including Honey Creek, Boren Creek, and the North, East, and South Forks of May Creek also contribute to the basin. The major lakes within the basin include Lake Kathleen and Lake Boren. Of these major drainages, the Preferred Alternative would cross May Creek and tributaries in the North Fork May Creek sub-basin, and the Green Route Alternative would cross May Creek, a tributary to May Creek, and a tributary to Lake Boren.

**May Creek**
May Creek originates from several small tributaries on Squak and Cougar Mountains south of Issaquah and on the Renton Plateau. These drainages converge to form May Creek, flowing approximately 7 miles to its mouth at Lake Washington near North 40th Street in Renton. Most of the eastern half of May Creek flows through May Valley, which is largely composed of a natural floodplain that seasonally fills with floodwaters. The floodplain stretches through pastures, commercial areas, and residential developments before draining into a sloped ravine near Coal Creek Parkway SE (King County and City of Renton, 2001).

King County maintains a stream gage (Site 37b) at the May Creek crossing of Coal Creek Parkway SE, just downstream of the project area. Daily average flows ranged from a low of 0.46 cfs in mid August to a high of 122.21 cfs in mid January at this gage during the 2005 water year. The median discharge for 2005 was 4.16 cfs (King County, 2006d).

**North Fork May Creek**
North Fork May Creek originates on Squak Mountain, flowing down the forested slope through a quarry to the valley bottom. It parallels SR 900 along the bottom of this valley, converging with several small tributaries before joining the May Creek main stem in May Valley. Land uses in this sub-basin consist of forested open space and scattered rural residences.

**Lake Boren**
Lake Boren has been identified as mesotrophic (i.e., a lake with moderate levels of nutrients and that can support moderate levels of plant life). The lake is fed primarily by stormwater runoff, groundwater inputs, and an inlet stream that enters the lake near the north end. Several large wetlands have been identified within this sub-basin. Land use in 52% of the sub-basin consists of areas developed for purposes other than agriculture or forestry. These lands are mostly
residential, with some commercial land use (King County, 2005c). The lake drains through Boren Creek near the southern end, which flows south to its confluence with May Creek along Coal Creek Parkway SE.

**Floodplains**

King County-mapped 100-year floodplains are located along May Creek and North Fork May Creek within the project area (Figure 5-2). Floodways are mapped along the fringes of most of North Fork May Creek, and along May Creek within May Valley (King County, 2006g).

The natural floodplain features of May Valley have been historically subjected to flooding. With stream channelization, increased development in upland areas of the basin, and the resulting sedimentation and increased runoff volumes, flooding problems have been exacerbated in this area. The floodplain within May Valley provides substantial flood storage; thus, it is sometimes subject to long-duration flooding. Therefore, flooding problems within May Valley can be severe at times. Structures and facilities within the floodplain, including May Creek Park and several residences, are particularly at risk for flood impacts. An estimated seven homes and businesses are located in the 100-year floodplain (King County and City of Renton, 2001).

**Water Quality**

May Creek and its tributaries are to be protected for the following designated uses: salmon spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WAC 173-210A-600). All lakes and streams that feed into lakes are protected for the designated uses of core summer salmonid habitat and extraordinary primary contact recreation (WAC 173-201A-600). Because May Creek feeds directly into Lake Washington, streams in this basin are also to be protected for core summer salmonid habitat and extraordinary primary contact recreation. Lake Boren is also protected for all of these designated uses.

May Creek is listed on Ecology’s 303(d) list of impaired water bodies for elevated temperatures and fecal coliform levels for a short reach near the mouth, downstream of the project area (Ecology, 2005b). Lake Boren is also on the 303(d) list for elevated fecal coliform levels (Ecology, 2005b). No TMDL studies have been performed on any waters within the May Creek basin.

**May Creek.** During the 2002, 2003, 2004, and 2005 water years, May Creek has been rated of “moderate concern” according to the Ecology Water Quality Index. Results of a 25-year trend analysis indicate a general decline in water quality in May Creek. Specifically, water temperatures, ammonia-nitrogen concentrations, and conductivity have increased. Furthermore, pH has decreased significantly, although levels are still within the State standards. Water quality improvements have been noted due to a decrease in TSS, ortho-phosphorus, nitrate, and total nitrogen concentrations (King County, 2006c).

King County maintains a water quality monitoring station near the mouth of May Creek, downstream of the project area. Sampling data from the 2002, 2003, 2004, and 2005 water years are summarized in Table 5-8.
Table 5-8. Summary of Water Quality Data Collected at the King County Monitoring Station near the Mouth of May Creek

<table>
<thead>
<tr>
<th>Parameter</th>
<th>May Creek (May Creek Site 0440)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>10.2</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>11.15</td>
</tr>
<tr>
<td>pH</td>
<td>7.4</td>
</tr>
<tr>
<td>Fecal Coliform (CFU/100 mL)</td>
<td>150</td>
</tr>
<tr>
<td>Total Suspended Solids (mg/L)</td>
<td>2.8</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>2.12</td>
</tr>
<tr>
<td>Total Phosphorus (μg/L)</td>
<td>0.0422</td>
</tr>
<tr>
<td>Total Nitrogen (mg/L)</td>
<td>1.34</td>
</tr>
</tbody>
</table>

Source: King County, 2006c

Lake Boren. The water quality of Lake Boren has been regularly monitored by volunteers with King County’s Water and Land Resources Division since 1980. Based on data from 2003, N:P ratios ranged from 18 to 52, and chlorophyll-a content was relatively low, with a short peak in mid-September (King County, 2005c). Table 5-9 summarizes this measured water quality monitoring data from Lake Boren based on 12 sample periods during 2003.

Table 5-9. Measured Water Quality Data Summary for Lake Boren

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Temperature (°C)</th>
<th>Secchi (m)</th>
<th>Chlorophyll-a (μg/L)</th>
<th>Total Phosphorus (μg/L)</th>
<th>Total Nitrogen (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>11.5 to 24.0</td>
<td>3.0 to 4.5</td>
<td>1.1 to 7.3</td>
<td>11.0 to 20.3</td>
<td>313.0 to 757.0</td>
</tr>
<tr>
<td>Median</td>
<td>18.0</td>
<td>3.8</td>
<td>2.7</td>
<td>14.4</td>
<td>406.0</td>
</tr>
</tbody>
</table>

Source: King County, 2005c

Groundwater
The alluvial fan deposits along May Creek have developed an unconfined alluvial aquifer (WSDOT, 2006). These areas generally correspond with areas of high groundwater recharge as shown in Figure 5-4.

Group A and Group B supply wells exist throughout the May Creek basin (see Figure 5-5). Only Group B WPAs in the May Creek basin were identified within the project area.

CARAs are located along May Creek and North Fork May Creek in the project area. The Preferred Alternative would cross Category 2 CARAs near May Creek and near North Fork May Creek along SR 900. The Green Route Alternative would cross a Category 2 CARA near May Creek (see Figure 5-4).
5.1.4 Coal Creek Basin

Surface Waters

**Basin Characteristics**

The Coal Creek basin drains approximately 7 square miles within the cities of Bellevue and Newcastle, and in unincorporated King County. Land uses in the basin consist primarily of single family residences and parks, including the Cougar Mountain County Park in the headwaters, and Coal Creek Regional Park, which includes the majority of the riparian corridors for Coal Creek and a tributary (Kerwin, 2001). The basin consists of 15% impervious area (King County, 2006c).

The basin was historically characterized by its mining activities that occurred beginning in the late 1800s. These actions resulted in disturbances that are currently apparent, including channelized stream reaches, altered stream course, and deposition of mine tailings near Coal Creek and tributary streams. Alterations caused by mining activities have also changed basin hydrology. For example, headwater streams of the South Fork currently originate from a collapsed section of a mine. The channel was diverted twice in the mid 1900s to accommodate development, and two large canals were excavated near the mouth of Coal Creek in the 1960s to accommodate inland properties. More recently, urbanization has been the major cause of disturbance in the Coal Creek basin, altering hydrology, influencing flood events, and increasing erosion and sedimentation (King County, 2006c; Kerwin, 2001).

Coal Creek is the primary stream in this basin, and contains only one major tributary, Newport Hills Creek, which drains to Coal Creek just upstream of I-405. The Green Route Alternative would cross Coal Creek; the Preferred Alternative is located entirely outside of the Coal Creek basin.

**Coal Creek**

Coal Creek originates on the west slope of Cougar Mountain at an approximate elevation of 1,400 feet. It drains generally northwest for about 7 miles, crossing and paralleling Coal Creek Parkway SE for about a mile. It crosses under I-405 and discharges to Lake Washington just south of I-90 (King County and City of Bellevue, 1987).

King County maintains a stream gage (06a) near the mouth of Coal Creek, downstream of the project area. Daily average flows at this site ranged from a low 1.7 cfs in early October to a high 130.02 cfs in mid-October during the 2004 water year. The median flow rate during 2004 was 6.165 cfs (King County, 2006c).

**Floodplains**

King County-mapped 100-year floodplains are located along Coal Creek within the project area (Figure 5-2). Floodways are not mapped along Coal Creek within the project area (King County, 2006g).

Urbanization within the Coal Creek basin has resulted in increased stormwater runoff volumes and sedimentation, causing an increase in the duration, frequency, and peak of flood events (City of Bellevue and King County, 1987). The City of Bellevue has maintained two sediment retention ponds along Coal Creek, one upstream of Coal Creek Parkway SE and one upstream of I-405, in an attempt to prevent suspended sediments from settling downstream. These ponds are somewhat effective at removing sediments and thus reducing downstream flooding during
most of the year; however, a majority of the flooding occurs during the winter when the ponds cannot be maintained (Kerwin, 2001).

**Water Quality**

Coal Creek and its tributaries are to be protected for the following designated uses: salmon spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WAC 173-210A-600). All streams that feed into lakes are protected for the designated uses of core summer salmonid habitat and extraordinary primary contact recreation (WAC 173-201A-600). Because Coal Creek feeds directly into Lake Washington, streams in this basin are also to be protected for core summer salmonid habitat and extraordinary primary contact recreation.

Coal Creek is listed on Ecology’s 303(d) list of impaired water bodies for elevated levels of fecal coliform in the lower reaches, within the project area (Ecology, 2005b). No TMDL studies have been performed on any waters within the Coal Creek basin.

**Coal Creek.** Ecology’s Water Quality Index rates Coal Creek as being of “high concern”. Over the past 25 years, temperature and fecal coliform levels have shown significant increases. However, TSS, pH, conductivity, and ortho-phosphorus concentrations have decreased significantly over this period, resulting in some improvement in overall water quality (King County, 2006c).

A water quality monitoring station is maintained by King County on Coal Creek near Coal Creek Parkway SE. Sampling data from the 2002, 2003, 2004, and 2005 water years are summarized in Table 5-10.

**Table 5-10. Summary of Water Quality Data Collected at the King County Monitoring Station on Coal Creek**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Coal Creek (Coal Creek Site 0442)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>10.7</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>10.9</td>
</tr>
<tr>
<td>pH</td>
<td>8</td>
</tr>
<tr>
<td>Fecal Coliform (CFU/100 mL)</td>
<td>90</td>
</tr>
<tr>
<td>Total Suspended Solids (mg/L)</td>
<td>2.05</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>3.6</td>
</tr>
<tr>
<td>Total Phosphorus (μg/L)</td>
<td>0.02725</td>
</tr>
<tr>
<td>Total Nitrogen (mg/L)</td>
<td>0.7665</td>
</tr>
</tbody>
</table>

Source: King County, 2006c
Groundwater
Sediments deposited along Coal Creek have created an unconfined alluvial aquifer throughout portions of the Coal Creek stream corridor. The depth to groundwater in these areas is generally about 15 feet below ground surface (WSDOT, 2006).

No Group A or Group B supply wells were identified in the Coal Creek basin within the project area (see Figure 5-5). Mapping of CARAs was not obtained for the Coal Creek basin; however, it is likely that areas of high groundwater recharge are present in the vicinity of Coal Creek (GeoEngineers, 2006). WPAs were not identified in the Coal Creek basin within the project area (see Figure 5-5).

5.1.5 Tibbetts Creek Basin

Surface Waters

Basin Characteristics
The Tibbetts Creek basin drains approximately 5.7 square miles from Cougar and Squak Mountains to the southern end of Lake Sammamish. The upper reaches of the basin flow down steep, forested grades with various cascades, entering a lower gradient, broad floodplain in the lower reaches. During significant flood events, this lower portion shares a common floodplain with Issaquah Creek, which is located east of the Tibbetts Creek basin (City of Issaquah, 2003; Williams et al., 1975).

The basin was historically impacted by mining activities and livestock, and continues to be impacted by suburban development (Ecology, 2004). Land uses consist mostly of open space and rural residences in the upper reaches, with more suburban residential and commercial uses in the lower reaches.

Tibbetts Creek is fed by numerous small streams draining off the east slope of Cougar Mountain and the west slope of Squak Mountain. Eight tributaries have been identified that the Preferred Alternative would cross, as follows: 08-0177; 08-0176; 08-0174; Unnamed Tributary; Clay Pit Creek (08-0172); West Fork Tibbetts Creek (08-0171); North Tributary (08-0169K); 08-0169L. The Green Route Alternative would be located entirely outside of the Tibbetts Creek basin.

Tibbetts Creek
Tibbetts Creek originates from springs and surface drainages on Squak Mountain at an elevation of 1,080 feet, flowing approximately 4.3 miles north to its mouth in the southwest end of Lake Sammamish (King County, 2006c; Williams et al., 1975). The stream banks consist of earth rock cuts and solid rock faces with shale-type slide areas. The mouths of most tributary streams contain falls and cascades. The lower 1.2 miles flow through an artificially channelized ditch through pastureland, with residences located between RM 1 and RM 2 (Williams et al., 1975).

King County maintained a stream gage (67a) near the mouth of Tibbetts Creek from 1987 to 1991. This gage was located downstream of the project area. Although the gage was in service for this 4-year period, data do not exist for a complete water year. During the entire period of record, the minimum discharge rate was 0.01 cfs in late September 1990, the maximum discharge rate was 170.65 cfs in April 1991, and the median discharge rate was 3.34 cfs.
Floodplains

King County-mapped 100-year floodplains are located along the lower reaches of Tibbetts Creek within the project area (Figure 5-2). Mapped floodways are located along Tibbetts Creek in the lower reaches (King County, 2006g).

Drainages in the Tibbetts Creek basin are high-energy streams in the upper reaches flowing down steep grades off of Cougar and Squak Mountains. High flows bring increased discharge volumes to the Tibbetts Creek Valley, leading to regular flooding problems in the City of Issaquah (City of Issaquah, 2001). Sediment deposition within the channel has reduced channel capacity, and resulted in increased flood problems in the lower reaches. Floods have particularly affected Tibbetts Valley Park, roads within the City of Issaquah, and private lands in the west end of Issaquah. These problems have been somewhat alleviated due to recent efforts by the City of Issaquah through the Tibbetts Creek Greenway Project (City of Issaquah, 2006c).

Water Quality

Tibbetts Creek and its tributaries are to be protected for the following designated uses: salmon spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WAC 173-210A-600). All streams that feed into lakes are protected for the designated uses of core summer salmonid habitat and extraordinary primary contact recreation (WAC 173-201A-600). Because Tibbetts Creek feeds directly into Lake Sammamish, streams in this basin are also to be protected for core summer salmonid habitat and extraordinary primary contact recreation. Tibbetts Creek is listed on Ecology’s 303(d) list of impaired water bodies for dissolved oxygen and elevated temperature in the lower reaches, downstream of the project area (Ecology, 2005b).

Tibbetts Creek was listed on Ecology’s 1998 303(d) list for fecal coliform; however, a TMDL study performed on fecal coliform in the Issaquah Creek basin also addressed levels in Tibbetts Creek (Ecology, 2000; Ecology, 2004). This TMDL was approved by the USEPA in October 2004. The 303(d) listing for fecal coliform has been removed in the current 2002/2004 list.

Tibbetts Creek. Water quality in Tibbetts Creek has been degraded by sedimentation due to disturbance in the basin. These disturbances, including the Cougar Mountain clay pit, two quarries, tailings from abandoned coal mines, and, more recently, construction activities in the lower basin, have resulted in high turbidity, TSS, and fecal coliform levels, and low dissolved oxygen concentrations (City of Issaquah, 2003). It is likely that these disturbances have also caused elevated nitrate and ammonia concentrations, and a buildup of sediments near the mouth of the creek. Ecology has rated Tibbetts Creek of “high concern” using the Water Quality Index (King County, 2006c).

King County maintains a water quality monitoring station on Tibbetts Creek near the mouth, downstream of the project area. Sampling data from the 2002, 2003, 2004, and 2005 water years are summarized in Table 5-11.
Table 5-11. Summary of Water Quality Data Collected at the King County Monitoring Station on Tibbetts Creek

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Tibbetts Creek (Tibbetts Creek Site X630)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>9.7</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>9.8</td>
</tr>
<tr>
<td>pH</td>
<td>7.15</td>
</tr>
<tr>
<td>Fecal Coliform (CFU/100 mL)</td>
<td>140</td>
</tr>
<tr>
<td>Total Suspended Solids (mg/L)</td>
<td>3.7</td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>4.08</td>
</tr>
<tr>
<td>Total Phosphorus (μg/L)</td>
<td>0.0397</td>
</tr>
<tr>
<td>Total Nitrogen (mg/L)</td>
<td>1.12</td>
</tr>
</tbody>
</table>

Source: King County, 2006c

Groundwater

The Issaquah Creek Valley Groundwater Management Area covers approximately 93 square miles south and east of Lake Sammamish, including the Tibbetts Creek basin. Groundwater supplies almost all of the water used for private, municipal, industrial, and agricultural purposes within the Groundwater Management Area (King County, 2006h).

One Group B supply well is located in the Tibbetts Creek basin within the project area, although no Group A wells were identified (see Figure 5-5). No WPAs in the Tibbetts Creek basin were identified within the project area.

Category 2 CARAs are located near the headwaters of Tibbetts Creek and along stream 08-0174. The Preferred Alternative would cross these CARAs along SR 900 (see Figure 5-4).

5.1.6 Mercer Slough Basin

Surface Waters

**Basin Characteristics**

The Mercer Slough basin drains approximately 17 square miles containing several tributaries that converge with Kelsey Creek before entering Mercer Slough. Mercer Slough is a large wetland area and channel along the east side of Lake Washington. Land uses in the basin consist primarily of residential and open space uses, with some commercial uses. The basin has become increasingly urbanized and is considered to have reached built-out conditions. Therefore, future development within the basin will mostly consist of the redevelopment of existing properties (Kerwin, 2001).
Kelsey Creek is the major waterway within this basin. The Kelsey Creek main stem originates from the Phantom Lake and Larsen Lake wetland. The northern basin headwaters drain to Valley Creek, which flows south from an area north of SR 520 to Kelsey Creek. The southern portion of the basin originates from Sunset Creek on the north slopes of Cougar Mountain and drains to Kelsey Creek (Kerwin, 2001).

The major tributaries in the basin include Kelsey Creek, Sturtevant Creek, Valley Creek, the West Tributary, Goff Creek, Richards Creek, East Creek, and Sunset Creek. Neither the Preferred Alternative nor the Green Route Alternative would cross any streams in the Mercer Slough basin. However, the Green Route Alternative would be located within the southern portion of the basin, and would parallel Sunset Creek for approximately 3,000 feet.

**Floodplains**

King County-mapped 100-year floodplains are located along Sunset Creek within the project area, along the north side of SE Newport Way (Figure 5-2). Floodways are not mapped in this basin within the project area (King County, 2006g).

No records of flooding problems were found associated with Mercer Slough or its tributaries within the project area.

**Water Quality**

Streams within the Mercer Slough basin are to be protected for the following designated uses: salmon spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WAC 173-210A-600). All streams that feed into lakes are protected for the designated uses of core summer salmonid habitat and extraordinary primary contact recreation (WAC 173-201A-600). Because Mercer Slough feeds directly into Lake Washington, it is also to be protected for core summer salmonid habitat and extraordinary primary contact recreation. As tributaries to Mercer Slough, Kelsey and Sunset Creeks are also protected for these uses. Mercer Slough is listed on Ecology’s 303(d) list of impaired water bodies for elevated levels of fecal coliform and temperature (Ecology, 2005b). Sunset Creek is not on the 303(d) list, although this may be due to a lack of adequate data (Ecology, 2005b). No TMDL studies have been performed on any waters within the Mercer Slough basin.

Water quality in Kelsey Creek has declined over the past 25 years due to increased water temperatures, nitrate-nitrogen, and conductivity; decreased dissolved oxygen; and pH. Improvements to Kelsey Creek water quality over this period include decreased TSS and orthophosphorus. According to Ecology’s Water Quality Index, water quality in Kelsey Creek has been rated as being of “high concern” (King County, 2006c).

**Groundwater**

No Group A wells, Group B wells, WPAs, or CARAs were identified in the Mercer Slough basin within the project area.
5.1.7 Preferred Alternative

Stormwater Drainage

Stormwater runoff generally collects from roadways along the Preferred Alternative and flows through a combination of open channel drainages and pipes prior to discharging to one of the four following receiving waters (see Figure 5-1): Big Soos Creek, Lower Cedar River, May Creek, or Tibbetts Creek. Few roadways along the Preferred Alternative provide water quality and/or quantity treatment for runoff. Most of the stormwater along the Preferred Alternative drains from impervious surfaces through artificial drainage features, although relatively natural stormwater drainage occurs in some of the cross-country sections. These areas include the section of the route between Jenkins Creek and SR 516, the cross-country option between 140th Way SE and SR 169, and areas along SR 900 that are not within the roadway. It is likely that precipitation in these areas drains by sheet flow or infiltrates the soil, eventually collecting in groundwater or entering nearby surface waters.

Watercourse Conditions within the Project Area

The Preferred Alternative would require 26 stream crossings (Figure 5-3). The streams would cross the alignment of the Preferred Alternative either in a culvert or in an open channel. Table 5-12 summarizes characteristics of these streams at the crossings.

<table>
<thead>
<tr>
<th>Sub-basin</th>
<th>Watercourse</th>
<th>Crossing Number</th>
<th>Number of Crossings</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenkins Creek</td>
<td>Jenkins Creek (09-0087)</td>
<td>R1a, R1b</td>
<td>1</td>
<td>Crossings would be similar for both possible crossings of Jenkins Creek. Jenkins Creek is an open channel at both possible crossing locations, with riparian wetland corridors. The crossings would use trenchless construction methods spanning the ordinary high water mark and wetland corridor.</td>
</tr>
<tr>
<td>Little Soos Creek</td>
<td>Little Soos Creek (09-0092)</td>
<td>R2</td>
<td>1</td>
<td>Little Soos Creek is an open channel at the crossing, which is located about 0.1 mile upstream of the confluence with Big Soos Creek. The crossing would use a trenchless construction method and span the ordinary high water mark and riparian wetlands.</td>
</tr>
<tr>
<td>Big Soos Creek</td>
<td>Unnamed Tributary</td>
<td>R3</td>
<td>1</td>
<td>This waterway would be crossed either above or below the existing concrete piped culvert under 160th Avenue SE.</td>
</tr>
<tr>
<td>Sub-basin</td>
<td>Watercourse</td>
<td>Crossing Number</td>
<td>Number of Crossings</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------------------------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>R4</td>
<td>1</td>
<td></td>
<td>This small drainage crosses the roadway in a corrugated polyethylene pipe (CPEP) culvert. This channel would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>R5</td>
<td>1</td>
<td></td>
<td>This waterway runs under 156th Avenue SE in a concrete pipe culvert. The crossing would be either above or below this culvert.</td>
</tr>
<tr>
<td>Unnamed Tributary (09-0094)</td>
<td>R6</td>
<td>1</td>
<td></td>
<td>This stream crosses 156th Avenue SE in a concrete culvert at SE 224th Street. This stream would be crossed either above or below this culvert.</td>
</tr>
<tr>
<td>Unnamed Tributary</td>
<td>R7</td>
<td>1</td>
<td></td>
<td>This stream crosses 156th Avenue SE in a corrugated metal pipe (CMP) culvert north of SE 234th Street. This stream would be crossed either above or below the culvert.</td>
</tr>
<tr>
<td>United Nations Creek</td>
<td>R8</td>
<td>1</td>
<td></td>
<td>This stream is conveyed under 148th Avenue SE in a CMP culvert. United Nations Creek would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Molasses Creek</td>
<td>R9</td>
<td>1</td>
<td></td>
<td>Molasses Creek crosses 140th Avenue SE in a CMP culvert. This stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Madsen Creek</td>
<td>R10</td>
<td>1</td>
<td></td>
<td>Madsen Creek crosses 149th Avenue SE in a concrete box culvert. This stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Lower Cedar River (Cedar Main Urban)</td>
<td>R11</td>
<td>1</td>
<td></td>
<td>The Cedar River is an open channel at the crossing, at the site of the removed Elliot Bridge. The crossing would use a trenchless construction method and span the ordinary high water mark.</td>
</tr>
<tr>
<td>Sub-basin</td>
<td>Watercourse</td>
<td>Crossing Number</td>
<td>Number of Crossings</td>
<td>Notes</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------</td>
<td>----------------</td>
<td>---------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Orting Hills</td>
<td>Stewart Creek (08-0307)</td>
<td>R12</td>
<td>1</td>
<td>Stewart Creek crosses SE Jones Road in a concrete box culvert. This stream would be crossed above or below the existing culvert.</td>
</tr>
<tr>
<td>May Creek</td>
<td>May Creek (08-0282)</td>
<td>R13</td>
<td>1</td>
<td>May Creek is an open channel at the crossing with a large floodplain-type wetland complex. The crossing would use a trenchless construction method spanning the ordinary high water mark and most of the riparian wetlands.</td>
</tr>
<tr>
<td></td>
<td>Unnamed (08-0294A)</td>
<td>R14</td>
<td>1</td>
<td>This stream crosses SR 900 in a piped culvert. The stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td></td>
<td>Wilderness Creek</td>
<td>R15</td>
<td>1</td>
<td>Wilderness Creek is conveyed across SR 900 in a culvert. The stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Tibbetts Creek</td>
<td>Tibbetts Creek (08-0169)</td>
<td>R16, R20, and R26</td>
<td>3</td>
<td>Tibbetts Creek would be crossed in three places using the following construction methods: (1) above or below an existing culvert under SR 900; (2) using an open-cut trench with streamside mitigation off the side of SR 900; (3) using an open-cut trench in conjunction with the construction of a new culvert by WSDOT on SR 900 near Newport Way NW.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary – (08-0177)</td>
<td>R17</td>
<td>1</td>
<td>This stream crosses SR 900 in a culvert. The stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary (08-0176)</td>
<td>R18</td>
<td>1</td>
<td>This stream crosses SR 900 in a culvert. The stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary (08-0174)</td>
<td>R19</td>
<td>1</td>
<td>08-0174 crosses SR 900 in a box culvert. The stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Sub-basin</td>
<td>Watercourse</td>
<td>Crossing Number</td>
<td>Number of Crossings</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
<td>-----------------</td>
<td>--------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary R21</td>
<td>R21</td>
<td>1</td>
<td>This stream crosses SR 900 in a culvert. The stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td></td>
<td>Clay Pit Creek (08-0172)</td>
<td>R22</td>
<td>1</td>
<td>Clay Pit Creek crosses SR 900 in a concrete box culvert. This stream would likely be crossed during dry channel conditions using an open-cut trench. The crossing may coincide with WSDOT’s replacement of this culvert.</td>
</tr>
<tr>
<td></td>
<td>West Fork Tibbetts Creek (08-0171)</td>
<td>R23</td>
<td>1</td>
<td>West Fork Tibbetts Creek crosses SR 900 in a concrete box culvert. This stream would likely be crossed during dry channel conditions using an open-cut trench. This crossing would occur in conjunction with WSDOT’s replacement of the existing culvert.</td>
</tr>
<tr>
<td></td>
<td>North Tributary (08-0169K)</td>
<td>R24</td>
<td>1</td>
<td>This stream crosses SR 900 in a culvert. This stream would be crossed either above or below the culvert.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary (08-0169L)</td>
<td>R25</td>
<td>1</td>
<td>08-0169L is conveyed across SR 900 in a culvert. The crossing would occur either above or below the existing culvert.</td>
</tr>
</tbody>
</table>
5.1.8 Green Route Alternative

Stormwater Drainage
Stormwater runoff from roadways associated with the Green Route Alternative generally collects and flows through a combination of open channel drainages and pipes. Few roadways along the Green Route Alternative provide water quality and/or quantity treatment for runoff. Stormwater ultimately drains to one of the five following major receiving waters (see Figure 5-1): Big Soos Creek, Lower Cedar River, May Creek, Coal Creek, or Mercer Slough. A large majority of runoff along the Green Route Alternative drains from impervious surfaces through artificial drainages. It is likely that precipitation in the cross-country option between 140th Way SE and SR 169 drains by sheet flow or infiltrates the soil, eventually collecting in groundwater or entering wetlands or the Cedar River.

Watercourse Conditions within the Project Area
The Green Route Alternative would cross 19 streams (Figure 5-3). Characteristics of these streams at the crossings are summarized in Table 5-13.

<table>
<thead>
<tr>
<th>Sub-basin</th>
<th>Watercourse</th>
<th>Crossing Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soosette Creek</td>
<td>Westside Soos Creek (09-0075)</td>
<td>G1</td>
<td>Westside Soos Creek crosses 132nd Avenue SE in a CMP culvert. This stream would be crossed either above or below the culvert.</td>
</tr>
<tr>
<td></td>
<td>Soosette Creek (09-0073)</td>
<td>G2</td>
<td>Soosette Creek is conveyed under 132nd Avenue SE via a concrete box culvert. This stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary</td>
<td>G3</td>
<td>This stream crosses 132nd Avenue SE in a piped culvert. This stream would be crossed either above or below the culvert.</td>
</tr>
<tr>
<td>Lake Meridian</td>
<td>Unnamed Tributary (09-0091)</td>
<td>G4</td>
<td>This drainage crosses 132nd Avenue SE in a smooth-wall steel culvert. The drainage would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Meridian Valley Creek</td>
<td>Unnamed Tributary</td>
<td>G5</td>
<td>This stream is conveyed across 132nd Avenue SE in a CMP culvert. The stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td></td>
<td>Meridian Valley Creek</td>
<td>G6</td>
<td>Meridian Valley Creek crosses 132nd Avenue SE in a box culvert. This stream would be crossed using a trenchless construction method spanning the ordinary high water mark and riparian wetlands.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary</td>
<td>G7</td>
<td>This drainage is conveyed under 132nd Avenue SE in a piped culvert. This waterway would be crossed either under or over the existing culvert.</td>
</tr>
<tr>
<td>Sub-basin</td>
<td>Watercourse</td>
<td>Crossing Number</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-----------------</td>
<td>-------</td>
</tr>
<tr>
<td>Big Soos</td>
<td>Big Soos Creek (09-0072)</td>
<td>G8</td>
<td>Big Soos Creek crosses under a bridge on SE 208th Street. The creek would be crossed using a trenchless construction method spanning the ordinary high water mark and riparian wetlands.</td>
</tr>
<tr>
<td></td>
<td>United Nations Creek</td>
<td>G9</td>
<td>United Nations Creek crosses 140th Avenue SE via one large CMP and two smaller culverts. This stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Molasses Creek</td>
<td>Molasses Creek (08-0304)</td>
<td>G10</td>
<td>Molasses Creek crosses 140th Avenue SE in a CMP culvert. This stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Madsen Creek</td>
<td>Madsen Creek (08-0305)</td>
<td>G11</td>
<td>Madsen Creek crosses 149th Avenue SE in a concrete box culvert. This stream would be crossed either above or below the existing culvert.</td>
</tr>
<tr>
<td>Lower Cedar River (Cedar Main Urban)</td>
<td>Cedar River (08-0299)</td>
<td>G12</td>
<td>The Cedar River is an open channel at the crossing, at the site of the removed Elliot Bridge. The crossing would use a trenchless construction method and span the ordinary high water mark.</td>
</tr>
<tr>
<td>Orting Hills</td>
<td>Stewart Creek (08-0307)</td>
<td>G13</td>
<td>Stewart Creek crosses SE Jones Road in a concrete box culvert. This stream would be crossed above the existing culvert.</td>
</tr>
<tr>
<td>May Creek</td>
<td>May Creek (08-0282)</td>
<td>G14</td>
<td>May Creek is an open channel at the crossing with a large floodplain-type wetland complex. The crossing would use a trenchless construction method spanning the ordinary high water mark and most of the riparian wetlands.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary (08-0287E)</td>
<td>G15</td>
<td>This stream is conveyed across SE May Valley Road in a culvert. The stream would be crossed above or below the culvert.</td>
</tr>
<tr>
<td></td>
<td>Unnamed Tributary to Lake Boren</td>
<td>G16</td>
<td>This unnamed stream crosses Coal Creek Parkway SE in a culvert. The stream would be crossed above or below the culvert.</td>
</tr>
<tr>
<td></td>
<td>China Creek (08-0287)</td>
<td>G17</td>
<td>China Creek would be crossed outside of the road prism in an open channel using one of two possible crossing methods: (1) an open-cut trench with stream mitigation, including removal of a concrete flume on the west side of Coal Creek Parkway SE; or (2) a trenchless crossing on the east side of Coal Creek Parkway SE.</td>
</tr>
</tbody>
</table>
5.2 Environmental Impacts

5.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to water.

5.2.2 Preferred Alternative

Direct Impacts - Construction

Drainage and Surface Water
Clearing, grading, excavating, soil stockpiling, and other construction activities that would temporarily remove vegetation from the project area or reduce soil stability could increase velocities and volumes of runoff from these disturbed areas. These construction activities associated with the Preferred Alternative could cause short-term adverse impacts to surface waters by increasing erosion and runoff volumes (for estimated areas of clearing and excavation quantities, see Chapter 3). Runoff during construction would likely be collected and disposed of through the use of culverts, ditching, or pumping. Furthermore, flooding could result from sedimentation within the drainage systems and receiving waters. These temporary impacts would be avoided or minimized by implementing standard construction Best Management Practices (BMPs) (see the mitigation measures in Section 5.3.2).

Impervious surfaces can increase stormwater runoff volumes and velocities, prevent infiltration, and increase pollutant loads to receiving waters. Construction of the rechlorination facility could result in a net increase of up to one-half acre of impervious surface. The details of the on-site stormwater management system would be determined during final design of the facility.

Potential water quality impacts at stream crossings are discussed in the Water Quality section below.

Floodplains
Impacts to floods and floodplains from erosion and sedimentation during construction would not be anticipated due to preventive measures discussed in Section 5.3.2.
Water Quality

Short-term erosion impacts could occur during clearing and grading. Stormwater runoff could erode soils exposed during construction, potentially resulting in increased sediment quantities entering the drainage systems and receiving waters. Erosion could also occur as a result of surface water runoff along haul routes. Very fine soil particles, such as clays, could be carried relatively long distances and result in poor water clarity in receiving waters. Erosion control measures would be designed in accordance with the King County *Surface Water Design Manual* (King County, 2005b) to capture and treat stormwater exiting the construction site.

Water discharged from dewatering wells would be tested and treated prior to discharge to surface watercourses. Typically, once wells are developed, the discharge water is clear and can be discharged directly to surface drainage courses.

Fuel, hydraulic lubricants, and engine coolant could spill from construction equipment and vehicles. Any spills could degrade receiving surface waters and groundwater. Also, the potential exists for encountering contaminated soils or groundwater, or breaking municipal utilities during excavation (see Chapter 11).

The potential water quality impacts to the receiving waters within the Preferred Alternative project area during construction could include an increase in phosphorus loading from eroding soils that have been hydroseeded, the increased risk of spills of chemicals associated with construction activities, and the potential for sediment deposition within stream or river beds.

Large-diameter pipelines are typically disinfected to kill bacteria and viruses for sanitation purposes before placing them in service. Disinfection would occur using the “slug” process, by which concentrated chlorinated water (typically about 100 parts per million [ppm]) is pushed through the pipeline by potable water meeting drinking water standards. The “slug” of chlorinated water would be discharged from the end of the pipeline during the disinfection process. The “slug” would discharge directly to a sanitary sewer, or would be dechlorinated and treated to safe levels established by Ecology water quality standards before discharging to a stormwater system. Water discharged to a stormwater system during the disinfection process would be controlled. An analysis of the capacity of the surface or storm drainage system receiving discharges would be performed to assess potential impacts. Discharge rates would be monitored to avoid exceeding the receiving watercourse capacity.

The Preferred Alternative would require 26 stream crossings, as opposed to the 19 stream crossings associated with the Green Route Alternative (see Figure 5-3). Each stream crossing poses a potential risk to water quality, such as sedimentation in the stream channel. Therefore, the Preferred Alternative has a higher potential to affect water quality during construction. Construction impacts associated with specific stream crossing types are discussed below.

**Stream Crossings – Trenchless Construction.** Table 5-12 identifies the crossing method for each stream that would be crossed by the Preferred Alternative. As discussed in Appendix D, a trenchless construction method would consist of either a jack-and-bore or microtunnel crossing. Both of these methodologies avoid in-stream work; therefore, they avoid significant water quality impacts such as increasing turbidity levels and direct contaminant spills to surface waters. Appropriate setbacks of launching and receiving pits and erosion control would further minimize impacts from construction occurring outside of these watercourses.
Appropriate scour analysis would be performed for each trenchless waterway crossing to estimate the maximum depth of scour. The pipeline would be located at least 10 feet below the maximum scour depth.

Although not anticipated, trenchless construction could cause a break or collapse of the stream channel. If the pipeline was not located at a great enough depth, or if soft alluvial soils were encountered, damage to the creek could occur. Jack-and-bore construction would have a greater risk of a break or collapse due to the open pipe casing at the front of the bore. Soft soils could enter and flow through the casing through the open front, potentially resulting in damage to the stream channel and water quality. A microtunnel construction method would reduce this potential because of the closed face of the cutting head. Engineering studies would be performed prior to construction to minimize this potential and to ensure a safe depth for pipe placement.

Stream Crossings – Under/Over Existing Culverts. Crossings that would take place under or over existing culverts are identified in Table 5-12. These crossing techniques would avoid in-water work; therefore, they would avoid related water quality impacts. Erosion control would further minimize impacts from construction occurring outside of these watercourses.

Generally, about 12 inches of clearance would be left between the pipeline and the existing culvert. During construction, the top or bottom of the culvert would be exposed, and then backfilled once the pipeline was installed. Ground-moving activities in close proximity to these waterways pose the threat of sedimentation, although these threats would be mitigated by appropriate BMPs.

Temporary impacts to water quality would be controlled by mitigation measures (see the mitigation measures described in Section 5.3.2).

Stream Crossings – Open-Cut Trench. Open-cut trench crossings are identified in Table 5-12. This crossing technique would require a temporary diversion and bypass of the stream during a period of low flow to allow for dry conditions in the stream channel. Diversion of surface water would involve a temporary cofferdam and flow bypass culvert or pumping. The flow would re-enter the channel downstream of the construction work area.

The pipe would be installed using an open trench through the dry stream channel. Trench depths would range from 10 to 12 feet, allowing the pipe to be 6 to 8 feet below the streambed. Excavated materials would be temporarily stockpiled in adjacent upland areas above ordinary high water. The pipe would be bedded in control density fill (CDF), as appropriate. Following pipeline installation, the trench would be backfilled with native streambed material above the pipe zone to preconstruction contours and the stream bank would be re-planted with suitable native riparian vegetation.

Because this method requires work within the stream channel, there would be an increased risk of sediment loading into the waterway. This could result in increased turbidity and TSS. There would also be an increased risk of hazardous materials spills directly into the stream. Potential impacts would be mitigated by implementing the control measures discussed in Section 5.3.2.

Groundwater

Shallow groundwater could be encountered along the Preferred Alternative during construction, especially in the vicinity of Jenkins Creek, Little Soos Creek, Big Soos Creek, Cedar River, May Creek, and Tibbetts Creek, and in the lowlands adjacent to these drainages (GeoEngineers,
Groundwater recharge rates are high in all of these locations (see Figure 5-4). Therefore, impacts on groundwater levels in these areas, if they were to occur, would be localized and temporary. Construction dewatering is typically accomplished by pumping from wells or vacuum well points to lower groundwater in moderate to high permeability soils. Low conductivity glacial till soils and limited areas of low conductivity lacustrine deposits and bedrock would likely be encountered during excavation of most of the remaining alignment. Minimal or no construction dewatering would be necessary at these locations. If shallow groundwater is encountered, dewatering would occur using low flow pumping from shallow sumps. Exact quantities of groundwater withdrawal cannot be accurately approximated at this phase of project design. Dewatering systems used for construction would be removed after construction was completed.

Two to four deep wells (200 to 400 feet deep) would be installed in the pipeline right-of-way for the cathodic protection system. Per federal, state, and local jurisdiction requirements, the well casing would be installed to prevent surface water intrusion into the groundwater (e.g., aquifers).

Construction activities would be limited to within the pipeline right-of-way. The pipeline trench backfill and roadway restoration materials would be compacted using hoe pacs and vibratory roller-type equipment. The travel of vibrations from this equipment would be limited to a few feet from the applied force. Vibratory impacts on adjacent wells would not be anticipated.

Accidental spills associated with construction could occur. Groundwater resources could become contaminated depending on the location of the spill and subsequent spill pathway. Management of such a spill would be addressed in a Spill Prevention Control and Countermeasures (SPCC) Plan.

Direct Impacts - Operation

Drainage and Surface Water
Approximately 65 blowoff or drain valves would be located along the Preferred Alternative. These valves would be used only to drain water from the pipe to allow for pipeline maintenance. Control valves would be used to regulate flows at blowoff locations in combination with flow diffusers (energy dissipaters) to prevent erosion and turbidity at points of discharge. Water would discharge directly to a sanitary sewer, or, following appropriate treatment, to a storm drain or natural water body. Draining of the pipeline to storm drains or water bodies could potentially increase flows within receiving waters. Use of control valves and flow diffusers would minimize the rate of discharge. Discharge rates would be monitored to avoid exceeding the receiving watercourse capacity.

In the unlikely event of a break in the pipeline, large volumes of water could potentially discharge from the pipe. Volume of discharge would depend on the location, pressure, and size of the breach; volumes would be higher in the northern portions of the Preferred Alternative than in the southern portions because water would flow north via gravity within the pipeline. Discharge could alter drainage patterns and result in increased flows within receiving waters. Sound design, construction, and materials would make this occurrence extremely unlikely. The pipeline would be designed in accordance with the latest design codes and standards utilizing adequate factors of safety. The Preferred Alternative would have systems to monitor flows and pressures. Cascade would evaluate appropriate valve controls to minimize loss of water under a pipeline breach condition. A breach of the pipeline would not be anticipated and would likely result only from non-permitted, unrelated excavation along the pipeline, a high magnitude earthquake, or
other unpredictable catastrophic events. Operation procedures would be developed and documented in an Operations Plan for normal and emergency operation.

**Floodplains**

The completed project would result in a buried water pipe located within the 100-year floodplain of Jenkins Creek, Little Soos Creek, Big Soos Creek, Cedar River, May Creek, North Fork May Creek, and Tibbetts Creek (see Figure 5-2). The areas within the Jenkins Creek and Little Soos Creek floodplains are mostly vegetated riparian corridor. An existing road (SR 516) is located within the Big Soos Creek floodplain near the Preferred Alternative. The Cedar River Trail, Ron Regis Park, and existing roadways are present within the Cedar River floodplain near the Preferred Alternative. An existing road (SR 900) and agricultural lands are located near the crossing of the May Creek floodplain. SR 900 is also present in the area within the Tibbetts Creek floodplain where the pipeline would be located. If disturbed, surfaces within these floodplains would be restored to original contours following pipe installation. Therefore, operation of the Preferred Alternative would not affect flooding or floodplains.

**Water Quality**

Impervious surfaces can contribute pollutants such as nutrients (forms of phosphorus and nitrogen that act as plant growth stimulants); suspended sediments (sediments typically consisting of sand, silts, and clays); toxic metals (lead, copper, zinc, cadmium, chromium); biochemical oxygen demand (a measure of the tendency of polluted water to consume life-supporting oxygen supplies); and oil and grease to receiving waters.

As previously mentioned, blowoff valves would be used only to drain water from the pipe to allow for pipeline maintenance. This discharge would consist of treated, potable water and would contain safe concentrations of chlorine that meet Ecology standards. Blowoff valves would be located at all low point elevations along the pipeline profile and on the upstream side of isolation valves. This water would discharge into the local sanitary sewer, where available.

The discharged potable water would be dechlorinated and treated to meet Ecology water quality standards prior to entering any natural drainage system. Water discharged to a stormwater system during normal operations would be controlled. The water would be tested for chlorine residual, dechlorinated, and treated, if necessary, to safe levels established by Ecology water quality standards before discharging to stormwater systems. Control valves would be used to regulate flows at blowoff or drain locations in combination with flow diffusers (energy dissipaters) to prevent erosion and turbidity at points of discharge. An analysis of the capacity of the surface drainage system or storm drainage system receiving discharges would be performed to assess potential impacts. Discharge rates would be monitored to avoid exceeding the receiving watercourse capacity.

Suspended sediment could settle out of the water in the pipeline. Several approaches could be implemented to manage the sediments before the water reached connections to members'
systems. Periodic flushing is one option that could be used as part of the sediment management process. Flushing would involve the discharge of water from the pipeline via a blowoff valve to drain sediments. If the flushing approach was used, water discharged from the pipe would drain directly to a local sanitary sewer or receive treatment before draining to a storm drain or natural water body. If water were discharged to a storm drain or natural water body, discharge rates would be controlled and monitored to meet regulatory requirements.

**Groundwater**

Typical pipeline bedding and backfill material within the roadway prism would be free-draining, granular materials, and would not be expected to alter groundwater hydrology during project operation. Trench dams would be selectively installed to prevent groundwater flow along the pipeline trench. Trench dams would prevent the permeable pipe bedding and backfill from acting like a drain, thus preventing alteration of groundwater flows during project operation. If the confining impermeable layer underlying an adjacent wetland was disturbed during pipeline installation, the impermeable layer would be restored to ensure long-term wetland integrity. With these control measures, operation of the Preferred Alternative would not affect groundwater hydrology.

Operation of the rechlorination facility would involve the use of sodium hypochlorite, commonly referred to as a form of household bleach, to increase chlorine concentrations in the pipeline. Sodium hypochlorite solution would be generated onsite, as needed. Because of this as-needed generation, a spill, although not anticipated, would involve only a very small quantity of a dilute solution that would not contaminate local groundwater. Safety measures and appropriate design of the facility would considerably reduce the risk of a spill.

The risk of a breach or pipeline failure would be very small. The pipeline would be designed in accordance with the latest design codes and standards utilizing factors of safety. The Preferred Alternative would have systems to monitor flows and pressures. Cascade would evaluate appropriate valve controls to minimize loss of water under a pipeline breach condition. A breach of the pipeline would not be anticipated and would likely result only from non-permitted, unrelated excavation along the pipeline, a high magnitude earthquake, or other unpredictable catastrophic events. Operation procedures would be developed and documented in an Operations Plan for normal and emergency operation.

Operation of the cathodic protection system would not affect groundwater.

**Indirect Impacts - Construction**

**Drainage and Surface Water**

Direct temporary impacts to surface water drainage would be minor and would be unlikely to result in indirect effects.

**Floodplains**

Construction of the Preferred Alternative would not directly affect flooding or floodplains. Therefore, no indirect impacts to flooding or floodplains would occur.

**Water Quality**

While direct water quality impacts associated with construction of the Preferred Alternative would be minor, any negative impacts to receiving surface water bodies could result in indirect
ecosystem health impacts. For example, increased sediment loads could settle in salmonid spawning gravels, thus degrading habitat.

**Groundwater**

Although not anticipated, if an accidental spill were to occur during construction, contamination of groundwater resources could result. Due to the proximities of drinking water wells and other groundwater resources, contamination could reach human drinking water supplies, resulting in indirect impacts to human health. Contamination of groundwater as a result of an accidental spill would be unlikely with the implementation of control measures. Control measures and spill management would be addressed in the SPCC Plan.

**Indirect Impacts - Operation**

**Drainage and Surface Water**

The Preferred Alternative would not permanently alter drainage patterns. Therefore, no indirect impacts would be expected from project operation.

**Floodplains**

Because affected floodplains would be restored to original contours following construction, operation of the Preferred Alternative would not cause indirect impacts related to flooding or floodplains.

**Water Quality**

Operation of the Preferred Alternative would not be expected to result in direct water quality impacts. Therefore, no indirect impacts would be anticipated.

**Groundwater**

Although not anticipated and extremely unlikely, a breach of the pipeline could occur during project operations, resulting in seepage of chlorine-treated water into soils and groundwater. Due to the high reactivity of chlorine, it is not likely to enter groundwater. If chlorine reacts with groundwater, it can stay in solution for extended periods. Further, when chlorine reacts with organic molecules, disinfection byproducts (DBPs) such as trihalomethanes and haloacetic acids can form. Studies have shown that high doses of several DBPs can cause cancer and undesirable growth and reproductive effects on laboratory animals. If a rupture leaked water into a groundwater supply well, exposure to DBPs by groundwater consumers would be of low dosage. No conclusive studies have shown a positive relationship between low dosage, long-term exposure and negative human health effects (DOH, 2004). Wellhead protection zones and water supply wells within the vicinity of the Preferred Alternative are shown in Figure 5-5. A breach of the pipeline is not anticipated and would likely result only from non-permitted, unrelated excavation along the pipeline, a high magnitude earthquake, or other unpredictable catastrophic events. The pipeline would be buried with a minimum of 4 feet of cover, and below most utilities, making it less vulnerable to dig-ups.

**Cumulative Impacts**

**Drainage and Surface Water**

The project area has been urbanizing rapidly over the past few decades, and continues to do so. Urban development has resulted in extensive changes to drainage networks, including vegetation removal, creation of impervious surfaces, ditch excavation, and conveyance of
drainages through culverts. Surface waters within the Soos Creek, Lower Cedar River, May Creek, and Tibbetts Creek basins would not be significantly modified by the Preferred Alternative; therefore, the Preferred Alternative would not have significant cumulative impacts.

**Floodplains**
The Preferred Alternative would restore affected floodplains to original contours following construction. Therefore, no cumulative impacts would be expected due to construction of the Preferred Alternative.

**Water Quality**
Potential impacts of the Preferred Alternative would be infrequent or unlikely, and would be controlled if they were to occur. Therefore, the Preferred Alternative would not contribute to cumulative impacts to water quality.

**Groundwater**
Impacts to groundwater would be unlikely or minimal. The Preferred Alternative would use appropriate control measures to prevent impacts to groundwater. Therefore, no cumulative impacts to groundwater would be expected.

### 5.2.3 Green Route Alternative

**Direct Impacts - Construction**

**Drainage and Surface Water**
As with the Preferred Alternative, Green Route Alternative construction impacts to surface water and drainage would be associated with clearing, grading, excavation, soil stockpiling, and other construction activities that would remove vegetation from the project area or reduce soil stability. These activities could increase velocities and volumes of runoff from these disturbed areas (see Section 5.2.2). See Chapter 3 for estimated areas of clearing and excavation quantities.

Potential water quality impacts at stream crossings are discussed in the Water Quality section below.

**Floodplains**
Impacts to floods and floodplains from erosion and sedimentation during construction would not be anticipated due to the mitigation measures discussed in Section 5.3.3.

**Water Quality**
Construction of the Green Route Alternative would result in impacts to water quality similar to those generally associated with construction of the Preferred Alternative (see Section 5.2.2). However, because 19 stream crossings would be associated with the Green Route Alternative, as opposed to the 26 stream crossings associated with the Preferred Alternative (see Figure 5-3), a lower potential

![Westside Soos Creek near 132nd Avenue SE](image)
exists to affect water quality during construction of the Green Route Alternative. Each stream crossing poses a potential risk to water quality, such as sedimentation in the stream channel. Construction impacts associated with specific stream crossing types are discussed below.

**Stream Crossings – Trenchless Construction.** Table 5-13 identifies the streams that would be crossed by the Green Route Alternative using a trenchless construction method. As discussed in Appendix D, a trenchless construction method would consist of either a jack-and-bore or microtunnel crossing. Potential impacts of these crossings would be generally similar to those associated with the Preferred Alternative, as discussed in Section 5.2.2.

**Stream Crossings – Under/Over Existing Culverts.** Potential crossings under or over existing culverts are identified in Table 5-13. These crossing techniques would avoid in-water work; therefore, they would avoid related water quality impacts. Erosion control would further minimize impacts from construction occurring outside of these watercourses. Potential impacts of these crossings would be generally similar to those associated with the Preferred Alternative, as discussed in Section 5.2.2.

**Stream Crossings – Open-Cut Trench.** Table 5-13 identifies streams that would be crossed using an open-cut trench. These crossings would require a temporary diversion and bypass of the stream during a period of low flow to allow for dry conditions in the stream channel. The pipe would be installed using an open trench through the dry stream channel. Impacts to water quality would be similar to those associated with the Preferred Alternative (see Section 5.2.2).

**Groundwater**

Shallow groundwater could be encountered along the Green Route Alternative during construction, especially in the vicinity of Big Soos Creek, United Nations Creek, May Creek, Coal Creek, and in the lowlands adjacent to these drainages (GeoEngineers, 2005; GeoEngineers, 2006). Groundwater recharge rates are high in all of these locations (see Figure 5-4). Although groundwater recharge for the northern section of the Green Route Alternative has not been mapped, it is expected that the vicinity of Coal Creek is also an area of high groundwater recharge (GeoEngineers, 2006). Therefore, impacts to groundwater levels in these areas, if they were to occur, would be localized and temporary. Construction dewatering is typically accomplished by pumping from wells and vacuum well points to lower groundwater in moderate to high permeability soils. Low conductivity glacial till soils and limited areas of low conductivity lacustrine deposits and bedrock would likely be encountered during excavation of most of the remaining alignment. Minimal or no construction dewatering would be necessary at these locations. If shallow groundwater was encountered, dewatering would occur using low flow pumping from shallow sumps. Exact quantities of groundwater withdrawal cannot be accurately estimated at this phase of project design. Dewatering systems used for construction would be removed after construction was completed.

Two to four deep wells (200 to 400 feet deep) would be installed in the pipeline right-of-way for the cathodic protection system. Per federal, state, and local jurisdiction requirements, the well casing would be installed to prevent surface water intrusion into the groundwater (e.g., aquifers).

Construction activities would be limited to within the pipeline right-of-way. The pipeline trench backfill and roadway restoration materials would be compacted using hoe pacs and vibratory roller-type equipment. The travel of vibrations from this equipment would be limited to a few feet from the applied force. Vibratory impacts on adjacent wells would not be anticipated.
Accidental spills associated with construction could occur. Groundwater resources could become contaminated depending on the location of the spill and subsequent spill pathway. Management of such a spill would be addressed in an SPCC Plan.

**Direct Impacts - Operation**

**Drainage and Surface Water**
The impacts of operation for the Green Route Alternative on drainage and surface water would be generally similar to those of the Preferred Alternative (see Section 5.2.2)

**Floodplains**
The completed project would result in a buried water pipe located within the 100-year floodplain of Big Soos Creek, Cedar River, May Creek, and Coal Creek (see Figure 5-2). An existing roadway (SE 208th Street) is present within the Big Soos Creek floodplain at the crossing. The Cedar River Trail, Ron Regis Park, and existing roadways are present within the Cedar River floodplain near the Preferred Alternative. Existing roads are also located at the crossing of the May Creek floodplain (148th Avenue SE and SE May Valley Road) and the Coal Creek floodplain (Coal Creek Parkway SE). If disturbed, surfaces within these floodplains would be restored following pipe installation. Operation of the Green Route Alternative would not be expected to affect flooding or floodplains.

**Water Quality**
The impacts to water quality from operation of the Green Route Alternative would be generally similar to those of the Preferred Alternative (see Section 5.2.2).

**Groundwater**
The impacts to groundwater from operation of the Green Route Alternative would be generally similar to those associated with the Preferred Alternative (see Section 5.2.2).

**Indirect Impacts - Construction**

**Drainage and Surface Water**
Direct temporary impacts to surface water drainage would be minor and not likely to result in indirect impacts.

**Floodplains**
Construction of the Green Route Alternative would not directly affect flooding or floodplains. Therefore, no indirect impacts to flooding or floodplains would occur.

**Water Quality**
Direct water quality impacts associated with construction of the Green Route Alternative would be minor. However, any potential negative impacts on receiving surface water bodies could result in indirect ecosystem health impacts. For example, increased sediment loads could increase turbidity in streams, thus affecting salmonid foraging.

**Groundwater**
Although not anticipated, if an accidental spill were to occur during construction, contamination of groundwater resources could result. Due to the proximities of drinking water wells and other
groundwater resources, contamination could reach human drinking water supplies, resulting in indirect impacts to human health. Contamination of groundwater as a result of an accidental spill would be unlikely with the implementation of control measures. Control measures and spill management would be addressed in the SPCC Plan.

**Indirect Impacts - Operation**

**Drainage and Surface Water**
The Green Route Alternative would not permanently alter drainage patterns. Therefore, no indirect impacts would be anticipated from project operation.

**Floodplains**
Operation of the Green Route Alternative would have no indirect impacts to flooding or floodplains.

**Water Quality**
Operation of the Green Route Alternative would not be expected to result in direct water quality impacts. Therefore, no indirect impacts would occur.

**Groundwater**
Indirect groundwater impacts of the Green Route Alternative would be generally similar to those associated with the Preferred Alternative (see Section 5.2.2).

**Cumulative Impacts**

**Drainage and Surface Water**
The Green Route Alternative would not be expected to modify drainage systems or surface waters within the Soos Creek, Lower Cedar River, May Creek, Coal Creek, or Mercer Slough basins; therefore, it would not have cumulative impacts.

**Floodplains**
The Green Route Alternative would restore affected floodplains to original contours following construction. Therefore, no cumulative impacts would be expected.

**Water Quality**
Potential impacts of the Green Route Alternative on water quality would be infrequent or unlikely, and would be controlled if they were to occur. Therefore, the Green Route Alternative would not contribute to cumulative impacts to water quality.

**Groundwater**
Impacts to groundwater would be unlikely or minimal. The Green Route Alternative would use appropriate control measures to prevent impacts to groundwater. Therefore, no cumulative impacts to groundwater would occur.
5.3 Mitigation Measures

5.3.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

5.3.2 Preferred Alternative

The measures described below would be implemented to minimize impacts to water resources.

Construction

- Using trenchless construction wherever feasible to avoid any disturbance in the waterways.

- Limiting construction to practical minimum construction corridors through sensitive areas to lessen temporary impacts.

- Developing, implementing, and maintaining an ESC Plan to address erosion control during and after construction (including directing runoff away from unstabilized soils, slowing runoff with structures, and installing silt fencing to catch particulates). ESC measures would be designed in accordance with the King County Surface Water Design Manual (King County, 2005b). The ESC Plan would be a component of contract documents.

- Using erosion control BMPs (e.g., straw mulch, fabric, erosion and sedimentation control (ESC) matting for temporary erosion control of areas such as stockpiles during construction. Stabilizing exposed soils with a vegetative cover or other erosion control treatment (e.g., straw mulch, fabric, ESC matting) immediately following construction.

- Including contractor qualifications and performance requirements for ESC measures in the specifications. ESC Plans with BMPs designed in accordance with code requirements would be included in the contract documents submitted for review and approval to all permit jurisdictions. The contractor’s installation and maintenance of the ESC measures would be inspected and monitored throughout construction of the project. The use of an independent environmental monitor would be considered by Cascade.

- Inspecting and monitoring of the ESC measures would be performed to meet or exceed established regulatory requirements. Sampling of runoff discharged from temporary sediment ponds and traps would be performed at or exceeding required frequencies. The method of sampling would be determined by Cascade.

- Developing, implementing, and maintaining a Stormwater Pollution Prevention Plan (SWPPP) to minimize erosion and sediments from rainfall runoff at construction sites, and to reduce, eliminate, and prevent the pollution of stormwater.

- Developing an SPCC Plan to manage toxic materials associated with construction activities (equipment leaks, disposal of oily wastes, cleanup of any spills, storing petroleum products/chemicals in contained areas away from streams, ponds, and wetlands).

- Installing trench dams where necessary to prevent groundwater from flowing along the pipeline trench, altering groundwater hydrology. Trench dams would prevent the permeable pipe bedding and backfill from acting like a drain.
• Restoring the impermeable confining layer underlying a wetland to ensure its integrity if the wetland were disturbed during construction activities.

• Installing the well casings of deep water wells to prevent surface water intrusion into the groundwater (e.g., aquifers).

**Operation**
Chlorinated water from blowoff valve operation would discharge into a local sanitary sewer, where available. If discharge to the storm drainage system or other surface drainage was unavoidable, the water would be dechlorinated to safe levels established by Ecology prior to discharging to storm drainage systems. The method of dechlorination would be determined in later stages of the project.

If flushing were to occur to manage sediments in the pipeline, discharged water would either drain directly to a local sanitary sewer or receive treatment before discharging to a storm drain or natural water body.

5.3.3 **Green Route Alternative**
Mitigation measures for the Green Route Alternative would be similar to those for the Preferred Alternative.

5.4 **Significant Unavoidable Adverse Impacts**
None of the potential project-related impacts to water resources are considered to be significant unavoidable adverse impacts.
Figure 5-1. Drainage Sub-basins
Figure 5-2. Floodplains
Figure 5-3. Waterways
Figure 5-4. Groundwater Recharge
Figure 5-5. Groundwater - Drinking Water Resources
Chapter 6: Animals

This chapter focuses on the potential environmental impacts to fish and wildlife species and their habitats. Evaluation of fisheries and wildlife along the Preferred Alternative and the Green Route Alternative was based on field reconnaissance and review of existing documents. Field reconnaissance was conducted from road rights-of-way and public access areas. Creek conditions (e.g., open channel or culvert) were confirmed immediately upstream and downstream of the each action alternative route. Existing documents were reviewed to assist in identifying fish and wildlife species and to describe fisheries and wildlife habitat.

6.1 Affected Environment

Six basins extend into the project area: the Soos Creek, Lower Cedar River, May Creek, Coal Creek, Tibbetts Creek, and Mercer Slough basins. Figure 5-1 shows the boundaries of these basins and their smaller sub-basins. Many lakes, rivers, and streams comprise the basins’ extensive network of surface water, and support many species of fish and wildlife. Numerous anadromous fish species are found in the six basins, including Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), steelhead (*O. mykiss*), bull trout/dolly varden (*Salvelinus confluentus*), and sea-run cutthroat trout (*O. clarki*) (King County, 1990b; Kerwin, 2001; WDFW, 1993). Resident fish species include cutthroat trout, rainbow trout, and kokanee (King County, 1990b; Kerwin, 2001). Non-native fish species also have been introduced into these systems.

Although stream and fish habitat is generally good in the creek and river systems, human activities, especially urban and suburban development, are affecting the quality of stream and riparian habitat. These activities have resulted in channelization of streams and loss of riparian habitat (King County, 1990b; Kerwin, 2001), which has subsequently contributed to current stream conditions and has affected fish and wildlife habitat.

The Soos Creek State Fish Hatchery, located near the mouth of Big Soos Creek, has operated continuously since 1901. The hatchery presently captures adult chinook and coho for on- and off-season releases. Approximately 3.2 million fall chinook sub-yearlings and 600,000 coho yearlings are produced annually. Currently, the hatchery uses a hatchery rack from about August 15 to the third week in November to create a holding pond. A sheet-pile dam equipped with a fish ladder diverts water into the hatchery, and two removable weirs are used to create the holding pond. The weirs, which
comprise the hatchery rack, act as an upstream migration barrier when in place, although certain factors, such as high flows, debris, and beavers, often allow for adult passage. For example, a storm event in September 1997 caused the weirs to fail, resulting in about 8,000 chinook migrating upstream out of the hatchery. During this storm event, flows in Big Soos Creek at the hatchery peaked at 79 cubic feet per second (cfs) (USGS, 2006b). Fish that can bypass the hatchery rack may spawn naturally in waters upstream. Other fish may make their runs before August 15 or in late November when the hatchery rack is not in place, and spawn in the upper reaches of Big Soos Creek or its tributaries. During periods of low flows, migrating adults may spawn in reaches below the hatchery. The hatchery does not serve as a downstream juvenile migration barrier (Kerwin and Nelson, 2000). The Soos Creek State Fish Hatchery is located approximately 11.2 miles downstream of the Green Route Alternative crossing of Big Soos Creek.

6.1.1 Preferred Alternative

The Preferred Alternative would cross 24 watercourses, including 3 crossings of Tibbetts Creek, for a total of 26 waterway crossings (see Figure 5-3). Some waterway crossings along the Preferred Alternative would be achieved with trenchless construction methods, where the pipeline would pass at least 10 feet below the maximum scour depth of the stream. In situations where the streams are currently in culverts, the pipeline would pass above or below the culverts. In a few locations, streams would likely be crossed during dry channel conditions using an open-cut trench (see Chapter 5 for more information).

As part of this study, each waterway was assigned a unique designation consisting of a letter representing the alternative (R for the Preferred Alternative, G for the Green Route Alternative), and a number. The numbers increase from south to north. For example, the southernmost waterway along the Preferred Alternative is R1; the next waterway north is R2, etc.

Fish

In the majority of cases along the Preferred Alternative, the pipeline would pass below streams that flow through culverts (see Chapter 5 for details on each creek crossing). Figure 5-3 illustrates the location of each creek crossing. All culverts are passable for fish as reported in Washington Department of Fish and Wildlife (WDFW) databases (Salmonscape, 2006), except the culvert on West Fork Tibbetts Creek (R23). The culvert at Clay Pit Creek (R22) is also a partial barrier to fish passage.

Table 6-1 identifies anadromous and resident fish species documented to occur in streams that the Preferred Alternative would intersect. Jenkins Creek, Little Soos Creek, Cedar River, May Creek, and Tibbetts Creek support the greatest number of fish. Non-native, pisciverous fish occur in Jenkins Creek, including catfish and pumpkinseed (Kerwin, 2001). Some creeks support populations of fish listed under the Endangered Species Act (ESA), including Chinook salmon (threatened), bull trout (threatened), steelhead (proposed threatened), and coho salmon (species of concern). The Puget Sound/Strait of Georgia population of coho salmon was originally listed as a candidate species under the ESA and in 2004 down-listed to a species of concern (69 FR 19975; April 15, 2004). In March 2006, the Puget Sound population of steelhead was proposed for listing as a threatened species under the ESA (71 FR 15666; March 29, 2006).
## Table 6-1. Documented Occurrence of Fish Species in Creeks along the Preferred Alternative

<table>
<thead>
<tr>
<th>Sub-Basin/Creek</th>
<th>Map ID</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Jenkins Creek Main Sub-Basin</strong></td>
<td></td>
<td></td>
</tr>
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<td>Jenkins Creek (09-0087) R1a, R1b</td>
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<tr>
<td><strong>Little Soos Creek Sub-Basin</strong></td>
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<td>Little Soos Creek (09-0092) R2</td>
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</tr>
<tr>
<td><strong>Sooos Creek Main Sub-Basin</strong></td>
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<td></td>
</tr>
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<td>Unnamed tributary to Soos Creek 1 R3</td>
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<td></td>
</tr>
<tr>
<td>Unnamed tributary to Soos Creek 2 R4</td>
<td>x x x x x x x</td>
<td></td>
</tr>
<tr>
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<tr>
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<td>Unnamed tributary 6 R21</td>
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<td>West Fork Tibbetts Creek (08-0171) R23</td>
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<th>CO</th>
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<th>SO</th>
<th>CT</th>
<th>BT</th>
<th>O</th>
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<td>X</td>
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<td>X</td>
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</tbody>
</table>

1 Williams et al., 1975; WDFW, 2005; USACE, 2004; Salmonscape, 2006; Kerwin, 2001; City of Issaquah, 2003
2 CH – Chinook, CO – Coho, ST – Winter Steelhead, SO – Sockeye, CT – Cutthroat Trout, BT - Bull Trout, O – Other (e.g., resident and non-native species)

### Jenkins Creek and Little Soos Creek

Jenkins Creek and Little Soos Creek are low-gradient, open channels that flow through scrub-shrub wetlands at the proposed pipeline crossings. Clean, unconsolidated gravel occurs in patches throughout the streams (King County, 1990b) and is suitable for spawning. More consolidated gravels occur in reaches where the streambed is silt and sand, generally in the more urbanized, lower reaches of the streams. Small to medium-sized particles were observed in both streams.

Jenkins Creek is approximately 20 to 30 feet wide with a wide riparian zone near the pipeline crossing. The riparian zone includes a riparian wetland dominated by shrub species, including red alder, red-osier dogwood, salmonberry, and Indian plum. These plants provide ample overhanging vegetation to shade the creek. Channel and riparian conditions of Little Soos Creek are similar to those of Jenkins Creek. Little Soos Creek flows through a shrub-dominated riparian wetland at the proposed pipeline crossing; however, reed canary grass encroaches into the creek near the proposed pipeline crossing.

Lack of clean, unconsolidated gravels makes these reaches of Jenkins and Little Soos Creeks unsuitable for salmonid spawning (WDFW, 2005; Salmonscape, 2006). The lower reaches, however, provide suitable spawning habitat for coho. These streams lie within wetlands; wetlands with deep pools and dense riparian vegetation provide excellent rearing habitat for the fish species listed in Table 6-1 (King County, 1990b; WDFW, 2005).

### Big Soos Creek and Tributaries

The Preferred Alternative would cross five unnamed tributaries to Big Soos Creek north of Little Soos Creek. Two tributaries (R4 and R5) appear to originate from stormwater ponds or stormwater runoff from upstream urban development. These tributaries are extremely channelized with eroded banks and are generally vegetated with conifers (predominantly Douglas fir), Indian plum, and salmonberry. Although the fish species listed in Table 6-1 are not reported in R4 or R5, it was assumed that these tributaries are fish-bearing waterways because: (a) there are no natural barriers to fish passage; and (b) the precise stream gradient was unknown, thus it was assumed that the gradient is not too steep to preclude fish passage.

Two other tributaries (R6 and R7) originate out of wetland complexes and are similar to the two previously described tributaries. Species listed in Table 6-1 are not reported in these tributaries; however, it was assumed that R6 and R7 are fish-bearing waterways for the same reasons described above for R4 and R5. Native and non-native fish from Ham Lake may enter into R6. The Preferred Alternative would cross another tributary (R3) at SE 160th Street, converging with
Big Soos Creek at a backwater area. This tributary may provide rearing habitat for juvenile salmonids in Big Soos Creek.

The Preferred Alternative would cross United Nations Creek, a tributary to Big Soos Creek. The creek emerges from its headwaters (scrub-shrub wetland), flows through a culvert on 148th Avenue SE (where the Preferred Alternative would cross), and parallels the road approximately 50 feet before entering another scrub-shrub wetland complex. Despite its proximity to the road and its disturbed nature, WDFW (2005) documents coho utilizing the creek near where the pipeline would cross.

**Cedar River and Tributaries**

The Preferred Alternative would cross Molasses Creek, one of three tributaries to the Cedar River in the project area, at 140th Avenue SE. The creek outlets from a large wetland complex immediately east of 140th Avenue SE and flows northwesterly through a culvert. Coho, sockeye (*O. nerka*), and cutthroat trout utilize Molasses Creek, but only cutthroat trout are found where the pipeline would cross (Table 6-1). Utilization of Molasses Creek by coho and sockeye is limited by the stream’s steep gradient downstream of where the pipeline would cross (Kerwin, 2001).

Madsen Creek, Stewart Creek, and the Cedar River are common to both alternatives. Madsen Creek and Stewart Creek are tributaries to the Cedar River and are located in culverts where the Preferred Alternative would cross. As shown in Table 6-1, Madsen Creek supports several fish species. Stewart Creek currently supports several fish species including Chinook, coho, and sockeye salmon; cutthroat trout; sculpin; stickleback; and dace (King County, 2007). Completion of current restoration activities near its mouth may improve access to Stewart Creek for these fish species. The Cedar River provides migration, spawning, and rearing habitat for species listed in Table 6-1 at the proposed crossing of the Preferred Alternative.

**May Creek and Tributaries**

May Creek is an open channel where the Preferred Alternative would cross. Pastures and large wetland complexes dominate the May Creek floodplain in this area. Where the Preferred Alternative would cross, May Creek meanders through a large wetland complex. All the fish species listed in Table 6-1, except bull trout, are documented to occur in May Creek at the proposed crossing. Due to lack of suitable habitat, Chinook are not likely to be present where the Preferred Alternative would cross (Fisher, 2006).

The Preferred Alternative would cross two tributaries to North Fork May Creek at SR 900: an unnamed tributary (R14) and Wilderness Creek (R15). Both tributaries discharge to North Fork May Creek via culverts. No fish species are reported in R14, but coho are present in Wilderness Creek (see Table 6-1).

**Tibbetts Creek and Tributaries**

The Preferred Alternative would cross Tibbetts Creek at three locations (R16, R20, and R26). Similar to other stream systems along the Preferred Alternative, Tibbetts Creek has been altered by residential, commercial, and light industrial development, and by mining activities. These activities have altered the stream channel and channel stability, increased sedimentation, degraded water quality, and reduced the quantity and quality of instream habitat (King County, 1996). Tibbetts Creek has continually failed to meet water quality standards (Entranco, 1998; 1999). Consequently, fish habitat has been compromised. All species listed in Table 6-1, except bull trout, are present in Tibbetts Creek. Salmonids are not likely present as far upstream as the
southernmost crossing of Tibbetts Creek (R16) due to unsuitable creek conditions and the large number of culverts on the creek, which can limit fish movement through the stream system. Chinook and steelhead are rarely observed in Tibbetts Creek. Coho salmon and kokanee are at extremely depressed numbers (City of Issaquah, 2003). It is likely that coho in the creek are stray hatchery returns or the result of stocking of hatchery-produced fry, rather than natural production (City of Issaquah, 2003).

The Preferred Alternative would cross eight tributaries to Tibbetts Creek; all of these waterways are located in corrugated metal pipe (CMP) or concrete culverts. The culvert on West Fork Tibbetts Creek (R23) is a complete barrier to fish passage and the Clay Pit Creek (R22) culvert partially blocks fish migration. Fish in West Fork Tibbetts Creek occur only downstream of the proposed pipeline crossing because the culvert is impassable to fish. For Clay Pit Creek, some species may migrate upstream of the proposed pipeline crossings at SR 900 because the culvert is only a partial barrier. As noted in Table 6-1, all tributaries to Tibbetts Creek support all species listed for Tibbetts Creek, except Chinook.

Wildlife

The extensive network of streams, riparian corridors, and wetlands in the project area provides excellent habitat for a variety of wildlife species. In urban environments particularly, where natural habitats are fragmented and isolated, habitat reserves consist of designated areas such as wildlife refuges and undesignated areas such as parks and open space. Corridors may be vegetated slopes, riparian corridors, or fence rows. Kerwin and Nelson (2000) and King County (1990b) report common urban wildlife including coyotes (Canis latrans), Columbian black-tailed deer (Odocoileus hemionus columbianus), beaver (Castor canadensis), raccoons (Procyon lotor), opossums (Didelphis virginiana), rats (Rattus species), mice (Mus species), and voles (Microtus species) along the Preferred Alternative.

Numerous bird species using the project area include great blue heron (Ardea herodias), white-crowned sparrow (Zonotrichia leucophrys), song sparrow (Melospiza melodia), common yellowthroat (Geothlypis trichas), yellow warbler (Dendroica petechia), northern flicker (Colaptes auratus), American robin (Turdus migratorius), American crow (Corvus brachyrhynchos), spotted towhee (Pipilo maculatus), red-winged blackbird (Agelaius phoeniceus), dark-eyed junco (Junco hyemalis), black-capped chickadee (Poecile atricapillus), and marsh wren (Cistothorus palustris). Bald eagles (Haliaeetus leucocephalus), a threatened species under the ESA, are frequent in certain areas along the Preferred Alternative. There is a known bald eagle nest located south of Lake Meridian, approximately 1.25 miles west of the Preferred Alternative (WDFW, 2005). Two additional bald eagle nests are located near the Preferred Alternative. These nests are located approximately 2 miles north of the Preferred Alternative’s northern terminus, on the eastern shoreline of Lake Sammamish (WDFW, 2005). A great blue heron colony exists in Lake Sammamish State Park, approximately 1.5 miles north of the Preferred Alternative (WDFW, 2005).

The Preferred Alternative lies within the Pacific Flyway, a migratory corridor consisting of the western coastal areas of South, Central, and North America. Wetlands and lakes near the Preferred Alternative, including Ham Lake, likely serve as foraging or resting grounds for migratory and resident bird species.
6.1.2 Green Route Alternative

Fish

The Green Route Alternative would cross a total of 19 waterways. All streams, except Big Soos Creek, Cedar River, and May Creek, would cross the Green Route Alternative through pipe or box culverts (refer to the Chapter 5 for details on each creek crossing). Figure 5-3 illustrates the location of each stream crossing. Molasses Creek, Madsen Creek, Stewart Creek, and the Cedar River are common to both alternatives; refer to the discussion of these water bodies for the Preferred Alternative. Table 6-2 identifies anadromous and resident fish species documented to occur in streams that the Green Route Alternative would intersect.

Table 6-2. Documented Occurrence of Fish Species in Creeks along the Green Route Alternative

<table>
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<th>Species 1</th>
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<td></td>
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<tr>
<td>Soosette Creek Sub-Basin</td>
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<tr>
<td>Westside Soos Creek (09-0075)</td>
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<td>Soosette Creek (09-0073)</td>
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</tr>
<tr>
<td>Meridian Valley Creek</td>
<td>G6</td>
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<td>G7</td>
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<tr>
<td>Soos Creek Main Sub-Basin</td>
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<td></td>
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<tr>
<td>Soos Creek (09-0072)</td>
<td>G8</td>
<td>x</td>
</tr>
<tr>
<td>United Nations Creek</td>
<td>G9</td>
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<td>Molasses Creek Sub-Basin</td>
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<td></td>
</tr>
<tr>
<td>Molasses Creek (08-0304)</td>
<td>G10</td>
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<td>Madsen Creek Sub-basin</td>
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<tr>
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<td>G11</td>
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<td>Cedar Main Urban Sub-basin</td>
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<tr>
<td>Cedar River (08-0299)</td>
<td>G12</td>
<td>x</td>
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<tr>
<td>Orting Hills Sub-basin</td>
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<td></td>
</tr>
<tr>
<td>Stewart Creek (08-0307)</td>
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<tr>
<td>Unnamed tributary to May Creek (08-0287E)</td>
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</table>
### Soosette Creek and Tributaries

Westside Soos Creek, a tributary to Soosette Creek, is the southernmost stream along the Green Route Alternative. The creek flows through a series of riparian scrub-shrub/forested wetlands before flowing through a pipe culvert where the Green Route Alternative would cross. For details on these wetlands, see Chapter 7. The creek’s banks are well vegetated with red alder, willow species, red-osier dogwood, Indian plum, and reed canary grass. Reed canary grass encroaches into the creek channel at the upstream end of the pipe culvert. Overhanging bank vegetation and associated riparian wetlands provide rearing habitat for juvenile salmonids. WDFW (2005) identifies coho and cutthroat trout in Westside Soos Creek, as noted in Table 6-2.

The Green Route Alternative would cross Soosette Creek south of SE 272nd Street where the creek flows through a box culvert. Habitat conditions are similar to Little Soos Creek (King County, 1990b). Spawning is difficult for fish in Soosette Creek; however, the creek is suitable for juvenile rearing (King County, 1990b; Salmonscape, 2006). As noted in Table 6-2, Soosette Creek provides habitat for coho and cutthroat trout. The riparian zone is vegetated with shrubs, but is dominated by reed canary grass and encroaches a little into the creek channel. The creek becomes more channelized downstream of 132nd Avenue SE with coniferous trees lining the creek bank.

Conditions of the unnamed tributary to Soosette Creek (G3) may not be suitable for fish habitat. Low flows and channels choked with invasive, non-native plants may preclude fish use of this waterway. Although fish presence is not documented in the unnamed tributary to Soosette Creek, it was assumed that G3 is fish-bearing because there are no known barriers to preclude fish use of this waterway.

### Meridian Valley Creek and Tributaries

The Green Route Alternative would cross Meridian Valley Creek where the creek flows through bottomless box culverts.

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<tr>
<td>Unnamed tributary to Coal Creek (08-0268U)</td>
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1 Williams et al., 1975; WDFW, 2005; USACE, 2004; Salmonscape, 2006; Kerwin, 2001; Adolfson Associates, Inc., 2002
2 CH – Chinook, CO – Coho, ST – Winter Steelhead, SO – Sockeye, CT – Cutthroat Trout, BT - Bull Trout, O – Other (e.g., resident and non-native species)
Downstream of this alignment (at SE 256th Street and 148th Avenue SE), Meridian Valley Creek was relocated and a concrete flume removed to improve channel and fish habitat (USACE, 2004). Upstream of 132nd Avenue SE, the creek flows through a moderately vegetated riparian corridor of shrubs and herbaceous species, with a scrub-shrub wetland abutting the creek. Banks are somewhat eroded and bank vegetation provides some shade for the stream. Coho, cutthroat trout, rainbow trout, and steelhead utilize this creek for rearing, foraging, and migration (WDFW, 2005; USACE, 2004). Bullhead (Ameiurus species), sculpin (Cottus species), and lamprey are also reported in Meridian Valley Creek (USACE, 2004). Immediately downstream of 140th Avenue SE, riparian vegetation is absent from the creek. The creek flows through a mitigation site that, in the future, should provide cover for the creek.

Both tributaries to Meridian Valley Creek (G5 and G7) originate from wetlands. The northernmost tributary (G7) starts as a swale east of 132nd Avenue SE, likely conveying surface water runoff from the surrounding suburban development. This tributary may be unsuitable for fish due to lack of substrate and low flows, as noted in Table 6-2. Tributary G5, however, supports coho (WDFW, 2005). Habitat conditions of Tributary G5 are similar to those of Meridian Valley Creek.

**Big Soos Creek and Tributaries**

Big Soos Creek is constricted by the bridge crossing at SE 208th Street, as evidenced by slow-moving, nearly stagnant water on both sides of the bridge. The riparian corridor is dominated by trees, shrubs, and herbaceous plants. Big Soos Creek supports the greatest number of fish species, as noted in Table 6-2. Extensive wetlands are associated with the creek, providing excellent rearing, off-channel, and foraging habitat for juveniles and adults. Spawning conditions for Chinook salmon improve downstream of the crossing as well as in the lower reaches of some tributaries, whereas coho are known to spawn in most tributaries (King County, 1990b; WDFW, 2005; Salmonscape, 2006). Non-native, piscivorous species such as black crappie (Pomoxis nigromaculatus) and large-mouth bass (Micropterus salmoides) have also been introduced into the system.

Habitat conditions in United Nations Creek are different for the Green Route Alternative than for the Preferred Alternative. The creek flows through an extensive forested, scrub-shrub wetland at the proposed pipeline crossing, providing good riparian habitat. The riparian zone is densely vegetated, which provides good cover and shade for the creek, improving conditions for salmonids, coho in particular.

**May Creek and Tributaries**

Similar to the proposed crossing of the Preferred Alternative, May Creek is constricted by the bridge crossing at 148th Avenue SE, as evidenced by slow-moving, nearly stagnant water on both sides of the bridge. At the proposed crossing, May Creek meanders through a mosaic of scrub-shrub and emergent wetlands. All fish species listed in Table 6-2, except bull trout, are documented to occur in May Creek at the proposed crossing. Due to lack of suitable habitat, Chinook are not likely to be present at the proposed pipeline crossing (Fisher, 2006). The Green Route Alternative would cross an unnamed tributary to May Creek (G15) that flows through a culvert west of the Coal Creek Parkway SE and 148th Avenue SE intersection.

The Green Route Alternative would cross two tributaries to Lake Boren: one unnamed tributary (G16) and China Creek (G17). The Green Route Alternative would likely cross both tributaries at Coal Creek Parkway SE where they flow through culverts. Downstream of 133rd Avenue SE, China Creek has been significantly altered by development in surrounding areas, resulting in a
channelized and extensively armored creek. Thus, in-stream and riparian habitat has been reduced in quality and function (Adolfson Associates, Inc., 2002). Although classified as a salmonid-bearing stream (Adolfson Associates, Inc., 2002), no fish species are documented in China Creek at the proposed pipeline crossings. However, resident fish in Lake Boren may migrate upstream into China Creek, if the fish can pass through the concrete flume on the west side of Coal Creek Parkway SE.

**Coal Creek and Tributaries**
The Green Route Alternative would cross Coal Creek at Coal Creek Parkway SE where the creek flows through a 4- to 5-foot-diameter culvert. As noted in Table 6-2, Coal Creek supports all species listed in the table, except bull trout. Chinook, coho, sockeye, winter steelhead, sea-run and resident cutthroat trout, and rainbow trout have been observed in Coal Creek. Juvenile steelhead and Chinook rear in the creek at the proposed pipeline crossing, and coho are known to spawn at the proposed crossing (Salmonscape, 2006). The northernmost waterway along the Green Route Alternative is the unnamed tributary to Coal Creek (G19). The Green Route Alternative would cross this tributary below Coal Creek Parkway SE, where the creek flows in a steep ravine. No fish are documented to utilize this tributary, as shown in Table 6-2, likely due to the steep gradient.

**Wildlife**
Wildlife and bird species along the Green Route Alternative are similar to those along the Preferred Alternative. The bald eagle nest south of Lake Meridian is closer to the Green Route Alternative, approximately 0.75 mile east of the alignment. Two other bald eagle nests are located along the Green Route Alternative, approximately 1.5 to 2 miles north of the alternative’s northern terminus. A great blue heron colony is located near Big Soos Creek on the north side of 256th Street SE, approximately 0.5 mile west of the Green Route Alternative. The colony is located near the confluence of Meridian Valley Creek and Big Soos Creek (WDFW, 2005). One other great blue heron colony is located along the Green Route Alternative. The colony is located in Mercer Slough, approximately 2 miles north-northwest of the Green Route Alternative.

### 6.2 Environmental Impacts

#### 6.2.1 No-Action Alternative
Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to fish and wildlife species.

#### 6.2.2 Preferred Alternative
The discussion of environmental impacts is based on a reconnaissance-level inventory of fish and wildlife species and habitat and on preliminary engineering design. The impacts discussed are qualitative. Where quantities are provided, the quantities are estimates based on preliminary engineering. Impacts to threatened and endangered species are not discussed in detail. Impacts to these species would be addressed in a Biological Assessment (BA) prepared for this project.
**Direct Impacts - Construction**

Construction of the Preferred Alternative would impact approximately 25 acres of vegetation. See Chapter 7 for specific amounts and types of vegetation that would be affected. The Preferred Alternative would not result in permanent alteration or loss of fish or wildlife habitat. All cleared vegetation corridors would be re-vegetated with trees, shrubs, and herbs. Riparian vegetation would also be re-vegetated; thus, no permanent loss of riparian vegetation would result from the Preferred Alternative.

A maintenance corridor would be required for ongoing pipeline maintenance in undeveloped areas along the Preferred Alternative. See Chapter 7 for specific amounts and types of vegetation that would be affected. Trees would be removed from this area permanently, but native shrubs and heraceous species would be allowed to grow. Trees would not be planted in order to maintain a tree-free corridor for ongoing maintenance.

Construction would not affect the creeks that the Preferred Alternative would intersect or the fish species utilizing the creeks. The proposed pipeline would cross Jenkins Creek, Little Soos Creek, Cedar River, and May Creek using a trenchless construction method, either jack-and-bore or microtunnel (see Appendix D). The trenchless construction method would avoid in-water work, as this method would span the ordinary high water mark (OHWM) and any wetlands associated with the creek. For the trenchless creek crossings, the proposed pipeline would be installed at least 10 feet below the maximum scour depth, which is expected to be 2 to 3 feet. Additionally, appropriate best management practices (BMPs) would be implemented to mitigate the potential for erosion and sedimentation in or near the creeks.

West Fork Tibbetts Creek, Clay Pit Creek, and the northernmost crossing of Tibbetts Creek (R26) would be crossed using an open-cut trench technique during dry channel conditions and during agency-approved work windows. Riparian vegetation would be affected at the open-cut creek crossings; however, the impacts to streamside vegetation would be mitigated. Riparian vegetation would not be permanently affected by the proposed pipeline. The southernmost crossing of Tibbetts Creek (R20) would be open-cut above or below the existing culvert.

All other creeks would be crossed above or below the existing culvert. It is expected that there would be about 18 inches of clearance between the pipeline and the existing culvert. These crossing techniques would avoid in-water work. It is not expected that the pipeline would contact the creek channel or culverts; therefore, damage to the stream channel and fish utilizing the streams would not be anticipated.

Ambient noise levels would be anticipated to increase during construction of the Preferred Alternative. The change in ambient noise levels would be greater at the southern end of the Preferred Alternative in the more rural areas where existing ambient noise levels are likely lower than in the more urban and suburban areas in the northern portion of the Preferred Alternative, and would decrease toward the north in the more urban and suburban areas. Urban wildlife and bird species could be disturbed by the temporary increases in noise and may migrate to adjacent habitats during construction. Construction activities would likely occur during work hours approved by local jurisdictions, thus minimizing the duration of increased noise levels and potential disturbance to mammals and birds.
Direct Impacts - Operation

No impacts to fish and wildlife species and habitat would occur during normal operation of the Preferred Alternative. Blowoff valves would be used only to drain water from the pipe to allow for pipeline maintenance. This discharge would consist of treated, potable water and would contain safe concentrations of chlorine that meet Ecology standards. Chlorinated water (the chlorination process ensures that water in the pipeline is potable water, meeting drinking water standards) drained from the pipeline would be discharged directly to sanitary sewers, or receive treatment prior to discharging to stormwater systems or drainages courses in a controlled manner. No untreated water would be discharged to natural drainage systems.

There is a possibility that the proposed pipeline could breach during operation, although the probability of a pipeline breach is very low. A breach in the pipeline could discharge the chlorinated water in the pipeline to natural drainage systems. The chlorinated water would not be treated prior to entering the streams, thus discharging chlorinated water to fish-bearing streams. Chlorine in the water could be toxic to fish.

Indirect Impacts - Construction

Indirect impacts from construction of the Preferred Alternative could include changes in wildlife movement and migration. Changes in the size and stability of fish stocks reported in the creeks would not be anticipated for the Preferred Alternative. During construction, large and small mammals and birds affected by the added human presence and noise may flee to other, less disturbed habitats in the project area. Wildlife movement could lead to increased use of other habitat and corridors, which could temporarily change wildlife use.

Indirect Impacts - Operation

As mentioned above, there is a possibility that the proposed pipeline could breach during operation, although a pipeline breach is highly unlikely. If a complete breach occurred in the general vicinity of a tributary to Big Soos Creek, flows could increase significantly. If the breach occurred between August and November during operation of the hatchery rack at the Soos Creek State Fish Hatchery, increased flows could impact hatchery operations. However, it is unlikely that a pipeline breach would impact the hatchery even in a worst-case scenario. If a significant breach of the pipeline occurred in the vicinity of Jenkins Creek (the southernmost tributary to Big Soos Creek that would be crossed by the Preferred Alternative), water would flow out at the breach, draining water in the pipeline upstream of the breach until the flow could be shut off. Some water downstream of the breach would flow within the basin surrounding the crossing. Assuming that:

(a) the flow from the SSP would be the projected maximum of 33 million gallons per day (mgd), or about 51 cubic feet per second (cfs);
(b) the remaining water (about 1.2 million gallons) in the pipe downstream of the breach would drain into the creek; and
(c) a power failure occurred, preventing remote operation of the shutoff valve such that it would take 1 hour for Tacoma Water and Cascade to shut off the water and halt leakage;

then the total volume discharged into Jenkins Creek would be approximately 2.6 million gallons.
Over the assumed 1-hour period, the peak and average discharge rates from the pipe breach would be approximately 175 cfs and 85 cfs, respectively. The Preferred Alternative crossing of Jenkins Creek would be approximately 5.8 miles upstream of the hatchery. If the discharged water from the breached pipeline stayed entirely within the channel of Jenkins Creek to the mouth of Big Soos Creek, and no water was lost or distributed throughout the channel, flows at the hatchery could increase by a maximum of 175 cfs. In this scenario, an increase of 175 cfs as a result of a pipeline breach could cause damage to the hatchery facilities like that which occurred in September 1997. However, flows in Big Soos Creek at the hatchery can reach much higher flow rates during the months of hatchery operation (see Table 6-3). A breach in the pipe would therefore not greatly increase flow rates at the hatchery compared with normal storm events. It would be expected that Tacoma Water and Cascade would be able to halt discharge in less than 1 hour if a breach occurred and that water would be lost between the Jenkins Creek crossing and the Soos Creek State Fish Hatchery, thus making the discharge volume smaller.

It should be noted that the 33-mgd flow is a maximum rate that would occur only during the 4 or 5 weeks of peak demand. This maximum flow rate would occur during the summer months when natural creek flows are very low, and would decrease through the autumn. An average flow that would occur during the same period as the maximum flow would be about 12 mgd. If the pipeline was operated under normal conditions, a breach would result in a sudden drop in pressure. The valve would then be closed remotely by Cascade or Tacoma Water within approximately 10 minutes of the event. In this more realistic scenario with an average flow of 12 mgd, approximately 1.3 million gallons would be discharged into Jenkins Creek at an average rate of 70 cfs.

Table 6-3 lists daily mean summary statistics for data collected downstream of the hatchery for the months that the hatchery rack was in operation in 1993 through 2003.

| Table 6-3. Daily Mean Flow Summary Statistics for Big Soos Creek, Downstream of the Soos Creek State Fish Hatchery, 1993 through 2003 |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| August (cfs)  | September (cfs) | October (cfs)  | November (cfs)  |
| Minimum        | 20              | 18              | 19              | 23              |
| Maximum        | 65              | 73              | 438             | 853             |
| Average        | 31              | 28              | 44              | 114             |

Source: USGS, 2006d

Because of lower base flows, if the breach occurred in August or September, flow rates in receiving waters would potentially be lower than if the breach occurred in October or November. If a breach occurred and flows increased significantly, the weirs comprising the hatchery rack could wash out, allowing for upstream migration of adult salmonids. Impacts to the hatchery could include: a loss of fish resulting from a reduced number of adults available for egg take; a loss of fry rearing in ponds at the hatchery; a loss of eggs and fry resulting from increased sediment disrupting flow at the hatchery intake; and possible physical damage to the weirs. Increased flows could also increase erosive processes upstream, resulting in possible sedimentation near the hatchery.
The low probability of a breach, implementation of control measures, and the large distance between the Preferred Alternative and the hatchery indicate that impacts would be highly unlikely.

**Cumulative Impacts**

Cumulative impacts to fish and wildlife species and their habitat would be minimal. Use of other habitats and migration corridors could increase over time, as some animals could temporarily move away from the project area. Additionally, cumulative impacts to fish species and habitat would be low. Impacts to streams would be minimal as a result of avoidance or minimization of in-water work and mitigation for streamside vegetation of streams that were open-cut. Impacts to individual fish, species, or populations would not be expected as a result of construction or operation of the project.

If other projects were constructed simultaneously along the Preferred Alternative, short-term cumulative impacts to animals could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

**6.2.3 Green Route Alternative**

**Direct Impacts - Construction and Operation**

Construction-related impacts of the Green Route Alternative would be similar to those for the Preferred Alternative. Big Soos Creek, Meridian Valley Creek, Cedar River, and May Creek would be crossed using a trenchless construction method, as described for the Preferred Alternative. There are two options for crossing China Creek: trenchless crossing on the east side of Coal Creek Parkway SE or open-cut on the west side of Coal Creek Parkway SE. The open-cut option for China Creek would involve removal of sections of a concrete flume that may serve as a migration barrier for salmonids. This section of the creek would be replanted and the channels would be restored to more natural conditions. Most of the Green Route Alternative would occupy road rights-of-way.

Impacts due to operation of the Green Route Alternative would be similar to those for the Preferred Alternative.

**Indirect Impacts - Construction**

Indirect impacts from construction of the Green Route Alternative would be similar to those for the Preferred Alternative.

**Indirect Impacts - Operation**

As discussed in Section 6.2.2, there is a possibility that the proposed pipeline could breach during operation, although a pipeline breach is highly unlikely. Indirect impacts could be associated with damage to the Soos Creek State Fish Hatchery due to increased flows. Westside Soos Creek, the southernmost tributary to Big Soos Creek that would be crossed by the Green Route Alternative, is approximately 4.5 miles upstream of the hatchery. Similar to the Preferred Alternative, a worst-case scenario could result in a maximum of 175 cfs of supplemental flows to Big Soos Creek, although flows would likely be much less. A more realistic discharge rate during the maximum pipeline flow periods would be an average of about 70 cfs. The indirect impacts of a pipeline breach would be similar to those described in Section 6.2.2 for the Preferred Alternative.
Cumulative Impacts
Cumulative impacts of the Green Route Alternative would be the similar to those for the Preferred Alternative.

6.3 Mitigation Measures

6.3.1 No-Action Alternative
Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

6.3.2 Preferred Alternative
Mitigation measures to minimize impacts to fish and wildlife resources would include:

- Minimizing the area of clearing and grading.
- Avoiding wetlands and riparian zones, where possible.
- Restoring disturbed vegetation corridors with plantings of shrubs and herb species.
- Avoiding in-water work, water withdrawals, or diversions, where possible.
- Crossing some streams using trenchless construction methods; or, crossing above or below the culvert; or, when open-cutting, crossing streams during dry channel conditions and during agency-approved work windows.
- Implementing BMPs to minimize erosion and sedimentation.
- Ensuring the adequacy of the pipeline design by specifying the use of good quality construction materials.

6.3.3 Green Route Alternative
Mitigation measures for the Green Route Alternative would be similar to those for the Preferred Alternative.

6.4 Significant Unavoidable Adverse Impacts
Of the potential project-related impacts to animals, none are considered to be significant unavoidable adverse impacts.
Chapter 7: Plants

7.1 Affected Environment

The project would be located in the larger *Tsuga heterophylla* Zone (Western Hemlock Zone), a vegetative zone that occupies extensive areas of western Washington. For this zone, pre-development native vegetation consisted of western hemlock (*Tsuga heterophylla*), Douglas fir (*Psuedotsuga menziesii*), and western red cedar (*Thuja plicata*) with an understory of swordfern (*Polystichum munitum*), vine maple (*Acer circinatum*), and salmonberry (*Rubus spectabilis*) (Franklin and Dyrness, 1988).

Existing vegetation along the Preferred Alternative and the Green Route Alternative has been altered by development and urbanization, and includes a mixture of vegetation types. Discussion in this chapter of existing vegetation is divided into two categories:

- **Wetland communities.** Wetlands include forested, shrub, emergent, and open water communities.

- **Upland communities.** Upland communities consist of:
  - Developed areas, including a mixture of newly developed and mature residential neighborhoods, the latter incorporating landscaped yards and remnant native trees.
  - Agricultural uplands, including pastures, orchards, and plant nurseries.
  - Remnant native vegetation, including forested, shrub, and herbaceous plant communities.

7.1.1 Wetlands Identification and Classification

Potential wetlands were identified using a two-step process. The initial step involved review of existing wetland inventory documents. The second step was field verification of the inventories to incorporate additional wetlands. Wetlands have not been formally delineated at this time.

Document Review

Existing information was reviewed to help identify potential wetlands in the study areas. This review provided background information on soils, hydrology, topography, wetlands, and streams. Reviewed documents included, but were not limited to:

- Aerial photography by the King County Wastewater Division (2002)
- The United States Fish and Wildlife Service (USFWS) Wetlands Online Wetland (USFWS, 2006)

For the plants analysis, study areas were defined that extend 100 feet on either side of the centerline of each action alternative. The study areas encompass the practical limits of visual plant identification for analysis at this level.
- King County Wetlands Inventory (available online at [http://www.metrokc.gov/gis/mappportal/iMAP_main.htm](http://www.metrokc.gov/gis/mappportal/iMAP_main.htm) or in hard copy as *The King County Wetlands Inventory* Vol. 3 South [1990a])

- *Soil Survey of King County Area, Washington* (Snyder et. al., 1973)


- *City of Kent Wetland Inventory* (City of Kent, 2001)

- *City of Covington Critical Areas Inventory* (City of Covington, 2002)

- *City of Bellevue Wetland Inventory* (City of Bellevue, 2003)

- *City of Issaquah Wetland Inventory* (City of Issaquah, 2003)

- *City of Newcastle 2005 Wetland Inventory* (Adolfson, 2005)

- *Critical Areas Inventory: City of Renton Wetlands and Stream Corridors* (Jones and Stokes Associates, 1991)

- *City of Renton Shoreline Master Plan Amendments* (Jones and Stokes Associates, 2004)

Composite maps were prepared from these sources using the Arc/Info Geographic Information System (GIS).

**Field Verification**

The proposed action alternatives were reviewed in the field to locate potential wetlands that are too small to appear on inventories, or wetlands that have changed since being mapped. The field verification was conducted from road rights-of-way and other areas open to public access.

The presence, type, and approximate boundaries of wetlands were confirmed based on readily visible wetland indicators such as areas of visible inundation and plant communities consistent with long-term saturation (e.g., soft rush [*Juncus effusus*], red osier dogwood [*Cornus sericea*], or hardhack [*Spiraea douglasii*]). Wetlands were not delineated, and have not been reviewed by any jurisdictional authority, including the U.S. Army Corps of Engineers (USACE), Ecology, or county or municipal governments. Detailed delineations would be prepared if one of the action alternatives is selected.

Wetland boundaries were estimated based on these observations, and the results hand-drawn onto an aerial photograph in the field. The resulting composite aerial photograph was digitized into ArcGIS.
Naming Convention, Classification, and Rating

Each wetland was assigned a unique designation (see Figure 7-1) consisting of a letter and a number. The numbers generally increase from south to north. Wetlands that are located along both action alternative routes were labeled with the Preferred Alternative number, since these wetlands are discussed first.

The wetlands in the study areas were classified according to the Cowardin system (Classification of Wetlands and Deepwater Habitats of the United States [Cowardin et al., 1979]). This system is summarized in Table 7-1.

### Table 7-1. Overview of Cowardin Classification System for Wetlands

<table>
<thead>
<tr>
<th>Abbreviation²</th>
<th>System</th>
<th>Class</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEM</td>
<td>Palustrine³</td>
<td>Emergent</td>
<td>Erect, rooted, herbaceous vegetation species, usually dominated by perennial plants.</td>
</tr>
<tr>
<td>PSS</td>
<td>As Above</td>
<td>Scrub-Shrub</td>
<td>Woody plants less than 20 feet tall, including shrubs, tree saplings, or stunted trees or shrubs.</td>
</tr>
<tr>
<td>PFO</td>
<td>As Above</td>
<td>Forested</td>
<td>Woody plants that are 20 feet or taller.</td>
</tr>
<tr>
<td>POW</td>
<td>As Above</td>
<td>Open Water</td>
<td>Inundated, unvegetated areas where water depth is greater than 6.6 feet (2 meters).</td>
</tr>
</tbody>
</table>

¹ Definitions are based on information from Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al., 1979).

² P = Palustrine, EM = Emergent, SS = Scrub/Shrub, FO = Forested, OW = Open Water

³ Palustrine wetlands are non-tidal and are dominated by trees, shrubs, emergent vegetation, mosses, or lichens.

Wetlands in the project area were also classified according to their landscape position and hydrologic characteristics. This type of classification system is referred to as hydrogeomorphic (or HGM) classification. The HGM classification used for this study (see Table 7-2) is described in the Washington State Wetland Rating System for Western Washington, Revised (Hruby, 2004).
Table 7-2. Overview of Hydrogeomorphic Classification of Wetlands (after Hruby, 2004)

<table>
<thead>
<tr>
<th>Class</th>
<th>Dominant Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depressional</td>
<td>Wetlands located either in a topographic depression where the outlet is above the interior of the wetland or on a flat where the source of hydrology is groundwater.</td>
</tr>
<tr>
<td>Riverine</td>
<td>Wetlands located in valleys or in stream channels that overflow their banks at least once every 2 years.</td>
</tr>
<tr>
<td>Lake Fringe</td>
<td>Vegetated wetlands located on the shores of water bodies that are at least 20 acres in size and have over 30% open water over 6.6 feet (2 meters) deep.</td>
</tr>
<tr>
<td>Slope</td>
<td>Wetlands located on a slope, with water flow in one direction (unidirectional flow) and where flows are not impounded.</td>
</tr>
<tr>
<td>Flat</td>
<td>Wetland located on topographic flats where precipitation is the only source of water.</td>
</tr>
<tr>
<td>Tidal (Freshwater)</td>
<td>Wetlands where the water levels are controlled by the tides, and salinity is less than 0.5 parts per thousand.</td>
</tr>
<tr>
<td>Tidal (Estuarine)</td>
<td>Wetlands where the water levels are controlled by the tides, and salinity is more than 0.5 parts per thousand.</td>
</tr>
</tbody>
</table>

Preliminary wetland ratings were developed for each wetland according to local ordinance requirements for King County (King County Code, Title 21A.24.318) and the Cities of Covington (Covington Municipal Code, 18.65.319), Kent (Kent City Code, Chapter 11.06.580), Renton (Renton Municipal Code Title 4, Chapter 3, 43.050), Newcastle (Newcastle Municipal Code, Chapter 18.24), Bellevue (Bellevue Land Use Code, Chapter 20.50.054), and Issaquah (Issaquah Municipal Code, Chapter 18.10.059). As previously noted, the wetland ratings provided are preliminary only, and have not been reviewed by local agencies at this time. A comparison of the rating systems for applicable jurisdictions is provided in Table 7-3.
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Category I</th>
<th>Category II</th>
<th>Category III</th>
<th>Category IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>King County&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>Category I Wetlands:</td>
<td></td>
<td></td>
<td>Category IV Wetlands have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include:</td>
</tr>
<tr>
<td></td>
<td>• Represent a unique or rare wetland type; or</td>
<td></td>
<td></td>
<td>1. Wetlands scoring less than 30 points out of 100 on the wetland rating form.</td>
</tr>
<tr>
<td></td>
<td>• Are more sensitive to disturbance than most wetlands; or</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Provide a high level of functions. Specific wetlands that meet the Category I criteria include:</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>1. Relatively undisturbed estuarine wetlands over one acre in size; or</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>2. Natural Heritage Wetlands, specifically,</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Wetlands identified by the Washington Natural Heritage Program/Department of Natural Resources as high quality relatively undisturbed wetlands; and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wetlands that support State listed threatened or endangered plants;</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Bogs;</td>
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<td></td>
<td>4. Mature and old-growth forested wetlands over one acre in size;</td>
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<td></td>
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<td></td>
<td>5. Wetlands in coastal lagoons; and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Wetlands that perform many functions very well, as indicated by a score of 70 or more points out of 100 on the wetland rating form.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Category II wetlands are difficult, though not impossible to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Estuarine wetlands less than one acre in size, or disturbed estuarine wetlands larger than one acre; and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Interdunal wetlands greater than one acre; and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Wetlands scoring between 51 and 69 points out of 100 on the wetland rating form.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Covington&lt;sup&gt;a,c&lt;/sup&gt;</td>
<td>The City of Covington has adopted the Washington State Wetland Rating System for Western Washington, Revised (Hruby, 2004).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Kent&lt;sup&gt;d&lt;/sup&gt;</td>
<td>The City of Kent has adopted the Washington State Wetland Rating System for Western Washington, Revised (Hruby, 2004).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jurisdiction</td>
<td>Category I</td>
<td>Category II</td>
<td>Category III</td>
<td>Category IV</td>
</tr>
<tr>
<td>--------------</td>
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<td>-------------</td>
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<td>-------------</td>
</tr>
</tbody>
</table>
| City of Renton | Category 1 wetlands are wetlands which meet one or more of the following criteria:  
(a) The presence of species listed by federal or state government as endangered or threatened, or the presence of essential habitat for those species; and/or  
(b) Wetlands having forty percent (40%) to sixty percent (60%) permanent open water (in dispersed patches or otherwise) with two (2) or more vegetation classes; and/or  
(c) Wetlands equal to or greater than ten (10) acres in size and having three (3) or more vegetation classes, one of which is open water; and/or  
(d) The presence of plant associations of infrequent occurrence; or at the geographic limits of their occurrence; and/or  
(e) Wetlands assigned the Unique/Outstanding #1 rating in the current King County Wetlands Inventory 1991 or as thereafter amended. | Category 2 wetlands are wetlands greater than two thousand two hundred (2,200) square feet which meet one or more of the following criteria:  
(a) Wetlands greater than two thousand two hundred (2,200) square feet that are not Category 1 or 3 wetlands; and/or  
(b) Wetlands that have heron rookeries or raptor nesting trees, but are not Category 1 wetlands; and/or  
(c) Wetlands of any size located at the headwaters of a watercourse, but are not Category 1 wetlands; and/or  
(d) Wetlands assigned the Significant #2 rating in the current King County Wetlands Inventory 1991 or as thereafter amended; and/or  
(e) Wetlands having minimum existing evidence of human-related physical alteration such as diking, ditching, or channelization. | Category 3 wetlands are wetlands greater than five thousand (5,000) square feet which meet one or more of the following criteria:  
(a) Wetlands that are severely disturbed. Severely disturbed wetlands are wetlands which meet the following criteria:  
° Are characterized by hydrologic isolation, human-related hydrologic alterations such as diking, ditching, channelization and/or outlet modification; and  
° Have soils alterations such as the presence of fill, soil removal, and/or compaction of soils; and  
° May have altered vegetation.  
(b) Wetlands that are newly emerging. Newly emerging wetlands are:  
° Wetlands occurring on top of fill materials; and  
° Characterized by emergent vegetation, low plant species richness, and used minimally by wildlife. These wetlands are generally found in the areas such as the Green River Valley and Black River Drainage Basin.  
(c) All other wetlands not classified as Category 1 or 2 such as smaller, high quality wetlands. | Not used by the City of Renton |
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Category I</th>
<th>Category II</th>
<th>Category III</th>
<th>Category IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Newcastle&lt;sup&gt;f&lt;/sup&gt;</td>
<td>The City of Newcastle has adopted the <em>Washington State Wetland Rating System for Western Washington, Revised</em> (Hruby 2004).</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>City of Bellevue&lt;sup&gt;g&lt;/sup&gt;</td>
<td>The City of Bellevue has adopted the <em>Washington State Wetland Rating System for Western Washington, Revised</em> (Hruby 2004).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City of Issaquah&lt;sup&gt;h&lt;/sup&gt;</td>
<td>The City of Issaquah has adopted the <em>Washington State Wetland Rating System for Western Washington, Revised</em> (Hruby 2004).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> King County has adopted the *Washington State Wetland Rating System for Western Washington, Revised* (Hruby, 2004).

<sup>b</sup> King County Critical Areas Code (KCC 21A.24.318).

<sup>c</sup> City of Covington Critical Areas Ordinance (CMC 18.65.319).

<sup>d</sup> City of Kent Critical Areas Code (KCC 11.06.580).

<sup>e</sup> City of Renton (Renton Municipal Code Title 4, Chapter 3, 43.050).

<sup>f</sup> City of Newcastle (Newcastle Municipal Code, Chapter 18.24).

<sup>g</sup> City of Bellevue (Bellevue Land Use Code, Chapter 20.50.054).

<sup>h</sup> City of Issaquah (Issaquah Municipal Code, Chapter 18.10.059).
7.1.2 Upland Vegetation Assessment

Upland vegetation was assessed within the study areas using existing aerial photography. This information was verified in the field. All of the observations were conducted from public rights-of-way. Detailed studies (e.g., plant surveys) have not been conducted at this time.

As described at the beginning of this chapter, upland vegetation in the study area can be broadly divided into three categories: (1) developed areas (e.g., residential yards); (2) agricultural areas (e.g., tilled land, pastures, orchards, or plant nurseries); and (3) remnant native or natural vegetation. Developed or landscaped areas can be further divided into recently developed areas and areas with mature trees. Remnant native or natural vegetation can be divided into herbaceous, shrub, and forested (broad-leaf, coniferous, or mixed) communities.

7.1.3 Preferred Alternative

Wetlands

In the Preferred Alternative study area, 80 wetlands were identified (Table 7-4). Of these identified wetlands:

- 4 are located within the City of Covington
- 8 are located within the City of Issaquah
- 7 are located within the City of Renton
- 61 are located within unincorporated King County

A summary of the characteristics of these wetlands is provided in Table 7-4.

<table>
<thead>
<tr>
<th>Wetland Identifier</th>
<th>Jurisdiction</th>
<th>USFWS Classificationa</th>
<th>Dominant Species</th>
<th>Hydrogeomorphic Classificationb</th>
<th>Preliminary Wetland Rating (Category)b,c,d,e</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR-1</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, redtwig dogwood, salmonberry, creeping buttercup</td>
<td>Riverine (Jenkins Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-2</td>
<td>Covington</td>
<td>PFO</td>
<td>Red alder, salmonberry</td>
<td>Riverine (Jenkins Creek)</td>
<td>I</td>
</tr>
<tr>
<td>WR-3</td>
<td>Covington</td>
<td>PFO/PSS</td>
<td>Red alder, Pacific willow, salmonberry, redtwig dogwood, Himalayan blackberry, reed canary grass</td>
<td>Riverine (Little Soos/Big Soos Creeks)</td>
<td>I</td>
</tr>
<tr>
<td>WR-4</td>
<td>Covington</td>
<td>PFO/ PSS</td>
<td>Willows, skunk cabbage</td>
<td>Riverine (Big Soos Creek)</td>
<td>I</td>
</tr>
<tr>
<td>WR-5</td>
<td>Covington</td>
<td>PFO</td>
<td>Red alder, Pacific willow, redtwig dogwood</td>
<td>Riverine (Unnamed tributary to Big Soos Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-6</td>
<td>King County</td>
<td>PSS</td>
<td>Hardhack</td>
<td>Depressional</td>
<td>II/III</td>
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<tr>
<td>WR-7</td>
<td>King County</td>
<td>PSS</td>
<td>Hardhack</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
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<td>Wetland Identifier</td>
<td>Jurisdiction</td>
<td>USFWS Classification</td>
<td>Dominant Species</td>
<td>Hydrogeomorphic Classification</td>
<td>Preliminary Wetland Rating (Category)</td>
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</tr>
<tr>
<td>WR-8</td>
<td>King County</td>
<td>PEM</td>
<td>Mixed grasses, soft rush</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-9</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, Himalayan blackberry, reed canary grass</td>
<td>Depressional</td>
<td>II/III</td>
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<tr>
<td>WR-10</td>
<td>King County</td>
<td>PEM</td>
<td>Soft rush, reed canary grass</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-11</td>
<td>King County</td>
<td>PEM</td>
<td>Mowed grass (pasture)</td>
<td>Depressional</td>
<td>IV</td>
</tr>
<tr>
<td>WR-12</td>
<td>King County</td>
<td>PSS</td>
<td>Hardhack</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-12a</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, salmonberry</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-13</td>
<td>King County</td>
<td>PSS/ PEM/ POW</td>
<td>Willows, hardhack, reed canary grass</td>
<td>Riverine (tributary to Ham Lake)</td>
<td>I</td>
</tr>
<tr>
<td>WR-14</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, willows, reed canary grass</td>
<td>Riverine (tributary to Ham Lake)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-15</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, hardhack, Himalayan blackberry, reed canary grass</td>
<td>Riverine (tributary to Ham Lake)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-16</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, salmonberry, hardhack</td>
<td>Riverine (tributary to Ham Lake)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-17</td>
<td>King County</td>
<td>PEM</td>
<td>Reed canary grass</td>
<td>Riverine (tributary to Ham Lake)</td>
<td>II/III</td>
</tr>
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<td>WR-18</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, Himalayan blackberry</td>
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<td>II/III</td>
</tr>
<tr>
<td>WR-19</td>
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<td>PSS</td>
<td>Hardhack</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-20</td>
<td>King County</td>
<td>PSS</td>
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</tr>
<tr>
<td>WR-21</td>
<td>King County</td>
<td>PEM</td>
<td>Soft rush, water parsley</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-22</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, hardhack</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-23</td>
<td>King County</td>
<td>PEM</td>
<td>Mixed grasses (grazed pasture)</td>
<td>Slope</td>
<td>IV</td>
</tr>
<tr>
<td>WR-24</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, willows, salmonberry</td>
<td>Slope</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-25</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, hardhack, reed canary grass</td>
<td>Slope</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-26</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, salmonberry</td>
<td>Riverine (United Nations Creek)</td>
<td>II/III</td>
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<tr>
<td>WR-27</td>
<td>King County</td>
<td>PFO</td>
<td>Western red cedar, red alder, salmonberry, reed canary grass</td>
<td>Riverine (United Nations Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-28</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, Himalayan blackberry</td>
<td>Depressional</td>
<td>II/III</td>
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<tr>
<td>WR-29</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, soft rush</td>
<td>Depressional</td>
<td>II/III</td>
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<td>WR-30</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, black cottonwood</td>
<td>Depressional</td>
<td>II/III</td>
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<tr>
<td>Wetland Identifier</td>
<td>Jurisdiction</td>
<td>USFWS Classification</td>
<td>Dominant Species</td>
<td>Hydrogeomorphic Classification</td>
<td>Preliminary Wetland Rating (Category)</td>
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<td>WR-31</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Red alder, hardhack</td>
<td>Riverine (Molasses Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-32</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, redtwig dogwood, hardhack, soft rush</td>
<td>Riverine (Molasses Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-33</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Willows, redtwig dogwood, hardhack, soft rush</td>
<td>Riverine (Molasses Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-34</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, redtwig dogwood</td>
<td>Riverine (Molasses Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>WR-35</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, western red cedar</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>R1</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, hardhack</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>R2</td>
<td>Renton</td>
<td>PSS/PEM</td>
<td>Willows, reed canary grass, soft rush, creeping buttercup, planted black twinberry, roses, and salmonberry</td>
<td>Slope</td>
<td>II/III</td>
</tr>
<tr>
<td>G10</td>
<td>Renton</td>
<td>PSS</td>
<td>Willows, reed canary grass</td>
<td>Riverine (Cedar River tributary)</td>
<td>3</td>
</tr>
<tr>
<td>R3</td>
<td>Renton</td>
<td>PSS</td>
<td>Red alder saplings, reed canary grass</td>
<td>Depressional</td>
<td>2/3</td>
</tr>
<tr>
<td>R4</td>
<td>Renton</td>
<td>POW/PSS</td>
<td>Black cottonwood, willows, mixed grasses, common cattail</td>
<td>Riverine (Cedar River)</td>
<td>2/3</td>
</tr>
<tr>
<td>R5</td>
<td>Renton</td>
<td>PFO</td>
<td>Red alder, weeping willows, native willows</td>
<td>Riverine (Madsen Creek)</td>
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<tr>
<td>R6</td>
<td>Renton</td>
<td>PFO</td>
<td>Black cottonwood, willows, reed canary grass</td>
<td>Riverine (Cedar River)</td>
<td>2/3</td>
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<tr>
<td>R7</td>
<td>Renton</td>
<td>PFO</td>
<td>Red alder, willows, reed canary grass</td>
<td>Riverine (Cedar River)</td>
<td>2/3</td>
</tr>
<tr>
<td>R8</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, reed canary grass</td>
<td>Riverine (Cedar River)</td>
<td>II/III</td>
</tr>
<tr>
<td>R9</td>
<td>King County</td>
<td>PSS</td>
<td>Cascara, currant, roses</td>
<td>Riverine (Cedar River/Stewart Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>R10</td>
<td>King County</td>
<td>PSS</td>
<td>Cascara, currant, roses, salmonberry</td>
<td>Riverine (Cedar River)</td>
<td>II/III</td>
</tr>
<tr>
<td>R11</td>
<td>King County</td>
<td>PFO</td>
<td>Black cottonwood, red alder, and willows</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>L1</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Red alder, western red cedar, willows</td>
<td>Riverine (Unnamed tributary to May Creek)</td>
<td>I</td>
</tr>
<tr>
<td>L2</td>
<td>King County</td>
<td>PSS</td>
<td>Sitka and other willows, redtwig dogwood, reed canary grass, cattails</td>
<td>Riverine (Unnamed tributary to May Creek)</td>
<td>I</td>
</tr>
<tr>
<td>L3</td>
<td>King County</td>
<td>PSS</td>
<td>Pacific and other willows, hardhack, salmonberry, skunk cabbage</td>
<td>Depressional</td>
<td>II</td>
</tr>
<tr>
<td>Wetland Identifier</td>
<td>Jurisdiction</td>
<td>USFWS Classification</td>
<td>Dominant Species</td>
<td>Hydrogeomorphic Classification</td>
<td>Preliminary Wetland Rating (Category)</td>
</tr>
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<tr>
<td>L4</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, Scouler’s and other willows, hardhack and salmonberry</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>L5</td>
<td>King County</td>
<td>PEM</td>
<td>Reed canary grass and mixed grasses (unidentified)</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>L6</td>
<td>King County</td>
<td>PSS/PEM</td>
<td>Willows, hardhack, reed canary grass and mixed grasses (unidentified)</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>L7</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, willows</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>L8</td>
<td>King County</td>
<td>PFO</td>
<td>Willows, hardhack</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>L9</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, redtwig dogwood</td>
<td>Depressional</td>
<td>II/III</td>
</tr>
<tr>
<td>L10</td>
<td>King County</td>
<td>PFO/PSS/PEM</td>
<td>Red alder, Pacific and other willows, salmonberry, reed canary grass, soft rush, mowed/grazed grasses</td>
<td>Riverine (May Creek)</td>
<td>I</td>
</tr>
<tr>
<td>L10A</td>
<td>King County</td>
<td>PFO/PSS/PEM</td>
<td>Black cottonwood, Pacific willow, other willows, reed canary grass, Himalayan blackberry</td>
<td>Riverine (May Creek)</td>
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<tr>
<td>L10B</td>
<td>King County</td>
<td>PFO/PSS/PEM</td>
<td>Red alder, salmonberry, redtwig dogwood</td>
<td>Riverine (May Creek)</td>
<td>I</td>
</tr>
<tr>
<td>L11</td>
<td>King County</td>
<td>PSS</td>
<td>Willows, skunk cabbage</td>
<td>Riverine (Unnamed tributary to May Creek)</td>
<td>I</td>
</tr>
<tr>
<td>L12</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, redtwig dogwood, salmonberry, reed canary grass, lady fern</td>
<td>Riverine (Unnamed tributary to May Creek)</td>
<td>I</td>
</tr>
<tr>
<td>L13</td>
<td>King County</td>
<td>PSS</td>
<td>Black cottonwood, red alder, western red cedar, willows, salmonberry</td>
<td>Riverine (Unnamed tributary to May Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>L14</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Red alder, willows</td>
<td>Riverine (Unnamed tributary to May Creek)</td>
<td>II/III</td>
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<tr>
<td>L14A</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Red alder, willows</td>
<td>Riverine (Unnamed tributary to May Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>L15</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Red alder, willows, redtwig dogwood, reed canary grass</td>
<td>Riverine (Tibbetts Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>L15A</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Red alder, willows, redtwig dogwood, reed canary grass</td>
<td>Riverine (Tibbetts Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>L16</td>
<td>King County</td>
<td>PFO</td>
<td>Red alder, willows, salmonberry, skunk cabbage</td>
<td>Riverine (Unnamed tributary to Tibbetts Creek)</td>
<td>II/III</td>
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<tr>
<td>L17</td>
<td>King County</td>
<td>PFO/PSS</td>
<td>Red alder, willows, salmonberry, American brooklime</td>
<td>Riverine (Unnamed tributary to Tibbetts Creek)</td>
<td>II/III</td>
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</tbody>
</table>
### Wetland Identifier | Jurisdiction | USFWS Classification | Dominant Species | Hydrogeomorphic Classification | Preliminary Wetland Rating (Category)\(^{b,c,d,e}\)
--- | --- | --- | --- | --- | ---
L18 | King County | PEM | Reed canary grass | Slope | II/III
L19 | King County | PFO | Red alder, willows, reed canary grass, stinging nettle | Riverine (Tibbetts Creek) | II/III
L20 | King County | PFO | Western red cedar, reed canary grass | Slope | II/III
L21 | Issaquah | PFO | Red alder, willows, salmonberry, creeping buttercup, and common horsetail | Riverine (Tibbetts Creek) | II/III
L22 | Issaquah | PSS | Willows, salmonberry, hardhack, and lady fern | Depressional | II/III
L23 | Issaquah | PFO/PEM | Red alder, Pacific willow, Skunk cabbage, reed canary grass | Riverine (Tibbetts Creek) | II/III
L24 | Issaquah | PEM | Reed canary grass, soft rush | Riverine (Tibbetts Creek) | II/III
L25 | Issaquah | PSS/PEM | Red alder saplings, willows, salmonberry, Himalayan blackberry, soft rush, reed canary grass, lady fern | Riverine (Tibbetts Creek) | II/III
L26 | Issaquah | PEM | Reed canary grass, soft rush, creeping buttercup | Riverine (Tibbetts Creek tributary) | II/III
L27 | Issaquah | PSS/PEM | Willows, soft rush, reed canary grass, cattail | Riverine (Tibbetts Creek tributary) | II/III
L28 | Issaquah | PSS/PEM | Red alder saplings, willows, soft rush, reed canary grass, creeping buttercup | Riverine (Tibbetts Creek) | II/III

\(^a\) Cowardin et al., 1979. All wetlands are palustrine. P = Palustrine, EM = Emergent, FO = Forested, OW = Open Water, SS = Scrub/Shrub.
\(^b\) Hruby (2004) and King County Critical Areas Code (KCC 21A.24.318).
\(^c\) City of Covington Critical Areas Ordinance (CMC 18.65.319).
\(^d\) City of Renton Critical Areas Ordinance (KCC 15.08.400).
\(^e\) Wetland ratings are preliminary and have not been reviewed by regulatory agencies.

Of the 80 wetlands identified in the Preferred Alternative study area:

- 42 wetlands are forested; 13 of these forested wetlands also include scrub/shrub components, and 4 have an emergent component.
- 28 of the wetlands are shrub communities; 6 of these have an emergent community, and 2 have an open water component.
- 10 wetlands are emergent communities.
**Forested Wetlands Vegetation**

Forested wetlands in the Preferred Alternative study area are generally dominated by black cottonwood (*Populus balsamifera*), red alder (*Alnus rubra*), Pacific willow (*Salix lucida* var. *lasiandra*) and western red cedar (*Thuja plicata*). Shrubs present in the forested wetlands include hardhack (*Spiraea douglasii*), redtwig dogwood (*Cornus sericea*), salmonberry (*Rubus spectabilis*), and Hooker’s and Scouler’s willows (*Salix hookeriana* and *S. scouleriana*). Herbaceous species present in the forested wetlands include American brooklime (*Veronica americana*), creeping buttercup (*Ranunculus repens*), lady fern (*Athyrium filix-femina*), skunk cabbage (*Lysichiton americanus*), and soft rush (*Juncus effusus*). Invasive species (notably Himalayan blackberry [*Rubus armeniacus*] and reed canary grass [*Phalaris arundinacea*]) are present in many of the forested wetlands.

**Scrub/shrub Wetlands Vegetation**

Scrub/shrub wetlands in the Preferred Alternative study area are primarily dominated by hardhack and Hooker’s and Scouler’s willows. Five wetlands are exclusively hardhack. Redtwig dogwood and salmonberry are frequently present as well. Cascara (*Rhamnus purshiana*), black twinberry (*Lonicera involucrata*), various currants (*Ribes* sp.), and native roses (*Rosa* sp.) are present in the three wetlands that have been enhanced as part of wetland mitigation projects (R2, R9, and R10). Soft rush, skunk cabbage, and reed canary grass are the most common herbaceous vegetation in the scrub/shrub wetlands.

**Emergent Wetlands Vegetation**

Emergent wetlands in the Preferred Alternative study area are largely grazed pastures. As a result, species diversity is low, and more disturbance-tolerant species such as soft rush and reed canary grass are generally dominant along with pasture grasses. Water parsley (*Oenanthe sarmentosa*) is present in one shallowly inundated wetland.
Water Resources Associated with Wetlands

In the Preferred Alternative study area:

- 46 wetlands are associated with streams (riparian wetlands), as follows:
  - 2 with Jenkins Creek
  - 1 with Little Soos Creek
  - 1 with Big Soos Creek
  - 1 with an unnamed tributary to Big Soos Creek
  - 5 with the tributary to Ham Lake
  - 2 with United Nations Creek
  - 4 with Molasses Creek
  - 1 with Madsen Creek
  - 7 with the Cedar River
  - 10 with May Creek and its tributaries
  - 12 with Tibbetts Creek and its tributaries

- 28 wetlands are associated with low spots in the landscape (depressional wetlands).

- 6 wetlands are slope wetlands, and likely result from either hillside seeps or impermeable strata on the hill slopes.

Wetland Ratings

Wetlands were rated according to local ordinances. All 7 of the wetlands in the City of Renton are small and show some indications of disturbance. These wetlands would likely be rated as Category 2 or Category 3 according to the City of Renton rating system.

The remaining 73 wetlands are located in the cities of Covington and Issaquah and within unincorporated King County. These local governments have adopted the Ecology rating system (Hruby, 2004). Of these wetlands, 10 are part of large wetland complexes that have multiple vegetation classes and/or are associated with salmon-bearing streams. These systems are likely to be rated Category I in the Ecology rating system. Another 60 wetlands include a mixture of sizes and vegetation classes, and would provide moderate levels of habitat and structural diversity. These wetlands would likely fall into either Category II or III. Along the Preferred Alternative, 2 of the smallest wetlands consist of grazed pastures and have little habitat value or biological diversity. These wetlands would likely be rated Category IV.

Upland Vegetation

The Preferred Alternative would be located within paved rights-of-way for a majority of the alignment. Land use alongside the roads in the study area includes a mixture of commercial, residential, agricultural, and open space areas. Vegetation in the residential and commercial properties is largely landscaped areas, lawns, and remnant native trees (Douglas fir \(Psuedotsuga menziesii\) and western red cedar). The agricultural land uses are primarily grazing, and vegetation in these areas consists of mixed pasture grasses with occasional patches of Himalayan blackberry and Scot’s broom (Cytissus scoparius).

Second Supply Pipeline (SSP) to SR 169

Beginning at the southern end of the Preferred Alternative where it would connect with the SSP and extending north to 164th Place SE, the upland vegetation primarily consists of small pastures and landscaped yards. The pasture vegetation is mixed grasses and disturbance-tolerant forbs (e.g., dandelion, plantains, thistles, etc.). The landscaped areas have similar
species interspersed with ornamental shrubs and a few remnant Douglas fir and western red cedar.

From 164th Place SE to SR 18, the Preferred Alternative would cross the BNSF Railway and Bonneville Power Administration (BPA) rights-of-way, and a former mine site. Two forested wetlands (WR-1 and WR-2, see above) are located in this portion of the proposed route, immediately alongside Jenkins Creek. The upland forest is predominantly Douglas fir with a few scattered bigleaf maple (*Acer macrophyllum*), red alder, and a few scattered cascara (*Rhamnus purshiana*). The understory includes Oregon grape (*Berberis nervosa*), salal (*Gaultheria shallon*), snowberry (*Symphicarpos alba*), and Himalayan blackberry. Thimbleberry (*Rubus parviflorus*) is dominant in some areas. Sword fern (*Polystichum munitum*) is also common in the understory of this forest.

The areas immediately beneath the BPA power lines are maintained free of trees. Vegetation in this area consists of mixed grasses interspersed with stands of Scot's broom (*Cytisiss scoparius*) and Himalayan blackberry. The former quarry site is used for topsoil/composting, and most vegetation has been removed. A narrow strip of meadow dominated by mixed grasses (reed canary grass, orchard grass [*Dactylis glomerata*]) and weedy forbs is located immediately south of SR 18.

A road right-of-way option in this area would follow 164th Place east to Covington Way SE, and Covington Way SE to SE 277th Street. Properties along this right-of-way include a mixture of commercial properties (including a power substation and composting facility) and residential lots. Vegetation in this area consists of roadside vegetation with scattered pockets of Scot’s broom and mixed forest.

Between SR 18 and SE 272nd Street, the Preferred Alternative would cross upland forest (similar to those described above) and a scrub/shrub and forested wetland (WR-3) associated with the confluence of Little Soos and Big Soos Creeks.

Between SE 272nd Street and SE 216th Street, the Preferred Alternative would be located within existing road rights-of-way. Upland vegetation in this area consists of a mixture of small farms with pastures and occasional Douglas fir and western red cedar, remnant forested areas (similar to the upland forest described above), and landscaped yards in more recently developed residential tracts.

From SE 216th Street north to SE 192nd Street, a large tract of upland forest associated with Lake Youngs occupies the east side of 148th Avenue SE. Vegetation in this area includes smaller amounts of black cottonwood and red alder interspersed with larger amounts of Douglas fir, western red cedar, and western hemlock (*Tsuga heterophylla*). Understory species include salmonberry, snowberry, and sword fern.
Along SE 192nd Street, land use is predominantly residential. Vegetation includes mowed lawns and a few remnant coniferous trees. A few of the larger lots are used as pasture.

The alignment turns north from the intersection of SE 192nd Street and 140th Avenue SE. The area includes a mixture of landscaped yards (some with mature trees) and a few small forested areas. The newly developed subdivisions lack large trees. A few commercially developed properties are present near SE Petrovitsky Road; these properties are largely devoid of vegetation. Douglas fir and occasional western red cedar dominate the forested areas, and Himalayan blackberry is common in the understory.

North of SE Petrovitsky Road, a large relatively undisturbed forested area is located on the west side of 140th Avenue SE. Western red cedar, Douglas fir, salmonberry, and sword fern are the dominant species in this area. The east side of 140th Avenue SE is currently a golf course, but red alder, bigleaf maple, and Douglas fir line the road. Continuing north, the Preferred Alternative follows one of two options to reach Maple Valley Highway (SR 169). The first option continues along 140th Way SE and stays within the right-of-way. The second option travels overland directly north, passing east of a residential development and crossing a forested ravine. Vegetation in this area consists of mixed forest, predominantly Douglas fir, red alder, black cottonwood, and bigleaf maple.

**SR 169 to Northern Terminus**

From SR 169 to SE 128th Street, the corridor crosses through a mixture of mowed roadsides, wetlands associated with the Cedar River and its tributaries, residential neighborhoods with lawns, landscaping and some mature trees, and isolated areas of upland forest. The Preferred Alternative would be located within existing road rights-of-way in this area.

From 128th Street north to the crossing of May Creek near Renton-Issaquah Road SE (SR 900), the Preferred Alternative would travel through existing road right-of-way. The vegetation in this area includes residential yards for small and large lot residential parcels, maintained power line easements, and agricultural parcels. Vegetation in the residential lots is similar to that already described, except that on larger parcels remnants of upland forest are present. Vegetation in the power line easement is similar, although trees have generally been removed to avoid potential impacts on the power lines. The agricultural parcels are primarily used for grazing, and the dominant vegetation includes mixed pasture grasses and a few scattered trees. Trees are also present on road edges. A large quarry site is also located on the south side of SE Renton-Issaquah Road at 176th Avenue SE; this site is bordered by a narrow fringe of trees as well. The areas surrounding May Creek are largely wetlands. Currently these areas are grazed or used for hay production.

From May Creek northward, the route parallels SR 900. Undeveloped areas are a mixture of forested uplands and forested and shrub wetlands. The uplands are dominated by Douglas fir and bigleaf maple (*Acer macrophyllum*), with an understory of Indian plum (*Oemleria cerasiformis*), vine maple (*Acer circinatum*), snowberry (*Symphoricarpos albus*), Oregon grape (*Berberis nervosa*), salal (*Gaultheria shallon*), and sword fern (*Polystichum munitum*). Himalayan blackberry and Scot’s broom are present in the more disturbed areas, particularly along the road edges and cleared portions of the PSE rights-of-way.
7.1.4 Green Route Alternative

In the Green Route Alternative study area, 68 wetlands were identified (Table 7-5). Of these wetlands:

- 14 are located within the City of Kent.
- 8 are within the City of Newcastle.
- 11 are within the City of Renton,
- 3 are within the City of Bellevue.
- 32 are located within unincorporated King County.

A summary of the characteristics of these wetlands is provided in Table 7-5.

<table>
<thead>
<tr>
<th>Wetland Identifier</th>
<th>Jurisdiction</th>
<th>USFWS Classification</th>
<th>Dominant Species</th>
<th>Hydrogeomorphic Classification</th>
<th>Preliminary Wetland Rating (Category)</th>
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<td>P16</td>
<td>Bellevue</td>
<td>PFO</td>
<td>Red alder, salmonberry, skunk cabbage</td>
<td>Riverine (Coal Creek)</td>
<td>II/III</td>
</tr>
<tr>
<td>P17</td>
<td>Bellevue</td>
<td>PSS</td>
<td>Willows</td>
<td>Slope</td>
<td>II/III</td>
</tr>
<tr>
<td>P18</td>
<td>Bellevue</td>
<td>PFO</td>
<td>Red alder, willows</td>
<td>Slope</td>
<td>II/III</td>
</tr>
</tbody>
</table>

*a Cowardin et al., 1979. All wetlands are palustrine. P = Palustrine, EM = Emergent, FO = Forested, OW = Open Water, SS = Scrub/Shrub.

b Hruby (2004) and King County Critical Areas Ordinance (KCC 21A.24.318).

c City of Kent Critical Areas Code (KCC 11.06.580).

d City of Renton (Renton Municipal Code Title 4, Chapter 3, 43.050).

e City of Newcastle (Newcastle Municipal Code, Chapter 18.24).

f City of Bellevue (Bellevue Land Use Code, Chapter 20.50.054).

g Wetland ratings are preliminary and have not been reviewed by regulatory agencies.
Of the 68 wetlands identified in the Green Route Alternative study area:

- 39 of the wetlands are forested; 6 of these also have a shrub component and 4 have emergent components.
- 19 wetlands are predominantly shrub communities; 5 of these have an emergent component and 1 has an open water component.
- 10 wetlands are emergent communities.

**Forested Wetlands Vegetation**
The vegetation in forested wetlands along the Green Route Alternative is similar to that found in forested wetlands along the Preferred Alternative (see Section 7.1.3).

**Scrub/shrub Wetlands Vegetation**
The vegetation in scrub/shrub wetlands along the Green Route Alternative is similar to that found in scrub/shrub wetlands along the Preferred Alternative (see Section 7.1.3).

**Emergent Wetlands Vegetation**
Emergent wetlands along the Green Route Alternative include both grazed pastures and naturalized emergent wetlands. Soft rush and reed canary grass are the most common species in these systems, although unidentified grasses, creeping buttercup (*Ranunculus repens*), skunk cabbage, and common cattail (*Typha latifolia*) are present in several areas.
Water Resources Associated with Wetlands

In the Green Route Alternative study area:

- 35 wetlands are associated with streams (riparian wetlands), as follows:
  - 2 with Westside Soos Creek
  - 1 with Soosette Creek
  - 8 with tributaries to Meridian Creek
  - 4 with Big Soos Creek
  - 1 with United Nations Creek
  - 1 with Coal Creek
  - 4 with Molasses Creek
  - 1 with Madsen Creek
  - 7 with the Cedar River
  - 2 with May Creek
  - 3 with Boren Creek/Lake Boren
  - 1 with Coal Creek
  - 1 with a tributary to Coal Creek

- 20 wetlands are associated with depressions.
- 13 wetlands are associated with slopes.

Wetland Ratings

Wetlands in the project study area were rated according to local ordinance requirements. The 11 wetlands within the City of Renton were rated using Renton’s wetland rating system. One wetland is part of a large wetland complex, includes multiple vegetation classes, and is associated with May Creek, a salmon-bearing stream. This wetland would likely be rated Category 1. The other wetlands are smaller systems and are relatively disturbed. These wetlands would be rated Category 2 or 3, depending on the degree of disturbance.

The remaining 57 wetlands were rated according to the critical areas ordinances for the cities of Bellevue, Kent, Newcastle, and for King County, all of which use the Ecology rating system. Of these wetlands, 7 are larger wetlands with multiple vegetation classes and are associated with either a salmon-bearing stream or a relatively large lake. These wetlands likely meet the requirements for Category I. There are 44 wetlands that are systems with less structural and species diversity, which would likely fall in either Category II or III. The remaining 6 wetlands are small wetlands dominated by invasive species. These wetlands appear to meet the Category IV criteria.

Upland Vegetation

Second Supply Pipeline (SSP) to SR 169

Beginning at SE 296th Street, the Green Route Alternative would travel north along 132nd Avenue SE through a short stretch of large lot residential development to the east and agricultural land to the west. The vegetation in this area includes a few small pastures,
residential lawns with remnant native trees (primarily Douglas fir), and birch and evergreen trees in what appear to be a tree farm to the west. North of SE 292nd Street, smaller pastures are interspersed with newer developments with little mature vegetation. The intersection of SE 256th Street and 132nd Avenue SE is devoid of vegetation, but the mixture of small pastures and residential development continues on the north side of the intersection to SE 208th Street. A few small patches of upland forest remain undeveloped; these are primarily associated with riparian corridors for Westside Soos Creek, Soosette Creek, and Meridian Valley Creek and its unnamed tributary. Outside of any associated wetlands, vegetation in these forests is predominantly Douglas fir, black cottonwood, bigleaf maple, red alder, and western red cedar. Understory vegetation varies, but typically includes Indian plum, Oregon grape, salal, salmonberry, snowberry, and sword fern in less disturbed areas, and Himalayan blackberry in more disturbed areas.

The Green Route Alternative would turn to the east on SE 208th Street to 140th Avenue SE. Vegetation in this area includes residential lots and small pastures. Two small forest areas are located on either side of SE 208th Street. Species present in these areas include red alder, bigleaf maple, Indian plum, salmonberry, and sword fern. At the Big Soos Creek crossing, vegetation includes emergent and forested wetlands (WG-26 through WG-30).

Continuing north, the Green Route Alternative would follow 140th Avenue SE. Vegetation in this area includes residential yards and forested wetlands associated with Big Soos Creek and United Nations Creek, as noted above.

From SE 240th Street north to SE 192nd Street, the Green Route Alternative would pass through residential areas with mowed lawns and occasional coniferous and deciduous trees. The route for the Green Route Alternative from SE 192nd Street north to 154th Avenue SE would be identical to that of the Preferred Alternative.

**SR 169 to the Northern Terminus**

Continuing northward along 156th Avenue SE, the Green Route Alternative would pass through more small residential and small agricultural parcels. As the Green Route Alternative turns northward, it would follow 148th Street SE. The land use in this area changes to a mixture of larger lot residential properties interspersed with small farms. Vegetation in large residential lots is similar to the smaller residential parcels, but more trees are generally present. Agricultural use in this area is primarily grazing, and the vegetation consists of mixed pasture grasses. This combination of large lot residential use and small farms continues as the route continues northward, crossing May Creek and its associated wetlands, and turning west to follow SE May Valley Road.

The Green Route Alternative would travel from 148th Street SE westward along SE May Valley Road to the intersection with Coal Creek Parkway SE. Upland vegetation in this area consists of a mixture of landscaped yards, small pastures, and patches of mixed upland forest (mostly on the north side of the road). Vegetation in the residential and pasture areas is similar
to that described above. The forested areas are primarily bigleaf maple, with smaller amounts of Douglas fir, western red cedar, Himalayan blackberry, and beaked hazelnut (*Corylus cornuta*).

From the intersection of Coal Creek Parkway SE and SE May Valley Road, the Green Route Alternative would continue northward along Coal Creek Parkway. Between SE May Valley Road and SE 84th Way, the adjacent properties are primarily residential lots and open space. Vegetation in this area consists of landscaped yards and small patches of upland forest, similar to that found along SE May Valley Road.

Between SE 84th Way and SE 67th Street, the areas along Coal Creek Parkway SE are a mixture of multiple family residential developments and commercial properties. Vegetation is largely absent from these areas, with the exception of narrow strips of lawn and occasional street trees along the residential properties.

From SE 67th Street northward, the vegetation includes relatively large areas of upland forest and riparian wetlands. The upland forests are predominantly Douglas fir, bigleaf maple, western red cedar, Indian plum, and sword fern. Red alder and black cottonwood are common along the banks of Coal Creek and its tributaries. North of Forest Drive SE, residential land uses are present on the north side of Coal Creek Parkway SE, and the forested area continues along the south side of the street.

The Green Route Alternative would turn north and eastward following SE Newport Way. The area eastward to SE 42nd Street is residential, and vegetation consists of mowed lawns with occasional Douglas fir and western red cedar. East of SE 42nd Street, a forested parcel occupies the south side of SE Newport Way. Vegetation in this area consists of western red cedar, bigleaf maple, Douglas fir, salmonberry, and Indian plum.

### 7.2 Environmental Impacts

Environmental impacts were analyzed using reconnaissance-level resource information and preliminary engineering data. As a result, the impacts discussion is qualitative rather than quantitative.

#### 7.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to plants.

#### 7.2.2 Preferred Alternative

**Direct Impacts - Construction**

**Wetlands**

Construction-related impacts of the Preferred Alternative on wetlands could include vegetation clearing, potential disturbance to groundwater flows, and construction-related sedimentation and erosion. Each of these issues is discussed below.

The majority of the pipeline would be located in the existing road prism. However, the clearing limits could extend to the width of the rights-of-way. Wetlands that extend to the edge of the road prism could be within the affected portion of the rights-of-way. These areas would be...
avoided and no clearing would be required. As a result, the Preferred Alternative would not be expected to affect wetlands that extend to the edge of the road prism.

Seven wetlands are located in areas where the Preferred Alternative would leave existing road rights-of-way. Construction of the TCP has the potential to affect these wetlands. Of these 7 wetlands, 2 (WR1 and WR2) are located along Jenkins Creek and 5 (L10, L17, L20, L21, and L22) are located between the PSE rights-of-way and SR 900 just south of Issaquah. Depending on the option selected (see Chapter 2 for a description of options), some or all of these wetlands would be affected by construction of the Preferred Alternative. Table 7-6 lists the approximate areas of clearing that could be required for each wetland.

<table>
<thead>
<tr>
<th>Wetland</th>
<th>Approximate length of clearing (feet)</th>
<th>Approximate area of temporary clearing (square feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WR1</td>
<td>Trenchless crossing</td>
<td>Trenchless crossing</td>
</tr>
<tr>
<td>WR2</td>
<td>Trenchless crossing</td>
<td>Trenchless crossing</td>
</tr>
<tr>
<td>L10</td>
<td>Combination of trench and trenchless – length undetermined</td>
<td>Combination of trench and trenchless – length undetermined</td>
</tr>
<tr>
<td>L17</td>
<td>500</td>
<td>42,500</td>
</tr>
<tr>
<td>L20</td>
<td>250</td>
<td>21,250</td>
</tr>
<tr>
<td>L21</td>
<td>300</td>
<td>25,500</td>
</tr>
<tr>
<td>L22</td>
<td>300</td>
<td>25,500</td>
</tr>
<tr>
<td>Total</td>
<td>1,350</td>
<td>114,750 (2.6 acre)</td>
</tr>
</tbody>
</table>

Note: Length of clearing and impact areas were calculated based on preliminary wetland boundaries and preliminary engineering. Areas reflect an estimated 85-foot-wide corridor.

Because wetlands WR-1 and WR-2 would be crossed using trenchless crossing methods, there would be no excavating, clearing, or filling in these wetlands. Wetlands L17, L20, L21, and L22 would be crossed via an open trench. Impacts to these wetlands would include clearing of approximately 2.6 acres of wetland vegetation, trench excavating, and refilling the trench with native soils. Wetland L10 would be crossed with a combination of trench and trenchless methods (affected area has not been determined at this time). Estimated areas of temporary clearing are listed in Table 7-6. See Table 7-7 for a comparison of the Preferred Alternative and Green Route Alternative wetland impacts. Most of the affected wetlands are a mixture of forested and shrub communities and fall into the Category II/Category III range; however, Wetland L10 is rated Category I. Species in these wetlands that may be cleared include western red cedar, red alder, various willows, salmonberry, hardhack, American brooklime, reed canary grass, creeping buttercup, common horsetail, and lady fern.
A temporary excavation would be required within the cleared area to install the pipe. Trench widths have not been determined at this time, but would be expected to be up to 28 feet wide. This would result in approximately 0.9 acre of temporary wetland excavation. Following construction of the Preferred Alternative, the trenches would be refilled with native soils and all disturbed and cleared areas would be replanted with appropriate native vegetation.

Project construction could interrupt groundwater flows in the study area, or convey groundwater in a manner different from that of current conditions. While the impacts of groundwater changes on wetlands are difficult to assess because wetlands could be receiving water from several sources, changes to groundwater connections could result in a loss of wetlands. However, the pipeline bedding and backfill within the roadway prism would be free-draining granular materials that would not be expected to change the hydrology of nearby wetlands. Trench dams, which would prevent the pipe bedding and backfill from acting like a drain, would be installed at the edges of the wetland. Any confining impermeable layer that underlies the pipeline would be restored to ensure the integrity of nearby wetlands. With these measures in place, the project would not be expected to affect the groundwater component of wetlands. See Chapter 5 for additional details on the project’s impacts on groundwater.

Construction runoff could convey sediments or toxins (such as petroleum products) into wetlands, which could cause mortality of plants and animals in the wetlands. BMPs (erosion control measures, temporary erosion and sediment control plans, and spill prevention plans) would be implemented to limit the potential effects of construction-related runoff on wetlands.

### Uplands

Vegetation would be disturbed to allow for pipeline construction. The estimated width of disturbed area cross-country (not on roadways) would be approximately 85 feet. Based on a review of aerial photos, the estimated area requiring some clearing of vegetation would be approximately 18 acres. Approximately 10 acres of the potential clearing would be between the 164th Avenue SE and SE 272nd Street (Kent-Kangley Road). Approximately 3 acres of clearing would be located in the cross-country section east of 140th Way SE. The remaining 5 acres of clearing would be in the off-road areas near SR 900. An unspecified amount of vegetation could also be removed in the road rights-of-way areas, depending on the final location of the pipeline. See Table 7-7 for a comparison of the Preferred Alternative and Green Route Alternative upland impacts.

A temporary trench for installing the pipeline would be excavated in the cleared area. The top of the trench would be up to 28 feet wide, and would require approximately 8.1 acres of temporary excavation. This area would be refilled with native material after construction and replanted with native shrubs and herbs.

In off-road areas, the cleared vegetation would consist of a mixture of deciduous and coniferous trees (primarily Douglas fir, with smaller amounts of red alder and bigleaf maple) and native and non-native shrubs (Oregon grape, salal, Himalayan blackberry, and Scot's broom). Vegetation cleared in the road rights-of-way would include small patches of trees (Douglas fir, western red cedar, red alder, bigleaf maple, western hemlock), some upland shrubs (primarily snowberry), landscape plants, and mowed or grazed lawns.

The vegetation loss in uplands would be short-term. Cross-country areas along the Preferred Alternative would be replanted with appropriate vegetation following construction, although a smaller tree-free corridor would be maintained for ongoing maintenance activities (see Direct
Impacts – Operation below). Developed areas along the Preferred Alternative would be replanted with landscape or native species, as appropriate.

Construction runoff could convey sediments or toxins (such as petroleum products) into upland areas, killing or stressing plants. Erosion control measures would be implemented to limit the potential impacts of construction-related runoff on uplands.

<table>
<thead>
<tr>
<th>Wetland and Upland Impacts</th>
<th>Preferred Alternative</th>
<th>Green Route Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetlands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Clearing1</td>
<td>2.6 acres</td>
<td>-</td>
</tr>
<tr>
<td>Temporary Excavation</td>
<td>0.9 acre</td>
<td>-</td>
</tr>
<tr>
<td>Maintenance Corridor</td>
<td>1.0 acre</td>
<td>1.3 acres</td>
</tr>
<tr>
<td>Uplands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Clearing1</td>
<td>18.0 acres</td>
<td>2.5 acres</td>
</tr>
<tr>
<td>Temporary Excavation</td>
<td>8.1 acres</td>
<td>0.9 acre</td>
</tr>
<tr>
<td>Maintenance Corridor</td>
<td>8.8 acres</td>
<td>0.9 acre</td>
</tr>
</tbody>
</table>

1The temporary excavation and maintenance corridor values are included in the temporary clearing limits.

**Direct Impacts – Operation**

**Wetlands**

Ongoing operation of the Preferred Alternative would include vegetation management to allow for pipeline maintenance. A maintenance corridor would be required in some of the undeveloped areas along the Preferred Alternative. This maintenance corridor (permanent easement) would be narrower than the construction easement (approximately 30 feet wide), and would be located within previously cleared areas. The affected area would be approximately 1 acre. Trees would be removed permanently from the areas over the pipeline. Native shrubs and herbaceous species would be replanted in all areas. This clearing would reduce the amount of contiguous habitat in the affected wetlands. See Chapter 6 for additional details about the impacts of vegetation clearing on wildlife.

Approximately every 10 years or more, water would be discharged from the TCP at selected locations as part of ongoing operations and maintenance. These discharges could affect wetland hydrology and habitat along the Preferred Alternative. Discharges would contain treated, potable water and the discharged water would be de-chlorinated to Ecology water quality standards prior to entering any natural waters or wetlands. Potable water is used to irrigate residential lawns and landscape vegetation with no long-term effects. Higher-than-normal flows associated with maintenance could cause loss of wetland vegetation and potential...
increases in sedimentation and erosion. The blowoff or drain valves would be sized to regulate flows at valve locations, and flow diffusers (energy dissipaters) would be used to prevent erosion and turbidity at points of discharge. Discharges would be directed to existing stormwater or sanitary sewer conveyances, where available. Discharges would also be brief and would be unlikely to have long-term impacts on wetland plants. As a result, discharges from the Preferred Alternative would not be expected to affect wetlands.

A failure of the pipeline (breach) could affect wetlands along the Preferred Alternative. The volume of water from a breach could vary depending on the size of the breach. A large breach could cause erosion and sedimentation at the breach location. However, the risk of a breach or pipeline failure is very small, as evidenced by the small number of pipeline failures recorded for many miles of installed transmission pipelines. The pipeline would be designed in accordance with the latest design codes and standards utilizing factors of safety to minimize the potential of a breach. The pipeline would also have systems to monitor flows and pressures. Appropriate valve controls would be used to minimize loss of water under a pipeline breach condition. Procedures would be developed and documented in an Operations Plan for normal and emergency operations.

**Uplands**

Operational impacts of the Preferred Alternative on uplands include vegetation maintenance, discharge of water for maintenance purposes, and potential impacts of a breach in the pipeline.

As noted for the wetland areas, a maintenance corridor would be required for ongoing pipeline maintenance in undeveloped areas along the Preferred Alternative. This maintenance corridor would be the same size as the corridor in wetland areas (approximately 30 feet wide), and would be located within the area cleared for construction. The affected area is approximately 8.8 acres in size. Approximately 3.4 acres of the affected area would be located between SE 296th Street and SE 272nd Street. The remaining acres could be located in the cross-country areas east of 140th Way SE (2.5 acres) and near SR 900 (2.9 acres). Trees would be permanently removed from this area, but native shrubs and herbaceous species would be allowed to grow.

Potential impacts on uplands related to discharges and breaches of the pipeline would be similar to those described above for wetlands.

**Indirect Impacts - Construction**

**Wetlands**

Construction of the Preferred Alternative could produce indirect impacts as a result of direct impacts to wetlands. These indirect impacts could include changes to groundwater hydrology caused by installation of the pipeline. This change in groundwater could result in changes to wetland plant communities and habitat, and changes to water quantity and quality for wetlands outside the study area.

Construction of the Preferred Alternative could also alter groundwater levels in wetlands outside the study area. Changes in groundwater levels could change saturation and inundation levels, which in turn could reduce wetland area or change wetland plant composition and structure.

Groundwater changes to wetlands outside the project area would be minimized through the use of permeable pipeline bedding material and the use of trench dams. The use of these measures
would avoid potential impacts to groundwater along the Preferred Alternative. Potential indirect impacts on wildlife are discussed in Chapter 6.

Construction of the Preferred Alternative could also create erosion or sedimentation, which could affect the water quality in wetlands outside the Preferred Alternative study area. These changes in water quality could result in changes in wetland vegetation structure and species composition. Erosion control measures would be implemented to minimize these impacts. Implementation of these measures would minimize potential indirect impacts of erosion and sedimentation.

**Uplands**

Removing trees to construct the Preferred Alternative could increase wind exposure for remaining trees outside of the cleared areas. This increase in exposure could result in more downed trees in nearby uplands or wetlands during storm events, particularly in the undeveloped areas. Increases in windthrow (trees uprooted by wind) are site- and vegetation-specific, and are difficult to quantify.

Loss of natural cover could increase opportunities for invasive species to colonize new areas beyond the areas cleared for construction. This could result in a potential change in species composition that could also affect habitat structure and use. See Chapter 6 for details regarding the impacts of vegetation change on wildlife.

**Indirect Impacts – Operation**

**Wetlands**

Discharges from the TCP during operation could affect downstream hydrology, which could result in changes to wetland structure and species composition outside the Preferred Alternative study area. These changes would be minimized due to the very infrequent nature of discharges.

For wetlands outside the study area, pipeline breaches could have impacts similar to those described above under direct impacts. A large breach could cause short-term sedimentation and erosion that could affect wetlands inside and outside the study area over time due to vegetation loss or change in structure. Impacts of a pipeline breach would be minimized using the methods described above under Direct Impacts – Operation.

**Uplands**

Indirect impacts to upland vegetation during operation could include changes in plant composition and structure. The maintenance of a tree-free corridor could create additional opportunities for invasive species to become established, broadening these species’ distribution along the Preferred Alternative. However, these areas are currently affected by existing roads and power line rights-of-way, and invasive species are common in these uplands.

Discharges from the TCP during operation could affect downstream hydrology, which could result in changes to upland vegetation structure and species composition outside the Preferred Alternative study area. These potential changes in structure and composition could cause changes in habitat quality and wildlife use over time (see the Chapter 6 for details). Potential indirect impacts on plant composition would be minimized due to the very infrequent nature of discharges. Discharges would also be treated to meet Ecology standards and directed to stormwater or sanitary sewer systems, where feasible, limiting the potential for indirect impacts to uplands.
Pipeline breaches could also result in loss of upland vegetation or changes in plant communities via erosion or sedimentation. Erosion and sedimentation at a breach site would be controlled using methods similar to those discussed under Direct Impacts – Operation. These measures would reduce the potential for indirect effects resulting from a pipeline breach.

**Cumulative Impacts**

**Wetlands**
Cumulative impacts from the Preferred Alternative could result from clearing and grading in the temporary clearing areas (2.6 acres), temporary excavation (0.9 acre), ongoing maintenance activities (1.0 acre), and potential changes to wetland hydrology. Short-term sedimentation and runoff could also potentially affect wetlands along the Preferred Alternative. These impacts could result in cumulative loss of wetlands, or changes in wetland function. Avoidance and minimization measures would be used to limit the impacts of the Preferred Alternative on wetlands, and compensatory mitigation would be provided for unavoidable impacts to wetlands. As a result of these measures, the project would not be expected to have significant cumulative impacts on wetlands.

**Uplands**
Cumulative effects to upland vegetation could result from temporary clearing of 18 acres of upland, temporary excavation in approximately 3.5 acres of uplands, ongoing maintenance in 8.8 acres of upland, potential changes to local hydrology, ongoing maintenance activities, and short term sedimentation and erosion. These impacts to uplands could result in an increase in invasive species, or in changes in upland function. However, these areas currently have substantial populations of invasive species, and are subject to disturbance from nearby roads, development, and utility rights-of-way. Avoidance and minimization measures would be used to limit impacts on uplands. As a result, the project would not be expected to have significant cumulative impacts on uplands.

**7.2.3 Green Route Alternative**

**Direct Impacts - Construction**

**Wetlands**
Direct impacts to wetlands resulting from construction of the Green Route Alternative would be similar to those for the Preferred Alternative. One large wetland crossing would occur along the Green Route Alternative. This crossing would affect wetlands WG-27, WG-28, WG-29, and WG-30. These four wetlands are associated with the confluence of Big Soos Creek and United Nations Creek along SE 208th Street and 140th Avenue SE. The crossing would span all four wetlands. The associated streams would be crossed via trenchless technology that would not require excavation or fill in the wetlands. See Table 7-7 for a comparison of the Green Route Alternative and Preferred Alternative wetland impacts.

The remaining wetlands along the Green Route Alternative are located alongside existing roadways. Construction work in these areas would be confined to the existing road rights-of-way. Due to the preliminary nature of the project design, exact areas of wetland clearing within the right-of-way have not been calculated.

The potential for changes in groundwater and construction-related runoff resulting from construction of the Green Route Alternative would be similar to that of the Preferred Alternative.
The impacts of these potential changes in groundwater and runoff on wetland vegetation would be similar to those discussed for the Preferred Alternative.

**Uplands**

Direct impacts to upland vegetation from construction of the Green Route Alternative could include vegetation removal and the effects of toxic construction runoff. The impacts would be similar to those discussed for the Preferred Alternative, but would be less. The only cross-country segment within uplands would be east of 140th Way SE near SR 169. Up to 2.5 acres of vegetation would be temporarily cleared in this area, depending on the option chosen. Vegetation loss in road rights-of-way would be short-term, and the affected areas along the Green Route Alternative would be replanted with appropriate vegetation following construction. See Table 7-7 for a comparison of the Green Route Alternative and Preferred Alternative upland impacts.

Approximately 0.9 acre of temporary excavation within uplands would also be required to install the pipeline. This 0.9 acre of excavation would be within the 2.5-acre cleared area. The disturbed area would be backfilled with native soil material, re-graded, and replanted with appropriate native vegetation.

Construction runoff along the Green Route Alternative would have impacts similar to those discussed for the Preferred Alternative. Erosion control measures would be implemented to limit the potential impacts of construction-related runoff.

**Direct Impacts - Operation**

**Wetlands**

Potential impacts of ongoing operation of the Green Route Alternative on wetlands include permanent clearing, discharges of water from the TCP for maintenance purposes, and potential breaches in the pipeline.

Some clearing (approximately 1.3 acres total) for maintenance purposes would be required in wetlands associated with Soos Creek. Of the 1.3 acres, approximately 1 acre would be forested wetland. This loss of forested wetlands would change the composition of the habitat in the wetlands; however, shrubs and emergent vegetation would be allowed to grow, so habitat area would not be lost. See Chapter 6 for additional details on the impacts of vegetation clearing on wildlife.

Maintenance discharges and the results of pipeline breaches along the Green Route Alternative would be similar to those for the Preferred Alternative. Impacts of ongoing pipeline operation on wetland vegetation would also be similar to those discussed for the Preferred Alternative.

**Uplands**

Impacts on uplands due to operation of the Green Route Alternative would include maintenance of vegetation and potential impacts of a breach in the pipeline.

The maintenance corridor for the Green Route Alternative would be approximately 30 feet wide, and would be located largely within existing rights-of-way. Two cross-country areas would be proposed along the Green Route Alternative. The first crossing would be near Big Soos Creek. This area is all wetland, and no additional upland area would be disturbed. The second cross-country area would be the uplands located east of 140th Way SE near SR 169. Approximately
0.9 acre of upland would be maintained as a tree-free corridor in this area. Appropriate vegetation would be replanted in the corridor to minimize the impacts of the maintenance corridor.

Potential impacts of pipeline discharges and breaches in the pipeline would be similar to those discussed for the Preferred Alternative.

**Indirect Impacts - Construction and Operation**

**Wetlands**
Construction and operation of the Green Route Alternative could produce indirect impacts to wetland vegetation; these indirect impacts would be similar to those discussed for the Preferred Alternative.

**Uplands**
Indirect impacts of construction and operation of the Green Route Alternative on uplands would be similar to those discussed for the Preferred Alternative.

**Cumulative Impacts**

**Wetlands**
Cumulative impacts to wetlands along the Green Route Alternative could result from loss of 1.3 acres vegetation in the maintenance corridor, and from changes to hydrology that could result from the project. Short-term sedimentation and runoff could also affect wetlands. These impacts could result in cumulative loss of wetlands or in changes to wetland function. Avoidance and minimization measures would be used to limit impacts on wetlands, and compensatory mitigation would be provided for unavoidable impacts to wetlands. As a result of these measures and the existing level of disturbance in the affected wetlands, the Green Route Alternative would not be expected to have significant cumulative impacts on wetlands.

**Uplands**
Temporary clearing (2.5 acres), temporary excavation (0.9 acre), ongoing maintenance practices (0.9 acre), changes in wetland vegetation and changes in hydrology, temporary sedimentation and erosion could result in cumulative loss of uplands area functions. As noted for the Preferred Alternative, these impacts could result in an increase in invasive species or in changes in upland function. However, the affected areas along the Green Route Alternative currently have substantial populations of invasive species, and are subject to disturbance from nearby roads, utility rights-of-way, agricultural use, and ongoing suburban development. Avoidance and minimization measures would be used to limit the impacts of the Green Route Alternative on uplands. As a result, the Green Route Alternative would not be expected to have significant cumulative impacts on uplands.
7.3 Mitigation Measures

7.3.1 No-Action Alternative
Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

7.3.2 Preferred Alternative
The following mitigation measures would be implemented to mitigate for lost wetland and upland vegetation:

- Avoiding in-water work in most streams.
- Limiting disturbance to the minimum practical for construction of the project in order to limit impacts to nearby wetlands.
- Stabilizing exposed soils to control erosion.
- Developing, implementing, and maintaining an Erosion and Sedimentation Control (ESC) Plan, Stormwater Pollution Prevention Plan (SWPPP), and Spill Prevention Control and Countermeasures (SPCC) Plan during construction.
- Discharging water from blowoff valves to sanitary sewers, or, if sewers are unavailable, dechlorinating water prior to discharge.
- Restoring temporarily disturbed wetland buffers to pre-construction grades and replanting with appropriate native species.
- Restoring temporary impact areas in wetlands to pre-construction grades and replanting with native wetland species.
- Providing compensatory mitigation in accordance with federal, state, and local guidelines and regulations.
- Restoring any planting strips and landscaped areas along the road that were damaged during construction with new roadside plantings or hydroteeering, as appropriate.
- Replacing trees cut in riparian areas at a 2:1 ratio.
- Leaving trees felled in riparian areas to provide large woody debris in the affected areas.

7.3.3 Green Route Alternative
Mitigation measures for the Green Route Alternative would be similar to those proposed for the Preferred Alternative.
7.4 Significant Unavoidable Adverse Impacts

7.4.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no significant unavoidable adverse impacts.

7.4.2 Preferred Alternative

The significant unavoidable adverse impacts to plants due to construction of the Preferred Alternative would be associated with removing approximately 18 acres of upland vegetation. The type of vegetation impacted would include deciduous and coniferous trees, native and non-native upland shrubs, native herbs, landscape plants, and mowed or grazed lawns. In addition to the affected upland, approximately 2.7 acres of wetland would be affected. The majority of this area would require clearing only, but approximately 0.9 acre of wetland excavation would also be required. All wetland excavation would be temporary and short-term. These areas would be restored and replanted after construction. A portion of the wetland cleared area (1 acre) would be maintained as a permanent maintenance area. Trees would be removed from this area, but shrubs and emergent species would be allowed to grow. The remaining portions of the temporarily cleared areas would be restored after construction was completed.

7.4.3 Green Route Alternative

The significant unavoidable adverse impacts to plants along the Green Route Alternative would be similar to but less than those of the Preferred Alternative. The Green Route Alternative would require clearing approximately 1.3 acres of wetland vegetation for a permanent maintenance easement. Approximately 2.5 acres of upland would also be cleared, and 0.9 acre of this area would be permanently maintained free of trees. Approximately 0.9 acre of temporary upland excavation would also be required for the alternative.
Figure 7-1. Wetlands
Chapter 8: Transportation

8.1 Affected Environment

Local and regional transportation system elements that could be affected by project construction and operation include the existing local roadways and state routes, key bicycle and pedestrian routes, and transit service.

Information on existing conditions was collected from published sources. These include the cities of Covington, Kent, and Newcastle Web sites; the King County Web site; the City of Bellevue Traffic Data Book (City of Bellevue, 2004), and the Washington State Department of Transportation Annual Traffic Report (WSDOT, 2005). Field visits were also conducted to verify existing conditions. Existing traffic conditions were analyzed using methodologies consistent with the latest edition of the Highway Capacity Manual (TRB, 2000).

Transportation Facilities

Table 8-1 lists key transportation facilities that the Preferred Alternative or Green Route Alternative would utilize.

**Table 8-1. Transportation Facilities in the Project Area**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Jurisdiction</th>
<th>Classification</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>132nd Avenue SE</td>
<td>King County &amp; City of Kent</td>
<td>North/south principal arterial</td>
<td>Links Kent to the north</td>
</tr>
<tr>
<td>160th Avenue SE</td>
<td>King County</td>
<td>North/south local road</td>
<td>Provides access to the neighborhoods south of Covington</td>
</tr>
<tr>
<td>164th Avenue SE</td>
<td>King County</td>
<td>North/south local road</td>
<td>Provides access to the neighborhoods south of Covington</td>
</tr>
<tr>
<td>SR 18</td>
<td>WSDOT</td>
<td>East/west freeway</td>
<td>Provides a bypass route between I-90 and I-5</td>
</tr>
<tr>
<td>Kent Black Diamond Road SE</td>
<td>King County &amp; City of Kent</td>
<td>North/south principal arterial</td>
<td>Provides a connection between SR 18 and the communities to the southeast</td>
</tr>
<tr>
<td>SE 272nd Street / Kent Kangley Road (SR 516)</td>
<td>City of Kent &amp; City of Covington</td>
<td>East/west principal arterial</td>
<td>Provides a connection within the immediate vicinity of Kent, Covington, and Maple Valley. Farther west, provides a connection between Auburn and Federal Way with SR 167 and I-5.</td>
</tr>
<tr>
<td>156th Avenue SE</td>
<td>King County &amp; City of Covington</td>
<td>North/south local road</td>
<td>Provides access to the neighborhoods north of Covington</td>
</tr>
<tr>
<td>SE 256th Street</td>
<td>City of Kent &amp; City of Covington</td>
<td>East/west minor arterial</td>
<td>Provides a connection between Kent and Covington</td>
</tr>
<tr>
<td>SE 224th Street</td>
<td>King County</td>
<td>East/west collector arterial</td>
<td>Links SR 18 to the west</td>
</tr>
<tr>
<td>Facility</td>
<td>Jurisdiction</td>
<td>Classification</td>
<td>Function</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SE 240th Street</td>
<td>King County &amp; City of Kent</td>
<td>East/west minor arterial</td>
<td>Provides a connection between Kent, Covington, and Maple Valley</td>
</tr>
<tr>
<td>SE 208th Street</td>
<td>King County</td>
<td>East/west collector arterial (east of 132nd Avenue SE) East/west principal arterial (west of 132nd Avenue SE)</td>
<td>Links SR 167 to the east</td>
</tr>
<tr>
<td>148th Avenue SE</td>
<td>King County</td>
<td>North/south collector arterial (north of SE 256th Street)</td>
<td>Provides for movement within the smaller areas that are often definable neighborhoods</td>
</tr>
<tr>
<td>SE 192nd Street</td>
<td>King County</td>
<td>East/west minor arterial</td>
<td>Links SR 515 to the east</td>
</tr>
<tr>
<td>140th Avenue SE</td>
<td>King County</td>
<td>North/south principal arterial</td>
<td>Provides a connection between the Renton and Kent</td>
</tr>
<tr>
<td>SE Petrovitsky Road</td>
<td>King County</td>
<td>East/west principal arterial</td>
<td>Links SR 167 to the east</td>
</tr>
<tr>
<td>SR 169</td>
<td>WSDOT</td>
<td>East/west principal arterial</td>
<td>State highway that links I-405 to the east</td>
</tr>
<tr>
<td>SE 144th Street</td>
<td>King County</td>
<td>East/west collector arterial</td>
<td>Provides access between the residential neighborhoods and the surrounding north/south collectors</td>
</tr>
<tr>
<td>154th Place SE/156th Avenue SE</td>
<td>King County</td>
<td>North/south principal arterial</td>
<td>Provides access between SR 169 and SE 128th Street</td>
</tr>
<tr>
<td>160th Avenue SE</td>
<td>King County</td>
<td>North/south local road</td>
<td>Provides access to the residential neighborhoods south of SE 128th Street</td>
</tr>
<tr>
<td>SE 128th Street</td>
<td>King County &amp; City of Renton</td>
<td>East/west principal arterial</td>
<td>Links Renton to the east</td>
</tr>
<tr>
<td>176th Avenue SE (north of SE 128th Street)</td>
<td>King County</td>
<td>North/south local road</td>
<td>Provides access to residential neighborhoods north of SE 128th Street</td>
</tr>
<tr>
<td>148th Avenue SE (north of SE 128th Street)</td>
<td>King County &amp; City of Renton</td>
<td>North/south collector arterial</td>
<td>Provides access to the residential neighborhoods north of SE 128th Street</td>
</tr>
<tr>
<td>SE May Valley Road</td>
<td>King County &amp; City of Newcastle</td>
<td>East/west collector arterial</td>
<td>Links SR 900 to the west and Coal Creek Parkway SE to the east</td>
</tr>
<tr>
<td>SR 900</td>
<td>King County &amp; City of Issaquah</td>
<td>North/south principal arterial</td>
<td>State highway that links Renton and Issaquah</td>
</tr>
<tr>
<td>Coal Creek Parkway SE</td>
<td>City of Newcastle &amp; City of Bellevue</td>
<td>North/south principal arterial</td>
<td>Links Renton with Newcastle and Bellevue</td>
</tr>
<tr>
<td>SE Newport Way</td>
<td>City of Bellevue</td>
<td>East/west minor arterial</td>
<td>Links the residential neighborhoods to the principal arterials south of I-90</td>
</tr>
</tbody>
</table>
**Traffic**

Traffic volume data were compiled from King County (King County, 2006b), the City of Covington (City of Covington, 2006), the City of Kent (City of Kent, 2006), the City of Newcastle (City of Newcastle, 2006), the City of Bellevue 2004 *Traffic Data Book* (City of Bellevue, 2004), and the WSDOT *Annual Traffic Report* (WSDOT, 2005). Traffic volume data for the cities of Renton and Issaquah were obtained from King County (King County, 2006b).

Traffic volume data obtained is the average daily traffic (ADT) count expressed in vehicles per day (vpd). King County’s most recent data, recorded in 2004, were used. For the King County data, stations were set up at various intersections and counts were conducted at all possible locations within the intersection. For the City of Kent traffic counts, the most recent data were recorded for 2006; for the City of Covington and the City of Newcastle, the most recent data were recorded for 2003.

**Pedestrian and Bicycle Circulation**

Pedestrian circulation is provided for within the project area via sidewalks in urban areas and walkable shoulders in rural areas. Crosswalks are marked at most signalized intersections. The sidewalks near major signalized intersections provide access to retail stores and adjacent schools. Bicycle facilities in the project area are limited to paved road shoulders, a portion of the paved Cedar River Trail along SR 169, and a soft surface trail around Lake Youngs.

**Transit**

King County Metro provides transit service in the project area. Existing bus routes are described in Sections 8.1.1 and 8.1.2.

### 8.1.1 Preferred Alternative

**Traffic**

Figures 2-2 and 2-3 show the route for the Preferred Alternative. The classifications for existing roads along the Preferred Alternative range from principal arterials to local roads; local roads feed the minor arterials and collector arterials. Road widths vary from two to five lanes, and the posted speed limits range between 25 and 50 miles per hour (mph).

ADT volumes and levels of service (LOS) along the Preferred Alternative are noted in Figure 8-1. Table 8-2 summarizes existing ADT volumes and LOS for roadway segments along the Preferred Alternative. All roadway segments along the Preferred Alternative currently operate at LOS B, C, or D, which is considered satisfactory under their respective local jurisdictions or under unincorporated King County. The worst existing LOS (LOS D) occurs for stretches along SE 224th Street, 148th Avenue SE, SE 192nd Street, and SR 900.

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The Transportation Research Board (TRB) (2000) defines **Levels of Service (LOS)** for roadways as follows:

- **LOS A** – operates under free-flow conditions; minimal delays.
- **LOS B** – operates reasonably unimpeded at average speeds; delays not significant.
- **LOS C** – operates at a stable level; delays and longer queues may occur.
- **LOS D** – small increases in flow may cause substantial increases in delay and decreases in travel speed.
- **LOS E** – characterized by significant delays.
- **LOS F** – characterized by extremely low speeds for the given street class, delays, and extensive queuing.

Jurisdictions in the project area differ in how they designate an acceptable LOS rating. Most affected jurisdictions have adopted LOS A through D as acceptable. King County considers LOSA through LOSE acceptable. For more details about LOS, see Appendix B.
Parking

For most streets along the Preferred Alternative, on-street parking is prohibited, or the streets do not have shoulder widths wide enough to allow on-street parking. The one exception is SE 144th Street, where on-street parking is allowed.

Pedestrian and Bicycle Circulation

There are horse trails and pedestrian crossings at 148th Avenue SE south of SE 200th Street and north of SE 216th Street. A mid-block crossing is located on 156th Avenue SE north of where it connects to SE 142nd Place. Near SE 192nd Street, sidewalk is installed on both sides of 140th Way SE south of SR169/Renton Maple Valley Road. Crosswalks are installed at the signalized intersections on SR 169, but not sidewalks.

There are pedestrian crosswalks at the signalized intersections and 5-foot-wide sidewalks on both sides of SE 128th Street. At SR 900, crosswalks are installed at the intersections of SR 900/May Valley Road and SR 900/Newport Way NW. Sidewalks are not provided in this portion of the route. The remainder of the Preferred Alternative is rural with a minimal number of sidewalks.

A paved bike trail, the Cedar River Trail, runs parallel to SR 169 along a portion of the Preferred Alternative. Near SE 192nd Street, there is a paved shoulder to accommodate bicycle traffic. The soft-surfaced Lake Youngs Trail runs around Lake Youngs and is parallel to the 148th Avenue SE right-of-way between SE 216th Street and SE 192nd Street. The remainder of the area along the Preferred Alternative does not have bicycle facilities.

Table 8-2. Roadway Segment ADT and LOS, Preferred Alternative

<table>
<thead>
<tr>
<th>Roadway Segment(s)</th>
<th>No. Lanes</th>
<th>ADT (vpd)</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>160th Avenue SE between SE 296th Street and SE 291st Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>164th Avenue SE between SE 296th Street and SE 291st Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>156th Place SE between SE 272nd Street and SE 256th Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>156th Avenue SE between SE 256th Street and SE 240th Street</td>
<td>2</td>
<td>15,820</td>
<td>C</td>
</tr>
<tr>
<td>156th Avenue SE between SE 240th Street and SE 224th Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>SE 224th Street between 156th Avenue SE and 148th Avenue SE</td>
<td>2</td>
<td>6,400</td>
<td>D</td>
</tr>
<tr>
<td>148th Avenue SE between SE 224th Street and SE 208th Street</td>
<td>2</td>
<td>8,900</td>
<td>C</td>
</tr>
<tr>
<td>148th Avenue SE between SE 208th Street and SE 192nd Street</td>
<td>2</td>
<td>5,050</td>
<td>D</td>
</tr>
<tr>
<td>SE 192nd Street between 140th Avenue SE and 148th Avenue SE</td>
<td>2</td>
<td>6,480</td>
<td>D</td>
</tr>
<tr>
<td>140th Avenue SE between SE 192nd Street and SE Petrovitsky Road</td>
<td>4*</td>
<td>19,920</td>
<td>C</td>
</tr>
<tr>
<td>140th Avenue SE between SE Petrovitsky Road and SE Fairwood Boulevard</td>
<td>4*</td>
<td>22,710</td>
<td>C</td>
</tr>
<tr>
<td>140th Avenue SE between SE Fairwood Boulevard and SR 169</td>
<td>5*</td>
<td>27,700</td>
<td>B</td>
</tr>
</tbody>
</table>
## Roadway Segment(s)

<table>
<thead>
<tr>
<th>Roadway Segment(s)</th>
<th>No. Lanes</th>
<th>ADT (vpd)</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>160th Avenue SE between SE 296th Street and SE 291st Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>164th Avenue SE between SE 296th Street and SE 291st Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>SR 169 between 140th Way SE and 149th Avenue SE</td>
<td>4*</td>
<td>28,000</td>
<td>C</td>
</tr>
<tr>
<td>149th Avenue SE/154th Place SE between SR 169 and SE 144th Street</td>
<td>2</td>
<td>10,995</td>
<td>C</td>
</tr>
<tr>
<td>SE 144th Street between 156th Avenue SE and 160th Avenue SE</td>
<td>2</td>
<td>2,820</td>
<td>C</td>
</tr>
<tr>
<td>160th Avenue SE between SE 144th Street and SE 128th Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>SE 128th Street between 160th Avenue SE and 176th Avenue SE</td>
<td>4</td>
<td>16,070</td>
<td>B</td>
</tr>
<tr>
<td>176th Avenue SE between SE 128th Street and SR 900</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>SR 900 between 176th Avenue SE and SE May Valley Road</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>SR 900 between SE May Valley Road and Newport Way NW</td>
<td>2</td>
<td>17,000</td>
<td>D</td>
</tr>
</tbody>
</table>

NA = data is not available  
* = 2-way left turn lane present

### Transit

Several King County Metro bus routes operate on SE 272nd Street/Kent-Kangley Road. Bus route 159 stops on 164th Avenue SE immediately north of Kent-Kangley Road and runs from 5:00 a.m. to 7:00 a.m. and from 5:30 p.m. to 7:30 p.m., with 30-minute headways in each direction on weekdays. Headways are defined as the time interval between the passage of successive buses going by a fixed point.

King County Metro bus route 148 operates on 140th Avenue SE between SE Fairwood Boulevard and SE 177th Street, with 30-minute headways in each direction between 6:30 a.m. and 9:30 p.m. Bus route 155 serves 140th Avenue SE between SE Petrovitsky Road and SE 177th Street, and has the frequency of one bus per hour per direction between 5:00 a.m. and 7:00 p.m. The bus stops for both routes are located on SE 177th Street near the intersection of 140th Avenue SE.

King County Metro bus route 111 operates between Lake Kathleen and downtown Seattle. A portion of this route coincides with the proposed route of the Preferred Alternative, including: SE 128th Street between 144th Avenue SE and 176th Avenue SE, SE 134th Street between 172nd Avenue SE and 175th Avenue SE, 172nd Avenue SE between SE 134th Street and SE 136th Street, SE 136th Street between 171st Avenue SE and 172nd Avenue SE, and SE 144th Street between 156th Avenue SE and 169th Avenue SE. Bus route 111 operates exclusively in the westbound direction in the morning with headways ranging from 15 to 30 minutes, and runs exclusively in the eastbound direction in the afternoon with headways ranging from 20 to 30 minutes.

King County Metro bus routes 143 and 149 operate on SR 169/Renton Maple Valley Road. Bus route 143 operates exclusively in the westbound direction in the morning commute hours of 6:00 a.m. to 7:00 a.m., with an average headway of 30 minutes. It also operates exclusively in the
eastbound direction in the afternoon between 5:00 p.m. and 6:00 p.m., with an average headway of 30 minutes. Bus route 149 operates on an atypical schedule. The eastbound bus runs on an average headway of 30 minutes starting at 5:00 a.m. and converts to a 90-minute headway after 6:30 a.m. The last bus of the eastbound service ends around 4:00 p.m., which indicates that bus route 149 does not serve general public commuters. The westbound bus runs on a minimum headway of 100 minutes in the morning, and runs on an average headway of 30 minutes in the evening between 6:00 p.m. and 7:00 p.m.

8.1.2 Green Route Alternative

Traffic

Figures 2-2 and 2-3 show the Green Route Alternative. The classifications for roads along the Green Route Alternative range from principal arterials to collector arterials; local roads feed the minor arterials and collector arterials. Road widths vary from two to five lanes, and the posted speed limits range between 35 and 40 miles per hour (mph).

Existing ADT volumes and LOS for roadway segments along the Green Route Alternative are noted in Figure 8-1 and are summarized in Table 8-3. With two exceptions, roadway segments along the Green Route Alternative currently operate at LOS B, C, D, or E, which is considered satisfactory under their respective local jurisdictions or under unincorporated King County. The 132nd Avenue SE segment between SE 256th Street and SE 240th Street currently operates at an unacceptable LOS F under City of Kent jurisdiction. The two-lane segment of Coal Creek Parkway SE between SE May Valley Road and SE 84th Way operates at an unacceptable LOS F as well.

Analysis of existing year data indicates that there are more road segments with unacceptable LOS along the Green Route Alternative than along the Preferred Alternative. Additional care would need to be exercised during construction for road segments operating at LOS E and F, because these segments would not be able to handle as much detour route traffic as segments operating at LOSs A through D.
## Table 8-3. Roadway Segment ADT and LOS, Green Route Alternative

<table>
<thead>
<tr>
<th>Roadway Segment(s)</th>
<th>No. Lanes</th>
<th>ADT (vpd)</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>132nd Avenue SE between SE 296th Street and SE 272nd Street</td>
<td>2</td>
<td>11,200</td>
<td>C</td>
</tr>
<tr>
<td>132nd Avenue SE between SE 272nd Street and SE 256th Street</td>
<td>2</td>
<td>14,300</td>
<td>E</td>
</tr>
<tr>
<td>132nd Avenue SE between SE 256th Street and SE 240th Street</td>
<td>2</td>
<td>16,900</td>
<td>F</td>
</tr>
<tr>
<td>132nd Avenue SE between SE 240th Street and SE 208th Street</td>
<td>2</td>
<td>16,400</td>
<td>E</td>
</tr>
<tr>
<td>SE 208th Street between 132nd Avenue SE and 140th Avenue SE</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>140th Avenue SE between SE 208th Street and SE 200th Street</td>
<td>2</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>140th Avenue SE between SE 200th Street and SE 192nd Street</td>
<td>2</td>
<td>13,100</td>
<td>E</td>
</tr>
<tr>
<td>140th Avenue SE between SE 192nd Street and SE Petrovitsky Road</td>
<td>4*</td>
<td>19,920</td>
<td>C</td>
</tr>
<tr>
<td>140th Avenue SE between SE Petrovitsky Road and SE Fairwood Boulevard</td>
<td>4*</td>
<td>22,710</td>
<td>C</td>
</tr>
<tr>
<td>140th Avenue SE between SE Fairwood Boulevard and SR 169</td>
<td>5*</td>
<td>27,700</td>
<td>B</td>
</tr>
<tr>
<td>SR 169 between 140th Way SE and 149th Avenue SE</td>
<td>4*</td>
<td>28,000</td>
<td>C</td>
</tr>
<tr>
<td>149th Avenue SE/154th Place SE between SR 169 and SE 144th Street</td>
<td>2</td>
<td>10,995</td>
<td>C</td>
</tr>
<tr>
<td>156th Avenue SE between SE 144th Street and SE 128th Street</td>
<td>2</td>
<td>10,480</td>
<td>C</td>
</tr>
<tr>
<td>SE 128th Street between 156th Avenue SE and 148th Avenue SE</td>
<td>4*</td>
<td>19,095</td>
<td>C</td>
</tr>
<tr>
<td>148th Avenue SE between SE 128th Street and SE May Valley Road</td>
<td>2</td>
<td>1,750</td>
<td>B</td>
</tr>
<tr>
<td>SE May Valley Road between 148th Avenue SE and Coal Creek Parkway SE</td>
<td>2</td>
<td>4,230</td>
<td>C</td>
</tr>
<tr>
<td>Coal Creek Parkway SE between SE May Valley Road and SE 84th Way</td>
<td>2</td>
<td>21,700</td>
<td>F</td>
</tr>
<tr>
<td>Coal Creek Parkway SE between SE 84th Way and Newcastle Way</td>
<td>4</td>
<td>22,700</td>
<td>B</td>
</tr>
<tr>
<td>Coal Creek Parkway SE between Newcastle Way and Factoria Boulevard SE</td>
<td>4</td>
<td>24,900</td>
<td>C</td>
</tr>
<tr>
<td>Factoria Boulevard SE between Coal Creek Parkway SE and SE Newport Way</td>
<td>4*</td>
<td>13,930</td>
<td>C</td>
</tr>
<tr>
<td>SE Newport Way between Factoria Boulevard SE and west of 148th Avenue SE</td>
<td>2*</td>
<td>10,300</td>
<td>B</td>
</tr>
</tbody>
</table>

NA = data is not available
* = 2-way left turn lane present
Parking

On-street parking is prohibited along 140th Avenue SE north of SE 194th Street. South of 194th Street parking is not regulated, but the limited shoulder widths deter vehicles from on-street parking. On-street parking is prohibited along much of the northern part of the Green Route Alternative. Street parking is allowed where shoulder width is available along 156th Avenue SE, SE 128th Street, and 148th Avenue SE.

Pedestrian and Bicycle Circulation

There are seven signalized intersections with crosswalks along the Green Route Alternative. There is a mid-block crosswalk on 132nd Avenue SE south of the Sunrise School near SE 224th Street.

A paved bike trail, the Cedar River Trail, runs parallel to SR 169 through a portion of the Green Route Alternative. The remainder of the Green Route Alternative does not have bicycle facilities.

All construction adjacent to schools would be coordinated with the appropriate school district. The construction schedule would try to minimize impacts to adjacent schools by scheduling work during summer months when school was not in session. Should construction occur during the school year, access to and from the schools would be maintained.

Transit

Several King County Metro buses serve the southern portion of the Green Route Alternative. Bus route 158 serves 132nd Avenue SE between SE 240th Street and SE 272nd Street, traveling inbound to downtown Seattle from 5:00 a.m. to 7:30 a.m. and outbound from Seattle from 4:30 p.m. to 7:30 p.m., with 30-minute headways. Bus route 168 travels on 132nd Avenue SE between SE 256th Street and SE 272nd Street from 5:00 a.m. to midnight, with one bus per hour per direction. Bus route 164 travels along 132nd Avenue SE between SE 272nd Street and SE 276th Place from 6:00 a.m. to 10:00 p.m., with 30-minute headways during peak hours and 1-hour headways during off-peak hours. The Lake Meridian Park-and-Ride lot is located on 132nd Avenue SE south of SE 268th Street, and has 175 parking stalls.

Bus routes 210, 222, and 921 operate through the northern portion of the Green Route Alternative on SE Newport Way between Factoria Boulevard SE and 148th Avenue SE. Bus route 210 operates exclusively in the westbound direction in the morning from 6:00 a.m. to 8:00 a.m. with an average headway of 20 minutes. It also runs exclusively in the eastbound direction in the afternoon between 4:00 p.m. and 6:00 p.m. with an average headway of 30 minutes. Bus route 222 operates with an average headway of 30 minutes in both eastbound and westbound directions during the morning and afternoon peak hours. Bus route 921 travels both eastbound and westbound on SE Newport Way, with headways ranging from 30 to 60 minutes during the morning and afternoon peak hours. Bus routes 207 and 208 also operate in the area between Newport High School and the International School. Both bus routes have only one service in the morning around 7:00 a.m. and their afternoon services do not occur within the general afternoon peak hours.
8.2 Environmental Impacts

8.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to transportation.

8.2.2 Preferred Alternative

Direct Impacts – Construction

Temporary lane closures could occur on roads near construction areas. Project construction activities would have some impact on traffic congestion due to potential delays and detours. Activities of this type could include importing, disposing of, and hauling materials. A typical large-diameter pipe-laying operation needs a minimum of two vehicular travel lanes, one lane for the pipeline and the other for passing construction vehicles.

The potential exists for temporary lane closures to affect the movement of police, fire, and other emergency vehicles; however, access for emergency vehicles would be maintained. Local access to residences would also be maintained. Any lane or road closures would require preparation of detour plans for approval by the affected jurisdictions as well as input from police, fire, and other emergency services.

Typical progress rates for pipeline installation in roadways range from 40 to 240 feet per day. Pipeline installation could occur on a designated right-of-way, roadway shoulder, or on a travel way. Depending on construction conditions, work duration would mostly be short-term stationary, with occasional intermediate-term stationary. Appropriate means of traffic control approved by the affected jurisdictions would be maintained to provide safety of workers and safety of the road users.

For two-lane roads, a full road closure would be anticipated, with traffic detoured during the allowable daytime work hours or as approved by the local jurisdiction. One-lane, two-way traffic with flagger controls would be considered, but could result in traffic delays in excess of 5 minutes. All traffic would be restored at the end of each work day, with all construction equipment and materials moved to a staging area. At the end of each work day, the trench would be backfilled and temporarily patched or plated. On all roadways four lanes and wider, two-lane, two-way traffic would be maintained at all times. These roadways might not be subject to timing constraints, as approved by the local jurisdiction, depending on location and the direction of the traffic flow. Nighttime, weekend, or holiday construction would require prior approval from the local jurisdiction. Possible nighttime construction in non-residential areas could occur to expedite the overall construction schedule and to minimize construction impact; examples would be along SR 900 and along SE 272nd Street.

<table>
<thead>
<tr>
<th>Work duration is generally classified as:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term stationary – activities that occupy a location for more than 3 days.</td>
</tr>
<tr>
<td>Intermediate-term stationary – activities that occupy a location overnight or up to 3 days.</td>
</tr>
<tr>
<td>Short-term stationary – activities that occupy a location 1 to 12 hours.</td>
</tr>
<tr>
<td>Short duration – activities that occupy a location for up to 1 hour.</td>
</tr>
<tr>
<td>Mobile – work moves intermittently or continuously along the roadway. It often involves frequent, short stops as long as 15 minutes.</td>
</tr>
</tbody>
</table>
In some areas, pipeline construction could impact overlay pavement on existing roadways. Any impacts to overlay pavement would require coordination with the affected jurisdiction. For construction occurring within designated rights-of-way, traffic delays would be expected to occur due to construction and worker trips to and from the construction site.

A list of possible traffic control measures is presented in Section 8.3.2 for areas where construction would require partial or full road closures.

**Direct Impacts - Operation**

There would be minimal direct impacts to transportation due to operation of the pipeline and its ancillary features. The pipeline would be located underground and would require minimal maintenance. Any aboveground features would be located outside of the traveled roadway. Access to the pipeline would be through vaults with lids located within the paved roadway. Lids would be designed to handle traffic loads and would be accessed infrequently.

**Indirect Impacts - Construction**

Potential delays and detours during construction could have temporary, indirect impacts. Longer traffic queuing times could temporarily increase vehicle emissions and increase the response times of emergency vehicles. A Traffic Control Plan would be prepared subject to the review and approval of permitting jurisdictions.

**Indirect Impacts - Operation**

Because the direct impacts to transportation would be temporary, there would be no indirect impacts due to operation of the Preferred Alternative.

**Cumulative Impacts**

The Preferred Alternative’s impacts to transportation would be temporary, ranging in duration from a few hours to a few days; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Preferred Alternative, temporary cumulative impacts to transportation could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects. Work schedules and detours would be designed to avoid cumulative impacts.

### 8.2.3 Green Route Alternative

**Direct Impacts - Construction and Operation**

The direct impacts to transportation from construction and operation of the Green Route Alternative would be similar to those described in Section 8.2.2 for the Preferred Alternative. However, construction of the Green Route Alternative would result in more significant impacts to transportation compared with those for Preferred Alternative due to heavier traffic volumes along the Green Route Alternative.
**Indirect Impacts - Construction and Operation**

The indirect impacts to transportation from construction and operation of the Green Route Alternative would be similar to those described in Section 8.2.2 for the Preferred Alternative.

**Cumulative Impacts**

The cumulative impacts to transportation for the Green Route Alternative would be similar to those for the Preferred Alternative.

**8.3 Mitigation Measures**

**8.3.1 No-Action Alternative**

Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

**8.3.2 Preferred Alternative**

The Preferred Alternative would have no long-term impacts on transportation. Therefore, mitigation measures would be for construction only. The mitigation measures described below would be used to reduce impacts to the transportation system:

- Notifying the police, fire, ambulance, and transit agencies of lane encroachments. Providing a flagger or other traffic controls to maintain safe public access and emergency vehicle access routes. Hiring off-duty police, if necessary, to direct traffic near the construction site.
- Preparing complete and carefully considered Traffic Control Plans, including detours and standard plans.
- Scheduling work at night, if approved by the local jurisdiction, when construction was not near residential areas.
- Providing necessary traffic control at all affected locations, including temporary signing, striping, and traffic signals, as required; all temporary Traffic Control Plans would be subject to permitting jurisdiction review and approval.
- Providing safe access for bicyclists and pedestrians during construction. Constructing temporary or permanent facilities for non-motorized traffic, if practical.
- Establishing specific mitigation plans and potential detour routes with permitting agencies during the permit application process. Plans would be presented to permitting agencies and permits received prior to bidding.
- Carefully monitoring and managing the construction schedule to minimize duration of impact.
- Employing flaggers to perform several functions, including, but not limited to:
  - Alternately stopping and releasing traffic when both directions of traffic used one lane.
  - Stopping all traffic for short periods of time to accommodate moving of equipment, unloading of materials, placing of apparatus over the roadway, etc.
- Maintaining traffic through work areas at reduced speed and for construction during dark hours.
- Using steel plates to cover open trench areas for overnight conditions.

Traffic

A detour plan would be required prior to construction and would be subject to the approval of the affected jurisdiction. Table 8-4 lists potential traffic detours for the Preferred Alternative.

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern terminus/Tacoma SSP to BNSF Railway crossing</td>
<td>This part of 160th Avenue SE and 164th Place SE would be closed to all through-traffic, and SE 292nd Street, Kent-Black Diamond Road SE, and Covington Way SE would be used as a detour route. Traffic impacts would be temporary and local access would be maintained during construction.</td>
</tr>
<tr>
<td>SR 18 crossing</td>
<td>The Preferred Alternative would cross the divided highway of SR 18. A trenchless construction method would be proposed to minimize construction impacts. During construction, access to residences would be maintained.</td>
</tr>
<tr>
<td>156th Place SE from Kent-Kangley Road to SE 224th Street</td>
<td>The crossing of Kent-Kangley Road would be open-cut at night if approved by the local jurisdiction, and two-lane, two-way traffic would be maintained, including access for emergency vehicles. The SE 240th Street crossing would temporarily affect arterial through-traffic. The primary north/south detour route would include 148th Avenue SE and 164th Avenue SE. The crossing of SE 256th Street and SE 240th Street would involve open-cutting while maintaining channelized two-lane, two-way traffic. Nighttime work could be used to reduce traffic impacts if approved by the local jurisdiction.</td>
</tr>
<tr>
<td>SE 224th Street/156th Avenue SE intersection to SE 192nd Street/148th Avenue SE intersection</td>
<td>The primary north and south detour route would be 140th Avenue SE and 132nd Avenue SE. Local access would be maintained.</td>
</tr>
<tr>
<td>SE 192nd Street from 148th Avenue SE to 140th Avenue SE</td>
<td>Construction would result in temporary impacts; local access would be maintained.</td>
</tr>
<tr>
<td>140th Avenue SE from SE 192nd Street to SE 171st Way</td>
<td>Construction would occupy two northbound lanes of the five total lanes, allowing two-lane, two-way traffic. At the intersection of 140th Avenue SE and SE Petrovitsky Road, the proposed crossing method would be open-cut at night, if approved by the local jurisdiction, with two lanes remaining open for two-way traffic on both roads. A detour route would not be necessary.</td>
</tr>
<tr>
<td>SE 171st Way to SE Fairwood Boulevard</td>
<td>Construction of the overland portion of the pipeline would have negligible impacts to traffic in this area. Two lanes would remain open to two-way traffic during construction; therefore, a detour route would not be necessary.</td>
</tr>
<tr>
<td>SE Fairwood Boulevard to SR 169</td>
<td>Construction would occupy two of the five lanes, allowing two lanes to remain open to two-way traffic during construction; therefore, a detour route would not be necessary.</td>
</tr>
<tr>
<td>SR 169 crossing</td>
<td>This portion of the pipeline would cross SR 169. A trenchless construction method would be proposed to minimize construction impacts.</td>
</tr>
<tr>
<td>Cedar River Trail</td>
<td>Construction would occur along/in the trail; therefore, a temporary trail would be provided parallel to the existing trail.</td>
</tr>
<tr>
<td>SR 169 to 154th Place SE</td>
<td>This area of 149th SE and Jones Road would be closed to all except local traffic. Both streets are dead ends and do not have through-traffic in this area.</td>
</tr>
</tbody>
</table>
**Pedestrian and Bicycle Circulation**

Pedestrian infrastructure is currently installed only through a small portion of the Preferred Alternative. The southern portion of the Preferred Alternative would be constructed partially through undeveloped land that is not heavily traveled by pedestrians; therefore, the construction impacts to pedestrian traffic would be limited. Pedestrian crossings on 148th Avenue SE south of SE 200th Street and north of SE 216th Street would be maintained during the full roadway closure. During construction of the Preferred Alternative, signs would be placed at intersections to provide warning and detour messages to pedestrians.

If 148th Avenue SE were closed for construction of the Preferred Alternative, bicycle traffic could use the regional trail between SE 192nd Street and SE 216th Street. Bike traffic on the paved shoulder of SE 128th Street would be redirected to an adjacent roadway because it is unlikely that the width of the bike lane would be maintained during construction. The Preferred Alternative would be constructed along/in the Cedar River Trail along SR 169/Renton Maple Valley Road between 140th Way SE and 149th Ave SE. A temporary trail would be provided along the existing trail during the construction. The remaining area along the Preferred Alternative does not have bicycle facilities. Therefore, no special accommodation would need to be made during construction.
Transit

Impacts to transit routes would be mitigated by redirecting buses to designated detour routes. The impact of construction on King County Metro bus routes 148 and 155 would be limited prior to the morning peak hour. It would not be necessary to redirect these bus routes. Although the Preferred Alternative would not conflict with bus route 159, a detour could be expected if 164th Avenue SE were chosen to be the detour for construction between Kent-Kangley Road and SE 256th Street. The detour route would coincide with the bus route for two blocks between SE 272nd Street and SE 268th Street.

The Preferred Alternative would be constructed along SE 128th Street between 160th Avenue SE and 176th Ave SE. Construction along SE 128th Street could impact bus route 111 by temporarily inconveniencing bus users and by slowing down the bus services. Bus routes 143 and 149 operate on SR 169/Renton Maple Valley Road. Because the pipeline would be constructed along/in the Cedar River Trail, vehicular traffic and bus services on SR 169/Renton Maple Valley Road would not be affected during construction of the Preferred Alternative.

8.3.3 Green Route Alternative

The transportation system mitigation measures for the Green Route Alternative would be similar to those described for the Preferred Alternative.

Traffic

A detour plan would be required prior to construction and would be subject to the approval of the affected jurisdiction. Table 8-5 lists potential traffic detours for the Green Route Alternative.

Temporary access would be maintained to areas with low-income housing and to other residential and commercial properties without alternative access. Access to public transit and school buses would be maintained during pipeline construction.
<table>
<thead>
<tr>
<th>Roadway</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern terminus/Tacoma SSP to SE 272nd Street</td>
<td>This area of 132nd Avenue SE between SE 272nd Street and SE 296th Street would be closed to all through-traffic except for local traffic. Detour routes would include 124th Avenue SE, SE 296th Street, and SR 516.</td>
</tr>
<tr>
<td>132nd Avenue SE from SE 272nd Street to SE 256th Street</td>
<td>This area of 132nd Avenue SE between SE 256th Street and SE 272nd Street would be closed to all through-traffic except for local traffic. The detour route would consist of SR 516, 124th Avenue SE, and SE 256th Street.</td>
</tr>
<tr>
<td>132nd Avenue SE from SE 256th Street to SE 240th Street</td>
<td>This area of 132nd Avenue SE would be closed to all through-traffic except for local traffic. The detour route would consist of SE 256th Street, 124th Avenue SE, 120th Avenue SE, and SE 240th Street.</td>
</tr>
<tr>
<td>132nd Avenue SE from SE 240th Street to SE 208th Street</td>
<td>This area of 132nd Avenue SE between SE 208th Street and SE 240th Street would be closed to all traffic. The primary detour route would consist of SE 240th Street, 116th Avenue SE, SE 208th Street, and 148th Avenue SE.</td>
</tr>
<tr>
<td>132nd Avenue SE/SE 208th Street intersection to SE 204th Way/140th Avenue SE intersection</td>
<td>These areas of SE 208th Street and 140th Avenue SE would be closed to all through-traffic except for local traffic. SE 204th Way would be used as a detour route.</td>
</tr>
<tr>
<td>SE 204th Way/140th Avenue SE intersection to SE 192nd Street</td>
<td>This area of 140th Avenue SE would be closed to all through-traffic except for local traffic. SE 200th Street, 148th Avenue SE, and SE 192nd Street would be used as a detour route.</td>
</tr>
<tr>
<td>140th Avenue SE from SE 192nd Street to SE 171st Way</td>
<td>Construction would occupy two of the five lanes, allowing two-lane, two-way traffic. At the intersection of 140th Avenue SE and SE Petrovitsky Road, the proposed crossing method would be open-cut at night, if approved by the local jurisdiction, with two lanes remaining open for two-way traffic on both roads. A detour route would not be necessary.</td>
</tr>
<tr>
<td>SE 171st Way to SE Fairwood Boulevard</td>
<td>Construction of the overland portion of the pipeline would have negligible impacts to traffic in this area. Two lanes would remain open to two-way traffic during construction; therefore, a detour route would not be necessary.</td>
</tr>
<tr>
<td>SE Fairwood Boulevard to SR 169</td>
<td>Construction would occupy two of the five lanes, allowing two lanes to remain open to two-way traffic during construction; therefore, a detour route would not be necessary.</td>
</tr>
<tr>
<td>SR 169 crossing</td>
<td>The Green Route Alternative would cross SR 169. A trenchless construction method would be proposed for pipe installation to minimize construction impacts.</td>
</tr>
<tr>
<td>Cedar River Trail</td>
<td>Construction would occur along/in the trail; therefore, a temporary trail would be provided parallel to the existing trail.</td>
</tr>
<tr>
<td>SR 169 to 154th Place SE</td>
<td>This area of 149th Avenue SE and Jones Road would be closed to all except local traffic. Both streets are dead ends and do not have through-traffic in this area.</td>
</tr>
<tr>
<td>SE Jones Road to SE 144th Street</td>
<td>For this area of 154th Place SE, work would occur in one-lane. Two-way traffic would be maintained using the roadway shoulders.</td>
</tr>
<tr>
<td>SE 144th Street to SE 128th Street</td>
<td>This area of 156th Avenue SE would be closed to all through-traffic except for local traffic. The detour route would include utilizing 144th Avenue SE and 160th Avenue SE as alternate north/south routes.</td>
</tr>
</tbody>
</table>
### Roadways and Description

<table>
<thead>
<tr>
<th>Roadway</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>156th Avenue SE to 148th Avenue SE</td>
<td>Within this area of SE 128th Street, construction would occupy two of the four lanes, allowing two lanes to remain open to two-way traffic during construction; therefore, a detour route would not be necessary.</td>
</tr>
<tr>
<td>SE 128th Street to SE May Valley Road</td>
<td>This area of 148th Avenue SE would be closed to all through-traffic except for local traffic. The detour route would include utilizing 138th Avenue SE and 164th Avenue SE as alternate north/south routes.</td>
</tr>
<tr>
<td>148th Avenue SE to Coal Creek Parkway SE</td>
<td>This area of SE May Valley Road would be closed to all through-traffic except for local traffic. The detour route would include SR 900, Coal Creek Parkway SE, and 148th Avenue SE.</td>
</tr>
<tr>
<td>SE May Valley Road to SE 84th Way</td>
<td>This two-lane segment of Coal Creek Parkway SE would be closed to all through-traffic except for local traffic. The detour route would include Sunset Boulevard, I-405, and SE 69th Way.</td>
</tr>
<tr>
<td>SE 84th Way to Factoria Boulevard SE</td>
<td>Within this area of Coal Creek Parkway SE, construction would occupy two of the four lanes, allowing two lanes to remain open to two-way traffic during construction; therefore, a detour route would not be necessary.</td>
</tr>
<tr>
<td>Coal Creek Parkway SE to SE Newport Way</td>
<td>Within this area of Factoria Boulevard SE, construction would occupy two of the four lanes, allowing two lanes to remain open to two-way traffic during construction; therefore, a detour route would not be necessary.</td>
</tr>
<tr>
<td>Factoria Boulevard SE to west of 148th Avenue SE</td>
<td>This area of SE Newport Way would be closed to all through-traffic except for local traffic. The detour route would include Factoria Boulevard SE, SE 36th Street, and 150th Avenue SE.</td>
</tr>
</tbody>
</table>

### Pedestrian and Bicycle Circulation

During construction of the Green Route Alternative, trenchless construction methods would be used to cross SE 240th Street and SE 272nd Street. There would be negligible impacts to the pedestrian traffic at both intersections. For the remainder of the intersections, signs would be incorporated with warning and detour messages to maintain pedestrian safety. If the road segments near schools (Sunrise Elementary, Soos Creek Elementary, Lake Youngs Elementary, Carriage Crest Elementary, and Kentridge High School) were closed for construction, mid-block crossings would be maintained and detour routes would not restrict school traffic.

Where the Green Route Alternative would coincide with SE 128th Street, sidewalks are currently installed on both sides. Crosswalks are installed only at the intersection of SE 128th Street and 156th Avenue SE. Sidewalks are currently installed at the signalized intersections on Coal Creek Parkway. Crosswalks are also installed at the signalized intersection on Coal Creek Parkway. Mid-block crossings are located on 156th Avenue SE south of SE 139th Place, on 148th Avenue SE north of SE 117th Street, and on SE Newport Way south of SE 42nd Place.

The Green Route Alternative would travel through a few of the heavily used retail areas in Bellevue, Newcastle, and Renton. Construction in these areas would create larger-scale impacts; access to retail centers and pedestrian safety features would be maintained.

Bike infrastructure is located in several areas along the Green Route Alternative, including: SE 128th Street between 148th Avenue SE and 156th Avenue SE; Coal Creek Parkway between SE 79th Place and Factoria Boulevard SE; and SE Newport Way between Factoria Boulevard SE and 148th Avenue SE. The bike lanes in these areas range from 3 feet to 5 feet wide and...
are installed on both sides of the roadways. During the construction, designated detour routes for bike traffic would be required if a full roadway closure were implemented. The detour route would accommodate the vehicular traffic and provide the same level of safety features for bike riders.

The Green Route Alternative would also be constructed along/in the Cedar River Trail along SR 169/Renton Maple Valley Road between 140th Way SE and 149th Ave SE. A temporary bike path could be maintained along the existing trail during the construction.

Transit

The impacts to the public transit system due to construction along the southern portion of the Green Route Alternative would potentially be greater than those for the Preferred Alternative because of higher levels of transit service along the Green Route Alternative. Bus route 158 travels on 132nd Avenue SE between SE 240th Street and SE 272nd Street. Bus route 168 travels on 132nd Avenue SE between SE 256th Street and SE 272nd Street. Bus route 164 travels on 132nd Avenue SE from SE 272nd Street to SE 276th Place. If acceptable detour routes could not be determined, a full roadway closure would not be implemented. A single lane of traffic would need to be maintained at all times along the bus routes.

The Lake Meridian Park-and-Ride lot is located on 132nd Avenue SE south of SE 268th Street and has 175 parking stalls. Along this part of the Green Route Alternative, there is a three-lane cross-section along 132nd Avenue SE. Therefore, a single lane of traffic could be maintained through the use of flaggers to allow access to the park-and-ride lot.

The bus services are concentrated in the northern portion of the Green Route Alternative on SE Newport Way between Factoria Boulevard SE and 148th Avenue SE. This section of the roadway has a typical cross-section of three 12-foot lanes (including a center left-turn lane) and a bike lane ranging from 3 to 5 feet wide on either side. Construction in this area could require a full roadway closure; therefore, bus routes 210, 222, 921, 207, and 208 would need to be redirected to the designated detours.

8.4 Significant Unavoidable Adverse Impacts

8.4.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no significant unavoidable adverse impacts to transportation.

8.4.2 Preferred Alternative

There would be the potential for temporary, short-term, but significant unavoidable delays in traffic movement and circulation in work zone areas during construction along the Preferred Alternative. Potential detour routes could be required for the following key segments along the Preferred Alternative:

- Along 160th Avenue SE or 164th Avenue SE from the southern terminus at the SSP to SE 292nd Street
- Kent-Kangley Road to SE 224th Street
- SE 224th Street/156th Avenue SE Intersection to SE 192nd Street/148th Avenue SE
• 140th Avenue SE from SE 192nd Street to SE 171st Way
• SE 171st Way to SE Fairwood Boulevard
• SE Fairwood Boulevard to SR 169
• SR 169 to 154th Place SE
• SE Jones Road to SE 144th Street
• 156th Avenue SE to 160th Avenue SE
• SE 144th Street to SE 128th Street
• SE 128th Street to SE May Valley Road
• SR 900 from SE May Valley Road to Issaquah

To minimize access restrictions to residents and businesses, specific detour routes and closures would be developed in close consultation with the local jurisdictions as part of the permitting process. A Traffic Control Plan would be prepared to provide advance notification to the public of the approved road closures and detours. If during the permitting process it appeared that satisfactory detours could be implemented, longer acceptable work hours would be requested to shorten the overall construction schedule and associated impacts.

In some areas, pipeline construction could impact overlay pavement on existing roadways. Any impacts to overlay pavement would require coordination with the affected jurisdiction. Roadways impacted by pipeline construction would be restored, including temporary patching, permanent patching, and new overlays where required by permit.

8.4.3 Green Route Alternative

Similar to the Preferred Alternative, there could be temporary, short-term, but potentially significant unavoidable delays in traffic movement and circulation during construction along the Green Route Alternative. Potential detour routes could be required for the following key segments along the Green Route Alternative:

• Southern terminus at the SSP to SE 272nd Street
• 132nd Avenue SE from SE 272nd Street to SE 256th Street
• 132nd Avenue SE from SE 256th Street to SE 240th Street
• 132nd Avenue SE from SE 240th Street to SE 208th Street
• 132nd Avenue SE/SE 208th Street intersection to SE 204th Way/140th Avenue SE intersection
• SE 204th Way/140th Avenue SE intersection to SE 192nd Street
• 156th Avenue SE from SE 144th Street to SE 128th Street
• 148th Avenue SE from SE 128th Street to SE May Valley Road
- SE May Valley Road from 148th Avenue SE to Coal Creek Parkway SE
- Coal Creek Parkway from SE May Valley Road to SE 84th Way
- SE Newport Way from Factoria Boulevard SE to west of 148th Avenue SE

Road work hours and durations would be similar to those described for the Preferred Alternative. To reduce the potential significant adverse impacts to transportation, specific mitigation plans, potential detour routes, and haul route agreements would be formally established with affected jurisdictions during the permit application process.

Similar to the Preferred Alternative, construction of the Green Route Alternative could impact overlay pavement on existing roadways. Any impacts to overlay pavement would require coordination with the affected jurisdiction. Roadways impacted by pipeline construction would be restored, including temporary patching, permanent patching, and new overlays where required by permit.
Figure 8-1. Average Daily Traffic Volume and Level of Service
Chapter 9: Historic and Cultural Preservation

The State Environmental Policy Act (SEPA) states that potential significant impacts on historic and cultural resources are to be considered in project planning during the environmental review process.

The historic registers that are relevant to the project include the Washington Heritage Register, the King County Landmarks Registry, and the National Register of Historic Places. To qualify for listing on a historic register, a resource must meet the following criteria:

- Be at least 40 years old. If less than 40 years old, the resource should have documented exceptional significance. (The age criterion for the National Register of Historic Places is 50 years).
- Have a high to medium level of integrity; that is, it should retain important character-defining features from its historic period of significance.
- Have documented significance at the local, state, or federal level.

Historic and cultural resources are considered under SEPA review with reference to the following cultural resource laws:

- Executive Order 05-05, Archaeological and Cultural Resources
- Washington Advisory Council on Historic Preservation (WAC 25-12)
- Washington State Historic Building Code (WAC 51-19)
- State Historical Societies – Historic Preservation (RCW 27.34)
- Abandoned and Historic Cemeteries and Historic Graves (RCW 68.60)
- Archaeological Sites and Resources (RCW 27.53)
- National Historic Preservation Act of 1966, as amended (36 CFR 800)

A reconnaissance survey was conducted to determine the presence of historic and cultural resources in the project area. Details and results of the reconnaissance survey are reported in the Cascade Water Alliance Central Segment Pipeline Route Alternatives Study, Archaeological and Cultural Resources (HRA, 2005), and in Cultural Resources Assessment for the Cascade Water Alliance North Segment Pipeline (HRA, 2006). A reconnaissance survey is typically undertaken in the early stages of large projects when several different alternatives are being considered. The objective of a reconnaissance survey in a SEPA review is to record historic and cultural resources, and identify specific areas where archaeological resources may be present.
based on what is known about previously recorded archaeological sites in the project vicinity, past human land use, and environmental factors.

The reconnaissance survey for the project began with determining whether historic and cultural resources that are listed in or proposed for listing in the Washington Heritage Register, the King County Landmarks Registry, and the National Register of Historic Places are present on or adjacent to the route alternatives. Background research for the survey included reviewing records on file at the Department of Archaeology and Historic Preservation (DAHP). These preliminary research efforts were followed by fieldwork that consisted of a "windscreen" (vehicle) survey of the project area to identify potentially historic buildings or structures on or adjacent to each route alternative. Finally, the results of background research and fieldwork were used to evaluate the route alternatives in terms of their potential to contain unknown archaeological resources. Areas with a high probability of containing unknown archaeological resources are identified as "archaeologically sensitive."

Identification of archaeologically sensitive areas for each route alternative was accomplished by reviewing the nature and distribution of known archaeological sites within approximately 1 to 2 miles of the project area; reviewing regional archaeological survey studies; examining maps, environmental data, and aerial photographs; and recording field observations. For example, a segment of the Preferred Alternative near Jenkins Creek between 164th Place SE and Covington Way SE was identified as being archaeologically sensitive for several reasons: (a) it is an undeveloped area in the Big Soos Creek floodplain; (b) it is about half a mile northwest of a known archaeological site; (c) Government Land Office (GLO) maps dating to the late 1800s depict a Native American trail north of Jenkins Creek; and (d) several Southern Lushootseed place names are associated with Big Soos Creek, which is adjacent to the segment (HRA, 2005).

9.1 Affected Environment

Coal mining, logging and milling, and hop farming have left their marks on the regional historical landscape. While remnants of these activities can still be viewed on the landscape, no significant historical resources were identified along the Preferred Alternative or Green Route Alternative. Most areas along the Preferred Alternative and Green Route Alternative consist of relatively recent residential and commercial development; however, there are areas along both action alternative routes that are rural in character and include older residences and commercial buildings more than 40 years old. The Preferred Alternative would generally follow a PSE corridor utility corridor and SR 900 on the southeastern flank of Cougar Mountain, where some of the historical houses, farming-related structures, and stone bridges date to the early 1900s. None of the historic buildings or structures identified in the affected environment would be directly or indirectly impacted by construction or operation of either action alternative.

Based on regional archaeological research, Native American use and occupation of the project vicinity may date to many thousands of years ago (Hollenbeck, 1987; Lewarch and Larson, 1978; Samuels, 1993). At the time of initial American settlement, several Puget Sound Salish groups occupied the project vicinity (Suttles and Lane, 1990). Their aboriginal way of life focused on the major rivers, which provided abundant salmon and easy transportation along tributaries. In Puget Sound Geography, an ethnographic study prepared about 1920, ethnographer T.T. Waterman recorded many Native American place names in the project vicinity (Hilbert, 2001). Two that are located near the Preferred Alternative are Tsqel’pu’cuL, a place on Tibbetts Creek meaning "loading things on a canoe," and Teqaiyuwa’liut, meaning a "corpse’s house" on Squawk [sic] Mountain (Hilbert, 2001:118). Several other place names are located in
the vicinity of the Cedar River: *Tuxudidû*, meaning "little Cedar River" near Renton, and *TuwE’b-qo*, a village at the confluence of the Cedar and Black rivers (Hilbert, 2001:151).

Evidence of prehistoric and historic Native American use of the landscape may now be deeply buried in the floodplains of rivers and creeks, where habitation sites would have been located. For archaeological resources, the affected environment for both action alternatives includes areas in which installation of the pipeline could directly impact buried archaeological resources. These areas typically include floodplains and relatively flat areas associated with waterways, areas in the vicinity of known archaeological sites, and areas associated with Native American place names. Within these areas, the potential impact zone of the pipeline is an area up to 28 feet wide for the trench to a depth of approximately 10 to 12 feet or deeper. This could vary greatly where waterway crossings are proposed, depending upon the engineering requirements of the crossing. The environmental history of the landforms identified as archaeologically sensitive for each action alternative has been included in the assessment of potential project impacts.

Tables 9-1 and 9-2 list historic buildings and structures and archaeologically sensitive areas along the Preferred Alternative and the Green Route Alternative.

<table>
<thead>
<tr>
<th>Resource Description or Issue</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>House and barn</td>
<td>28841 – 164th Avenue SE</td>
</tr>
<tr>
<td>Horse farm</td>
<td>28836 – 164th Avenue SE</td>
</tr>
<tr>
<td>Archaeologically sensitive area: SE 292nd Street to SR 18</td>
<td>Historic maps depict a Native American trail in the vicinity of Jenkins Creek.</td>
</tr>
<tr>
<td>Archaeologically sensitive area: SR 18 to SE 256th Street</td>
<td>This route segment would be located at the confluence of Little Soos Creek and Big Soos Creek, and would be in the Big Soos Creek floodplain. Also associated with Native American place names.</td>
</tr>
<tr>
<td>Big Soos Creek Nature Preserve Barn</td>
<td>156th Avenue SE</td>
</tr>
<tr>
<td>House</td>
<td>156th Avenue SE</td>
</tr>
<tr>
<td>House and barn with pasture off-set from corner</td>
<td>SW corner of SE 256th Street and 156th Avenue SE</td>
</tr>
<tr>
<td>House and barn with pasture off-set from corner</td>
<td>SE corner of SE 256th Street and 156th Avenue SE</td>
</tr>
<tr>
<td>House</td>
<td>24845 – 156th Avenue SE</td>
</tr>
<tr>
<td>House, “Cramen Farm”</td>
<td>24624 – 156th Avenue SE</td>
</tr>
<tr>
<td>Barn</td>
<td>24624 – 156th Avenue SE</td>
</tr>
<tr>
<td>House</td>
<td>Across from 24624 – 156th Avenue SE</td>
</tr>
<tr>
<td>Farmhouse, barn, and silo</td>
<td>NE corner of SE 240th Street and 156th Avenue SE</td>
</tr>
<tr>
<td>“One horse farm”, stone barn</td>
<td>23200 – 156th Avenue SE</td>
</tr>
<tr>
<td>Resource Description or Issue</td>
<td>Location</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Barn</td>
<td>22443 – 156th Avenue SE</td>
</tr>
<tr>
<td>Archaeologically sensitive area: SE 224th Street to SE 192nd Street</td>
<td>This route segment would be located in the Big Soos Creek floodplain and western Lake Youngs drainages. Also associated with Native American place names.</td>
</tr>
<tr>
<td>House and barn</td>
<td>21808 – 148th Avenue SE</td>
</tr>
<tr>
<td>Columbia &amp; Puget Sound Railroad Grade (Site 45KI538)</td>
<td>Cedar River Trail, north of SR 169</td>
</tr>
<tr>
<td>Elliott Farm - four structures (in ruins)</td>
<td>14207 Maple Valley Highway</td>
</tr>
<tr>
<td>House</td>
<td>14235 Maple Valley Highway</td>
</tr>
<tr>
<td>Hynes House</td>
<td>15214 149th Avenue SE</td>
</tr>
<tr>
<td>House</td>
<td>15202 149th Avenue SE</td>
</tr>
<tr>
<td>House</td>
<td>15120 149th Avenue SE</td>
</tr>
<tr>
<td>&quot;Old Elliott Bridge&quot;</td>
<td>Cedar River crossing at 149th Avenue SE and SR 169</td>
</tr>
<tr>
<td>House</td>
<td>15002 149th Avenue SE</td>
</tr>
<tr>
<td>House</td>
<td>13833 156th Avenue SE</td>
</tr>
<tr>
<td>House</td>
<td>7927 Talus Drive at Renton-Issaquah Road SE (SR 900)</td>
</tr>
<tr>
<td>House/Barn</td>
<td>8020 Renton-Issaquah Road SE (SR 900) just south of Talus Drive</td>
</tr>
<tr>
<td>House</td>
<td>8324 Renton-Issaquah Road SE (SR 900)</td>
</tr>
<tr>
<td>House</td>
<td>11225 Renton-Issaquah Road SE (SR 900)</td>
</tr>
<tr>
<td>Building/House (&quot;Hillside Farm Antiques&quot;)</td>
<td>11309 Renton-Issaquah Road SE (SR 900)</td>
</tr>
<tr>
<td>Stone bridge</td>
<td>At Tibbetts Creek on Renton-Issaquah Road SE (SR 900)</td>
</tr>
</tbody>
</table>
Table 9-2. Historic and Cultural Resources along the Green Route Alternative

<table>
<thead>
<tr>
<th>Resource Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>House 28641 – 132nd Avenue SE</td>
<td></td>
</tr>
<tr>
<td>House Address unavailable</td>
<td></td>
</tr>
<tr>
<td>House Address unavailable</td>
<td></td>
</tr>
<tr>
<td>House and barn 25303 SE 132nd Avenue SE</td>
<td></td>
</tr>
<tr>
<td>Archaeologically sensitive area:</td>
<td></td>
</tr>
<tr>
<td>SE 256th Street to SE 233rd Street</td>
<td>This route segment would cross two waterways near Lake Meridian, Clark Lake, and Lake Jolie. Also associated with Native American place names.</td>
</tr>
<tr>
<td>Archaeologically sensitive area:</td>
<td></td>
</tr>
<tr>
<td>SE 208th Street to SE 200th Street</td>
<td>This route segment would be located in the Big Soos Creek floodplain at the confluence with Lake Youngs drainages. Also associated with Native American place names.</td>
</tr>
<tr>
<td>House 11920 148th Avenue SE</td>
<td></td>
</tr>
</tbody>
</table>

9.2 Environmental Impacts

Because most of the construction and operation of the pipeline would take place within established road and utility rights-of-way, neither action alternative would have the potential to impact the historic houses or structures identified in the affected environment (see Tables 9-1 and 9-2). Construction of the pipeline would permanently remove or alter the vegetation in the area above and adjacent to the pipeline; however, none of the vegetation observed in the affected environment could be classified as significant historic landscaping.

Ground disturbance associated with construction has the potential to directly or indirectly affect archaeological resources in the subsurface affected environment. Ground disturbance includes trenching, tunneling or boring, and use of equipment lay-down or staging areas. Potential impacts to archaeological resources are therefore relative to the depth and degree of proposed ground disturbances and the archaeological sensitivity of the specific project area. The depth of trenchless excavations would be a minimum of two pipe diameters (approximately 10 to 12 feet) below the drainage channel bottom, which would have the potential to directly impact archaeological resources buried many feet below the present ground surface.

9.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to historic or cultural resources.
9.2.2 Preferred Alternative

Direct Impacts - Construction
Most of the Preferred Alternative would be constructed within existing road and utility rights-of-way. There are currently no known archaeological resources in the immediate vicinity of the Preferred Alternative. However, Table 9-1 lists specific route segments of the Preferred Alternative that are archaeologically sensitive and that have not been assessed through archaeological survey and subsurface testing. It is therefore unknown whether the Preferred Alternative contains archaeological resources that could be removed or destroyed by ground disturbance from trenching, grading, and equipment lay-down or staging.

Direct Impacts - Operation
No direct impacts to historic resources would occur during operation. However, future repairs involving relocation of segments of the pipeline in archaeologically sensitive areas (listed in Table 9-1) have the potential to directly impact archaeological resources, if present.

Indirect Impacts - Construction and Operation
No indirect impacts to historic resources would occur during construction or operation. There are no foreseeable indirect impacts to archaeological resources, if present.

Cumulative Impacts
No cumulative impacts to historic resources would occur. There are no foreseeable cumulative impacts to archaeological resources, if present.

9.2.3 Green Route Alternative

Direct Impacts - Construction
Most of the Green Route Alternative would be constructed within existing road and utility rights-of-way. There are currently no known archaeological resources in the immediate vicinity of the Green Route Alternative. However, Table 9-2 lists specific route segments of the Green Route Alternative that are archaeologically sensitive and that have not been assessed through archaeological survey and subsurface testing. It is therefore unknown whether the Green Route Alternative contains archaeological resources that could be removed or destroyed by ground disturbance from trenching, grading, and equipment lay-down or staging.

Direct Impacts - Operation
No direct impacts to historic resources would occur during operation. Future repairs involving relocation of segments of the pipeline in archaeologically sensitive areas (listed in Table 9-2) have the potential to directly impact archaeological resources, if present.

Indirect Impacts - Construction and Operation
No indirect impacts to historic resources would occur during construction or operation. There are no foreseeable indirect impacts to archaeological resources, if present.

Cumulative Impacts
No cumulative impacts to historic resources would occur. There are no foreseeable cumulative impacts to archaeological resources, if present.
9.3 Mitigation Measures

9.3.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

9.3.2 Preferred Alternative

Measures to minimize impacts to archaeological resources during construction would include:

- Conducting archaeological surveys and appropriate subsurface testing in areas identified as archaeologically sensitive.
- Conducting appropriate construction monitoring of archaeologically sensitive areas where deeply buried archaeological deposits could not be identified through standard archaeological survey techniques.
- Halting work immediately and notifying the appropriate tribal, local, and state authorities if anything of cultural significance was encountered during construction.

9.3.3 Green Route Alternative

The mitigation measures for the Green Route Alternative would be similar to those for the Preferred Alternative.

9.4 Significant Unavoidable Adverse Impacts

Because of the nature and extent of the proposed construction and operation, none of the potential project-related impacts to archaeological resources are considered to be significant unavoidable adverse impacts. Archaeological deposits and the cultural and scientific information they contain could be recovered through controlled professional archaeological excavation.
Chapter 10: Energy and Natural Resources

10.1 Affected Environment

Energy and natural resources would be consumed by construction activities as well as in the manufacture and transport of materials used during construction. Energy would also be used for operating vehicles to maintain the facility.

10.2 Environmental Impacts

10.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to energy and natural resources.

10.2.2 Preferred Alternative

Direct Impacts - Construction

Construction of the Preferred Alternative would require heavy construction equipment for excavating, dewatering, transporting material, and installing the pipeline and associated materials. Some tools and equipment would use electricity as a power source; others would use gasoline or diesel fuels. If construction were to occur into the evening or nighttime hours, electricity would be needed to provide site lighting. However, the consumption of energy for construction of the Preferred Alternative would have no significant impact on the local energy supply.

It is assumed that the construction workers would be from the local area. The amount of fuel consumed by construction workers’ vehicles would be similar to that used at their previous construction projects.

Specific materials that would be used for the pipe, casings, and appurtenances have been determined on a preliminary basis. The proposed pipeline would be constructed of 42-inch-diameter welded steel pipe. The pipe would be covered with a synthetic lining and coating material to protect it from the corrosive effects of water and soils. The lining and coatings have not been determined, but could be cement mortar, coal tar enamel, or polyurethane. The coatings and linings would be applied at the vendor’s shop. Due to the size of the pipe, the number of manufacturers would be very limited. The most likely sources of the finished pipeline product would be manufacturers in Oregon, California, and Utah. Raw steel and lining materials used to fabricate the pipe could come from various suppliers within the western United States and possibly overseas. Pipeline appurtenances such as valves, meters, and fittings are constructed of various metals such as steels, stainless steel, ductile iron, copper, and brass. Other significant materials that would be used include processed soils for pipe bedding and backfill and asphalt for road pavement restoration. These materials would likely come from readily available sources and would not greatly affect natural resources.
**Direct Impacts - Operation**

Anticipated energy consumption during project operation would be little to none due to the gravity flow in the pipeline. There would be no pump stations or lift stations associated with the Preferred Alternative that would use energy. The rechlorination facility and the flow control facility would use some electrical energy for pumping, metering, and control systems. The cathodic protection system would also use some electrical energy. The energy that would be used during maintenance and operation of the project would be very minor.

With the exception of chlorine and sodium hypochlorite, no natural resources would be required for operation of the Preferred Alternative.

**Indirect Impacts - Construction and Operation**

Because direct impacts would be minimal, no temporary or permanent indirect impacts related to energy and natural resources would be associated with the Preferred Alternative.

**Cumulative Impacts**

The Preferred Alternative would not significantly affect energy or natural resource consumption; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Preferred Alternative, short-term cumulative impacts to energy or natural resource consumption could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

**10.2.3 Green Route Alternative**

Energy and natural resources impacts related to the Green Route Alternative would be similar to those described for the Preferred Alternative.

**10.3 Mitigation Measures**

Because the project would not result in energy or natural resources impacts, additional measures to minimize potential impacts would not be required.

**10.4 Significant Unavoidable Adverse Impacts**

Of the potential project-related impacts to energy and natural resources, none are considered to be significant unavoidable adverse impacts.
Chapter 11: Environmental Health

11.1 Affected Environment

11.1.1 Noise

Ambient noise levels are often attributed to land uses. Noise levels are usually higher in urban settings due to higher concentrations of human activity, such as vehicle use, than in less developed, more natural settings. Ambient noise levels in rural areas typically range from 35 to 50 decibels (A-weighted) (dBA), while ambient levels in suburban and urban residential settings range from 48 to 72 dBA (USEPA, 1974). Proximity to roadways or industrial land uses further increases ambient noise levels in these settings.

Land uses are generally rural in the southern and eastern portions of the project area, progressing to more suburban and urban residential uses in the central, western, and northern areas. Therefore, ambient noise levels are generally lower in the vicinity of the Preferred Alternative than in the vicinity of the Green Route Alternative. However, roadways and other localized noise-producing land use activities are present near each alternative. Due to the largely residential setting of the project, noise-sensitive receptors are present along the route of each alternative, except for the sections of the Preferred Alternative adjacent to Lake Youngs, the open space areas on Cougar and Squak Mountains, and the cross-country area near the Bonneville Power Administration (BPA) substation. Receptors are present along the Green Route Alternative except in the area adjacent to the open space associated with the Coal Creek riparian zone.

A-weighting of decibels refers to the emphasis given to certain frequencies within the range of sound levels, typically where the human ear is most sensitive. Some noise-sensitive receptors include residences, schools, parks, libraries, and healthcare facilities.

11.1.2 Hazardous Materials

Agency records associated with hazardous waste were obtained through Environmental Data Resources, Inc. (EDR) database services, which searches federal, state, and local agency databases (EDR, 2005; EDR, 2006). The database review was performed to identify and document known releases of hazardous wastes into the environment and to identify those businesses and industries that generate, store, or transport regulated hazardous materials, thus resulting in potential releases. Because the database search identifies only known hazardous waste sites, unidentified contaminated sites could exist within the project area that have not been discovered or that have not been reported to state or federal agencies.

Project team members performed a brief field reconnaissance of the project area, which consisted of driving the routes of both action alternatives and noting locations of potential contamination sources (e.g., dry cleaners and gas stations) (GeoEngineers, 2005; GeoEngineers, 2006). They also reviewed the EDR report with regard to both action alternatives (GeoEngineers, 2005). For each site listed in the EDR report, a relative probability of concern was assigned for construction-related environmental issues such as contaminated soil or groundwater. The review did not account for sites that could not be accurately depicted by EDR, uncontrolled fill or dumping of contaminants, old facilities with contaminant issues that are now
covered by roadways, undocumented releases from unlisted sites or sites on lower risk lists, or releases associated with railroad tracks.

### 11.1.3 Preferred Alternative

#### Noise

Specific sources of noise within the vicinity of the Preferred Alternative are:

- Industrial land uses south of SR 18
- SR 18
- SR 516
- SE 240th Street
- 140th Avenue SE
- SE Petrovitsky Road
- Commercial center at 140th Avenue SE and SE Petrovitsky Road intersection
- 140th Way SE
- SR 169
- 154th Place SE
- SE 128th Street
- SR 900
- Industrial land uses southeast of SR 900
- Newport Way NW
- Commercial center north of the SR 900 and Newport Way NW intersection

#### Hazardous Materials

Several hazardous materials sites are listed within the vicinity of the Preferred Alternative. Five sites with a relatively high probability of affecting pipeline construction due to soil or groundwater contamination were identified near the Preferred Alternative (see Figure 11-1):

1. 7-Eleven/Chevron, 13923 SE Petrovitsky Road. Cleanup started for petroleum release to soil.
2. ARCO AM/PM, 17200 140th Avenue SE. Cleanup started in 1995 for petroleum release to soil and groundwater.
4. Exxon #7, 16402 SE 128th Street. Cleanup started for petroleum products in groundwater and soil.
5. Washington State Department of Transportation (WSDOT) right-of-way, Issaquah, 17th Avenue, 960 17th Avenue NW. Awaiting cleanup for metals and cyanide, petroleum products, and non-halogenated solvents in groundwater and soil.
During field reconnaissance, team members identified two rows of ten monitoring wells which penetrate the pavement along the west end of the Iddings Sand and Gravel property, located at 27525 Covington Way SE, just south of the proposed SR 18 crossing. The site received a “No Further Action” status from the Washington State Department of Ecology (Ecology) in 2001; the site does not appear to be a source of contamination.

### 11.1.4 Green Route Alternative

#### Noise

Specific sources of noise within the proximity of the Green Route Alternative are:

- SR 516
- Commercial center at SR 516 and SE 132nd Avenue intersection
- 132nd Avenue SE
- SE 240th Street
- Commercial center at SE 240th Street and 132nd Avenue intersection
- 140th Avenue SE
- SE Petrovitsky Road
- Commercial center at 140th Avenue SE and SE Petrovitsky Road intersection
- 140th Way SE
- SR 169
- 154th Place SE
- SE 128th Street
- 148th Avenue SE
- SR 900
- Coal Creek Parkway SE
- Commercial center north of Factoria Boulevard SE and SE Newport Way intersection
- SE Newport Way

#### Hazardous Materials

Several hazardous materials sites along the Green Route Alternative were identified through field reconnaissance and review of the EDR report. Nine of the sites were determined to have a relatively high probability of affecting pipeline construction (see Figure 11-1):

1. 7-Eleven Store, 13131 SE 240th Street. Site is being monitored for a release of petroleum to soil and groundwater.

2. ARCO AM/PM, 17200 140th Avenue SE. Cleanup started in 1995 for petroleum release to soil and groundwater.

3. ConocoPhillips/Circle K, 13122 SE 240th Street. Small release of gasoline to groundwater reported and active service station.


5. Texaco, 13201 SE 272nd Street. Petroleum release to soil and groundwater awaiting cleanup.
6. 7-Eleven/Chevron, 13923 SE Petrovitsky Road. Cleanup started for petroleum release to soil.

7. Daniel’s Drycleaners Coal Creek, 6923 Coal Creek Parkway SE. High levels of halogenated organic compounds confirmed in soil and groundwater.

8. Velocity Investments Inc. ARCO NO 5375, 6966 Coal Creek Parkway SE. High levels of non-halogenated solvents confirmed in groundwater.


11.2 Environmental Impacts

11.2.1 No-Action Alternative

Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to environmental health.

11.2.2 Preferred Alternative

Direct Impacts - Construction

Noise

Construction of the Preferred Alternative would result in temporary increases in ambient noise levels. Construction noise would be audible at residences and other receptors adjacent to the proposed alignment. Along the Preferred Alternative, population densities are less than those along the Green Route Alternative. Population densities are notably low in the areas between Jenkins Creek and SR 516, adjacent to Lake Youngs Reservoir, and along SR 900. Therefore, fewer residents would be affected by noise associated with construction of the Preferred Alternative compared with construction of the Green Route Alternative.

Construction would generate temporary noise impacts caused by operating the equipment (e.g., jackhammers, trucks, cranes, trenching equipment, backhoes, etc.) associated with excavating, removing material, delivering and installing pipe, backfilling, and related activities. While the impact would be temporary, construction activities would be noticeable, particularly in residential areas. Maximum noise levels from construction equipment could range from 79 to 101 dBA (Bolt, Beranek, and Newman, Inc., 1981). Estimated noise levels for specific equipment are listed in Table 11-1. Levels listed in Table 11-1 represent estimates of the maximum amount of noise 50 feet away from the noise source. Expected noise levels decrease by about 6 dBA for every distance that is doubled. For example, if a grader produces 85 dBA at a distance of 50 feet, it will produce 79 dBA at 100 feet, and 73 dBA at 200 feet (USEPA, 1971)

Bedrock is mapped along the Preferred Alternative in the SR 900 corridor, between Cougar and Squak Mountains (GeoEngineers, 2006). If shallow bedrock is encountered during construction, blasting could be required. Blasting would produce very brief, high-decibel noise, accompanied by vibration discernable in the immediate vicinity. The areas mapped as bedrock along the Preferred Alternative are less densely populated compared with those along the Green Route Alternative. Therefore, if blasting were to occur, temporary impacts would be less severe for the Preferred Alternative.
The pipeline would be installed at an estimated rate of 40 to 250 feet per day. Therefore, construction would normally affect nearby receptors for a relatively short period of time. Special crossings, such as the trenchless crossing of Little Soos Creek, could slow the rate of progression, thus extending the duration of impacts on nearby noise receptors. A single trenchless crossing, depending on depth and length, would take approximately 3 to 4 months.

### Table 11-1. Construction Equipment Maximum Sound Levels

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Rating or Capacity</th>
<th>Engine Size (Horsepower)</th>
<th>Range of Maximum Sound Level at 50 feet (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trucks</td>
<td>100 to 400 hp</td>
<td>100 to 400</td>
<td>81 to 87</td>
</tr>
<tr>
<td>Front end loader</td>
<td>2.25 to 5 cu yd</td>
<td>116 to 299</td>
<td>82 to 86</td>
</tr>
<tr>
<td></td>
<td>6 to 15 cu yd</td>
<td>300 to 750</td>
<td>86 to 90</td>
</tr>
<tr>
<td>Crawler tractor / dozer</td>
<td>101 to 250 hp</td>
<td>101 to 250</td>
<td>81 to 85</td>
</tr>
<tr>
<td></td>
<td>251 to 700 hp</td>
<td>251 to 700</td>
<td>85 to 90</td>
</tr>
<tr>
<td>Hydraulic backhoe excavator</td>
<td>1.5 to 3 cu yd</td>
<td>131 to 335</td>
<td>82 to 86</td>
</tr>
<tr>
<td></td>
<td>3.25 to 7 cu yd</td>
<td>336 to 760</td>
<td>86 to 90</td>
</tr>
<tr>
<td>Grader</td>
<td>9 to 16 ft blade</td>
<td>60 to 350</td>
<td>79 to 86</td>
</tr>
<tr>
<td>Mobile crane</td>
<td>11 to 75 ton at 10 ft boom</td>
<td>121 to 240</td>
<td>82 to 85</td>
</tr>
<tr>
<td>Pile driver (effect)</td>
<td>Not specified</td>
<td>Not specified</td>
<td>101</td>
</tr>
<tr>
<td>Pile driver (sonic or vibratory)</td>
<td>Not specified</td>
<td>Not specified</td>
<td>96</td>
</tr>
<tr>
<td>Portable air compressor</td>
<td>400 to 2,000 cfm at 100 psi</td>
<td>126 to 600</td>
<td>82 to 89</td>
</tr>
</tbody>
</table>


Construction activities are exempt from noise regulations during daytime hours. Construction occurring outside of daytime hours would require a noise variance from the governing jurisdiction. The Preferred Alternative would be located within the jurisdictions of the cities of Covington, Renton, and Issaquah, and in unincorporated King County. Daytime hours for these jurisdictions are as follows:

- **City of Covington**: 7:00 a.m. to 8:00 p.m. weekdays; 9:00 a.m. to 6:00 p.m. weekends and holidays
- **City of Renton**: 7:00 a.m. to 10:00 p.m.
- **City of Issaquah**: 7:00 a.m. to 10:00 p.m.
- **King County**: 7:00 a.m. to 10:00 p.m. weekdays; 9:00 a.m. to 10:00 p.m. weekends and holidays

Sounds created by installing or repairing essential utility services are exempt from Washington State noise regulations between the hours of 7:00 a.m. and 10:00 p.m. (WAC 173-60-050).
Hazardous Materials

Contaminated soils or groundwater could be encountered during construction activities near 13923 SE Petrovitsky Road (7-Eleven/Chevron site), 17200 140th Avenue SE (ARCO AM/PM), 16402 SE 128th Street (the Friendly Food Mart and Exxon #7 sites), and 960 17th Avenue NW (the WSDOT right-of-way site). While the potential exists for encountering contamination along the entire Preferred Alternative, no previous studies indicate the presence of hazardous materials except in these areas. Because there are five documented contaminated sites along the Preferred Alternative compared with nine along the Green Route Alternative, there is a lower probability of encountering hazardous materials during construction of the Preferred Alternative.

Construction workers and the public could be affected if contaminated soils and/or groundwater are encountered during construction. Potential impacts include:

- Breathing dust or fumes from petroleum-contaminated soils or groundwater.
- Exposing contaminated soils that could erode, transporting contaminants downstream to receiving waters. Furthermore, dewatering activities within potentially contaminated sites could result in contamination of receiving waters if the effluent is not properly treated prior to discharge.
- Spilling hazardous materials such as acids, solvents, and asphalt products used during construction, resulting in soil, surface water, or groundwater contamination.
- Encountering buried asbestos cement water pipes. Improper removal and disposal of brittle asbestos materials could result in asbestos exposure for construction workers and the public. Exposure to asbestos fiber has been linked to various health effects, including asbestosis, pulmonary hypertension and immunological effects, mesothelioma, and lung cancer (USEPA, 2006).

These potential impacts would be limited by utilizing Best Management Practices (BMPs) and other mitigation measures (see Section 11.3).

Following pipeline installation, the pipeline would be sanitized, then filled with potable water. The pipe would be sanitized by pushing a highly concentrated chlorinated water "slug" through the entire pipe. Chlorine concentrations would be based on volume of the pipe and demand for sanitation, but are typically about 100 parts per million (ppm). The slug would remain generally localized until discharging from the end of the pipe. The discharged slug would drain to a sanitary sewer, where available, or receive appropriate treatment prior to discharging to a storm drain or natural water. If drinking water standards were met, the pipeline would go into service. Although not anticipated, the pipeline would need to be re-sanitized if standards were not met. Given sound construction practices, no construction-related impacts would result from sanitation.

Direct Impacts - Operation

Noise

The completed Preferred Alternative would consist of a buried water supply pipeline. Low levels of noise could be associated with infrequent maintenance activities and with the electrically-

1 An abandoned 10-inch-diameter asbestos cement pipeline is located along 140th Avenue SE. If the Preferred Alternative were constructed, a portion of this abandoned pipeline would need to be removed; proper removal and disposal practices would be followed.
operated valves in the flow control facility; however, any noise would be attenuated by the facility’s location in an underground vault. Operation of the Preferred Alternative would not result in long-term noise impacts.

**Hazardous Materials**

The Preferred Alternative would require installation of blowoff valves along the pipeline to enable dewatering of the pipeline for repair and maintenance. Blowoff valves would be located at all low point elevations along the pipeline and on the upstream side of isolation valves. While exact locations of blowoff valves have not been determined, there could be approximately 65 valves located along the pipeline. Discharge water would consist of potable water with chlorine levels that meet drinking water standards. Water from blowoff valves associated with the Preferred Alternative would discharge to a sanitary sewer, or receive appropriate treatment prior to discharging to a storm drain or surface water, thus avoiding potential contamination of surface or groundwater during project operation.

Sodium hypochlorite would be used during operation of the rechlorination facility to boost the chlorine concentration of the water in the pipeline. Hypochlorite solution would be generated onsite, as needed, within a contained area. Although not anticipated, if a spill of the solution were to occur, contamination of soil or groundwater could occur. Safety measures and appropriate design of the facility would considerably reduce the risk of a spill.

**Indirect Impacts - Construction**

**Noise**

Temporary, indirect noise impacts could result if motorists use alternate routes through areas not associated with the Preferred Alternative to avoid traffic restrictions associated with construction.

Temporary noise associated with construction equipment has the potential to affect human or wildlife health. Due to the generally low noise levels relative to ambient conditions and the temporary nature of construction, it is unlikely that these indirect impacts would occur.

**Hazardous Materials**

If hazardous materials are encountered during construction, the potential exists for spreading contamination to local surface waters or groundwater. Exposure to hazardous materials could affect human, wildlife, or vegetation health. Although not anticipated, there is a slight potential for spreading contaminants if shallow groundwater is encountered in construction areas.

**Indirect Impacts - Operation**

**Noise**

Because there would be no direct impacts from operation of the project, no indirect impacts associated with noise would result from operation of the Preferred Alternative.

**Hazardous Materials**

Any hazardous materials encountered during construction would be contained or removed. These actions would reduce the potential spread of contamination through surface waters or groundwater, thus reducing potential health impacts to humans, wildlife, or vegetation.
Cumulative Impacts

The Preferred Alternative would not alter long-term ambient noise levels or alter contamination; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Preferred Alternative, short-term cumulative impacts to environmental health could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

11.2.3 Green Route Alternative

Direct Impacts - Construction

Noise

Construction of the Green Route Alternative would result in temporary noise impacts similar to those associated with construction of the Preferred Alternative. Generally, land uses along the Green Route Alternative are relatively suburban to urban. Due to the relatively higher ambient noise levels, noise impacts associated with the Green Route Alternative would be expected to be relatively low. Most of the noise receptors along the Green Route Alternative are single- and multi-family residences and commercial centers. Although construction of this alternative could result in less variation in ambient noise levels, the population density in the vicinity of the Green Route Alternative is greater than that for the Preferred Alternative. Therefore, more residents and businesses would be affected by noise associated with construction of the Green Route Alternative compared with construction of the Preferred Alternative.

Bedrock is mapped within the Green Route Alternative in small areas near the May Creek crossing and near the Coal Creek crossing (GeoEngineers, 2006). If shallow bedrock is encountered during construction, blasting could be required. Noise impacts associated with blasting would be expected to be of a short duration. The areas mapped as bedrock along the Green Route Alternative are more densely populated than those along the Preferred Alternative. Therefore, if blasting were to occur, more residents would be affected by noise associated with construction of the Green Route Alternative compared with construction of the Preferred Alternative.

Construction activities are exempt from noise regulations during daytime hours. Construction occurring outside of daytime hours would require a noise variance from the governing jurisdiction. The Green Route Alternative would be located within the jurisdictions of the cities of Kent, Renton, Newcastle, and Bellevue, and in unincorporated King County. Daytime hours for these jurisdictions are as follows:

- City of Kent: 7:00 a.m. to 10:00 p.m.
- City of Renton: 7:00 a.m. to 10:00 p.m.
- City of Newcastle: 7:00 a.m. to 7:00 p.m. weekdays; 9:00 a.m. to 6:00 p.m. on weekends and holidays
- City of Bellevue: 7:00 a.m. to 10:00 p.m. weekdays; 9:00 a.m. to 10:00 p.m. on weekends and holidays
- King County: 7:00 a.m. to 10:00 p.m. weekdays; 9:00 a.m. to 10:00 p.m. weekends and holidays
Sounds created by the installation or repair of essential utility services are exempt from Washington State noise regulations between the hours of 7:00 a.m. and 10:00 p.m. (WAC 173-60-050).

**Hazardous Materials**

Contaminated soils or groundwater could be encountered during construction activities near 13131 SE 240th Street (7-Eleven store), 17200 140th Avenue SE (Arco AM/PM), 13122 SE 240th Street (Conoco Phillips/Circle K), 13054 Kent-Kangley Road (Conoco Phillips/Exxon), 13201 SE 272nd Street (Texaco), 13923 SE Petrovitsky Road (7-Eleven/Chevron), 6923 Coal Creek Parkway SE (Daniel’s Drycleaners), 6966 Coal Creek Parkway SE (Velocity Investments Inc. ARCO NO 5375), and 14509 SE Newport Way (City of Bellevue Parks spill site). No previous studies indicate the presence of hazardous materials along the Green Route Alternative except in the areas listed above, although the potential for encountering undocumented contamination exists along the entire route. Relative to the Preferred Alternative, the Green Route Alternative has a higher probability of encountering hazardous materials during construction. Nine documented contaminated sites associated with the Green Route Alternative compared with five for the Preferred Alternative indicate a greater potential for hazardous materials exposure.

If contamination was encountered during construction of the Green Route Alternative, the impacts would be similar to those for the Preferred Alternative.

**Direct Impacts - Operation**

**Noise**

The completed Green Route Alternative would consist of a buried water supply pipeline. With the exception of minor infrequent maintenance activities, no noise would be associated with the completed project. Operation of the Green Route Alternative would not result in long-term noise impacts.

**Hazardous Materials**

The impacts associated with hazardous materials during operation of the Green Route Alternative would be similar to those for the Preferred Alternative.

**Indirect Impacts - Construction**

**Noise**

Traffic restrictions along 132nd Avenue SE, SE 208th Street, 140th Avenue SE, and other roadways associated with the Green Route Alternative could cause motorists to use alternate routes. The redirection of traffic through areas not associated with the Green Route Alternative could result in temporary indirect noise impacts to receptors within these areas.

Temporary noise associated with construction equipment has the potential to affect human or wildlife health. These indirect impacts would be unlikely to occur due to the generally low noise levels relative to ambient conditions, and because of the temporary nature of construction.

**Hazardous Materials**

Contamination-related indirect impacts associated with the Green Route Alternative would be similar to those associated with the Preferred Alternative.
Indirect Impacts - Operation

**Noise**
Because there would be no direct impacts from operation of the project, no indirect impacts associated with noise would result from operation of the Green Route Alternative.

**Hazardous Materials**
Contamination-related indirect impacts associated with the Green Route Alternative would be similar to those associated with the Preferred Alternative.

**Cumulative Impacts**
The Green Route Alternative would not alter long-term ambient noise levels or alter contamination; therefore, no cumulative impacts would be expected. If other projects were constructed simultaneously along the Green Route Alternative, short-term cumulative impacts to environmental health could occur. Local jurisdictions would address the potential cumulative impacts resulting from multiple simultaneous projects.

### 11.3 Mitigation Measures

#### 11.3.1 No-Action Alternative
Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

#### 11.3.2 Preferred Alternative

**Noise**

**Construction**
Construction noise levels would be variable and short-term for either of the action alternatives. Contractors would be required to implement the following measures to minimize disruption and inconvenience caused by construction activities:

- Encouraging the adequacy of mufflers on all engines.
- Minimizing the idling time of equipment and vehicle operation.
- Operating equipment only during hours approved by each jurisdiction.

**Operation**
Project operation would not affect noise; therefore, no permanent mitigation measures would be necessary.
Hazardous Materials

Construction
The contractor would be required to provide an emergency response plan to address hazardous substance spills resulting from routine equipment operation, maintenance activities, and construction of either action alternative. The contractor would also be required to demonstrate knowledge of proper hazardous material storage, handling, and emergency procedures, including proper spill notification and response requirements.

Adherence to BMPs would be required. One source of appropriate BMPs is Chapter 2.2, Pollutant Source-Specific BMPs; Volume IV, Source Control BMPs; of Ecology’s Stormwater Management Manual for Western Washington (Ecology, 2005a). If hazardous materials were discovered during construction, activities in the immediate area would be stopped. The contractor would then notify Cascade and Ecology and follow the procedures described in the Model Toxics Control Act – Cleanup Regulation – Chapter 173-340 WAC. If buried asbestos cement water pipes were encountered during excavation, the contractor would be required to use approved disposal methods.

A Phase I Environmental Site Assessment would be conducted if one of the action alternatives is selected. A Phase I Environmental Site Assessment involves a review of federal, state, and local information sources; a review of historical aerial photographs and topographic maps; and a visual assessment of the project area to identify whether potentially contaminated sites are present. If recommended in the Phase I Environmental Site Assessment, Cascade would conduct a limited Phase II Environmental Site Assessment of the selected alternative, where necessary, including analyzing groundwater and soil samples to confirm the presence/absence of any contamination. The objective of a Phase II Environmental Site Assessment is to determine whether existing site conditions require further environmental action, such as monitoring or remediation. If recommended, monitoring or cleanup of identified sites could occur, or the design could be changed to avoid affecting these sites.

Operation
Chlorinated discharge water from blowoff valves associated with operation of the Preferred Alternative would either drain untreated to a permitted sanitary sewer system, or discharge to a storm sewer or watercourse following appropriate treatment. Appropriate treatment would reduce effluent chlorine level to below that which could cause acute toxicity to aquatic organisms. Water between isolation valves would drain from the blowoff valves to allow for pipeline maintenance.

11.3.3 Green Route Alternative
Mitigation measures for the Green Route Alternative would be similar to those for the Preferred Alternative.

11.4 Significant Unavoidable Adverse Impacts
Of the potential project-related impacts to environmental health, none are considered to be significant unavoidable adverse impacts.
Figure 11-1. Documented Contaminated Sites
Chapter 12: Land and Shoreline Use

12.1 Affected Environment

12.1.1 Preferred Alternative

Land Use
Land use planning helps create and maintain vital communities with close-knit neighborhoods, a sustainable economy, protected natural systems, and an efficient public infrastructure.

Jurisdictions along the Preferred Alternative would include: the cities of Covington, Issaquah, Renton, and unincorporated King County (see Figure 2-2). Each of these jurisdictions has comprehensive plans that describe how neighborhoods should evolve over time (see Appendix E for more information on each jurisdiction’s plans and policies). Land uses along the Preferred Alternative are varied and they are generally characterized by jurisdiction, as described below.

City of Covington
Land uses within the City of Covington along the Preferred Alternative are characterized by a mixture of zoning designations, including: urban separator, downtown commercial (DN 1-10), Industrial, and medium density residential with a density allocation of 6 dwelling units (du) per acre (ac) (City of Covington, 2005). The comprehensive plan designations along the Preferred Alternative are defined as follows: urban separator, medium density residential 6 du/ac, regional commercial, and public utility (City of Covington, 2003a).

City of Issaquah
Land uses within the City of Issaquah along the Preferred Alternative are characterized by a mixture of zoning designations, including: community facilities-open space, conservancy residential with a density allocation of 1 du per 5 acres, single-family estates with a density allocation of 1.24 du per acre, urban village/east village, single family suburban with a density allocation of 4.5 du per acre, community facilities-facilities, and community facilities-recreation (City of Issaquah, 2006a). The comprehensive plan designations along the Preferred Alternative are defined as follows: community facilities, low density residential, and low density residential/urban village (City of Issaquah, 2006b).

City of Renton
Land uses within the City of Renton along the Preferred Alternative are characterized by the zoning designation of resource conservation (City of Renton, 2006a). The comprehensive plan designation along the Preferred Alternative is residential low density (City of Renton, 2005).

As part of the implementation of the Growth Management Act (Chapter 36.78 RCW) in 1995, Renton and King County established the Urban Growth Boundary (areas in unincorporated King County that are defined as urban). These unincorporated urban areas were designated as Potential Annexation Areas (PAA) and assigned to a city that agreed to consider annexing them at some point in the future. Due to budget constraints, King County is actively encouraging all of the PAAs to annex to cities as soon as possible as part of the King County Annexation Initiative (City of Renton, 2006b). Recently, residents of the Maplewood Addition PAA voted to be
annexed to the City of Renton effective January 1, 2007. This area is located along the south and north side of SR 169 and could encompass a portion of the Preferred Alternative. For the purposes of this evaluation, the Maplewood Addition is considered a part of the City of Renton.

**King County**

Land uses within unincorporated King County along the Preferred Alternative are characterized by a mixture of zoning designations, including: urban reserve (UR), single and multi-family residential with densities ranging from 4 du per acre to 24 du per acre (R-4, R-6, R-12, and R-24), community business (CB), neighborhood business, mineral, and rural area with density allocations of one du per 2.5 and 5 acres (RA-2.5 and RA-5) (King County, 2005f).

The comprehensive plan designations along the Preferred Alternative include the following: rural residential (1 du per 2.5 to 10 acres), forestry, urban residential medium (4 to 12 du/acre), rural neighborhood, community business center, greenbelt/urban separator, urban residential (1 du/acre), commercial outside of centers, King County-owned open space/recreation, and mining (King County, 2004a).

**Shoreline Use**

Washington’s Shoreline Management Act (SMA) (Chapter 90.58 RCW) was adopted in 1972 with a goal of preventing the “inherent harm in an uncoordinated and piecemeal development of the state’s shorelines.” The SMA establishes a broad policy giving preferences to uses that protect the quality of water and the natural environment, depend on proximity to the shoreline, and preserve and enhance public access or increase recreational opportunities for the public along shorelines. Under the SMA, each city and county adopts a shoreline master program that is based on state guidelines but tailored to the specific needs of the community (Ecology, 2003).

Shoreline use along the Preferred Alternative is governed by local Shoreline Management Program (SMP) regulations enforced by King County and the cities of Covington, Issaquah, and Renton. There are two waterways that the Preferred Alternative would cross that fall under the jurisdiction of local SMPs:

- Jenkins Creek – Rural – King County (King County, 2006f)
- Cedar River – Conservancy – King County and City of Renton\(^1\) (King County, 2006f)

There are several other streams along the Preferred Alternative, as discussed in detail in Chapter 5 and as shown in Figure 5-3. Streams not directly identified in this chapter do not meet the criteria for streams of state-wide significance; however, they may be protected by local ordinances.

\(^1\) Due to approval of the Maplewood Addition annexation effective January 1, 2007, the City of Renton will have jurisdiction of the south side of the Cedar River where the Preferred Alternative would cross.
12.1.2 Green Route Alternative

Land Use

Jurisdictions along the Green Route Alternative would include: the cities of Bellevue, Kent, Newcastle, and Renton, and unincorporated King County (see Figure 2-2). Each of these jurisdictions has comprehensive plans that describe how neighborhoods should evolve over time. Land uses within the pipeline corridor are varied and are generally characterized by jurisdiction, as described below.

City of Bellevue

Land uses within the City of Bellevue along the Green Route Alternative are characterized by a mixture of zoning designations, including: single family (R-1, R-2.5, R-3.5, R-5), multi-family (R-10, R-15, and R-20), and office (City of Bellevue, 2005a). The comprehensive plan designations along the Green Route Alternative are defined as: park, single family low density (up to 1.8 du per acre), single family medium density (up to 3.5 du per acre), single family high density (up to 5 du per acre), multi-family low density (up to 10 du per acre), multi-family medium density (up to 20 du per acre), multi-family high density (up to 30 du per acre), and professional office (City of Bellevue, 2005b).

City of Kent

Land uses within the City of Kent along the Green Route Alternative are predominately characterized by single family residential zoning, with densities ranging from 1 to 8 du per acre (SR-1, 4.5, 6, and 8). There are also limited concentrations of multi-family and commercial zoning designations, such as the duplex multi-family (MR-D), garden density multi-family (MR-G), community commercial/mixed used (CC-MU), and community commercial (CC). An isolated mobile home park (MHP) zoning designation is also situated along the Green Route Alternative (City of Kent, 2006a).

The underlying land use classifications largely consist of single family residential (SF 4.5, 6, and 8 du/acre). Other comprehensive land use designations include parks and open space (OS), mobile home park (MHP), commercial (C), and low and medium density multi-family residential (LDMF/MDMF), urban separator (US), and King County urban residential 4 to 12 units per acre (UR4-12) (City of Kent, 2006b).

City of Newcastle

Land uses within the City of Newcastle along the Green Route Alternative are characterized by a mixture of zoning designations, including: single family residential 1 to 48 du/acre (R-1, R-4, R-6, R-12, R-48), community business, mixed use, mixed use industrial, mixed use residential, mixed use commercial, and limited open space (City of Newcastle, 2005). The comprehensive plan designations along the Green Route Alternative are defined as: single family residential, apartment, condominium, retail, light manufacturing, parks, open space, sensitive area tracts, stormwater and utility, and vacant (City of Newcastle, 2003).

City of Renton

Land uses within the City of Renton along the Green Route Alternative are characterized by a mixture of zoning designations, including: resource conservation, residential 1 du/ac (R-1), and residential 4 du/ac (R-4) (City of Renton, 2006a). The comprehensive plan designations along the Green Route Alternative are defined as rural low density (City of Renton, 2005). As with the
Preferred Alternative, the Maplewood Addition annexation to the City of Renton will be effective January 1, 2007.

King County
Land uses within unincorporated King County along the Green Route Alternative are characterized by a mixture of zoning designations, including: single and multi-family residential with densities ranging from 1 du per acre to 24 du per acre (R-1, R-4, R-6, R-8, R-12, R-18, and R-24), community business (CB), and rural area with density allocations of 1 du per 2.5 and 5 acres (RA-2.5 and RA-5) (King County, 2005d).

The comprehensive plan designations along the Green Route Alternative include the following: rural residential (1 du per 2.5 to 10 acres), forestry, urban residential medium (4 to 12 du/acre), community business center, greenbelt/urban separator, urban residential low, medium and high (1 du/acre, 4 to 12 du/ac, and >12 du/ac), other parks/wilderness, and King County-owned open space/recreation (King County, 2004a).

Shoreline Use
Shoreline use along the Green Route Alternative is governed by local SMP regulations enforced by King County and the cities of Bellevue and Renton. The City of Newcastle does not have any shorelines of state-wide significance within its jurisdictional boundary. There are two waterways that the Green Route Alternative would cross that fall under the jurisdiction of local SMPs:

- Big Soos Creek – Natural Environment/Urban Stream Corridor – City of Kent (City of Kent, 2004b)
- Cedar River – Conservancy – King County and City of Renton (King County, 2006f)

There are several other streams along the Green Route Alternative, as discussed in detail in Chapter 5 and as shown in Figure 5-3. Streams not directly identified in this chapter do not meet the criteria for streams of state-wide significance; however, they may be protected by local ordinances.

12.2 Environmental Impacts

12.2.1 No-Action Alternative
Because no construction or operation would take place under the No-Action Alternative, there would be no direct, indirect, or cumulative impacts to land and shoreline use.

12.2.2 Preferred Alternative
Direct Impacts - Construction

Land Use
During construction, land uses within and adjacent to the Preferred Alternative would continue; however, there would be short-term, temporary impacts to land uses. These would primarily include impacts to transportation (see Chapter 8). Following construction, restoration actions proposed under this alternative would help re-establish disturbed areas. These activities would...
include contouring and re-vegetating upland areas and restoring roadways to the local jurisdiction’s standards.

**Shoreline Use**

The Preferred Alternative would cross several waterways (see Chapter 5). For environmentally sensitive crossings, trenchless construction methods (see Appendix D) would be used in many cases. Of these waterways, only Jenkins Creek and the Cedar River are identified as shorelines of state-wide significance with shoreline designations of Rural and Conservancy, respectively. The crossing locations of Jenkins Creek and the Cedar River are summarized below:

- **Jenkins Creek (WRIA 09-0087)** – 0.9 miles upstream of its confluence with Big Soos Creek. The Preferred Alternative would use trenchless technologies at this location to complete the approximately 150-foot crossing under Jenkins Creek (HDR, 2005a). The area provides good access and a good staging area to accommodate trenchless technology (HDR, 2005a). Although no in-water work would occur, the launching and receiving shafts would be within the 200-foot shoreline jurisdiction.

- **Cedar River (WRIA 08-0299)** – 5.5 miles upstream of its confluence with Lake Washington. The Preferred Alternative would use trenchless technologies at this location to complete the approximately 250- to 300-foot crossing under the Cedar River. The area provides good access and a good staging area to accommodate trenchless technology (HDR, 2005a). Although no in-water work would occur, the launching and receiving shafts would be within the 200-foot shoreline jurisdiction.

The Preferred Alternative would be designed with setbacks to comply with the local jurisdiction’s riparian buffer and shoreline management regulations. Thus, the Preferred Alternative would avoid or minimize potential adverse impacts to the shoreline environment.

**Direct Impacts - Operation**

The Preferred Alternative would be designed and permitted in accordance with the applicable local code criteria. The Preferred Alternative would be constructed mostly within road rights-of-way. The completed project would be a buried pipeline which would be compatible with existing and future land uses within existing rights-of-way.

For overland portions, the completed project would restrict structures from being built on top of the buried pipeline due to maintenance and safety concerns. However, the primary existing land uses in the overland areas are characterized by private utilities and open space. The Preferred Alternative would be consistent with both of these uses.

**Indirect Impacts - Construction and Operation**

Indirect land use and shoreline impacts during construction and operation would not be anticipated because the Preferred Alternative would not change off-site land uses or the uses of off-site shoreline areas.

**Cumulative Impacts**

In overland areas, construction and operation of the pipeline could have an impact on future land uses by precluding construction of permanent structures above the pipeline. However, most of the pipeline would be located in public rights-of-way. There would be no significant cumulative impacts to land and shoreline uses.
12.2.3 Green Route Alternative

Direct Impacts - Construction

Land Use
Most of the Green Route Alternative would follow existing public rights-of-way; the remaining part of the route would be constructed in overland areas. As a result, direct impacts on land use would be similar to, but lower than, the construction impacts described for the Preferred Alternative.

During construction, land uses within and adjacent to the Green Route Alternative would continue; however, there would be short-term, temporary impacts to land uses. These would primarily include impacts to transportation (see Chapter 8). Following construction, restoration actions proposed under this alternative would help re-establish disturbed areas. These activities would include contouring and re-vegetating upland areas and restoring roadways to the local jurisdiction’s standards.

Shoreline Use
The Green Route Alternative would cross several waterways (see Chapter 5). For environmentally sensitive crossings, trenchless construction methods (see Appendix D) would be used in many cases. Of these waterways, Big Soos Creek and the Cedar River are identified as shorelines of state-wide significance with shoreline designations of Rural and Conservancy, respectively. The crossing locations of Big Soos Creek and the Cedar River are summarized below:

- Big Soos Creek Crossing (WRIA 09-0072) – This Class II stream would be crossed near the intersection of 128th Avenue SE and SE 208th Street (HDR, 2005a). The stream would be crossed using a trenchless construction method spanning the ordinary high water mark and riparian wetlands. Although no in-water work would occur, the launching and receiving shafts would be within the 200-foot shoreline jurisdiction.

- Cedar River (WRIA 08-0299) – 5.5 miles upstream of its confluence with Lake Washington. The pipeline alignment under the Green Route Alternative would use trenchless technologies at this location to complete the approximately 250 to 300-foot crossing under the Cedar River. The area provides good access and a good staging area to accommodate trenchless technology (HDR, 2005a). Although no in-water work would occur, the launching and receiving shafts would be within the 200-foot shoreline jurisdiction.

The Green Route Alternative would be designed with setbacks to comply with the local jurisdiction’s riparian buffer and shoreline management regulations. Thus, the Green Route Alternative would avoid or minimize potential adverse impacts to the shoreline environment.

Direct Impacts - Operation
The impacts from operating the Green Route Alternative would be similar to those of the Preferred Alternative.

Indirect Impacts - Construction and Operation
The indirect impacts from construction and operation under the Green Route Alternative would be similar to those of the Preferred Alternative.
**Cumulative Impacts**

In overland areas, construction and operation of the pipeline could have an impact on future land uses by precluding construction of permanent structures above the pipeline. However, most of the pipeline would be located in public rights-of-way. There would be no significant cumulative impacts to land and shoreline uses.

### 12.3 Mitigation Measures

#### 12.3.1 No-Action Alternative

Because no construction or operation would occur, no mitigation measures would be necessary under the No-Action Alternative.

#### 12.3.2 Preferred Alternative

Mitigation measures proposed for the Preferred Alternative would be:

- Using low-impact construction techniques (e.g., trenchless construction methods), where feasible.
- Restoring disturbed overland areas and paved road rights-of-way to local jurisdictions’ standards.
- Minimizing corridor width.
- Maximizing use of existing rights-of-way.

#### 12.3.3 Green Route Alternative

The mitigation measures for the Green Route Alternative would be similar to those for the Preferred Alternative.

### 12.4 Significant Unavoidable Adverse Impacts

Of the potential project-related impacts to land and shoreline use, none are considered to be significant unavoidable adverse impacts.
Chapter 13: Public Services and Utilities

Public services described in this chapter include law enforcement, fire and life safety, and schools. Utilities described in this section include water, sanitary sewer, electrical power, natural gas, and telecommunications.

13.1 AFFECTED ENVIRONMENT

13.1.1 Preferred Alternative

Public Services

Law Enforcement
Along the Preferred Alternative, police protection services are provided by the cities of Covington, Issaquah, Renton, and the King County Sheriff’s Office, depending on location.

The King County Sheriff’s Office serves the unincorporated portions King County, the City of Covington, and Precinct Three. Precinct Three is geographically large, covering approximately 900 square miles, and includes contracts for police services with the Cities of Covington, Maple Valley, and Newcastle; the Town of Beaux Arts Village; and the Muckleshoot Indian Tribe (King County, 2004b). The precinct’s boundaries are: I-90 on the north; Pierce County on the south; the cities of Renton, Kent, and Auburn on the west; and the Mount Baker-Snoqualmie National Forest on the east.

The Issaquah Police Department’s three major divisions (the Police Department, City Jail, and Communications Center) provide services to the Issaquah community and contract services to other jurisdictions. The Issaquah Police Department is located near downtown Issaquah.

The City of Renton provides police, municipal court, and jail services and facilities along the Preferred Alternative. All of these services and facilities are located on the City Hall campus in downtown Renton (City of Renton, 2004a).

Fire and Life Safety
Along the Preferred Alternative, fire and life safety services are provided by the cities of Covington, Issaquah, and Renton, and fire districts within unincorporated King County.

No fire and life safety stations are located inside the city limits of Covington. However, the City was annexed into Fire District 37 (City of Covington, 2003b). Fire District 37 provides services in connection with Kent Fire and Life Safety. The two primary Kent Fire and Life Safety Stations serving the Covington area are Stations 72 and 75 (City of Covington, 2003b).

Within the City of Issaquah, the Eastside Fire and Rescue provides fire protection services. The fire department provides fire protection, emergency medical services, fire code planning, engineering, and enforcement (City of Issaquah, 2005a).
Within the City of Renton, the Renton Fire Department provides fire protection services. King County Fire District 25 is operationally part of the Renton fire protection system; it serves portions of unincorporated King County.

**Schools**

Along the Preferred Alternative, school districts include the Issaquah School District, the Renton School District, and the Kent School District. The Kent School District serves the City of Covington. Schools in the vicinity of the Preferred Alternative include Covington Elementary, Jenkins Creek Elementary, Crestwood Elementary, Mattson Middle School, and Kentwood High School. The Issaquah School District includes Issaquah and Newcastle and portions of Bellevue, Renton, and unincorporated King County. Liberty High School is in the vicinity of the Preferred Alternative. Several Renton School District schools are in the vicinity of the project area, including Renton Park Elementary, Tiffany Park Elementary, Maplewood Heights Elementary, and Hazen High School.

**Utilities**

**Water**

Along the Preferred Alternative, water services are provided by the cities of Covington, Issaquah, and Renton, and a mix of public/private water systems operating in unincorporated King County.

The City of Covington's water is provided by the Covington Water District. The Covington Water District consists of a total of 12 production wells at 5 wellfield sites, 18 million gallons of storage in ground-level steel tanks at six sites throughout the District, and over 210 miles of pipeline. The primary water supply is the groundwater allotted by a Water Right granted by the State. In addition, the City has agreements with the City of Auburn and Seattle Public Utilities (SPU) to purchase limited amounts of water when necessary. In the summer of 2002, the City of Covington began receiving water from Tacoma Water’s SSP. The Covington Water District currently has 13,000 service connections (Covington Water District, 2006).

The City of Issaquah gets most of its potable water from groundwater. Groundwater rights allow the City to withdraw approximately 5.6 million gallons per day. Currently, the City has the capacity to pump a maximum of approximately 4.4 million gallons per day. The primary source of this groundwater is the Lower Issaquah Creek Basin Aquifer System, which lies below the valley floor. At the present time, the City of Issaquah has two interties with the Sammamish Plateau Water and Sewer District water system. The interties are located at 1st Avenue NE at NE Juniper Street and NW Sammamish Road at 221st Place SE. The intertie at 1st Avenue is manually operated and designed for emergency supply exchanges. The intertie at NW Sammamish Road is designed to supply water to the City from the District in the event of a pressure loss in the City’s system due to fire flow demands. The NW Sammamish Road intertie can be operated from the City operations facility (City of Issaquah, 2005b).

The City of Renton’s water system provides service to an area of approximately 16 square miles and more than 14,700 customers located in 12 hydraulically-distinct pressure zones. An inventory of the existing capital facilities in the water system consists of 8 wells and 1 spring for water supply, 11 booster pump stations, 8 reservoirs, water treatment facilities at each source (chlorine and fluoride and corrosion control), and approximately 283 miles of water main in service. In addition, the City maintains 1 standby well and 7 metered connections with the City of Seattle (Cedar River and Bow Lake supply pipelines) for emergency backup supply. Renton
supplies water on a wholesale basis to the Lakeridge Bryn-Mawr Water District (City of Renton, 2004b).

For unincorporated areas in King County, the City of Seattle, through SPU, provides potable water for approximately 1,300,000 million people in the region either through direct service or through the sale of water to over 27 water districts.

**Sanitary Sewer**

Along the Preferred Alternative, sanitary sewer services are provided by the cities of Covington, Issaquah, and Renton, and by King County.

The City of Covington is located within the Soos Creek Water and Sewer District. The Soos Creek Water and Sewer District boundary is approximately 28 square miles. The District’s wastewater is treated by the King County Department of Natural Resource’s Water Pollution Control Division Treatment Plant in Renton. Wastewater is discharged from the District at ten locations. The District serves 19,200 residential customers and 4,200 commercial customers. The District maintains approximately 350 miles of gravity sewer, 18.5 miles of force mains, and 24 lift stations (City of Covington, 2003b).

The City of Issaquah is served by its municipally owned and operated sewer utility with a service area that corresponds primarily to the city limits, except for the North Issaquah subarea, which is served by the Sammamish Plateau Water and Sewer District. Within the City’s service area there are several areas that remain unsewered due to physical difficulties associated with bringing in sewer lines (such as the need to construct pump stations in low-lying areas) (City of Issaquah, 2005b). Sewage from the City’s system flows by gravity to the northwest via the Issaquah Interceptor to the Sunset Pump Station. From the Sunset Pump Station, sewage is pumped through the Vasa Park Interceptor to the King County East Lake Washington Interceptor and then flows southward to Metro King County’s Renton wastewater treatment plant (City of Issaquah, 2005b).

As the regional sewerage authority, King County Department of Natural Resources, Division of Wastewater Treatment and Disposal (KCWWTD), provides transmission, treatment and disposal of Issaquah’s sewage after it leaves the City’s system. Sewage from the City is currently discharged into two King County interceptors, the Issaquah and the Issaquah Creek Interceptors.

The City of Renton’s sanitary sewer system consists of about 184 miles of gravity sewers, 23 lift stations with associated force mains, and approximately 3,400 manholes. Wastewater is discharged to regional facilities at over 70 locations within the service area. The City’s wastewater utility serves approximately 13,800 customers, which include approximately 95% of the City's population and 85% of the City's land area. The remaining 5% of the population currently utilizes private, on-site wastewater disposal systems, typically septic systems, while the balance of the population either utilizes private systems or the land remains undeveloped. The capacity of the existing facilities is adequate to handle the current demand (City of Renton, 2004b).

**Electrical Power**

Puget Sound Energy (PSE) provides electrical power to the project area for the cities of Covington, Issaquah, and Renton as well as to unincorporated King County. The Bonneville Power Administration (BPA) owns and operates most of the higher voltage transmission lines and substations in the Pacific Northwest. PSE and the BPA have substations within King
County, including several in the cities of Covington, Issaquah, Renton, and in unincorporated King County. In the City of Renton along the Preferred Alternative, electricity is provided to Bryn Mawr and Skyway distribution substations. Electrical service in Covington is provided by four substations in the city limits.

**Natural Gas**

PSE provides natural gas service to the cities of Covington, Issaquah, and Renton, and to unincorporated King County. Natural gas supply for these jurisdictions is provided by Williams Pipeline Corporation. Gas is delivered from the pipeline to Covington, Issaquah, and Renton, and to unincorporated King County through gate stations.

**Telecommunications**

Telecommunications include, but are not limited to, telephone, personal wireless services, microwave, and cable television. Qwest Communications is the primary provider of telephone service and certain related special services (alarm circuits and data transmittal) to the cities of Covington, Issaquah, and Renton, and for unincorporated King County. Due to changes in regulations by the Washington State Utilities and Transportation Commission, other providers such as Verizon and Multi Media have been able to join in the market. In addition, conventional telephone services in Renton are supplemented by StarCom Service Corporation. The existing main feeder routes serving the Issaquah area lie along the Juniper to Newport route (City of Issaquah, 2005b). Cable services are generally provided by Comcast and Viacom. Fiber optic lines are present along SR 900.

### 13.1.2 Green Route Alternative

**Public Services**

**Law Enforcement**

Along the Green Route Alternative, police protection services are provided by the cities of Bellevue, Kent, Newcastle, and Renton, and by the King County Sheriff’s Office.

For law enforcement services in Bellevue along the Green Route Alternative, police facilities consist of a central office located at Bellevue City Hall, a firing range, classroom facilities, an evidence room, police annex, 9-1-1 communications center located in the basement of Fire Station 3, and the two police substations at Crossroads and Factoria (City of Bellevue, 2006a).

For the City of Kent, the East Hill Precinct provides law enforcement services along the Green Route Alternative; this station is located at 24611 116th Avenue SE. The Springwood Substation is located at 27405 129th Place Southeast.

The City of Renton provides police, municipal court, and jail services and facilities along the Green Route Alternative. All of these services and facilities are located on the City Hall campus in downtown Renton (City of Renton, 2004a).

The King County Sheriff’s Office provides several key public safety services to Newcastle on a regional basis. Sheriff’s deputies are assigned to the Newcastle Police Department and are considered part of the City staff. The Chief of Police is a sergeant with King County Sheriff’s Office and reports to both the Newcastle City Manager and the Sheriff’s local precinct commander. The City provides office space for police functions (City of Newcastle, 2003a).
King County serves the unincorporated areas along the Green Route Alternative through the Sheriff’s Office and Precinct Three (see Section 13.1.1).

**Fire and Life Safety**

Along the Green Route Alternative, fire and life safety services are provided by the cities of Bellevue, Kent, Newcastle, and Renton, and by the King County Sheriff’s Office.

In the City of Bellevue, fire and emergency medical services and capital emergency facilities are managed and maintained by the Bellevue Fire Department. Bellevue Fire Station #9 is the closest facility to the Green Route Alternative (City of Bellevue, 2006a).

For the City of Kent, the fire and life safety stations along the Green Route Alternative include Fire Stations 72, 74, 75, and 77 (City of Kent, 2004a). These stations include: Station 72, located at 25620 140th Avenue SE; Station 74, located at 24611 116th Avenue SE; Station 75, located at 15635 SE 272nd Street; and Station 77, located at 20717 132nd Avenue SE.

The City of Newcastle contracts with the City of Bellevue for several services, including: fire protection services, emergency medical services, emergency preparedness capabilities, and hazardous materials response. Fire and emergency services staff are under the direction and control of the Bellevue Fire Chief and are not considered part of Newcastle’s staff. Bellevue Fire Station #9 is located just outside of Newcastle’s city limit off Newcastle Way (City of Newcastle, 2003a).

For information on the City of Renton Fire Department, see Section 13.1.1.

**Schools**

Along the Green Route Alternative, school districts include the Bellevue, Issaquah, and Kent School Districts. In the Kent School District, several schools are located in the vicinity of the Green Route Alternative, including Auburn Mountview High School, Junior Junction School, Sunrise Elementary, and Carriage Crest Elementary. Several other schools in close proximity include Horizon Elementary, Martin Sortun Elementary, Soos Creek Elementary, Lake Youngs Elementary, and Fairwood Elementary (HDR, 2005a).

Within Issaquah and Newcastle, the Green Route Alternative would be located adjacent to several schools in the Issaquah School District, including Apollo Elementary and Newcastle Elementary. Most of the City of Bellevue’s residents are served by the Bellevue School District, though some are served by the Lake Washington School District, the Issaquah School District, and the Renton School District. Several schools are located in the vicinity of the Green Route Alternative, including Newport High School and Tyee Middle School. There are also several private schools including Newport Covenant Church Preschool, St. Madeleine Sophie Catholic School, and Newport Children’s School (HDR, 2006b).

**Utilities**

**Water**

Water service providers along the Green Route Alternative include the City of Kent, King County Water District 111, and the Soos Creek Water and Sewer District. The City of Kent’s water utility serves a 27-square-mile area. Adjacent franchise areas within unincorporated King County serve the remainder of Kent. To the east, the service area boundary coincides with the boundary of King County Water District No. 111 and the Soos Creek Water and Sewer District.
To the north, the service area boundary coincides with the mutual Kent/Renton and Kent/Tukwila city limits. In the south, the service area coincides with the City of Auburn and the Lakehaven Utility District (City of Kent, 2004a).

Coal Creek Utility District serves the City of Newcastle. The source of water for the District is the City of Seattle's Regional Water Supply System; its main source for the area in which Coal Creek Utility District lies is the Cedar River Watershed, located in the foothills of the Cascade Mountains southeast of North Bend. The water is conveyed from the headwaters at Landsburg through large pipelines to Lake Youngs Reservoir, located east of Kent. Additional conduits convey water to Seattle service areas (City of Newcastle, 2003b).

For information on the City of Renton’s water system, see Section 13.1.1.

The publicly-owned water facilities serving Bellevue were all constructed and are maintained by the City of Bellevue. Water is supplied by Cascade, which currently obtains most of its water from SPU. Bellevue’s water system consists of 27 water tanks and 616 miles of water mains (4- to 24-inch-diameter pipes) serving a population of over 131,000 customers throughout the service area (City of Bellevue, 2006b).

Sanitary Sewer

Generally, the KCWWTD has the responsibility for interception, treatment, and disposal of wastewater from communities throughout south, east, and north King County at the South Treatment Plant located in Renton. Adjacent sewer utilities providing service include Soos Creek Water and Sewer District, the Cedar River Water and Sewer District, and the Lakehaven Utility District (King County, 2004b).

The City of Newcastle receives sewer service from the Coal Creek Utility District. Coal Creek Utility District collects wastewater and conveys it to KCWWTD. The District’s sanitary sewer system flows into KCWWTD’s Eastside Interceptor. The wastewater is treated at the South Treatment Plant. Currently, KCWWTD’s wastewater treatment consists of primary treatment, secondary treatment, and bio-solids processing (City of Newcastle, 2003b).

For information on the City of Renton’s sanitary sewer system, see Section 13.1.1.

The publicly-owned sewer facilities serving Bellevue were all constructed and are maintained by the City of Bellevue. Sewage from Bellevue flows into KCWWTD’s South Treatment Plant, where it receives secondary treatment and is discharged into Puget Sound. The sewer system consists of 519 miles of local lines and 46 lift or pump stations serving a population of over 132,000 customers throughout the service area. Approximately 1,600 properties within the service area have on-site septic tank systems (City of Bellevue, 2006b).

Electrical Power

PSE provides electrical power to the cities of Bellevue, Kent, Newcastle, and Renton, and to unincorporated King County. PSE and the BPA have substations within King County, including several in the City of Kent.

Electrical power is supplied to the Newcastle area from PSE’s Talbot Hill and Sammamish substations, located in Renton and Redmond, respectively, which are connected to the regional transmission grid. PSE has three transmission lines located within and serving the Newcastle area. A single distribution substation is located within the city with additional service provided from distribution substations located in Bellevue and Renton. Seattle City Light’s transmission lines connect the Campbell/Edison substation in Renton and the Sience substation in Auburn, providing power to a number of utilities in the service area.
Natural Gas

PSE provides natural gas service to the cities of Bellevue, Kent, Newcastle, and Renton, and to unincorporated King County. Natural gas supply for these jurisdictions is provided by Williams Pipeline Corporation. Gas is delivered from the pipeline to the primary jurisdictions through gate stations. Locally, the gate stations are defined as the South Seattle Gate Station, Covington Gate Station, and the Black Diamond Gate Station. The South Seattle Gate Station is served by high pressure lines (e.g., 250 pounds per square inch gauge [psig]), while the Covington and Black Diamond Gate Stations serve the intermediate pressure system (reduction to 52 psig) (City of Kent, 2004a). PSE takes delivery of natural gas to serve Newcastle and Renton from two parallel Williams pipelines in Renton for distribution locally through a series of smaller lines and pressure regulators. For Bellevue, natural gas is delivered to a regional distribution network via an interstate pipeline system. The pipeline serving Bellevue consists of two pipelines running north and south in an area east of Lake Sammamish.

Telecommunications

Conventional telephone service to the cities of Bellevue, Kent, Newcastle, and Renton, and to unincorporated King County are furnished by a combination of providers, including Qwest Communications, General Telephone, Electric Light Wave, and Pacific Telecommunications. Cable services are generally provided by Comcast and Viacom. Conventional telephone services in Renton are provided by StarCom Service Corporation. The lines generally parallel I-405.

13.2 Environmental Impacts

13.2.1 No-Action Alternative

The No-Action Alternative would not provide additional capacity and reliability to the regional water system. The outcome could have an adverse impact on the regional water supply in the long-term.

13.2.2 Preferred Alternative

Direct Impacts - Construction

Direct impacts on public services would include potential access restrictions and/or temporary detours to accommodate pipeline construction activities. Access restrictions and/or temporary detours along arterial routes could result in slight changes to law enforcement response times (Issaquah Police Department, Renton Police Department, and King County Precinct 3); fire and emergency vehicle incident response times (Issaquah Fire Station 10, Renton Fire Station 12, Kent Fire and Life Safety Stations 72 and 75, and King County Fire Protection District 25); and school bus accessibility (Issaquah School District, Renton School District, and Kent School District). Water line relocations could temporarily disrupt fire suppression services (Issaquah Fire Station 10, Renton Fire Station 12, Kent Fire and Life Safety Stations 72 and 75, and King County Fire Protection District 25) if they simultaneously affect fire hydrants. These actions would result in short-term minor adverse impacts on public services.

Direct construction impacts on local utilities could result from pavement demolition, excavation, backfill, pipeline installation, and repaving. Temporary service outages could be necessary.
Along SE 192nd Street between 140th Avenue SE and 148th Avenue SE, multiple water lines are present, including one 18-inch-diameter water line and one 6-inch-diameter water line. There would be multiple 10-inch-diameter sewer crossings and 8- to 12-inch-diameter water line crossings. Two major water storage reservoirs (6 million gallons [MG] and 15 MG) and a finished water pump station are also located at the intersection of SE 192nd Street and 148th Avenue SE (HDR, 2005a).

Along 140th Avenue SE between SE 192nd Street and SE 171st Place, there are 8- to 12-inch-diameter water lines along the entire area. There would be one 12-inch-diameter water line crossing on Petrovitsky Road and multiple 8- to 12-inch-diameter water line crossings near the intersection of SE 171st Place and SE 140th Street. The Preferred Alternative would cross a 12-inch-diameter sewer line at SE 182nd Street, and at Petrovitsky Road near the intersection of SE 171st Place and SE 140th Street. There are water and sewer lines along 154th Avenue SE and 160th Avenue SE, and a water line along 176th Avenue SE.

Because the Preferred Alternative would be adjacent to the Lake Youngs watershed, utility conflicts along 148th Avenue SE from SE 218th Street to SE 192nd Street would be minimal since there would not be any utility service connection to the east in this area.

Based on previous analysis (HDR, 2006b), minimal utility conflicts would be anticipated along the northern part of the proposed route in the City of Issaquah and in unincorporated King County. Limited relocation of small existing utilities, including power, sewer, and minor sanitary sewer/side sewer rework would be anticipated in the commercial area near SE 128th Street. Coordination with PSE would be required if the PSE right-of-way along SR 900 is utilized for the pipeline.

**Direct Impacts - Operation**

Operation of the Preferred Alternative would not affect other public services.

**Indirect Impacts - Construction**

Direct temporary impacts on service areas for law enforcement, fire and emergency medical, and schools would be short-term and minor. Therefore, no indirect impacts would be expected from construction.

**Indirect Impacts - Operation**

Beneficial indirect impacts on utilities would include improved regional water supply services to Cascade’s members and the region over the short- and long-term. This would achieve a higher quality of service and reliability to member jurisdictions and the region.

**Cumulative Impacts**

In general, cumulative impacts on utilities could result from overlapping construction schedules among a series of planned actions by increasing the risk and frequency of service disruption. Potential utility outages would affect business and residential customers as well as public services. Emergency response providers would be notified of construction plans and schedules in advance to reduce the impact of service disruptions.

Lane closures and traffic delays from multiple projects in the same or adjacent areas could pose difficulties in determining efficient routes for these services. If not properly mitigated, lane closures and traffic delays from multiple concurrent projects under construction could result in additional impacts to response times and travel time delays for police, fire, and emergency
medical services. However, construction scheduling and traffic control would be implemented in accordance with local jurisdictional requirements to reduce cumulative impacts.

13.2.3 Green Route Alternative

Direct Impacts - Construction and Operation

Generally, the direct construction and operation impacts on public services and utilities for the Green Route Alternative would be similar to those for the Preferred Alternative. For example, access restrictions and/or temporary detours along arterial routes associated with pipeline construction could result in slight changes to law enforcement response times (Kent Police Department [East Hill Precinct], Renton Police Department, Bellevue Police Department, and King County Precinct 3); fire and emergency vehicle incident response times (Kent Fire and Life Safety Stations 72 and 75, Renton Fire Station 12, Bellevue Fire Station 9, and King County Fire Protection District 25); and school bus accessibility (Kent School District, Issaquah School District, and Bellevue School District). Water line relocations could temporarily disrupt fire suppression services (Kent Fire and Life Safety Stations 72, 74, 75, and 77; Renton Fire Station 12; Bellevue Fire Station 9; and King County Fire Protection District 25) if they simultaneously affect fire hydrants.

The notable difference primarily relates to utilities, where the potential direct impacts of construction would be greater than for the Preferred Alternative based on the presence of multiple utilities, the size of utilities, the number of utility crossings, and the length of the congested utility segments. Several locations along the Green Route Alternative have moderate to highly congested conditions for utilities (HDR, 2005a). Some of these locations are described below.

The area along 132nd Avenue north of SE 288th Street to SE 272nd Street is highly congested with multiple utilities, including sewers, major water lines, storm drains, power lines, and high-pressure gas lines. The Green Route Alternative would parallel a 12- to 16-inch-diameter water line from SE 295th Street to Kent-Kangley Road. A major water line (30-inch diameter) is present in this area. There would also be several sewer line crossings and a storm drain along the Green Route Alternative. The Green Route Alternative would run along a 16-inch-diameter high-pressure gas line. At the intersection of Kent-Kangley Road and 132nd Avenue SE, the Green Route Alternative would cross a water line pipe (12-inch diameter), a sanitary sewer pipe (24-inch diameter), and a storm drain (21-inch diameter) (HDR, 2005a).

Along 132nd Avenue SE between SE 256th Street and SE 240th Street there are sewer (12- to 18-inch-diameter) and water (10- to 12-inch-diameter) pipelines. The Green Route Alternative would also cross several water and sewer lines. At the intersection of 132nd Avenue SE and SE 256th Street, the Green Route Alternative would cross multiple gravity sewers, a large-diameter sewer force main, and a water line.
Moderate utility conflicts exist along the Green Route Alternative in Renton, Newcastle, and Bellevue (HDR, 2006b). Significant residential development is occurring in the 148th Avenue SE area to SE May Valley Road and in the City of Newcastle. Construction in these areas would require coordination with planned and existing utilities and some sanitary sewer/side sewer relocation. The Green Route Alternative would cross SPU’s Cedar line.

**Indirect Impacts - Construction and Operation**

The indirect impacts to public services and utilities for the Green Route Alternative would be similar to, but greater than, the impacts described for the Preferred Alternative because more utilities are located along the Green Route Alternative.

**Cumulative Impacts**

The cumulative impacts on public services and utilities for the Green Route Alternative would be similar to those of the Preferred Alternative.

**13.3 Mitigation Measures**

**13.3.1 No-Action Alternative**

Because no construction or operation would take place under the No-Action Alternative, no mitigation measures would be necessary.

**13.3.2 Preferred Alternative**

The following mitigation measures would be implemented for the Preferred Alternative:

- Conducting all traffic control in accordance with local jurisdictional requirements (construction signing, night lighting, and barricades) and adhering to all applicable regulations for in-street work.
- Having emergency procedures in place to restore road access for emergency vehicles (may involve the use of steel plates to allow quick restoration of the roadway).
- Advising KCWWTD; school districts (Issaquah, Renton, and Kent School Districts); law enforcement (Issaquah, Renton, and King County); and fire and life safety services (Issaquah Fire Station 10, Renton Fire Station 12, and King County Fire Protection District 25) of construction dates in advance, and providing project schedule updates throughout the construction period.
- Posting construction schedules on area roads, providing to local papers for publication, or providing by mail to residents, where appropriate.
- Identifying intersections/roadways of concern and addressing project impacts in a Traffic Control Plan.
- Coordinating with the public and private utilities in the corridor as part of construction planning and design to minimize temporary disruptions and/or utility conflicts.
13.3.3 Green Route Alternative

The mitigation measures for the Green Route Alternative for public services and utilities would be similar to those described for the Preferred Alternative.

13.4 Significant Unavoidable Adverse Impacts

13.4.1 No-Action Alternative

Under the No-Action Alternative, additional infrastructure to provide short-term and long-term water supply capacity and reliability would not be developed. Consequently, the No-Action Alternative could result in water supply shortfalls, decreased system reliability, and reduced flexibility in regional system operations.

13.4.2 Preferred Alternative

Access restrictions or temporary road detours during construction could result in moderate to significant short-term changes to law enforcement, fire and life safety incident response times, and/or school bus accessibility. The access restrictions and temporary road detours would primarily occur at the key segments described in Chapter 8.

These impacts would be minimized by conducting traffic control in accordance with local jurisdictional requirements; keeping one or two lanes open to traffic, wherever possible; and coordinating the design with public service providers in advance of construction. An emergency response plan would be developed with the local jurisdictions and emergency response organizations directly affected by construction along the Preferred Alternative.

13.4.3 Green Route Alternative

Because more utilities are located along the Green Route Alternative, the significant unavoidable adverse impacts to public services for the Green Route would be similar to, but greater than those for the Preferred Alternative. The access restrictions and temporary road detours would primarily occur at the key segments described in Chapter 8.

Mitigation measures for the Green Route to reduce potential unavoidable significant adverse impacts to public services would be similar to those for the Preferred Alternative.
Chapter 14: References


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