FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas Branch 2
Northwest Pipeline Corporation
Capacity Replacement Project
Docket Nos. CP05-32-000, -001

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (Commission or FERC) has prepared this draft environmental impact statement (EIS) on the natural gas pipeline facilities and abandonment activities proposed by Northwest Pipeline Corporation (Northwest) in the above-referenced docket. The Capacity Replacement Project would be located in various counties in Washington.

The draft EIS was prepared to satisfy the requirements of the National Environmental Policy Act (NEPA). The FERC staff concludes that approval of the proposed project with appropriate mitigating measures as recommended, would have limited adverse environmental impact.

The U.S. Army Corps of Engineers (COE) is participating as a cooperating agency in the preparation of the EIS because the project would require permits pursuant to section 404 of the Clean Water Act (33 United States Code (USC) 1344) and section 10 of the Rivers and Harbors Act (33 USC 403). The COE would adopt the EIS per Title 40 Code of Federal Regulations (CFR) Part 1506.3 if, after an independent review of the document, it concludes that its comments and suggestions have been satisfied.

The Washington State Department of Ecology (WDOE) is participating as a cooperating agency in the preparation of the EIS because it has been designated the lead agency under the State Environmental Policy Act (SEPA) and is responsible for compliance with SEPA procedural requirements as well as for compiling and assessing information on the environmental aspects of the proposal for all agencies with jurisdiction in Washington. NEPA documents may be used to meet SEPA requirements if the requirements of the State of Washington Administrative Code (WAC) 197-11-610 and 197-11-630 are met. In compliance with SEPA requirements, this To the Party Addressed Letter includes the information required for a SEPA EIS Cover Letter and Fact Sheet. When the final EIS is completed, the WDOE would adopt it if an independent review of the document confirms that it meets the WDOE's environmental review standards.

The purpose of the Capacity Replacement Project is to replace the majority of the delivery capacity of Northwest's existing 268-mile-long, 26-inch-diameter pipeline between Sumas and Washougal, Washington in response to a Corrective Action Order issued by the U.S. Department of Transportation. The proposed facilities are designed to provide up to 360 thousand dekatherms per day of natural gas transportation capacity.

This draft EIS addresses the potential environmental effects (beneficial and adverse) of Northwest's proposal to:

- construct and operate 79.5 miles of new 36-inch-diameter pipeline in 4 separate loops[1] in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties;

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[1] A loop is a segment of pipeline that is usually installed adjacent to an existing pipeline and connected to it at both ends. The loop allows more gas to be moved through the system.

- modify 5 existing compressor stations, one each in Whatcom, Skagit, Snohomish, Lewis, and Clark Counties for a total of 10,760 net horsepower of new compression;
- install various pig[2] launchers, pig receivers, and mainline valves;
- abandon the existing 26-inch-diameter pipeline between Sumas and Washougal with the exception of a short segment within and between the existing Jackson Prairie Meter Station and the Chehalis Compressor Station; and
- use 13 pipe storage and contractor yards on a temporary basis to support construction activities.

Northwest proposes to begin construction in March 2006[3] and place the facilities in service by November 1, 2006. Abandonment of the 26-inch-diameter facilities that are currently in service cannot be completed until the Capacity Replacement Project is placed in service. All abandonment activities would be completed on or before December 31, 2006.

The FERC, the COE, and the WDOE have three alternative courses of action in considering Northwest's proposal. These options include granting authorizations with or without conditions, denying authorizations, or postponing action pending further study. In accordance with the Council on Environmental Quality (CEQ) regulations implementing NEPA, no agency decision on the proposed action may be made until 30 days after the U.S. Environmental Protection Agency (EPA) publishes a Notice of Availability of the final EIS in the Federal Register. However, the CEQ regulations provide an exception to this rule when an agency decision is subject to a formal internal appeal process that allows other agencies or the public to make their views known. This is the case at the FERC, where any Commission decision on the proposed action would be subject to a 30-day rehearing period. Therefore, the lead agency decision may be made at the same time that notice of the final EIS is published by the EPA, allowing the appeal periods to run concurrently.

After notice of the final EIS is published by the EPA, the COE would issue its own Record of Decision (ROD) adopting the EIS. The ROD would include the COE's section 404(b)(1) analysis. After issuance of the ROD, the COE could issue the section 404 and section 10 permits.

After the final EIS is issued, the WDOE would adopt it by identifying the document and stating why it is being adopted using the adoption form in WAC 197-11-965. The adoption form would be circulated to agencies with jurisdiction and to persons or organizations that have expressed an interest in the proposal. No action may be taken on the proposal until 7 days after the statement of adoption form has been issued. Once the 7-day waiting period is completed, the WDOE could begin issuing permits. Other state and local agencies cannot issue permits until the adoption procedure is complete.

The key environmental issues facing the agency decision makers relate to impacts on residential areas, waterbodies, and wetlands. These issues are addressed in this draft EIS. This draft EIS also evaluates alternatives to the proposal, including system alternatives, new pipeline corridors, and alternative configurations of Northwest's system; route variations and non-standard parallel offsets; abandonment alternatives; and construction method alternatives. The permits, approvals, and consultations required for the

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[2] A pig is an internal tool that can be used to clean and dry a pipeline and/or to inspect it for damage or corrosion.

[3] Northwest has requested that three river crossings be authorized to begin in late 2005 if weather permits.

project are listed in section 1.5 of this draft EIS; Appendix T lists the authors and principal contributors to the draft EIS.

Comment Procedures and Public Meetings

Any person wishing to comment on the draft EIS may do so. To expedite the FERC staff's receipt and consideration of your comments, the Commission strongly encourages electronic submission of comments on the draft EIS. See Title 18 CFR 385.2001(a)(1)(iii) and the instructions on the Commission's Internet website (www.ferc.gov) under the eFiling link and the link to the User's Guide. Before you can submit comments, you will need to create a free account by clicking on "Sign-up" under "New User." You will be asked to select the type of submission you are making. This type of submission is considered a "Comment on Filing." Your comments must be submitted electronically by **April 25, 2005**.

If you wish to mail comments, please mail your comments so that they will be received in Washington, DC on or before **April 25, 2005** and carefully follow these instructions:

Send **an original and two copies** of your letter to:

- Magalie R. Salas, Secretary
  Federal Energy Regulatory Commission
  888 First Street, NE, Room 1A
  Washington, DC 20426;
- Reference **Docket Nos. CP05-32-000, -001** on the original and both copies; and
- Label one copy of your comments for the attention of the Gas Branch 2, DG2E.

In addition to or in lieu of sending written comments, you are invited to attend the public comment meetings the FERC staff will conduct in the project area. **All meetings will begin at 7:00 PM (PST)**, and are scheduled as follows:

Date	Location
Monday, April 11, 2005	Hawthorn Inn & Suites 16710 Smokey Point Blvd. Arlington, WA 98223 (360) 657-0500
Tuesday, April 12, 2005	Marriott Redmond Town Center 7401 164th Avenue, NE Redmond, WA 98052 (425) 498-4120
Wednesday, April 13, 2005	Prairie Hotel 700 Prairie Park Lane Yelm, WA 98597 (360) 458-8300

These meetings will be posted on the Commission's calendar located at http://www.ferc.gov/EventCalendar/EventsList.aspx along with other related information. Interested groups and individuals are encouraged to attend and present oral comments on the draft EIS. Transcripts of the meetings will be prepared.

After the comments are reviewed, any significant new issues are investigated, and modifications are made to the draft EIS, a final EIS will be published and distributed by the FERC staff. The final EIS will contain the staff's responses to timely comments received on the draft EIS.

Comments will be considered by the Commission but will not serve to make the commentor a party to the proceeding. Any person seeking to become a party to the proceeding must file a motion to intervene pursuant to Rule 214 of the Commission's Rules of Practice and Procedures (18 CFR 385.214).

Anyone may intervene in this proceeding based on this draft EIS. You must file your request to intervene as specified above.[4] **You do not need intervenor status to have your comments considered.**

The draft EIS has been placed in the public files of the FERC, the COE, and the WDOE and is available for public inspection at:

Federal Energy Regulatory Commission
Public Reference Room
888 First Street, NE, Room 2A
Washington, DC 20426
(202) 502-8371

U.S. Army Corps of Engineers
Seattle District Library
4735 East Marginal Way South
Seattle, WA 98134
(206) 764-3728

Washington State Department of Ecology
Northwest Regional Office
Central File Room
3190 160th Avenue, SE
Bellevue, WA 98008
(425) 649-7190 or (425) 649-7239

Washington State Department of Ecology
Southwest Regional Office
Central File Room
300 Desmond Drive
Lacey, WA 98503
(360) 407-6365

The draft EIS is also available for viewing on the WDOE's Internet website at http://www.ecy.wa.gov/programs/sea/nw_capacity_replacement.

A limited number of copies are available from the FERC's Public Reference Room identified above.[5] In addition, copies of the draft EIS have been mailed to federal, state, and local government agencies; elected officials; Native American tribes; local libraries and newspapers; intervenors in the FERC's proceeding; and other interested parties (i.e., landowners, miscellaneous individuals, and environmental groups who provided scoping comments or asked to remain on the mailing list).

4 Interventions may also be filed electronically via the Internet in lieu of paper. See the previous discussion on filing comments electronically.

5 At no cost to the public.

Additional information about the project is available from the Commission's Office of External Affairs, at **1-866-208-FERC** or on the FERC Internet website (www.ferc.gov) using the eLibrary link. Click on the eLibrary link, click on "General Search" and enter the docket number excluding the last three digits in the Docket Number field. Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FERCOnlineSupport@ferc.gov or toll free at 1-866-208-3676, or for TTY, contact (202) 502-8659. The eLibrary link on the FERC Internet website also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission now offers a free service called eSubscription that allows you to keep track of all formal issuances and submittals in specific dockets. This can reduce the amount of time you spend researching proceedings by automatically providing you with notification of these filings, document summaries, and direct links to the documents. To register for this service, go to the eSubscription link on the FERC Internet website.

Information concerning the involvement of the COE is available from Olivia Romano at (206) 764-6960. Information concerning the involvement of the WDOE is available from Tiffany Yelton at (425) 649-4310.

Magalie R. Salas
Secretary

EXECUTIVE SUMMARY

This draft environmental impact statement (EIS) for the Capacity Replacement Project has been prepared by the staff of the Federal Energy Regulatory Commission (Commission or FERC) to fulfill the requirements of the National Environmental Policy Act (NEPA), the Commission's implementing regulations (Title 18 Code of Federal Regulations (CFR) Part 380), and the Council on Environmental Quality Regulations for implementing NEPA (Title 40 CFR Parts 1500-1508). The purpose of this document is to inform the public and the permitting agencies about the potential adverse and beneficial environmental impacts of the proposed project and its alternatives, and to recommend mitigation measures to reduce impacts to the maximum extent possible.

The U.S. Army Corps of Engineers (COE) has jurisdictional authority pursuant to section 404 of the Clean Water Act (33 United States Code (USC) 1344), which governs the discharge of dredged or fill material into waters of the United States, and section 10 of the Rivers and Harbors Act (33 USC 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody. Because the COE must comply with the requirements of NEPA before issuing permits under these statutes, it has elected to participate as a cooperating agency in the preparation of this EIS. The COE would adopt the EIS per Title 40 CFR Part 1506.3 if, after an independent review of the document, it concludes that its comments and suggestions have been satisfied.

The proposed project must also undergo an environmental review pursuant to the State Environmental Policy Act (SEPA) (Chapter 43.21C Revised Code of Washington). The Washington State Department of Ecology (WDOE) has been designated the lead SEPA agency and is responsible for compliance with SEPA procedural requirements as well as for compiling and assessing information on the environmental aspects of the proposal for all agencies with jurisdiction in Washington. As the lead SEPA agency, the WDOE is also responsible for the threshold determination[1] and preparation and content of an EIS when required. NEPA documents may be used to meet SEPA requirements if the requirements of the State of Washington Administrative Code 197-11-610 and 197-11-630 are met and the federal EIS is found to be adequate. To assist the FERC staff in addressing SEPA requirements, the WDOE is cooperating in the preparation of this EIS. When the final EIS is completed, the WDOE would adopt it if an independent review of the document confirms that it meets the WDOE's environmental review standards.

PROPOSED ACTION

On November 29, 2004, Northwest Pipeline Corporation (Northwest), a Williams Gas Pipeline company, filed an application with the Commission under sections 7(b) and 7(c) of the Natural Gas Act, as amended, and Part 157 of the Commission's regulations. Northwest is seeking a Certificate of Public Convenience and Necessity (Certificate) to construct, modify, and operate facilities to replace the contractual delivery capacity of its existing 268-mile-long, 26-inch-diameter pipeline between Sumas and Washougal, Washington in response to an amended Corrective Action Order (CAO) issued by the U.S. Department of Transportation (DOT). Northwest is also seeking an Order Permitting and Approving Abandonment of its existing 26-inch-diameter pipeline and related facilities.[2] Northwest filed an amendment to its application on February 4, 2005. Specifically, Northwest proposes to:

[1] A SEPA threshold determination is the formal decision as to whether or not the proposal is likely to cause a significant adverse environmental impact that requires review in an EIS.

[2] In utility law, the term abandonment refers to government authorization for a utility to cease provision of a particular service and/or to shut down a particular facility.

- construct and operate 79.5 miles of new 36-inch-diameter pipeline in 4 separate loops[3] (referred to as the Sumas, Mount Vernon, Snohomish, and Fort Lewis Loops) in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties, Washington;

- modify 5 existing compressor stations, 1 each in Whatcom, Skagit, Snohomish, Lewis, and Clark Counties for a total of 10,760 net horsepower of new compression;

- install 3 pig[4] launchers, 1 each at the beginning of the Sumas, Snohomish, and Fort Lewis Loops and collocated with proposed mainline valve (MLV) sites;

- install 3 pig receivers, 1 each at the end of the Sumas, Snohomish, and Fort Lewis Loops and collocated with proposed MLV sites;

- relocate 1 pig receiver from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop to the end of the proposed Mount Vernon Loop and collocated with a proposed MLV site;

- install 5 30-inch and 15 36-inch MLVs along the proposed loops (15 collocated with existing aboveground facilities, 4 collocated with proposed pig receiver sites, and 1 not collocated with other aboveground facilities);

- install 6 30-inch MLVs along the existing Evergreen Expansion Project loops (all collocated with existing aboveground facilities);

- abandon the existing 26-inch-diameter pipeline between Sumas and Washougal with the exception of a short segment within and between the existing Jackson Prairie Meter Station and the Chehalis Compressor Station. The abandonment activities would occur at 24 aboveground facility locations along the proposed loops and at 48 aboveground facility locations along the remainder of Northwest's existing system; and

- use 13 pipe storage and contractor yards on a temporary basis to support construction activities.

PUBLIC INVOLVEMENT AND AREAS OF CONCERN

On April 19, 2004, Northwest filed a request with the FERC to implement the FERC staff's NEPA Pre-Filing Process for the Capacity Replacement Project. At that time, Northwest was in the preliminary design stage of the project and no formal application had been filed with the FERC. On May 12, 2004, the FERC granted Northwest's request and established a pre-filing docket number (PF04-10-000) to place information related to the project into the public record. The purpose of the NEPA Pre-Filing Process is to encourage the early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve issues before an application is filed with the FERC. The COE and the WDOE agreed to conduct their environmental reviews of the project in conjunction with the FERC's NEPA Pre-Filing Process.

As part of the NEPA Pre-filing Process, Northwest mailed notification letters to landowners, government and agency officials, and the general public informing them about the project and inviting them to attend open houses between June 28-30, 2004 and July 12-15, 2004 to learn about the project and to ask questions and express their concerns. Notifications of the open houses were also published in local

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3 A loop is a segment of pipeline that is usually installed adjacent to an existing pipeline and connected to it at both ends. The loop allows more gas to be moved through the system.

4 A pig is an internal tool that can be used to clean and dry a pipeline and/or to inspect it for damage or corrosion.

newspapers. The open houses were held in Lynden, Deming, Arlington, Monroe, Redmond, Puyallup, and Yelm, Washington. The FERC staff attended the open houses to explain the environmental review process to interested stakeholders and take comments about the project.

On July 1, 2004, the FERC staff conducted an interagency scoping meeting in the project area to solicit comments and concerns about the project from jurisdictional agencies. Agencies present at the meeting included the COE; the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries); the Fort Lewis Military Reservation (Fort Lewis); the WDOE; the Washington Department of Fish and Wildlife (WDFW); the Washington State Department of Natural Resources (WDNR); and the Washington Utilities and Transportation Commission. The Lummi Nation was also represented. Throughout August 2004, the FERC staff conducted additional agency coordination and scoping meetings with many of these same agencies. Specifically, meetings were held with NOAA Fisheries on August 2, the Lummi Nation on August 3, Fort Lewis and the U.S. Fish and Wildlife Service (FWS) on August 4, and the WDOE on August 31, 2004.

On July 19, 2004, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Capacity Replacement Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings* (NOI). The NOI served as the WDOE's *Determination of Significance and Request for Comments on the Scope of the EIS*. The NOI described the project and the joint environmental review process, provided a preliminary list of EIS issues, invited written comments on the environmental issues to be addressed in the EIS, and listed the date and location of three public scoping meetings to be held in communities in the project area. These meetings were held in Arlington, Redmond, and Yelm, Washington on August 2-4, 2004, respectively. The NOI was mailed to affected landowners; federal, state, and local government agencies; elected officials; Native American tribes; environmental and public interest groups; other interested parties; and local libraries and newspapers. The comment period on the NOI closed on August 18, 2004.

A transcript of the public scoping meetings, summary of the interagency scoping meetings, and all written comments are part of the public record for the Capacity Replacement Project and are available for viewing on the FERC Internet website (http://www.ferc.gov).[5] The most frequently raised issue related to impacts on residential areas. Residents expressed concern about the loss of trees and other landscaping, the removal of fences, restricted access to homes, safety during construction and operation of the facilities, and impacts on property values. Numerous comments about impacts on soils, water wells, surface water and aquatic resources, wetlands, vegetation, special status species, cultural resources, safety, and alternatives were also received. The majority of the comments received from landowners regarding alternatives requested consideration of alternatives to avoid residential areas. The jurisdictional agencies were primarily concerned about Northwest's proposed waterbody crossing methods and requested a detailed evaluation of alternative crossing methods at major and sensitive waterbody crossings, including two large wetland complexes. The issues related to these waterbody and wetland crossings, as well as the impacts on residential areas, represent the primary areas of controversy associated with the Capacity Replacement Project.

This draft EIS was filed with the U.S. Environmental Protection Agency (EPA) and mailed to federal, state, and local government agencies; elected officials; Native American tribes; local libraries and newspapers; intervenors[6] in the FERC's proceeding; and other interested parties (i.e., landowners,

[5] Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., PF04-10 and CP05-32). Be sure to select an appropriate date range.

[6] Intervenors are official parties to the proceeding and have the right to receive copies of case-related Commission documents and filings by other intervenors. Likewise, each intervenor must provide 14 copies of its filings to the Secretary of the Commission and must send a copy of its filings to all other intervenors. Only intervenors have the right to seek rehearing of the Commission's decision.

miscellaneous individuals, and environmental groups who provided scoping comments or asked to remain on the mailing list). A formal notice indicating that the draft EIS is available for review and comment was published in the Federal Register and sent with a copy of this Executive Summary to the remaining parties on the mailing list. The public has 45 days after the date of publication in the Federal Register to review and comment on the draft EIS both in the form of written comments and at public meetings held in the project area. All environmental comments received on the draft EIS will be addressed in the final EIS.

ENVIRONMENTAL ISSUES

The environmental issues associated with construction and operation of the Capacity Replacement Project are analyzed in this EIS using information provided by Northwest and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; contacts with federal, tribal, state, and local agencies; and input from public groups and organizations. The FERC staff has determined that construction and operation of the Capacity Replacement Project and the associated abandonment activities would result in limited adverse environmental impacts.

Northwest would implement the January 17, 2003 versions of the FERC staff's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) and has prepared project-specific plans that include measures to mitigate potential environmental impacts. These plans include:

- *Erosion Control and Revegetation Plan* (ECR Plan);
- *Spill Prevention, Containment, and Countermeasures Plan* (SPCC Plan);
- *Horizontal Directional Drill Contingency Plan* (HDD Plan);
- *Groundwater Monitoring and Mitigation Plan*; and
- *Residential Area Work Plan for the Deer Park Subdivision*.

As part of the environmental analysis, specific mitigation measures were also identified that are feasible and that, when implemented, would reduce potential adverse impacts of project construction and operation. The environmental effects of constructing and operating the project as proposed are summarized below.

Geology

Physiography in the Capacity Replacement Project area consists of flat glacial plains, broad alluvial valleys, gently rolling terrain, and localized areas of moderate relief, particularly where the Sumas Loop would cross the western flank of Sumas Mountain. Construction and operation of the proposed facilities would not materially alter the geologic conditions of the project area. Effects from construction could include disturbances to the natural topography along the right-of-way and at aboveground facilities due to trenching and grading activities. Over most of the project area, natural topographic slope and contours would be temporarily altered by the small-scale grading of the construction right-of-way that is necessary to provide a level and safe work surface for equipment. After construction, Northwest would restore topographic contours and drainage conditions as closely as feasible to their preconstruction condition. Blasting is not expected to be required for project construction. However, if blasting is necessary, Northwest would prepare a detailed *Blasting Plan* and comply with all applicable federal, state, and local regulations.

Six active gravel pits and one stone quarry were identified within about 800 feet of the proposed loops; however, none of these active mineral recovery operations would be directly crossed. While portions of the proposed loops would be located adjacent to or in close proximity to potentially extractable mineral deposits, 93 percent of the loops would be constructed within Northwest's existing right-of-way, which already precludes surface mining operations. Therefore, construction and operation of the loops would not result in significant additional restrictions to current or future mining operations in the area. No apparent active mineral recovery operations were identified in close proximity to any of the aboveground and abandoned facilities. An active gravel pit is located adjacent to a proposed contractor yard in Pierce County; however, the contractor yard would be used on a temporary basis and no impacts on this gravel pit are anticipated.

Western Washington is a geologically active region characterized by relatively frequent low to moderate magnitude earthquakes, active volcanoes, and locally high relief. These conditions create the potential for geologic hazards such as mass wasting (e.g., landslides); erosion; earthquakes and associated ground shaking, surface faulting, and soil liquefaction; and volcanism to occur throughout the region, threatening the integrity of the Capacity Replacement Project. Shallow groundwater also exists beneath portions of the Capacity Replacement Project, presenting construction challenges and increasing the potential for liquefaction and other potentially detrimental effects to occur.

Northwest conducted a detailed geologic hazards analysis to identify those project areas that could be adversely impacted by geologic events. The geologic hazards analysis was also used to develop specific construction techniques and operation plans to minimize the potential for the project to activate a geologic event, and avoid or minimize damage to the project facilities if a geologic event were to occur. The geologic hazards study included a literature review, examination of aerial photographs and geologic maps, ground reconnaissance of higher risk areas, and review of geologic hazards identified in critical areas ordinances for those counties and cities crossed by the project. The geologic hazards analysis determined that, in general, landslides represent the most significant geologic hazard to the Capacity Replacement Project due in part to their relatively high rate of frequency. Major volcanic activity and major earthquakes could have catastrophic effects in the region, but are unlikely to occur during the operating life of the proposed project.

In general, the proposed loops would avoid areas with potential geologic hazards. However, due to routing constraints, the loops cannot avoid some high potential mass wasting, seismic, and volcanic hazard areas identified by Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties in their critical areas ordinances, or other areas identified by Northwest. These geologic hazards have the potential to damage the loops should they become active during construction or operation. The potential for significant damage to the loops from geologic hazards would generally be mitigated through implementation of best management practices (BMPs) and ongoing monitoring that is part of Northwest's formal Geotechnical Hazards Monitoring Program. Northwest would utilize various methods to monitor areas that could pose a risk to the proposed loops, including real-time strain gauges, survey data, and periodic surveillance. Also, by implementing good construction practices and erosion control measures, construction and operation of the loops should not increase the likelihood of damaging geologic events to occur.

Soils

Soils in the project area are diverse and include glacial tills and outwash, river and slope alluvium, colluvium derived from glacial drift and sandstone, volcanic ash, loess, glaciomarine drift, and glaciolacustrine sediment. Construction of the Capacity Replacement Project could result in a number of soil or soil-related impacts including increased erosion, compaction, soil mixing, reduced fertility, poor revegetation, and introducing rocks from deeper horizons to the soil surface due to trenching. In general, potential impacts on soils would be less during construction of the Capacity Replacement Project than for a new pipeline and related surface facilities because the majority of the construction would occur within Northwest's existing permanent right-of-way, which has been previously disturbed.

To reduce the impacts of construction on soils Northwest would implement the mitigation measures outlined in the FERC staff's Plan and Procedures. In addition, Northwest has developed a project-specific ECR Plan that incorporates agency-recommended revegetation and erosion control procedures, and addresses the WDOE's requirements for construction stormwater discharges. Two of the mitigation measures for upland construction included in Northwest's ECR Plan differ significantly from those in the FERC staff's Plan. The FERC staff would allow the two proposed variances with stipulations. It is further stipulated that both variances are acceptable only if the landowner does not object and the FERC staff has recommended that Northwest file a revised ECR Plan incorporating the stipulations before construction. Soil contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment would be avoided or minimized by implementing a project-specific SPCC Plan.

Of the total distance crossed by the loops, approximately 23.2 miles would be considered prime farmland, either under current conditions or if drained or irrigated. Potential impacts on prime farmland from pipeline construction include interference with and/or damage to agricultural drainage or irrigation systems, the mixing of topsoil and subsoil, the potential loss of topsoil, and compaction/rutting. As described above, Northwest has developed an ECR Plan to minimize these potential impacts. Northwest would probe drain tiles affected by project construction activities beyond the limits of the trench to determine if damage has occurred. Northwest would restore any damaged tiles to their original condition using trained personnel. Northwest would also test for soil compaction in agricultural and residential areas to determine if additional, site-specific mitigation measures would be required. Most impacts on prime farmland from pipeline construction would be short term and would not result in the permanent conversion of prime farmland to non-agricultural uses.

Approximately 1.5 acres would be permanently added to the Chehalis Compressor Station for operation of the facility (1.4 acres to expand the station's fenced area and 0.1 acre for a gravel road to an existing water supply well). The soils in this area are designated as hydric, and their main limitations would be seasonal wetness and a high perched water table between November and April. Northwest has scheduled the majority of the work at this location with these limitations in mind, which would minimize potential soil-related impacts.

Water Resources

The project would cross various regulatory units that have been established to protect groundwater resources including EPA-designated sole source aquifers, groundwater management areas, wellhead protection areas, and critical areas ordinance-designated aquifer recharge areas. Construction and operation of the Capacity Replacement Project could impact groundwater resources in the area, and the occurrence of shallow groundwater could affect the buoyancy of a pipeline by causing it to float. Construction-related impacts may include temporary alteration of overland flow and groundwater recharge. Most potential impacts on groundwater would be avoided or minimized by the use of standard construction techniques and compliance with the FERC staff's Procedures. In addition, Northwest would comply with all applicable regulations and requirements associated with the critical areas ordinances. To mitigate potential buoyancy concerns and/or flexure of the pipe, Northwest would install concrete-coated or weighted pipe in areas of shallow groundwater, as necessary.

Spills and leaks of petroleum and hazardous material could contaminate aquifers. Northwest developed an SPCC Plan to address preventive and mitigative measures that would be used to avoid or minimize the potential impact of petroleum or hazardous material spills during construction. In addition, unanticipated pre-existing contaminated groundwater could be encountered during construction. To ensure that potential impacts associated with the discovery of pre-existing contamination are minimized, the FERC staff has recommended that Northwest consult with the WDOE and prepare a plan for the discovery and management of contaminated soils, sediments, and groundwater.

A preliminary survey of water supply wells and springs in the project area identified 59 public water supply wells as potentially located within 400 feet of the construction right-of-way. No public water supply wells were identified within 400 feet of the compressor stations. More than 800 private water supply wells were identified as potentially located within 200 feet of the construction right-of-way. However, because the location data within the water well database used for the survey are only specified to within a 1-mile section, the actual number of private water supply wells within 200 feet is likely far fewer. No private water supply wells were identified within 200 feet of the compressor stations. To minimize impacts on water supply wells and springs within 200 feet of the construction right-of-way, Northwest has prepared a *Groundwater Monitoring and Mitigation Plan*. Northwest would determine the specific locations of wells and springs within the vicinity of the right-of-way through field investigations and contacts with landowners before construction. The FERC staff has recommended that Northwest file the location of all wells and springs within 200 feet of the construction work area with the FERC and the WDOE before construction.

Construction of the proposed project would require approximately 21,380,000 gallons of water to hydrostatically test the loops. Of this volume, approximately 15,320,000 gallons would be obtained from municipal sources. Hydrostatic testing activities would make a one-time, temporary demand on these municipal sources. The remaining 6,060,000 gallons of water would be withdrawn from a surface water source (i.e., the Centralia Canal). Northwest would minimize the potential effects of hydrostatic testing on surface water resources by adhering to the measures in its ECR Plan. These measures include screening intake hoses to prevent the entrainment of fish and other aquatic organisms and regulating the rate of withdrawal of hydrostatic test water to avoid adverse impact on aquatic resources or downstream flows. Only new pipe would be tested and no chemicals would be added to the water during hydrostatic testing. All discharges, including testing for potential contaminants, would be conducted in accordance with applicable requirements. Northwest would discharge all hydrostatic test water to upland locations at a significant distance from wetlands and waterbodies in a manner that would avoid runoff or erosion into surface waters, and would not discharge test water directly into surface waters.

The loops associated with the Capacity Replacement Project would cross a total of 146 waterbodies including perennial and intermittent streams and jurisdictional wetland and upland ditches. Work at one abandoned facility would cross an intermittent ditch. The waterbodies that would be affected by the project have been classified according to Washington Water Quality Standards, the State of Washington section 303(d) list, WDNR stream typing classifications, designated shorelines, and critical areas ordinances.

Pipeline construction could affect surface waters in several ways. Clearing and grading of streambanks, in-stream trenching, backfilling, trench dewatering, and in-stream blasting (if required) could affect waterbodies through modification of aquatic habitat, increased sedimentation, increased turbidity, decreased dissolved oxygen concentrations, stream warming, releases of chemical and nutrient pollutants from sediments, or introduction of chemical contamination such as fuel and lubricants.

During construction across waterbodies, Northwest would implement the mitigation procedures described in the FERC staff's Plan and Procedures, its ECR Plan, and SPCC Plan. Northwest would also implement additional specific procedures and protective and restoration measures where required by site-specific conditions or permitting agencies. Northwest would develop and follow BMPs for in-stream work as well as develop and follow BMPs for upland work adjacent to waterbodies. Similarly, Northwest would develop and implement a water quality monitoring strategy for measuring in-stream impacts as well as develop and implement a water quality monitoring strategy for measuring upland construction impacts. Northwest's implementation of these mitigation measures would reduce impacts on surface water resources.

At selected waterbodies, Northwest has requested variances to the FERC staff's Procedures relative to the location of temporary extra workspaces and construction right-of-way widths. Northwest depicted these locations on aerial photo-based Environmental Construction Alignment Sheets and site-specific plans and provided a site-specific explanation of the conditions that would require a wider right-of-way and prevent a 50-foot setback. The FERC staff reviewed the Environmental Construction Alignment Sheets and Northwest's explanations to make determinations whether to approve or deny each variance requested. Based on the FERC staff's review, most of the variances appear to be reasonable and adequately justified. Northwest would also submit these variance requests to other applicable agencies (e.g., the COE, the WDOE, and the WDFW) as part of its permit applications. Northwest's implementation of variances approved by the FERC would need to be consistent with its permits from other jurisdictional agencies.

Of the waterbodies that would be crossed by the loops, 91 percent are expected to be dry at the time of construction and, consequently, would be crossed using standard upland cross-country techniques, or would be crossed using standard dry waterbody crossing methods (i.e., flume or dam and pump). The remaining waterbodies would be crossed using the horizontal directional drill (HDD), aerial span, push-pull, or wet open-cut method. Use of the HDD and aerial span methods would avoid or minimize in-stream disturbance and associated impacts; however aerial spans would have permanent visual impacts, increased operational costs, and increased vulnerability of the pipeline to third-party damage. Flumed crossings would allow water to continue to flow during construction and result in increased turbidity for only short periods of time during the installation and removal of the flume pipe. Water flow would also be maintained during a dam and pump crossing. Use of the flume and dam and pump crossing methods are limited by water volume and velocity within the waterbody. A push-pull crossing would only be possible in waterbodies with minimal or no flow (i.e., wetland complexes) and would result in temporary increases in turbidity during work within the waterbody. The wet open-cut method would result in increased turbidity downstream but the effects would be temporary and the crossings would be completed relatively quickly.

Six major waterbodies (i.e., greater than 100 feet wide) would be crossed. These are the North Fork Nooksack River, North Fork Stillaguamish River, South Fork Stillaguamish River, Olson Lake, Evans Creek, and the Nisqually River. All of these waterbodies are considered sensitive because they provide coldwater habitat and essential fish habitat (EFH) and also support special status species.

Two of the major waterbodies, Olson Lake and Evans Creek, would be crossed by use of the push-pull method due to the size and low flow (e.g., inundated wetland) characteristics at these crossing locations. In accordance with the FERC staff's Procedures, Northwest has filed site-specific crossing plans for Olson Lake and Evans Creek. The FERC staff has reviewed these plans and finds them to be acceptable.

In the spring of 2004, Northwest completed a geotechnical investigation of the remaining major waterbodies (North Fork Nooksack River, North Fork Stillaguamish River, South Fork Stillaguamish River, and Nisqually River) to determine whether the HDD method would be feasible. Northwest included Pilchuck Creek in its geotechnical investigation due to its relatively large size (75 feet wide at the crossing location) and importance as a coldwater fishery. Based on the results of the geotechnical investigation, Northwest has determined that the probability of completing a successful HDD of the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers is 60 percent, 50 percent, and 80 percent, respectively. Northwest proposes to cross these waterbodies using the HDD method but also proposes to obtain permits for an alternative wet open-cut crossing at each of the three rivers should the HDD fail.

A successful HDD crossing of the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers would minimize impacts on these three waterbodies and their adjacent wetlands. The primary impact that could occur as a result of an HDD is an inadvertent release of drilling mud (also referred to as a frac-out) directly or indirectly into the waterbody. Northwest's HDD Plan describes how the drilling operations would be conducted and monitored to minimize the potential for inadvertent drilling mud releases as well as procedures for cleanup of drilling mud releases and for sealing the hole if a drill cannot be completed. The criteria for determining whether the HDD could be successfully completed or whether it would be abandoned are also outlined in Northwest's HDD Plan. Due to the width and the volume and velocity of the water at the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers, Northwest proposes to use the wet open-cut method to install these crossings in the event an HDD is unsuccessful.

Because the geotechnical investigation determined that there was a high likelihood of failure at Pilchuck Creek (75 percent) and an HDD of the Nisqually River would be infeasible, Northwest does not propose to attempt an HDD crossing of either of these waterbodies. Northwest proposes to use the wet open-cut method as the preferred crossing method for these two waterbodies and the aerial span method as the alternative.

As discussed above, the HDD and aerial span methods would avoid or minimize in-stream disturbance and associated impacts; therefore, additional mitigation measures are not proposed. Northwest would minimize impacts associated with a wet open-cut crossing of the North Fork Nooksack River, Pilchuck Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, and Nisqually River by installing the pipe during allowable in-stream construction windows specified by the WDFW. Work areas would be restored as near as practical to preconstruction contours, including replacement of the gravel and cobble streambed. Northwest would plant riparian tree and shrub species across the entire right-of-way within 50 feet of all fish-bearing streams and at other streams where riparian vegetation was present before construction. Fast growing native trees would be planted close to the top of the bank to provide the most rapid canopy recovery possible to shade and overhang the river.

Northwest would install large woody debris (LWD) at appropriate areas in the waterbody within the construction right-of-way to mitigate for potential short-term impacts on aquatic species due to the wet open-cut crossing. Additionally, Northwest would salvage pieces of LWD during clearing of the construction right-of-way and donate them to the WDFW and/or other conservation groups to provide for off-site in-stream habitat enhancement. Alternatively, Northwest would participate in an appropriate off-site mitigation project or bank in support of salmon recovery in the Water Resource Inventory Area (WRIA). Northwest is in the process of contacting various conservation groups, trusts, wetland mitigation banks, and local agencies in the various WRIAs the project would cross to identify potential mitigation opportunities.

In accordance with the FERC staff's Procedures, Northwest has filed site-specific crossing plans for the proposed and alternative crossing methods for the North Fork Nooksack River, Pilchuck Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, and the Nisqually River. The FERC staff has reviewed these plans and generally finds them to be acceptable. While use of the HDD method would be preferable and result in the least environmental impacts, if the HDD method is not feasible or fails, the FERC staff believes that the short-term impact of a wet open-cut crossing would be preferable to the permanent visual impact, increased operational costs, and increased vulnerability of the pipeline to third-party damage that would result from use of an aerial span.

Northwest is still in the process of consulting with other federal and state agencies and applicable Native American tribes to finalize its site-specific crossing plans and specific mitigation requirements. The FERC staff has recommended that Northwest continue to consult with the COE, the FWS, NOAA Fisheries, the WDOE, the WDFW, other applicable agencies, and appropriate Native American tribes to finalize its site-specific crossing plans and file a conceptual waterbody crossing mitigation plan with the FERC for analysis in the final EIS.

In the spring of 2004, Northwest conducted an evaluation of scour and erosion potential in the waterbodies that would be crossed by the proposed loops. This evaluation resulted in the designation of waterbodies as having either low, medium, or high potential for scour and/or lateral erosion. Of the waterbodies crossed by the loops, 2 have high scour potential, 21 have medium scour potential, and the remaining 123 have low scour potential. Northwest would design the project to protect the integrity of the loops, which includes installing the pipeline in waterbodies with a minimum of 5 feet depth of cover from the top of the pipe to the bottom of the streambed. Where warranted by site-specific conditions or required by local regulations, Northwest would increase the depth of cover to more than the 5-foot minimum to accommodate the potential for long-term scour and profile changes, and bank stabilization to deter channel migration. During detailed pipeline design, each waterbody crossing would be evaluated using the information in the scour and erosion assessment. The depth of cover for waterbody crossings that require more than 5 feet of cover, and additional lateral setbacks, would be determined at that time. These measures would minimize the potential for scour of the streambed or banks to expose the pipeline in the future.

Wetlands

Northwest conducted wetland delineations in the spring of 2004 along the proposed loops, including temporary extra workspaces and temporary and permanent access roads. Proposed pipe storage and contractor yard sites, aboveground facility sites, and sites where abandonment activities would occur were also surveyed for the presence of wetlands. Delineations were conducted in accordance with federal and state regulations and methodologies. Northwest also conducted functional assessments for each wetland and established WDOE wetland category ratings, WDNR wetland types, as well as city and county wetland ratings as established in critical areas ordinances (where applicable) for each wetland.

The proposed loops would cross 264 wetlands, 84 percent of which are classified as palustrine emergent wetlands. Pipeline construction activities would result in a short-term disturbance of 107.3 acres of wetland, of which 2.0 acres would be located within the proposed operational (permanent) right-of-way. The expansion of the Chehalis Compressor Station would permanently affect approximately 0.6 acre of a disturbed, emergent wetland. Less than 0.1 acre of a previously disturbed emergent wetland would be permanently filled by the expansion of the gravel pad that would surround the MLV at milepost 1440.1 along an Evergreen Expansion Project loop. Project activities at two facilities where abandonment activities would occur would temporarily affect 0.2 acre of wetland. Project activities at proposed contractor and pipe storage yards would not affect wetlands. The majority of the permanent impacts would be on the structure of the wetlands (i.e., result in more herbaceous vegetation and fewer trees and shrubs), but would not greatly reduce the existing wetland functions or amount of wetlands in the project area. However, about 0.7 acre of wetland would be permanently filled as a result of the project.

The primary impact of project construction and right-of-way maintenance activities on wetlands would be the temporary and permanent alteration of wetland vegetation. Other types of impacts could include temporary changes in wetland hydrology and water quality, soil mixing, soil compaction, rutting/erosion, and poor revegetation. Northwest's proposal to replace its existing 268-mile-long, 26-inch-diameter pipeline with 79.5 miles of 36-inch-diameter loop and abandon the majority of the 26-inch-diameter pipeline in place would avoid impacting wetlands along 70 percent of the Northwest system.

Impacts on wetlands from construction of the Capacity Replacement Project would further be avoided and minimized by Northwest's proposal to install the loops 20 feet east of Northwest's existing 30-inch-diameter pipeline and work over the existing 26-inch- and 30-inch-diameter pipelines. Northwest's existing easement was previously disturbed during installation of the 26-inch- and 30-inch-diameter pipelines and is maintained (periodically mowed) in a general herbaceous state for operation of the facilities. Northwest would use the existing permanent easement for the majority of the project's construction footprint (i.e., construction right-of-way and temporary extra workspaces). Northwest would mitigate construction-related impacts by implementing the FERC staff's Procedures and by complying with the COE's section 404 and the WDOE's section 401 permit conditions.

In addition, Northwest would further avoid wetland impacts by limiting the width of the construction right-of-way to 75 feet in most wetlands and locating extra workspaces at least 50 feet back from most wetland boundaries, consistent with the FERC staff's Procedures. In accordance with the Procedures, Northwest submitted requests for areas where a wider right-of-way and reduced extra workspace setbacks in wetlands would be necessary based on site-specific conditions. Northwest depicted these locations on aerial photo-based Environmental Construction Alignment Sheets and provided a site-specific explanation of the conditions that would require a wider right-of-way and prevent a 50-foot setback for extra workspace in wetlands. The FERC staff reviewed the Environmental Construction Alignment Sheets and Northwest's explanations to make determinations whether to approve or deny each variance requested. Based on this review, most of the variances appear to be reasonable and adequately justified. Northwest would also submit these variance requests to other applicable agencies (i.e., the COE, the WDOE, and local authorities) as part of its permit applications. Northwest's implementation of variances approved by the FERC would need to be consistent with its permits from the other jurisdictional agencies.

As previously discussed, Olson Lake and Evans Creek would be crossed by use of the push-pull method. Northwest investigated the possibility of using the HDD method to cross these wetland complexes; however, this method was not considered practical at Olson Lake or feasible at Evans Creek. An HDD crossing of Olson Lake would need to be between 2,600 and 3,600 linear feet to avoid the glacial till layer in the area and would require more temporary extra workspace than a push-pull crossing. A new operational right-of-way would also have to be established. Northwest states that an HDD crossing of Evans Creek would not be feasible due to the size of the wetland complex and the lack of available workspace on either side of the complex to stage the drill and fabricate the pipe string.

To comply with the COE's policy of "no net loss" of wetlands in the United States, the FERC staff has recommended that Northwest continue to consult with the COE, the WDOE, and other applicable agencies on wetland mitigation requirements to finalize a conceptual compensatory wetland mitigation plan and file it with the FERC for analysis in the final EIS.

Vegetation

Northwest's proposed pipeline facilities would disturb a total of about 878.3 acres of upland vegetation. The most common vegetation cover types occurring along the loops, shrubland (307.4 acres), agricultural (209.5 acres), and landscape (207.2 acres), account for over 80 percent of the vegetation that would be cleared or affected by construction. The next most common cover types that would be disturbed are mixed forest (71.2 acres), evergreen forest (36.7 acres), and grassland/herbaceous (35.4 acres). Disturbance to deciduous forest and oak woodland cover types would total 10.7 acres and 0.4 acre, respectively.

The expansion of the Chehalis Compressor Station would affect a total of 7.7 acres of vegetation. The majority of the vegetation (5.1 acres) consists of the grassland/herbaceous cover type. Pig receivers and MLVs not collocated with other aboveground facilities along the proposed loops would be constructed within Northwest's existing right-of-way but would permanently convert about 0.7 acre of the vegetation within the right-of-way because the sites would be graveled and fenced. The remaining pig launchers/receivers and MLVs along the proposed loops would be collocated with existing facilities within Northwest's existing permanent easement; however, they would require minor expansions of the graveled footprints of each site and would affect a total of about 1.7 acres of grassland/herbaceous cover type and less than 0.1 acre of shrubland cover type. The installation of six MLVs along the existing Evergreen Expansion Project loops would affect a total of 1.7 acres of land consisting primarily of the grassland/herbaceous cover type. Approximately 14.4 acres within Northwest's existing easement would be temporarily affected by work associated with the abandoned facilities. The temporary use of 13 pipe storage and contractor yards would affect 128.4 acres of the landscape vegetation cover type, 36.7 acres of the shrubland cover type, and 25.5 acres of the agricultural cover type.

The primary impact of the project on vegetation would be the cutting, clearing, and/or removal of existing vegetation within the construction work areas. The degree of impact would depend on the type and amount of vegetation affected, the rate at which the vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted during operation. Secondary effects associated with disturbances to vegetation could include increased soil erosion, increased potential for the introduction and establishment of invasive weedy species, and a local reduction in available wildlife habitat. In addition, trees located on the edge of the construction right-of-way may be subject to mechanical damage and root impacts, which could result in decreased health and viability of edge trees.

In general, the swath of vegetation that would be disturbed during construction would be 95 feet wide for the length of the Sumas, Mount Vernon, and Fort Lewis Loops and 60 to 75 feet wide for the Snohomish Loop. By working over its existing pipelines, Northwest would reduce the area of new disturbance and, therefore, would reduce impacts on vegetation. About 68 percent of the vegetation disturbance associated with construction of the loops would be within Northwest's existing, previously disturbed right-of-way. The remaining 32 percent of the vegetation disturbance would be outside Northwest's existing right-of-way.

To reduce impacts on vegetation within the construction and permanent rights-of-way and improve revegetation potential, Northwest would implement the FERC staff's Plan. In addition, Northwest would implement the measures for upland construction that are included in its ECR Plan. Northwest's ECR Plan incorporates many of the mitigation measures outlined in the FERC staff's Plan as well as agency-recommended revegetation and erosion control procedures. These measures would include, among others: topsoil segregation over the pipeline trenchline; providing temporary erosion control measures; recontouring disturbed areas as needed; testing for soil compaction in agricultural and residential areas and relieving compaction where necessary; fertilizing and reseeding all upland areas following U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) and WDNR recommendations; and monitoring the revegetation of the right-of-way the year following construction and again during the second growing year. Additional revegetation efforts would be conducted until revegetation is deemed successful.

Northwest states that it has consulted with the NRCS, the WDNR, and local counties regarding noxious weeds and Northwest's proposed treatments and has included their recommendations in its ECR Plan. Northwest would implement the measures in its ECR Plan to prevent the spread of noxious weeds during construction and control noxious weeds that develop after construction. Although Northwest has consulted with the county noxious weed control boards, it is not clear from the documentation provided by Northwest whether each of the county boards has agreed that Northwest's proposed noxious weed control measures would be adequate. Therefore, the FERC staff has recommended that Northwest consult with noxious weed control boards in each of the counties crossed by the loops to develop a *Noxious Weed*

Control Plan that includes a list of the noxious weed species that would be surveyed for and treated during construction and operation of the Capacity Replacement Project.

Wildlife and Aquatic Resources

The impact of the project on wildlife species and their habitats would vary depending on the requirements of each species and the existing habitat present along the loops. Direct impacts of construction on wildlife would include the displacement of wildlife on the right-of-way and direct mortality of some individuals. Depending on the season, construction could also disrupt bird courting or nesting and breeding of other wildlife on and adjacent to the right-of-way. The cutting, clearing, and/or removal of existing vegetation would also affect wildlife by reducing the amount of available habitat. The degree of impact would depend on the type of habitat affected and the rate at which vegetation regenerates after construction. The effect on forested areas would be much greater than for other habitats affected because forest lands would take the longest amount of time to regenerate and would be prevented from reestablishing over the permanent right-of-way due to periodic vegetation maintenance during operation of the loops. In general, these effects are not expected to have an impact on wildlife populations because the amounts of the habitats that would be affected are relatively minor and are adjacent to an existing maintained utility corridor. Furthermore, Northwest's implementation of its ECR Plan, which includes measures to reseed disturbed areas with seed mixes prescribed by the local NRCS offices and the WDNR, and its proposal to replant forest areas with tree seedlings would improve the potential for successful revegetation of the right-of-way after construction

Of the 146 waterbodies that would be crossed by the loops, 45 are known or presumed to be inhabited by fish and an additional 14 are classified as fish bearing but for which species' occurrence has not been documented by the WDFW, the Northwest Indian Fisheries Commission (NWIFC), or other sources. The waterbody that would be crossed by the abandonment activities does not have a fishery classification. In-stream construction across these waterbodies would directly affect aquatic resources. In addition, construction of the loops across waterbodies would remove vegetation and habitat and increase the sedimentation and turbidity of the water, the potential for streambank erosion, and the potential for fuel or chemical spills. Construction-related impacts on aquatic resources could also result from hydrostatic testing or an inadvertent release of drilling mud during HDDs. The degree of impact would depend on the proposed crossing method, the existing conditions at each crossing location, the mitigation measures employed, and the timing of construction.

In general, Northwest would attempt to reduce or eliminate potential impacts on most aquatic resources first through impact avoidance, then minimization, and then habitat restoration and enhancement. Northwest would be required to comply with a number of regulatory requirements and programs designed specifically to protect aquatic resources, including adherence to the FERC staff's Plan and Procedures and its project-specific ECR Plan. In addition, conditions of approval incorporated into permits and/or authorizations would help to minimize project-related impacts on aquatic resources. To minimize impacts on aquatic resources associated with the wet open-cut crossing method, Northwest would cross the waterbodies within allowable in-stream construction windows specified by the WDFW. As discussed above, the FERC staff has recommended that Northwest continue to consult with the COE, the FWS, NOAA Fisheries, the WDOE, the WDFW, other applicable agencies, and appropriate Native American tribes to finalize its site-specific waterbody crossing plans and prepare a conceptual waterbody crossing mitigation plan that would also minimize impacts on aquatic resources.

Special Status Species

The FWS identified 10 federally listed threatened and endangered species, 7 candidate species, and 31 species of concern that could occur in the counties crossed by the Capacity Replacement Project.

Designated critical habitat for two of the listed species (marbled murrelet and northern spotted owl) is also present in the project area. In addition, the FWS has recently proposed critical habitat for the Coastal-Puget Sound Distinct Population Segment of bull trout that includes some of the major watersheds crossed by the project. To preclude the need for further consultation in the event the Capacity Replacement Project is authorized and the proposed designation is finalized before construction, potential impacts on proposed critical habitat for the bull trout have been addressed.

Consultation with NOAA Fisheries identified one additional federally listed species that could occur in the counties crossed by the project. The chinook salmon Puget Sound Evolutionarily Significant Unit (ESU) is listed as threatened and is the only federally listed species under NOAA Fisheries' purview. Critical habitat for this ESU was designated in a final rule in 2000. NOAA Fisheries subsequently withdrew the critical habitat designation after it was challenged in District Court (Washington, DC), and the court vacated the designation in 2002. However, in 2003, NOAA Fisheries published an advance notice that critical habitat was to be proposed for various ESUs, including the chinook salmon Puget Sound ESU. The proposed rule has not yet been published in the Federal Register. Nevertheless, potential impacts on the former chinook salmon critical habitat are discussed in the event the proposed project is authorized and the designation is finalized before construction.

Based on the analysis of information regarding these species, the FERC staff has determined that, with implementation of Northwest's proposed minimization and conservation measures and its additional recommendations, the project would have no effect on seven species, would not likely adversely affect two species, and is likely to adversely affect two species (bull trout and chinook salmon). In addition, the FERC staff has determined that the project would have no effect on critical habitat for the marbled murrelet, would not likely adversely modify critical habitat for the northern spotted owl, would not likely adversely modify proposed critical habitat for the bull trout, and would not likely adversely modify former (and potential future) critical habitat for the chinook salmon.

In compliance with section 7 of the Endangered Species Act, the FERC staff submitted to the FWS and NOAA Fisheries under separate cover a Biological and EFH Assessment for the Capacity Replacement Project with a request to initiate formal consultation. The Biological and EFH Assessment details environmental baselines for EFH, federally listed species, and critical habitat; direct, indirect, interdependent and interrelated, and cumulative effects; proposed conservation measures; and the FERC staff's determinations of effect. In response, the FWS and/or NOAA Fisheries would issue a Biological Opinion as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

Consultation with the WDFW identified 16 state-listed threatened and endangered species, 18 candidate species, 8 sensitive species, and 1 monitor species that could occur in the counties crossed by the project. All of these species also have federal status. Northwest's general and species-specific conservation measures would avoid, minimize, or compensate for project impacts on these species.

Land Use, Recreation and Special Interest Areas, and Visual Resources

Approximately 99 percent of the pipeline route would be constructed within or adjacent to Northwest's existing right-of-way. Of this total, about 93 percent of the proposed loops would be constructed within Northwest's existing right-of-way and would not require any additional permanent right-of-way for operation. Construction of the loops would affect a total of about 1,024.1 acres of land. Developed land would be the primary land use affected totaling about 550.8 acres (54 percent). The remaining land uses that would be disturbed consist of 209.5 acres (20 percent) of agricultural land, 140.9 acres (14 percent) of open land, 119.3 acres (12 percent) of forest land, and 3.6 acres (less than 1 percent) of open water. About 9.4 acres of land would be disturbed by construction of the aboveground facilities.

Of this total, 1.5 acres would be retained during operation. The abandonment activities at the 24 locations along the proposed loops would occur within the construction right-of-way associated with each loop and would not require any additional land. Activities at the 48 abandoned facility sites located outside of the proposed loops would disturb about 14.4 acres of land within Northwest's existing permanent easement. The pipe storage and contractor yards would temporarily affect about 190.6 acres of land.

Northwest's proposed construction work area (i.e., construction right-of-way and temporary extra workspaces) would be located within 50 feet of 222 residences and 22 other structures, including shops, barns, garages, trailers, and commercial buildings. Temporary construction impacts on residential areas could include inconvenience caused by noise and dust generated by construction equipment, personnel, and trenching of roads or driveways; ground disturbance of lawns; removal of trees, landscaped shrubs, or other vegetative screening between residences and/or adjacent rights-of-way; potential damage to existing septic systems or wells; and removal of aboveground structures, such as fences, sheds, or trailers from within the right-of-way. Northwest has developed several measures it would implement to reduce impacts on residences, including the preparation of a *Residential Area Work Plan for the Deer Park Subdivision*.

In addition to the *Residential Area Work Plan for the Deer Park Subdivision*, Northwest has prepared and would follow site-specific residential construction mitigation plans to minimize disruption and to maintain access to the 244 residences and structures located within 50 feet of the construction work area for all the loops. Although the plans show the general tree line surrounding the residences within 50 feet of the construction work area, they do not specifically show the trees and other landscaping that would need to be removed during construction. The plans also do not show private water wells or septic systems. As a result, the FERC staff has recommended that Northwest file revised site-specific residential construction mitigation plans depicting this information with the FERC before construction. Northwest may also submit the site-specific residential construction mitigation plans to applicable local agencies as required by local regulations.

Facilities associated with the Capacity Replacement Project in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties would be located within the coastal zone of the State of Washington. The loops would also cross or be located adjacent to several recreation and/or special interest areas, including Fort Lewis. In addition, activities associated with the abandonment of the existing 26-inch-diameter pipeline could affect recreational uses in two locations.

No National Priority List sites, state-listed hazardous waste sites, or landfills were identified within 0.25 mile of any of the proposed loops. However, the WDOE has expressed concern over possible contamination at existing aboveground facility sites. Northwest provided the WDOE with a list of 78 aboveground facility sites that are associated with the Capacity Replacement Project. Northwest reviewed its records for these 78 sites and determined that 28 of the sites are known or suspected to have used mercury. Ten of these 28 sites are included on the WDOE's Confirmed and Suspected Contaminated Sites List. In addition to mercury, the WDOE is concerned that there is a potential for PCBs and petroleum hydrocarbons contamination as well as the potential for asbestos contamination at meter stations that currently contain or historically contained sheds constructed of corrugated asbestos board. Northwest would conduct sampling at each of the 28 sites to determine whether mercury, PCBs, petroleum hydrocarbons, or asbestos contamination is present. Based on the sampling results, the need for further actions would be determined by the WDOE's Toxics Cleanup Program. All necessary remediation to attain Model Toxics Control Act cleanup levels would be completed before the commencement of ground-disturbing activities at these specific locations.

Visual impacts associated with the loops would be greatest where the pipeline route parallels or crosses roads and the pipeline right-of-way may be seen by passing motorists, on residents where vegetation used for visual screening of existing utility rights-of-way or for ornamental value would be removed, and in forested areas. Generally, construction within or adjacent to existing rights-of-way typically reduces impacts on visual resources because it minimizes vegetation clearing for the construction work areas and permanent right-of-way and also minimizes new fragmentation of vegetation. As previously discussed, about 99 percent of the proposed loops would be located within or adjacent to Northwest's existing right-of-way. Modification activities at the Chehalis Compressor Station would require expansion of the existing footprint of the station to install the additional compression needed for the project and construction of a gravel road to an existing water supply well. The modifications and expansion would have a permanent impact on visual resources; however, the new building and road would be seen in the context of the existing industrial facility, thereby minimizing visual impacts. The pig launchers and receivers and MLVs that would be collocated with existing aboveground facilities would only slightly expand the footprint of the existing facilities and would not result in additional permanent impacts on visual resources. The two pig receivers and MLVs that would not be collocated with existing facilities would permanently affect visual resources. To minimize impacts on visual resources associated with these facilities, the FERC staff has recommended that they be painted to blend with the surrounding landscape.

Socioeconomics

Construction of the project would result in a temporary increase in population and the demand on temporary housing and public services in the area. Given the brief construction period (between 3 to 8 months), the large geographical extent of the work area, and the adequacy of existing infrastructure and services, these impacts are not considered significant.

Construction of the Capacity Replacement Project could affect transportation and traffic in the project area during construction across roads and highways, the commuting of the construction workforce to the project area, and the movement of construction vehicles and delivery of equipment and materials to the construction work areas. Construction across roads and highways would result in short-term impacts on public transportation while construction activities pass through the project area. Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. To minimize potential effects on traffic associated with the construction workforce, Northwest would require that construction workers use pipe storage and contractor yards and compressor station sites as the primary parking area for employees' personal vehicles. Workers would then be transported to the construction site in buses provided by the contractor. The construction equipment would be initially staged at a pipe storage or contractor yard and then transported to the construction right-of-way. Equipment would be dropped off in one location and would then move in a linear direction along the right-of-way. As a result, most equipment would be located on the pipeline right-of-way and would not affect traffic on local roads after its initial delivery to the construction site.

Construction and operation of the project would have a beneficial impact on local tax revenue and economies. Some of these benefits may be offset by a net increase in the rates paid by customers of the natural gas carried by Northwest's system.

Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA), as amended, requires that federal agencies take into account the effects of their undertakings (including the issuance of permits or Certificates) on properties listed on, or eligible for listing on, the National Register of Historic Places (NRHP) and to provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. Northwest, as a non-federal party, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in Title 36 CFR Part 800.

Northwest generally surveyed a 220-foot-wide corridor along the proposed loops. The survey corridor was centered on the existing 30-inch-diameter pipeline, which is offset 20 feet to the west of the centerline of the proposed loops. Portions of the loops had been previously surveyed by Northwest or other parties. In areas where extra workspace would be needed during construction, the survey corridor width was expanded to cover the larger area. In addition, surveys were completed at the five compressor stations, along the majority of the proposed access roads, and at the majority of the proposed pipe and contractor yards. A total of 45 cultural resources sites were identified, of which 36 are recommended as not eligible for listing on the NRHP. Of the remaining nine cultural resources sites, additional work is recommended at six of the sites and three sites would be avoided.

Northwest provided its *Unanticipated Discovery Plan* to be used in the event that cultural resources or human remains are discovered during construction. Northwest's *Unanticipated Discovery Plan* includes contact information for the FERC, the Washington State Historic Preservation Office (SHPO), Fort Lewis, the Bureau of Indian Affairs, the state police, and the offices of the county sheriffs. In addition, Northwest has indicated that it would work with the Native American tribes in the project area to develop a list of appropriate contacts and alternate contacts to be included in its *Unanticipated Discovery Plan before construction*.

The FERC NOI dated July 19, 2004 was sent to individuals from 22 Native American tribes and the NWIFC. The NOI described the proposed project and the environmental review process, listed the potential environmental effects, and requested tribal comments on issues and concerns that should be addressed in the EIS. The FERC staff also sent consultation letters on September 13 and 15, 2004 to 76 individuals from the 22 tribes and the NWIFC. These consultations were conducted in accordance with section 101(d)(6)(B) of the NHPA regarding consultation with Native American tribes and identified the FERC as the lead federal agency and the COE as a cooperating federal agency for the project. These consultations included additional representatives (e.g., cultural resources, natural resources, and fisheries program representatives) of the tribes that had been previously contacted by Northwest and its cultural resources consultant Archaeological Investigations Northwest, Inc. The FERC letters provided a description of the project and requested comments regarding its potential effects on religious or cultural properties, as well as natural resources concerns (e.g., usual and accustomed uses). As a follow-up to these letters, FERC representatives contacted the natural resources and fisheries departments of tribes that had not yet provided comments on the project. These contacts occurred in late October and early November 2004 and were made to discuss the project's potential impacts on waterbodies, fisheries, and other usual and accustomed use areas.

In order to complete the process of complying with section 106 of the NHPA for the proposed facilities, Northwest would need to conduct cultural resources surveys along portions of the proposed loops where project design changes have occurred, landowner permission has not been obtained, or field conditions prevented adequate survey, as well as nine access roads. In addition, further work is recommended at six cultural resources sites to determine their eligibility for listing on the NRHP and/or to identify their boundaries. Once cultural resources surveys and evaluations are complete, the FERC, in consultation with the SHPO, the COE, and Fort Lewis if applicable, will make determinations of NRHP eligibility and project effects. For affected traditional cultural properties, the appropriate Native American tribes would also be consulted. The FERC, as the lead federal agency, would comply with section 106 of the NHPA and the implementing regulations in Title 36 CFR Part 800 by notifying the ACHP of adverse effects to afford it an opportunity to participate in consultation. If it has been determined that any historic properties would be affected by the proposed project, Northwest would be required to prepare a treatment plan, in consultation with the appropriate parties, to mitigate adverse effects. Once a treatment plan is approved, a Memorandum of Agreement would be executed by the appropriate parties. Northwest would implement the specific treatment measures before notice to proceed with project construction is authorized in any given area. Implementation of treatment would occur only after certification of the proposed project.

Air Quality and Noise

Emissions from construction of the pipeline and aboveground facilities are not expected to cause or significantly contribute to a violation of an applicable ambient air quality standard at the property boundaries or the nearest residence. The proposed turbines and fuel gas heater would operate on natural gas. Therefore, the primary pollutants emitted by these units would be nitrogen oxides (NO_x) and carbon monoxide. The proposed modifications at the Chehalis and Washougal Compressor Stations would not be subject to Prevention of Significant Deterioration review. However, during the state permitting process, the modifications would be required to meet currently prescribed Best Available Control Technology requirements, quantitatively assess the ambient air impacts associated with the proposed project, and demonstrate that the project would not cause or significantly contribute to a violation of an applicable air quality standard. Currently, the use of dry low-NO_x technology and good combustion practices have been identified as the emission reduction measures for the proposed turbines that would be installed at the Chehalis and Washougal Compressor Stations.

Noise would be generated during construction of the pipeline, the activities associated with the abandonment of the existing facilities, and during the construction and operation of the modified aboveground facilities. Construction equipment would be operated on an as-needed basis during this period. While individuals in the immediate vicinity of the construction activities would experience an increase in noise, this effect would be temporary and local. Nighttime noise is not expected to increase during construction because most construction activities would be limited to daytime hours. Northwest would comply with all local noise ordinances during construction of the proposed facilities.

The modified compressor stations would generate noise on a continuous basis once operating (i.e., 24 hours per day). The noise impact associated with the operation of these aboveground facilities would be limited to the vicinity of the facilities. The predicted operational noise levels at the modified Chehalis and Washougal Compressor Stations are below the FERC guideline of 55 decibels of the A-weighted scale (dBA) day-night equivalent sound level (L_{dn}) at the nearest noise-sensitive areas (NSAs). The predicted property boundary noise level at the Chehalis Compressor Station is below the Washington state noise limit of 70 dBA at an agricultural property boundary. In addition, the predicted property boundary noise level at the Washougal Compressor Station is below the Washington state noise limit of 50 dBA for a residential property boundary at night. Northwest would perform post-construction noise surveys to ensure that the actual noise resulting from operation of the Chehalis and Washougal Compressor Stations does not exceed 55 dBA L_{dn} at any nearby NSAs and is in compliance with Washington state noise limits. The FERC staff has recommended that Northwest make all reasonable efforts to assure its predicted noise levels are not exceeded at nearby NSAs and file noise surveys showing this with the FERC no later than 60 days after placing the modified compressor stations into service.

Reliability and Safety

The pipeline and aboveground facilities associated with the Capacity Replacement Project would be designed, constructed, operated, and maintained in accordance with or to exceed the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

Cumulative Impacts

Existing conditions in the vicinity of the proposed Capacity Replacement Project reflect the extensive changes brought about by long-term human occupancy and use of the project area. For example, native vegetation communities in the project area have been substantially altered from their pre-Euro-American settlement condition by timber harvest, agricultural practices, introduction of non-native species, and commercial/industrial and residential developments, while fisheries have been affected by commercial harvest and physical alteration of rivers and streams used by anadromous species. When the impacts of the Capacity Replacement Project are considered additively with the impacts of other past, present, or reasonably foreseeable future projects, there is some potential for cumulative effect on resources such as wetlands, vegetation and wildlife (including special status species), land use, visual resources, socioeconomics, cultural resources, air quality, and noise. For the Capacity Replacement Project, mitigation has been developed or recommended to minimize, avoid, or compensate for adverse impacts on each of these resources. Consequently, the Capacity Replacement Project would not contribute significantly to a cumulative adverse effect on the region's environment.

ALTERNATIVES CONSIDERED

The No Action or Postponed Action Alternative was considered. If the FERC were to deny or postpone action on Northwest's application, Northwest would not be able to comply with the DOT's CAO unless it were to replace the entire existing 26-inch-diameter pipeline with a new 26-inch-diameter pipeline according to the phased schedule outlined in the CAO (to be completed by 2013). The entire 26-inch-diameter pipeline could be replaced without obtaining a FERC Certificate if Northwest were to either phase its construction into multiple, small projects that would remain within the provisions of the FERC's section 2.55 regulations or replace the entire 268 miles under those provisions.

However, if Northwest were to replace the 26-inch-diameter pipeline under the FERC's section 2.55 regulations, it would still need to obtain other federal, state, and local approvals. The cumulative environmental impact of a phased replacement of the entire 268 miles of 26-inch-diameter pipeline over a 10-year period would be greater than the impact of the 79.5-mile-long Capacity Replacement Project because it would involve more than three times the length of right-of-way and would be constructed in more than 1 year. Therefore, the likely outcome of the FERC, the COE, and the WDOE denying or postponing action on Northwest's applications for the Capacity Replacement Project would be the replacement of the entire 26-inch-diameter pipeline causing greater environmental impacts. Alternatively, if Northwest were to abandon the 26-inch-diameter pipeline without replacing its capacity, Northwest would not be able to meet its contractual obligations and Washington would lose a significant amount of its natural gas supply.

Northwest is currently the sole provider of interstate natural gas in the Interstate 5 corridor in western Washington. If Northwest could not meet its delivery contracts, its customers would likely seek natural gas from other sources. This could necessitate the construction of additional and/or new pipeline facilities in other locations (system alternatives) to transport natural gas to the markets Northwest serves. If other new natural gas pipeline facilities are approved and constructed, each project would result in specific environmental impacts that could be less than, similar to, or greater than those associated with the current proposal.

An insufficient supply of natural gas could cause many of Northwest's customers to use other fossil fuels, such as coal or oil, for its energy supplies. Compared to other fossil fuels, natural gas is a relatively clean and efficient fuel. Combustion of fuels, such as oil or coal, can generate 60 to 110 percent more carbon dioxide than natural gas. Other emissions from oil or coal combustion, including greenhouse gases, are also significantly higher than those from natural gas. The use of other fossil fuels in place of natural gas would not only increase atmospheric pollution, but would also result in secondary impacts associated with production (e.g., coal mining and oil drilling), transportation (e.g., oil tankers, rail cars, and pipelines), and refining.

Alternatives involving the use of other existing pipeline systems were evaluated. However, because Northwest is the sole provider of interstate natural gas in the western Washington area, there are no other companies or existing systems that could meet Northwest's contractual delivery requirements without constructing significant new transmission facilities.

Northwest system alternatives including new pipeline corridor alternatives and alternative configurations of the Northwest system were evaluated. Because of the significant advantages afforded by collocating with Northwest's existing corridor, an alternative using a new pipeline corridor was eliminated from further consideration.

Alternative configurations of the Northwest system evaluated included permanently returning the existing 26-inch-diameter pipeline to service, like-kind replacement of the 26-inch-diameter pipeline, a pipeline looping-only alternative, compression-only alternatives, alternative pipeline sizes, alternative pipeline loop locations, replacement of the 26-inch-diameter pipeline with the 36-inch-diameter loop in the same trench, use of the existing 30-inch-diameter pipeline, inserting a liner or smaller pipe inside the existing 26-inch-diameter pipeline, and a no turn back capacity alternative. These alternatives were found to either be infeasible or not environmentally preferable to the proposed action.

Northwest's standard design calls for installation of the new loops at a 20-foot offset to the east of the existing 30-inch-diameter pipeline. Several non-standard parallel offsets and three minor route variations from the existing 30-inch-diameter pipeline that are proposed by Northwest were analyzed to determine whether they would be environmentally preferable to a route adjacent to Northwest's existing 30-inch-diameter pipeline. All of these offsets and minor route variations were determined to be warranted and environmentally acceptable.

As part of the Capacity Replacement Project, Northwest has proposed to retain as much of the existing 26-inch-diameter pipeline in place as possible for potential future use. Because removing the 26-inch-diameter pipeline in the 188.5-mile-long unlooped portion of Northwest's existing 268-mile-long system would result in significant environmental impact, it was not determined to be environmentally preferable to abandoning the existing 26-inch-diameter pipeline in place.

Alternative construction methods were also evaluated, including the use of an HDD to avoid residential impacts on the Deer Park Subdivision on the Snohomish Loop. This alternative was not found to be a technically feasible or environmentally preferable alternative to the proposed action.

The use of the wet open-cut method at the North Fork Nooksack River, North Fork Stillaguamish River, and South Fork Stillaguamish River was evaluated in the event the proposed HDD crossings fail. The use of the aerial span method at Pilchuck Creek and the Nisqually River was evaluated in the event Northwest is not able to obtain permits to use the proposed wet open-cut crossing method at these two waterbodies. The key differences in these methods are discussed above in the water resources section. As previously discussed, Northwest has filed site-specific crossing plans for the proposed and alternative crossing methods for the North Fork Nooksack River, Pilchuck Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, and the Nisqually River. The FERC staff has reviewed these plans and generally finds them to be acceptable. However, Northwest is still in the process of consulting with other federal and state agencies and applicable Native American tribes to finalize its site-specific crossing plans and specific mitigation requirements. The FERC staff has recommended that Northwest continue to consult with the COE, the FWS, NOAA Fisheries, the WDOE, the WDFW, other applicable agencies, and appropriate Native American tribes to finalize its site-specific crossing plans and prepare a conceptual waterbody crossing mitigation plan.

MAJOR CONCLUSIONS

The conclusions presented in this section are those of the environmental staff of the FERC. These conclusions are based on input from the COE and the WDOE as cooperating agencies in the preparation of this EIS. However, the COE and the WDOE will present their own conclusions as part of their permit decisions.

The FERC staff has determined that construction and operation of the Capacity Replacement Project and the associated abandonment activities would result in limited adverse environmental impacts. These limited impacts would be most significant during the period of construction. The FERC staff has concluded that if the project is constructed and operated in accordance with applicable laws and regulations, Northwest's proposed mitigation, and the FERC staff's additional mitigation recommendations, it would be an environmentally acceptable action. Although many factors were considered in this determination, the principal reasons are:

- 99 percent of the proposed loops would be within or adjacent to Northwest's existing right-of-way and 93 percent of the proposed loops would be within Northwest's existing permanent easement;

- Northwest would abandon the existing 26-inch-diameter pipeline in place in the locations along the non-looped portions of its system, which would eliminate disturbance to 188.5 miles of the right-of-way with the exception of the activities that would occur to isolate the 26-inch-diameter pipeline from other system components;

- Northwest would submit a "federal consistency certification" to the WDOE certifying that the project is consistent with the Washington Coastal Zone Management Program;

- the project would be consistent with or in conformance with all identified comprehensive plans and critical areas ordinances;

- Northwest would implement the FERC staff's Plan and Procedures, its ECR Plan, SPCC Plan, HDD Plan, *Groundwater Monitoring and Mitigation Plan*, and *Residential Area Work Plan for the Deer Park Subdivision* to protect natural resources and residential areas during construction and operation of the project;

- use of the HDD method would avoid disturbances to the beds and banks of the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers and associated wetlands/riparian areas. If the HDD method fails and the alternative wet open-cut method were used to cross these waterbodies, the short-term impact of a wet open-cut crossing would be environmentally acceptable;

- Northwest would implement approved waterbody and wetland mitigation plans to compensate for unavoidable stream and wetland impacts;

- the appropriate consultations with the FWS, NOAA Fisheries, the SHPO, Fort Lewis, and Native American tribes, and any appropriate compliance actions resulting from these consultations, would be completed before Northwest would be allowed to begin construction in any given area; and

- an environmental inspection program would ensure compliance with all mitigation measures that become conditions of certification.

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FIGURES

ACRONYMS AND ABBREVIATIONS

° F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
ACHP	Advisory Council on Historic Preservation
AINW	Archaeological Investigations Northwest, Inc.
amsl	above mean sea level
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
BACT	Best Available Control Technology
BLM	Bureau of Land Management
BMPs	best management practices
CAA	Clean Air Act
CAO	Corrective Action Order
CEQ	Council on Environmental Quality
Certificate	Certificate of Public Convenience and Necessity
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
COE	U.S. Army Corps of Engineers
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act of 1972
CZMP	Washington Coastal Zone Management Program
dBA	decibels of the A-weighted scale
DOT	U.S. Department of Transportation
ECR Plan	*Erosion Control and Revegetation Plan*
EDNA	Environmental Designation for Noise Abatement
EFH	Essential Fish Habitat
EFSEC	Energy Facility Site Evaluation Council
EI	Environmental Inspector
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESU	Evolutionarily Significant Unit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
Fort Lewis	Fort Lewis Military Reservation
FWS	U.S. Fish and Wildlife Service
g	gravity
GIS	geographic information system
GMA	Groundwater Management Area
Golder	Golder Associates Inc.
HAPs	Hazardous Air Pollutants
HCAs	high consequence areas
HDD	horizontal directional drill
HDD Plan	*Horizontal Directional Drill Contingency Plan*
hp	horsepower
HUC	hydrologic unit code
INGAA	Interstate Natural Gas Association of America
L_{dn}	day-night equivalent sound level

LENS	Lynden, Everson, Nooksack, and Sumas
$L_{eq(24)}$	24-hour equivalent sound level
LWD	large woody debris
M	magnitude
MAOP	maximum allowable operating pressure
Mdth/d	thousand decatherms per day
Memorandum	Memorandum of Understanding on Natural Gas Transportation Facilities
MLVs	mainline valves
MMBtu/hr	million British thermal units per hour
MOA	Memorandum of Agreement
MP	milepost
mph	miles per hour
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NGA	Natural Gas Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOAA Fisheries	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NOI	*Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Capacity Replacement Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings*
Northwest	Northwest Pipeline Corporation
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSA	noise-sensitive area
NSPS	New Source Performance Standards
NSR	Nonattainment New Source Review
NWIFC	Northwest Indian Fisheries Commission
O_3	ozone
OCRM	U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coast and Ocean Resource Management
OEP	Office of Energy Projects
OPS	Office of Pipeline Safety
ORMA	Ocean Resource Management Act
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration
PC	Prior Converted
PCBs	polychlorinated biphenyls
PD	Preliminary Determination on Non-Environmental Issues
PFMC	Pacific Fishery Management Council
PGAs	peak ground accelerations
Plan	*Upland Erosion Control, Revegetation, and Maintenance Plan*
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in aerodynamic diameter

ppm	parts per million
Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
PSWQM Plan	*Puget Sound Water Quality Management Plan*
PTE	potential-to-emit
RCW	Revised Code of Washington
rpm	revolutions per minute
RSPA	Research and Special Programs Administration
RV	recreational vehicle
SCADA	supervisory control and data acquisition
Secretary	Secretary of the Commission
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Office
SMA	Shoreline Management Act
SMP	Shoreline Master Programs
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPCC Plan	*Spill Prevention, Containment, and Countermeasures Plan*
SRR	Seismic Risk Rating
STATSGO	State Soil Geographic
t	wall thickness of the pipe
TCP	traditional cultural properties
THPO	Tribal Historic Preservation Officer
TMDL	total maximum daily load
tpy	tons per year
TSP	total suspended particulate
USC	United States Code
USGS	U.S. Geological Survey
VOC	volatile organic compounds
WAAQS	Washington ambient air quality standards
WAC	State of Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WDOE	Washington State Department of Ecology
WDOH	Washington Department of Health
WNHP	Washington Natural Heritage Program
WPA	wellhead protection area
WRCC	Western Regional Climate Center
WRIA	Water Resource Inventory Areas
WSDOT	Washington State Department of Transportation
WUTC	Washington Utilities and Transportation Commission

1.0 INTRODUCTION

On November 29, 2004, Northwest Pipeline Corporation (Northwest), a Williams Gas Pipeline company, filed an application with the Federal Energy Regulatory Commission (Commission or FERC) under sections 7(b) and 7(c) of the Natural Gas Act (NGA), as amended, and Part 157 of the Commission's regulations. The application was assigned Docket No. CP05-32-000 and was noticed in the Federal Register on December 15, 2004. Northwest is seeking a Certificate of Public Convenience and Necessity (Certificate) to construct, modify, and operate facilities to replace the contractual delivery capacity of its existing 268-mile-long, 26-inch-diameter pipeline between Sumas and Washougal, Washington. Northwest is also seeking an Order Permitting and Approving Abandonment of its existing 26-inch-diameter pipeline and related facilities.[1] On February 4, 2005, Northwest filed an amendment to its application in Docket No. CP05-32-001.[2] The environmental staff of the FERC has prepared this draft environmental impact statement (EIS) to assess the environmental impact associated with the construction, operation, and abandonment of the facilities proposed by Northwest in accordance with the requirements of the National Environmental Policy Act (NEPA).

Northwest's proposal, referred to as the Capacity Replacement Project, would involve the construction and operation of about 79.5 miles of 36-inch-diameter pipeline in four separate loops;[3] modifications at five existing compressor stations, including the addition of 10,760 horsepower (hp) of compression; and installation of new mainline valves (MLVs) and pig[4] launchers and receivers. The proposed facilities are designed to provide up to 360 thousand dekatherms per day (Mdth/d) of natural gas transportation capacity to replace the majority of the delivery capacity of Northwest's existing 26-inch-diameter pipeline. Once the new facilities are installed, Northwest would disconnect the entire 268-mile-long, 26-inch-diameter pipeline and related facilities and abandon the system. The majority of the 26-inch-diameter pipeline would be left in place.

Northwest proposes to begin construction in March 2006[5] and place the facilities in service by November 1, 2006. Abandonment of the 26-inch-diameter facilities that are currently in service cannot be completed until the Capacity Replacement Project is placed in service. All abandonment activities would be completed on or before December 31, 2006. The proposed project is described in detail in section 2.0.

1.1 PROJECT PURPOSE AND NEED

Northwest developed its Capacity Replacement Project in response to an amended Corrective Action Order (CAO) issued by the U.S. Department of Transportation (DOT). The initial CAO was issued by the DOT on May 2, 2003 as a result of a rupture that occurred on May 1, 2003 at milepost (MP) 1352.7 on Northwest's existing 26-inch-diameter pipeline near Lake Tapps, Washington. The CAO restricted operating pressures on the 26-inch-diameter pipeline to 80 percent of the maximum allowable operating pressure (MAOP) and required Northwest to reevaluate pipeline integrity and undertake appropriate remedial actions. On December 13, 2003, the 26-inch-diameter pipeline failed again at MP 1281.5, approximately 7 miles south of the Chehalis Compressor Station near Toledo, Washington. The cause of both failures was determined to be stress corrosion cracking. As a result, the May 2, 2003 CAO

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1 In utility law, the term abandonment refers to government authorization for a utility to cease provision of a particular service and/or to shut down a particular facility.

2 The amendment addressed temporary extra workspace and equipment changes at the Chehalis Compressor Station, identified an additional facility where abandonment activities would occur, and requested additional wetland variances.

3 A loop is a segment of pipeline that is usually installed adjacent to an existing pipeline and connected to it at both ends. The loop allows more gas to be moved through the system.

4 A pig is an internal tool that can be used to clean and dry a pipeline and/or to inspect it for damage or corrosion.

5 Northwest has requested that three river crossings be authorized to begin in late 2005 if weather permits.

was amended on December 18, 2003 requiring Northwest to reduce the operating pressure on the 26-inch-diameter pipeline to 100 pounds per square inch gauge (psig) until subsequent testing justified the removal of the pressure restriction, and develop a plan for abandonment of the pipeline. The amended CAO requires Northwest to permanently abandon all segments of the 26-inch-diameter pipeline located in high consequence areas (HCAs) within 3 years from the date of the amended CAO (i.e., by December 18, 2006), all segments located in Class 2 areas within 5 years, and all remaining segments within 10 years. A second amendment to the CAO, issued April 9, 2004, clarified that the abandonment requirement would be satisfied by Northwest abandoning the 26-inch-diameter pipeline and constructing new pipeline facilities designed to meet its future capacity needs.

In compliance with the amended CAO, Northwest reduced the operating pressure on the 26-inch-diameter pipeline to 100 psig in January 2004. An integrity program was developed and Northwest successfully completed hydrostatic testing of 111 miles of the 26-inch-diameter pipeline in early 2004. The DOT then removed the pressure restriction and Northwest temporarily reestablished full service on the 111 miles of 26-inch-diameter pipeline. These segments of the 26-inch-diameter pipeline would remain in operation until December 18, 2006, or completion of the Capacity Replacement Project facilities provided the facilities are in service before December 18, 2006. The remaining 157 miles of 26-inch-diameter pipeline currently remain idled with an operating pressure limit of 100 psig.

Northwest determined that constructing approximately 79.5 miles of 36-inch-diameter pipeline in four separate loops and installing 10,760 hp of compression at two existing compressor stations would replace the required delivery capacity of the 26-inch-diameter pipeline. Therefore, the Capacity Replacement Project would allow Northwest to address the DOT's abandonment requirement for the entire pipeline in one project within 3 years rather than spread over a 3- to 10-year period.

At the time of the CAO, Northwest's system transportation capacity from Sumas to Washougal, Washington was fully contracted. Abandoning the 26-inch-diameter pipeline without replacement would reduce Northwest's Sumas to Washougal design capacity by 360 Mdth/d. Northwest has elected not to build replacement capacity for the approximately 58 Mdth/d of design capacity in the Jackson Prairie to Washougal corridor that currently is not committed under long-term contracts. In addition, in May and June 2004, Northwest held a reverse open season soliciting customer turn back of unneeded contract capacity from Sumas. The reverse open season resulted in commitments to turn back 13 Mdth/d of capacity upon completion of the Capacity Replacement Project. In order to meet existing long-term contract requirements, as well as maintain adequate infrastructure for future market needs, the Capacity Replacement Project is designed to provide 347 Mdth/d of firm capacity for the first 179 miles from Sumas, 360 Mdth/d for the next 16 miles, and approximately 302 Mdth/d for the last 73 miles to Washougal.

On September 15, 1999, the FERC issued a Policy Statement that established criteria for determining whether there is a need for a proposed project and whether the project would serve the public interest. The Policy Statement explains that, in deciding whether to authorize the construction of major new pipeline facilities, the FERC balances the public benefits against the potential adverse consequences. In evaluating new pipeline construction, the FERC's goal is to give appropriate consideration to the enhancement of competitive transportation alternatives, the possibility of overbuilding, subsidization by existing customers, the applicant's responsibility for unsubscribed capacity, the avoidance of unnecessary disruptions of the environment, and the unneeded exercise of eminent domain.

The FERC may issue a Preliminary Determination on Non-Environmental Issues (PD) for a project before completing its review of the project's environmental impacts. Consistent with the Policy Statement described above, the PD typically considers such issues as the need for the project and its economic effect on existing customers of the applicant, on other pipelines in the area, and on landowners and communities. For example, the Commission considers the extent to which the applicant may need to exercise eminent domain to obtain a right-of-way for the proposed project and balances that against the benefits to be provided by the project. The issuance of a PD does not prejudice any further actions by the Commission. Final action regarding issuance of a Certificate and Order Permitting and Approving Abandonment would not occur until after the environmental review is completed, all environmental issues have been appropriately addressed, and a final Order is issued by the Commission.

1.2 PURPOSE AND SCOPE OF THIS EIS

The principal purposes for preparing an EIS are to:

- identify and assess the potential direct, indirect, and cumulative impacts on the natural and human environment that would result from the implementation of the proposed project;
- describe and evaluate reasonable alternatives to the proposed project that would avoid or substantially lessen any significant adverse effects of the project on the environment;
- identify and recommend specific mitigation measures, as necessary, to avoid or minimize significant environmental effects; and
- encourage and facilitate involvement by the public and interested agencies in the environmental review process.

The topics addressed in this EIS include alternatives; geology; soils; water resources; wetlands; vegetation; wildlife and aquatic resources; special status species; land use, recreation and special interest areas, and visual resources; socioeconomics; cultural resources; air quality and noise; reliability and safety; and cumulative impacts. This EIS describes the affected environment as it currently exists, discusses the environmental consequences of the proposed project, and compares the project's potential impact to that of alternatives. The EIS also presents the FERC staff's recommended mitigation measures and conclusions.

The FERC is the lead agency for the preparation of this EIS. The U.S. Army Corps of Engineers (COE) and the Washington State Department of Ecology (WDOE) are cooperating agencies. A cooperating agency has jurisdiction by law or special expertise with respect to environmental impacts involved with the proposal. The roles of the FERC, the COE, and the WDOE in the project review process are described below. The federal, state, and local permits, approvals, and consultations for the project are discussed in section 1.5.

1.2.1 Federal Energy Regulatory Commission

The FERC is the federal agency responsible for evaluating applications filed for authorization to construct, operate, and abandon interstate natural gas pipeline facilities. As such, the FERC is the lead federal agency for the preparation of this EIS in compliance with the requirements of NEPA, the Council on Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA (Title 40 Code of Federal Regulations (CFR) Parts 1500-1508), and the FERC's regulations implementing NEPA (Title 18 CFR Part 380).

As the lead federal agency for the Capacity Replacement Project, the FERC is required to comply with section 7 of the Endangered Species Act of 1973 (ESA), the Magnuson-Stevens Fishery Conservation and Management Act (MSA), section 106 of the National Historic Preservation Act (NHPA), and section 307 of the Coastal Zone Management Act of 1972 (CZMA). Each of these statutes has been taken into account in the preparation of this EIS. The FERC will use the document to consider the environmental impact that could result if it issues Northwest a Certificate and Order Permitting and Approving Abandonment under section 7 of the NGA.

The FERC will also consider non-environmental issues in its review of Northwest's application. Authorization will be granted only if the FERC finds that the evidence produced on financing, rates, market demand, gas supply, existing facilities and service, environmental impacts, long-term feasibility, and other issues demonstrates that a project is required by the public convenience and necessity. Environmental impact assessment and mitigation development are important factors in the overall public interest determination.

1.2.2 U.S. Army Corps of Engineers

The COE has jurisdictional authority pursuant to section 404 of the Clean Water Act (CWA) (33 United States Code (USC) 1344), which governs the discharge of dredged or fill material into waters of the United States, and section 10 of the Rivers and Harbors Act (33 USC 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody. Because the COE must comply with the requirements of NEPA before issuing permits under these statutes, it has elected to cooperate in the preparation of this EIS. The COE would adopt the EIS per Title 40 CFR Part 1506.3 if, after an independent review of the document, it concludes that its comments and suggestions have been satisfied.

As an element of its review, the COE must consider whether a proposed project avoids, minimizes, and compensates for impacts on existing aquatic resources, including wetlands, to strive to achieve a goal of no overall net loss of values and functions.

Although this document addresses environmental impacts associated with the proposed action as they relate to sections 404 and 10, it does not serve as a public notice for any COE permits. Such public notice will be issued separately during the comment period for this draft EIS. The COE's Record of Decision resulting from consideration of the EIS will formally document its decision on the proposed action, including section 404 (b)(1) analysis and required environmental mitigation commitments.

1.2.3 Washington State Department of Ecology

The proposed project must also undergo an environmental review pursuant to the State Environmental Policy Act (SEPA) (Chapter 43.21C Revised Code of Washington (RCW)). The SEPA process involves the identification and evaluation of probable environmental impacts, and the development of mitigation measures that would reduce adverse environmental impacts. The WDOE has been designated the lead SEPA agency and is responsible for compliance with SEPA procedural requirements as well as for compiling and assessing information on the environmental aspects of the proposal for all agencies with jurisdiction in Washington. As the lead SEPA agency, the WDOE is also responsible for the threshold determination[6] and preparation and content of an EIS when required.

NEPA documents may be used to meet SEPA requirements if the requirements of the State of Washington Administrative Code (WAC) 197-11-610 and 197-11-630 are met and the federal EIS is found to be adequate. To assist the FERC staff in addressing SEPA requirements, the WDOE is cooperating in the preparation of this EIS. When the final EIS is completed, the WDOE would adopt it if an independent review of the document confirms that it meets the WDOE's environmental review standards. The WDOE would adopt the final EIS by identifying the document and stating why it is being adopted using the adoption form in WAC 197-11-965. The adoption form would be circulated to

[6] A SEPA threshold determination is the formal decision as to whether or not the proposal is likely to cause a significant adverse environmental impact that requires review in an EIS.

agencies with jurisdiction and to persons or organizations that have expressed an interest in the proposal. No action may be taken on the proposal until 7 days after the statement of adoption form has been issued. Once the 7-day waiting period is completed, the WDOE could begin issuing permits. Other state and local agencies cannot issue permits until the adoption procedure is complete.

1.3 PUBLIC REVIEW AND COMMENT

On April 19, 2004, Northwest filed a request with the FERC to implement the FERC staff's NEPA Pre-Filing Process for the Capacity Replacement Project. At that time, Northwest was in the preliminary design stage of the project and no formal application had been filed with the FERC. On May 12, 2004, the FERC granted Northwest's request and established a pre-filing docket number (PF04-10-000) to place information related to the project into the public record. The purpose of the NEPA Pre-Filing Process is to encourage the early involvement of interested stakeholders, facilitate interagency cooperation, and identify and resolve issues before an application is filed with the FERC. The COE and the WDOE agreed to conduct their environmental reviews of the project in conjunction with the FERC's NEPA Pre-Filing Process.

As part of the NEPA Pre-filing Process, Northwest mailed notification letters to landowners, government and agency officials, and the general public informing them about the project and inviting them to attend open houses between June 28-30, 2004 and July 12-15, 2004 to learn about the project and to ask questions and express their concerns. Notifications of the open houses were also published in local newspapers. The open houses were held in Lynden, Deming, Arlington, Monroe, Redmond, Puyallup, and Yelm, Washington. The FERC staff attended the open houses to explain the environmental review process to interested stakeholders and take comments about the project. The questions and concerns raised by the public at the open houses are addressed in this EIS.

On July 1, 2004, the FERC staff conducted an interagency scoping meeting in the project area to solicit comments and concerns about the project from jurisdictional agencies. Agencies present at the meeting included the COE; U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries); the Fort Lewis Military Reservation (Fort Lewis); the WDOE; the Washington Department of Fish and Wildlife (WDFW); the Washington State Department of Natural Resources (WDNR); and the Washington Utilities and Transportation Commission (WUTC). The Lummi Nation was also represented. Throughout August 2004, the FERC staff conducted additional agency coordination and scoping meetings with many of these same agencies. Specifically, meetings were held with NOAA Fisheries on August 2, the Lummi Nation on August 3, Fort Lewis and the U.S. Fish and Wildlife Service (FWS) on August 4, and the WDOE on August 31, 2004.

On July 19, 2004, the FERC issued a *Notice of Intent to Prepare an Environmental Impact Statement for the Proposed Capacity Replacement Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meetings* (NOI). The NOI served as the WDOE's *Determination of Significance and Request for Comments on the Scope of the EIS*. The NOI described the project and the joint environmental review process, provided a preliminary list of EIS issues, invited written comments on the environmental issues to be addressed in the EIS, and listed the date and location of three public scoping meetings to be held in communities in the project area. These meetings were held in Arlington, Redmond, and Yelm, Washington on August 2-4, 2004, respectively. The NOI was mailed to affected landowners; federal, state, and local government agencies; elected officials; Native American tribes; environmental and public interest groups; other interested parties; and local libraries and newspapers. The comment period on the NOI closed on August 18, 2004.

A transcript of the public scoping meetings, summary of the interagency scoping meetings, and all written comments are part of the public record for the Capacity Replacement Project and are available for viewing on the FERC Internet website (http://www.ferc.gov).[7] Table 1.3-1 lists the environmental issues that were identified during the scoping process described above and indicates the section of the EIS in which each issue is addressed. The most frequently raised issue related to impacts on residential areas. Residents expressed concern about the loss of trees and other landscaping, the removal of fences, restricted access to homes, safety during construction and operation of the facilities, and impacts on property values. Numerous comments about impacts on soils, water wells, surface water and aquatic resources, wetlands, vegetation, special status species, cultural resources, safety, and alternatives were also received. The majority of the comments received from landowners regarding alternatives requested consideration of alternatives to avoid residential areas. The jurisdictional agencies were primarily concerned about Northwest's proposed waterbody crossing methods and requested a detailed evaluation of alternative crossing methods at major and sensitive waterbody crossings.

Some issues that were raised during the scoping process are not environmental issues (e.g., the past hiring history of the applicant; qualifications of construction contractors; problems related to a fiber optic cable; and contract, rate, and turn back capacity issues). These issues are outside the scope of this EIS. Contract, rate, and turn back capacity issues will be addressed by the Commission during its non-environmental review of the project.

This draft EIS was filed with the U.S. Environmental Protection Agency (EPA) and mailed to federal, state, and local government agencies; elected officials; Native American tribes; local libraries and newspapers; intervenors[8] in the FERC's proceeding; and other interested parties (i.e., landowners, miscellaneous individuals, and environmental groups who provided scoping comments or asked to remain on the mailing list). A formal notice indicating that the draft EIS is available for review and comment was published in the Federal Register and sent with a copy of the Executive Summary to the remaining parties on the mailing list. The distribution list for the draft EIS and formal notice is in Appendix A. The public has 45 days after the date of publication in the Federal Register to review and comment on the draft EIS both in the form of written comments and at public meetings held in the project area. All environmental comments received on the draft EIS will be addressed in the final EIS.

1.4 NONJURISDICTIONAL FACILITIES

Under section 7 of the NGA, the FERC is required to consider, as part of its decision to certificate interstate natural gas facilities, all factors bearing on the public convenience and necessity. The facilities for the Capacity Replacement Project that would be under the FERC's jurisdiction include approximately 79.5 miles of new 36-inch-diameter pipeline, 10,760 hp of new compression, new MLVs, and new pig launchers and receivers. The FERC also has jurisdiction over the facilities that would be abandoned. The proposed and abandoned facilities are described in detail in section 2.1.

Occasionally, proposed projects have associated facilities that do not come under the jurisdiction of the FERC. These "nonjurisdictional" facilities may be integral to the need for the proposed project (e.g., a new or expanded power plant at the end of a pipeline that is not under the jurisdiction of the FERC) or they may be merely associated as a minor, non-integral component of the jurisdictional facilities that would be constructed and operated as a result of the proposed facilities.

There are no nonjurisdictional facilities associated with the Capacity Replacement Project.

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7 Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., PF04-10 and CP05-32). Be sure to select an appropriate date range.

8 Intervenors are official parties to the proceeding and have the right to receive copies of case-related Commission documents and filings by other intervenors. Likewise, each intervenor must provide 14 copies of its filings to the Secretary of the Commission and must send a copy of its filings to all other intervenors. Only intervenors have the right to seek rehearing of the Commission's decision.

TABLE 1.3-1

Issues Identified and Comments Received During the Public Scoping Process for the Capacity Replacement Project

Issue/Specific Comment	EIS Section Addressing Comment
GENERAL	
Project purpose and need	1.1
National Environmental Policy Act Pre-Filing Process, its use in project development, agency coordination, landowner notifications and communications	1.3, 2.5
Environmental inspection and third-party inspection	2.5
Construction, abandonment, operation, and maintenance procedures	2.3, 2.6, 4.12.1
Use of the pipeline to transport commodities other than natural gas	5.4
Environmental studies associated with the project	4.0
Depth of cover	2.3.1, 2.3.2, 4.12.1
Enforcement of easement agreements	2.5
Compliance with Coastal Zone Management determination, including section 401, Clean Air Act, State Environmental Policy Act, Shoreline Management Act and Shoreline Master Programs, other permit requirements	1.5
ALTERNATIVES	
Consideration of a no action alternative and the use of alternative energy sources	3.1
Potential to return the 26-inch-diameter pipeline to permanent service	3.2.2.2
Consideration of compression alternatives, alternative loop locations, like-kind replacement, same trench replacement	3.2.2.2
Consideration of a smaller pipe within the existing pipeline or a liner or sealant to continue use of the existing pipeline	3.2.2.2
Evaluation of alternative waterbody crossing methods where a horizontal directional drill (HDD) is not feasible	3.5, 4.3.2.3
GEOLOGY	
Potential geologic hazards (e.g., earthquakes, landslides, slope stability) and mitigation	4.1.3
Impacts on mines and quarries	4.1.2, 4.8.3.2
SOILS	
Topsoil segregation, erosion and sediment control, cleanup and restoration activities, including rock removal, topsoil replacement, decompaction activities	4.2.2, 4.2.3, Appendix E, Appendix G
Evaluation of hazardous waste sites and/or potential contamination (e.g., mercury, asbestos) encountered during construction, removal, and proposed mitigation	4.2.3, 4.3.1.2, 4.3.2.6, 4.8.5
WATER QUALITY AND AQUATIC RESOURCES	
Impacts on groundwater, well water, and water use	4.3.1.2, 4.3.1.3, Appendix M
Consideration of independent water test pre-, during, and post-construction.	4.3.1.3
Potential for chlorine contamination resulting from using municipal water sources for hydrostatic testing	4.3.1.4
Prevention of spills, cleanup, and notification during construction and operation, impacts from spills/leaks	4.2.3, 4.3.1.2, 4.3.1.3, 4.3.2.2, 4.6.2, Appendix H
Waterbody crossing time windows, methods and requirements, consideration of alternative crossing methods, and mitigation measures	4.3.2, 4.6.2.3, Appendix F, Appendix K
Impacts on waterbodies of interest to Native American tribes	4.3.2, 4.6.2.3, 4.10.3
Evaluation of crossings of Muck Creek and South Fork Muck Creek, including consideration of methods to prevent loss of flow (e.g., placement of seal material to a depth of at least 6 inches, determine baseline flow data, post-construction flow data)	4.3.2.3
Impacts on waterbodies due to hydrostatic text water discharges	4.3.2.7
Potential for ditches to contain Coho salmon, impacts on salmon and mitigation measures, including mitigation for critical salmon spawning areas (e.g., Lake Sammamish, Bear Creek, Evans Creek).	4.6.2, 4.7
WETLANDS	
Impacts on wetlands and hydrologic connectivity to other water resources	4.4.2

TABLE 1.3-1 (cont'd)

Issues Identified and Comments Received During the Public Scoping Process for the Capacity Replacement Project

Issue/Specific Comment	EIS Section Addressing Comment
Wetland delineation survey methods and results	4.4.1, Appendix J
Post-construction drainage	4.4.3
Wetland crossing methods, construction and operation impacts, and mitigation	2.3.2, 4.4.2, 4.4.3
VEGETATION	
Restoration measures, including seed mixes	4.5.2, Appendix G
Impacts on riparian areas	4.5.3
Right-of-way maintenance	2.6, 4.5
Use of herbicides, noxious weed control	4.5.2, 4.5.3
Impacts on trees, including oak, native conifers, douglas fir, hemlock, cedar trees, cottonwood, alder, and other old growth timber	4.5.2, 4.5.3
Impacts on a certified organic farm	4.5.2
WILDLIFE	
Impacts on wildlife, habitats, and migration corridors resulting from construction, tree removal, and operation	4.6.1.2, 4.6.1.3
SPECIAL STATUS SPECIES	
Agency coordination and requirements	4.7
Evaluation of biological surveys, existing habitats, and potential impacts on threatened or endangered species (e.g., spotted owl), sensitive or risk species, and their habitat	4.7
Analysis of mitigation measures	4.7
LAND USE	
Landowner notification and dispute resolution process	2.5
Residential construction procedures, timeline, noise restrictions, and safety issues and measures	4.8.3.1
Impacts on federal and state lands, including upland state trust land parcels	4.8.2
Abandonment activities on Camp Bonneville Military Reservation	4.8.2
Eminent domain and compensation process	4.8.2, 4.9.5
Ancillary areas such as equipment storage, pipe storage, and contractor yards	2.2, 4.0
Post-construction marking of pipeline location	2.3.1, 2.3.2, 2.6
Potential impacts on hunting and seasonal restrictions or coordination required	4.8.4
Consideration of plans and programs of the Lummi Nation's Natural Resources Department (e.g., *Flood Damage Reduction Plan*, *Multi-Hazard Mitigation Plan*) in the evaluation of the project's consistency with regional and local land use plans	1.5
Impacts on existing recreational uses and mitigation	4.8.4
Impacts on future development (e.g., $25,000,000, 184-unit retirement community) and future recreational areas (e.g., public trails), and mitigation	4.8.3.1
Mitigation for hazardous waste discovered and/or generated during construction	4.2.3, 4.3.1.2, 4.3.2.6, 4.8.5
TRAFFIC AND TRANSPORTATION	
Impacts on transportation and traffic and future developments, access to homes and public communications, avoidance of residential areas and private driveways, plans for alternative routes in the Deer Park Subdivision	4.9.4
Transportation safety and impacts	4.9.4
Federal, state, and local road crossing permitting requirements	1.5
Crossing methods at road crossings and timeline	4.9.4
Impacts on adjacent utilities situated within state highway right-of-way	4.9.4
Traffic-related impacts within Snohomish County, including detours, traffic control, and other mitigation measures	4.9.4
SOCIOECONOMICS	
Impacts on house and land values and use, effect on taxes, and potential for increased insurance rates	4.9.5, 4.9.6
Impacts from pipeline construction and operation on heavily populated areas	4.8.3.1

TABLE 1.3-1 (cont'd)

Issues Identified and Comments Received During the Public Scoping Process for the Capacity Replacement Project

Issue/Specific Comment	EIS Section Addressing Comment
Impacts on and access to schools during construction	4.9.3
Effects of the expanded pipeline capacity on the natural gas distribution system and employment opportunities	4.9.1, 4.9.5
Environmental justice considerations	4.9.7
CULTURAL RESOURCES	
Impact on cultural and archaeological resources; Traditional Cultural Properties; Native American properties, landforms, burials, and ceremonies	4.10
Tribal consultation, including fishing issues	4.10.3
Development of a Cultural Resources Management Plan, Unanticipated Discovery Plan, and Frac-Out Plan	2.3, 4.3.2.3, 4.10, Appendix I
AIR QUALITY	
Impacts on air quality and health resulting from construction	4.11.1
NOISE	
Noise regulations applicable to the project	4.11.2.1
Evaluation of noise generated during construction	4.11.2.2
Potential noise impacts resulting from compressor station upgrades	4.11.2.2
RELIABILITY AND SAFETY	
Maintenance and enforcement of protection and security matters	4.12
Construction and operation of the pipeline through the active Fort Lewis Military Reservation, including construction access and schedule	4.8.4
Regulations and safeguards	4.12.1, 4.12.3, 4.12.4
Pipeline depths, markers, corrosion impacts	2.3.1, 2.3.2, 2.6, 4.12.1
Security measures to prevent vandalism or terrorist-like attacks	4.12.4
Analysis of safety hazards and identification of safety features	2.6, 4.12.1
Emergency response plans	4.12.1
CUMULATIVE IMPACTS	
Analysis of cumulative impacts based on pre-development or "pristine" environmental conditions rather than current conditions	4.13
Analysis of cumulative impacts associated with multiple pipelines parallel to one another	4.13

1.5 PERMITS, APPROVALS, CONSULTATIONS, AND REGULATORY REQUIREMENTS

Table 1.5-1 lists the major federal, state, and local codes, ordinances, statutes, rules, regulations, and permits that would apply to the Capacity Replacement Project. A description of these requirements and how the project would comply with each requirement is also provided in table 1.5-1. A discussion of consultations with Native American tribes is presented in section 4.10.3. Additional information on the CZMA, Growth Management Act, and the *Puget Sound Water Quality Management Plan* (PSWQM Plan) is presented in sections 1.5.1, 1.5.2, and 1.5.3, respectively. Northwest would be responsible for obtaining all permits and approvals required to implement the proposed project, regardless of whether they appear in table 1.5-1.

1.5.1 Coastal Zone Management Act

In 1972, Congress passed the CZMA to "preserve, protect, develop, and where possible, to restore or enhance, the resources of the nation's coastal zone for this and succeeding generations" and to "encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone" (16 USC 1452, section 303 (1) and (2)).

Section 307 (c)(3)(A) of the CZMA states that "any applicant for a required federal license or permit to conduct an activity, in or outside the coastal zone, affecting any land or water use or natural resource of the coastal zone of that state shall provide a certification that the proposed activity complies with the enforceable policies of the state's approved program and that such activity will be conducted in a manner consistent with the program." In order to participate in the coastal zone management program, a state is required to prepare a program management plan for approval by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coast and Ocean Resource Management (OCRM). Once the OCRM has approved a plan and its enforceable program policies, a state program gains "federal consistency" jurisdiction. This means that any federal action (e.g., a project requiring federally issued licenses or permits) that takes place within a state's coastal zone must be found to be consistent with state coastal policies before the federal action can take place.

The Washington Coastal Zone Management Program (CZMP) received federal approval in 1976. The coastal zone in Washington includes the 15 counties with marine shorelines, including Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Mason, Pacific, Pierce, San Juan, Skagit, Snohomish, Thurston, Wahkiakum, and Whatcom Counties.

The Capacity Replacement Project is subject to a federal Coastal Zone Consistency Review because it would involve activities within the coastal zone of Washington, including activities in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties. The modifications to the existing Chehalis and Washougal Compressor Stations would not be included in the federal Coastal Zone Consistency Review because they are located in Lewis and Clark Counties, respectively, which are not part of the coastal zone. Activities associated with the abandonment of the existing 26-inch-diameter pipeline in Lewis, Cowlitz, and Clark Counties would also not be included in the federal Coastal Zone Consistency Review.

TABLE 1.5-1

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
FEDERAL			
Advisory Council on Historic Preservation	Section 106 Consultation, National Historic Preservation Act (NHPA)	Has the opportunity to comment on the undertaking.	Northwest, as a non-federal party, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in Title 36 Code of Federal Regulations (CFR) Part 800 (see section 4.10).
Federal Energy Regulatory Commission	National Environmental Policy Act (NEPA)	Complete the NEPA review of the proposed project.	The environmental staff of the FERC has prepared this draft environmental impact statement (EIS) to assess the environmental impact associated with the construction, operation, and abandonment of the facilities proposed by Northwest in accordance with the requirements of NEPA (see section 1.0).
	Section 7 Endangered Species Act (ESA) Consultation, Biological Assessment (BA)	Consult with the U.S. Fish and Wildlife Service (FWS) and/or the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) regarding federally listed endangered or threatened species and prepare a BA for those species that may be affected.	In compliance with section 7 of the ESA, a BA for the Capacity Replacement Project has been submitted to the FWS and NOAA Fisheries under separate cover (see section 4.7).
	Environmental Justice	Review the proposed project for consistency with Executive Order 12898.	The requirements of this Executive Order would be addressed through the NEPA process (see section 4.9.7).
	Noxious Weeds	Review the proposed project for consistency with Executive Order 13112.	The requirements of this Executive Order would be addressed through the NEPA process (see section 4.5.4).
	Certificate of Public Convenience and Necessity/Order Permitting and Approving Abandonment	Determine whether the construction, operation, and abandonment of the facilities associated with the project are in the public interest. Consider certification of the project.	Environmental impact assessment and mitigation development are important factors in the overall public interest determination. The environmental impacts of the project are addressed in this EIS in accordance with the requirements of NEPA (see section 1.2.1).

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
U.S. Department of Agriculture Natural Resources Conservation Service (NRCS)	NEPA	Provide comments on prime farmland soils, drain tiles, farmed wetlands, and planned channel relocation projects.	The environmental staff of the FERC has prepared this draft EIS to assess the environmental impact associated with the construction, operation, and abandonment of the facilities proposed by Northwest in accordance with the requirements of NEPA. The NRCS' responsibilities would be addressed through the NEPA process. Information on prime farmland soils and drain tiles is provided in section 4.2; farmed wetlands are discussed in section 4.4. The FERC staff is unaware of any planned channel relocation projects in the vicinity of the facilities associated with the Capacity Replacement Project.
U.S. Department of the Army Corps of Engineers (COE)			
Seattle District	Section 10 Rivers and Harbors Act Permit	Consider issuance of a section 10 permit for crossing navigable waterways.	Northwest would submit an application to the COE for a section 10 Rivers and Harbors Act permit for crossing navigable waterways. Additional information regarding the role of the COE in the project review process is provided in section 1.2.2. Information on the waterways crossed by the Capacity Replacement Project is provided in section 4.3.2.
	Section 404 Clean Water Act (CWA) Permit	Consider issuance of a section 404 permit for the placement of dredge or fill material into all waters of the United States, including wetlands.	Northwest would submit an application to the COE for a section 404 permit for the placement of dredge or fill material into all waters of the United States. Additional information regarding the role of the COE in the project review process is provided in section 1.2.2. Information on the surface waters and wetlands affected by the Capacity Replacement Project is provided in sections 4.3.2 and 4.4, respectively.
U.S. Department of the Army Corps of Engineers and U.S. Department of the Interior, Bureau of Land Management	Right-of-Way Grant Amendment	Consider amending Northwest's existing right-of-way grant to allow project-related activities on the Fort Lewis Military Reservation (Fort Lewis) and Camp Bonneville.	Northwest would submit a request to the Fort Lewis Real Estate Officer asking for an amendment to its existing easement for the activities associated with the Capacity Replacement Project (see section 4.8.2).
U.S Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries)	Section 7 ESA Consultation, Biological Opinion (BO)	Consider lead agency finding of impact on federally listed or proposed threatened and endangered species and their habitat. Provide a BO if the project is likely to adversely affect federally listed or proposed species or their habitat.	In response to the BA and the FERC's request for formal consultation to comply with section 7 of the ESA, NOAA Fisheries would issue a BO as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat (see section 4.7).

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Magnuson-Stevens Fishery Conservation and Management Act	Conduct review and oversight of essential fish habitat (EFH).	The required EFH Assessment has been incorporated into the BA for the Capacity Replacement Project and has been submitted to NOAA Fisheries under separate cover (see section 4.6.2.2).
U.S. Department of the Interior Fish and Wildlife Service (FWS)	Section 7 ESA Consultation, BO	Consider lead agency finding of impact on federally listed or proposed threatened and endangered species and their habitat. Provide a BO if the project is likely to adversely affect federally listed or proposed species or their habitat.	In response to the BA and the FERC's request for formal consultation to comply with section 7 of the ESA, the FWS would issue a BO as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat (see section 4.7).
	Fish and Wildlife Coordination Act (FWCA)	Provide comments to prevent loss of and damage to wildlife resources.	The requirements of the FWCA would be addressed through the NEPA process (see sections 4.6 and 4.7).
	Migratory Bird Treaty Act	Review the proposed project for consistency with Executive Order 13186.	The requirements of this Executive Order would be addressed through the NEPA process (see section 4.6.1.3).
U.S. Department of Transportation Federal Highway Administration	Encroachment Permit	Consider issuance of a permit to cross federally funded highways.	Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Information on the roads and highways crossed by the Capacity Replacement Project is provided in section 4.9.4.
U.S. Department of the Treasury Bureau of Alcohol, Tobacco, and Firearms	Explosive User's Permit	Consider issuance of a permit to purchase, store, and use explosives for site preparation during loop construction (if required).	For those areas where blasting cannot be avoided, Northwest would comply with all applicable federal, state, and local regulations (see section 4.1.1).
U.S. Environmental Protection Agency Region 10	Section 401, CWA, Water Quality Certification	Consider issuance of water use and crossing permits for the portion of the project on Fort Lewis and tribal lands.	Northwest would apply for the permits necessary for water use and crossings on Fort Lewis and tribal lands. Information on waterbody crossings and surface water uses during construction is provided in section 4.3.2.
	Section 404, CWA	Review CWA, section 404 wetland dredge-and-fill applications to the COE with 404(c) veto power for wetland permits issued by the COE.	Northwest would submit an application to the COE for a section 404 permit for the placement of dredge or fill material into all waters of the United States. Information on the surface waters and wetlands affected by the Capacity Replacement Project is provided in sections 4.3.2 and 4.4, respectively.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Stormwater Discharge Permit	Review and issue stormwater permit for the portion of the project on Fort Lewis and tribal lands.	Northwest would apply for a stormwater permit for the portion of the project on Fort Lewis and tribal lands and would implement the January 17, 2003 versions of the FERC staff's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures), as well as its project-specific *Erosion Control and Revegetation Plan* (ECR Plan), to minimize impacts associated with stormwater discharges (see section 4.2.2).
STATE			
Southwest Clean Air Agency	Air Quality Permit	Consider issuance of permits to construct and operate the Chehalis and Washougal Compressor Stations after modifications.	Northwest would apply for the permits necessary to construct and operate the Chehalis and Washougal Compressor Stations after modifications. An analysis of impacts on air quality associated with the modifications is provided in section 4.11.1.
Washington Department of Community, Trade and Economic Development			
Growth Management Project	Growth Management Act	Review consistency of the project with the Growth Management Act.	The Growth Management Act requires state and local governments to manage Washington's growth. Additional information regarding the Growth Management Act is provided in section 1.5.2.
Washington Department of Fish and Wildlife (WDFW)	Bald Eagle Management	Develop management plan to minimize impacts on bald eagles.	The requirements of this plan would be addressed through compliance with section 7 of the ESA. Measures Northwest would implement to minimize impacts on bald eagles are discussed in section 4.7.
	Hydraulic Project Approval	Consider issuance of permits to cross and withdraw water from waterbodies.	Northwest would apply for the permits necessary for water use and crossings associated with the project. Information on waterbody crossings and surface water uses during construction is provided in section 4.3.2. Northwest would apply for a permit to withdraw water from surface waters for hydrostatic testing (see section 4.3.2.7). Information on allowable in-stream construction windows is presented in section 4.6.2.3.
Washington Department of Transportation	Road Crossing Permits	Consider issuance of permits to cross state highways.	Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Information on the roads and highways crossed by the Capacity Replacement Project is provided in section 4.9.4.
Washington Office of Archaeology and Historic Preservation (State Historic Preservation Office)	Section 106 Consultation, NHPA	Review and comment on project activities potentially affecting cultural resources.	Northwest, as a non-federal party, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in Title 36 CFR Part 800 (see section 4.10).
Washington Office of the Governor - Puget Sound Action Team	*Puget Sound Water Quality Management Plan* (PSWQM Plan)	Review consistency of the project with the PSWQM Plan.	The PSWQM Plan is Washington's long-term strategy for protecting and restoring Puget Sound. Information regarding the PSWQM Plan is provided in section 1.5.3.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
Washington State Department of Ecology (WDOE)	State Environmental Policy Act (SEPA)	Complete SEPA review of the proposed project.	NEPA documents may be used to meet SEPA requirements if the requirements of the State of Washington Administrative Code 197-11-610 and 197-11-630 are met and the federal EIS is not found to be inadequate. Additional information on the SEPA process and the WDOE's role as the lead SEPA agency is provided in section 1.2.3. SEPA is also an enforceable policy under Washington's Coastal Program (see section 1.5.1).
	Section 401, CWA, Water Quality Certification	Certify that the proposed action is in compliance with state water quality laws and regulations except for the portion of the project on Fort Lewis and tribal lands.	Northwest would apply for the permits necessary for water use and crossings associated with the project. Information on waterbody crossings and surface water uses during construction is provided in section 4.3.2.
	Authorization to Work in Isolated Wetlands	Consider authorization to work in isolated wetlands.	Northwest has requested authorization to work in isolated wetlands, which are regulated by the state but not the federal government. An Administrative Order could be issued by the WDOE to set conditions on this work. Information on the wetlands affected by the Capacity Replacement Project is provided in section 4.4.
	Temporary Water Use Permit	Consider issuance of permit to withdraw water from surface waters for the purpose of hydrostatic testing.	Northwest would apply for a permit to withdraw water from surface waters for hydrostatic testing (see section 4.3.2.7).
	National Pollutant Discharge Elimination System Individual Permit for Stormwater Discharges	Review and issue an individual stormwater permit for the project except for the portion of the project on Fort Lewis and tribal lands. Construction at compressor stations or other facilities may require a separate permit.	Northwest would apply for a stormwater permit for the project and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with stormwater discharges (see section 4.2.2).
	Coastal Zone Management Act (CZMA)	Review consistency of the project with the CZMA.	Northwest would submit a "federal consistency certification" to the WDOE stating the project is consistent with the six laws or enforceable policies of Washington's Coastal Program. Additional information on the CZMA is provided in section 1.5.1.
	Shoreline Management Act (SMA)	Review local jurisdiction determination of the consistency of the project with the SMA.	Northwest would apply for the applicable shoreline permits from local jurisdictions affected by the proposed project (see the local permits section of this table). The SMA is an enforceable policy under Washington's Coastal Program. Additional information on the CZMA and SMA is presented in section 1.5.1.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	State CWA	Review consistency of the project with the state CWA.	Northwest would apply for the permits necessary for water use and crossings associated with the project. Information on waterbody crossings and surface water uses during construction is provided in section 4.3.2. The CWA is an enforceable policy under Washington's Coastal Program. Additional information on the CZMA and CWA is presented in section 1.5.1.
Washington State Department of Natural Resources (WDNR)	Aquatic Land Lease	Consider issuance or amendment of existing right-of-way agreement to cross state-owned lands.	Northwest would submit a request to the WDNR for an amendment to its existing agreement to cross state-owned lands associated with waterbody crossings. Details on the waterbodies crossed by the Capacity Replacement Project are provided in section 4.3.2.
	Forest Practices Act (FPA)	Review consistency of the project with the FPA.	The requirements of the FPA would be addressed through the NEPA/SEPA process. Forested areas affected by the project are discussed in section 4.5.
	Removal of Abandoned Facilities	Consider approval to leave abandoned facilities on WDNR land.	Northwest would obtain approval to leave abandoned facilities on WDNR land. Information on WDNR land crossed by the Capacity Replacement Project is provided in section 4.8.4.
LOCAL			
Whatcom County	Critical Areas Ordinance	Review consistency of the project with the county Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Grading Permit	Consider issuance of a permit for excavation and grading activities.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
	Floodplain Development Permit	Review consistency of the project with title 17, Flood Damage Prevention, of the Whatcom County Code (WCC).	Northwest would apply for a floodplain development permit per WCC 17.12.010 and would comply with all permit stipulations including those for utilities, alteration of watercourses (WCC 17.12.030 D), and floodway encroachments (WCC 17.12.120 A). Information on frequently flooded and flood hazard areas crossed by the Capacity Replacement Project is provided in section 4.3.2.1.
	Major Construction Permit	Consider issuance of a permit for project construction.	Northwest would apply for a major construction permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with construction (see section 4.2.2).
	Road Crossing Permits	Consider issuance of permits to cross county roads.	Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Information on the roads and highways crossed by the Capacity Replacement Project is provided in section 4.9.4.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Shoreline Substantial Development Permit	Consider issuance of a permit to cross waterbodies covered by the SMA.	Northwest would apply for a Shoreline Substantial Development Permit to cross waterbodies covered by the SMA and designated as "Rural" or "Conservancy." A list of these waterbodies and their associated designations is provided in section 4.3.2. The SMA is also an enforceable policy under Washington's Coastal Program. Additional information on the CZMA and SMA is presented in section 1.5.1.
	Shoreline Conditional Use Permit	Consider issuance of a permit to cross waterbodies covered by the SMA.	Northwest would apply for a Shoreline Conditional Use Permit to cross waterbodies covered by the SMA and designated as "Conservancy." A list of these waterbodies and their associated designations is provided in section 4.3.2. The SMA is also an enforceable policy under Washington's Coastal Program. Additional information on the CZMA and SMA is presented in section 1.5.1.
	Solid Waste Disposal	Consider approval to dispose of solid waste generated by construction.	Northwest would comply with all federal, state, and local statutes and regulations related to waste disposal. An analysis of the solid waste expected to be generated by the project is presented in section 4.9.3.
Skagit County [b]	Critical Areas Ordinance	Review consistency of the project with the county Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Franchise Agreement	Consider amending Northwest's existing agreement to include the new loop.	Northwest would apply for an amended Franchise Agreement to include the new facilities associated with the Capacity Replacement Project.
	Grading Permit	Consider issuance of a permit for excavation and grading activities.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
	Solid Waste Disposal	Consider approval to dispose of solid waste generated by construction.	Northwest would comply with all federal, state, and local statutes and regulations related to waste disposal. An analysis of the solid waste expected to be generated by the project is presented in section 4.9.3.
Snohomish County	Conditional Use Permit	Consider issuance of a land use permit.	Northwest would apply for a conditional use permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with construction (see section 4.2.2).
	Critical Areas Ordinance	Review consistency of the project with the county Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Flood Hazard Permit	Review consistency of the project with chapter 30.65 of the Snohomish County Code (SCC).	Northwest would apply for a flood hazard permit per SCC 30.43C.010-200 and would comply with all permit stipulations including those for utilities (SCC 30.65.200), alteration of watercourses (SCC 30.65.110 (4)), and floodway encroachments (SCC 30.65.220 and 230 (1)(b)). Information on frequently flooded and flood hazard areas crossed by the Capacity Replacement Project is provided in section 4.3.2.1.
	Franchise Agreement	Consider amending Northwest's existing agreement to include the new loop.	Northwest would apply for an amended Franchise Agreement to include the new facilities associated with the Capacity Replacement Project.
	Grading Permit	Consider issuance of a permit for excavation and grading activities.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
	Road Crossing Permits	Consider issuance of permits to cross county roads.	Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Information on the roads and highways crossed by the Capacity Replacement Project is provided in section 4.9.4.
	Shoreline Substantial Development Permit	Consider issuance of a permit to cross waterbodies covered by the SMA.	Northwest would apply for a Shoreline Substantial Development Permit to cross waterbodies covered by the SMA and designated "Rural" or "Conservancy." A list of these waterbodies and their associated designations is provided in section 4.3.2. The SMA is also an enforceable policy under Washington's Coastal Program. Additional information on the CZMA and SMA is presented in section 1.5.1.
	Solid Waste Disposal	Consider approval to dispose of solid waste generated by construction.	Northwest would comply with all federal, state, and local statutes and regulations related to waste disposal. An analysis of the solid waste expected to be generated by the project is presented in section 4.9.3.
King County	Critical Areas Ordinance	Review consistency of the project with the county Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Floodplain Development Permit	Review consistency of the project with chapter 21A.24 of the King County Code (KCC).	Northwest would apply for a floodplain development permit per KCC 21A.24.207 (A) and would comply with all permit stipulations including those for utilities (KCC 21A.24.240 (I)), alteration of watercourses (KCC 21A.24.275), and floodway encroachments (KCC 21A.24.156 (B)). Information on frequently flooded and flood hazard areas crossed by the Capacity Replacement Project is provided in section 4.3.2.1.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Franchise Agreement	Consider amending Northwest's existing agreement to include the new loop.	Northwest would apply for an amended Franchise Agreement to include the new facilities associated with the Capacity Replacement Project.
	Grading Permit	Consider issuance of a permit for excavation and grading activities.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
	Public Agency Utility Exemption (PAUE)	Consider issuance of a PAUE for the loop within critical areas.	Northwest would apply for a PAUE for the loop within critical areas. Additional information on critical areas ordinances is provided in section 1.5.2.
	Road Crossing Permits	Consider issuance of permits to cross county roads.	Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Information on the roads and highways crossed by the Capacity Replacement Project is provided in section 4.9.4.
	Solid Waste Disposal	Consider approval to dispose of solid waste generated by construction.	Northwest would comply with all federal, state, and local statutes and regulations related to waste disposal. An analysis of the solid waste expected to be generated by the project is presented in section 4.9.3.
Pierce County	Critical Areas Ordinance	Review consistency of the project with the county Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Grading Permit	Consider issuance of a permit for excavation and grading activities.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
	Floodplain Development Permit	Review consistency of the project with the Pierce County Flood Damage Ordinance found in chapter 17.24 of the Pierce County Code.	Northwest would apply for a floodplain development permit for any area of special flood hazard as established in Pierce County Ordinance 17A.50 and would comply with all permit stipulations including alteration of watercourses (17A.50.080), deep and/or fast flowing water (17A.50.110), utilities (17A.50.130), floodways (17A.50.170), and major watercourses (17A.50.180). Information on frequently flooded and flood hazard areas crossed by the Capacity Replacement Project is provided in section 4.3.2.1.
	Road Crossing Permits	Consider issuance of permits to cross county roads.	Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Information on the roads and highways crossed by the Capacity Replacement Project is provided in section 4.9.4.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Shoreline Substantial Development Permit	Consider issuance of a permit to cross the Nisqually River.	Northwest would apply for a Shoreline Substantial Development Permit to cross the Nisqually River, which is covered by the SMA and designated as "Conservancy." The crossing of the Nisqually River is discussed in section 4.3.2. The SMA is also an enforceable policy under Washington's Coastal Program. Additional information on the CZMA and SMA is presented in section 1.5.1.
	Solid Waste Disposal	Consider approval to dispose of solid waste generated by construction.	Northwest would comply with all federal, state, and local statutes and regulations related to waste disposal. An analysis of the solid waste expected to be generated by the project is presented in section 4.9.3.
Thurston County	Critical Areas Ordinance	Review consistency of the project with the county Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Franchise Agreement	Consider amending Northwest's existing agreement to include the new loop.	Northwest would apply for an amended Franchise Agreement to include the new facilities associated with the Capacity Replacement Project.
	Grading Permit	Consider issuance of a permit for excavation and grading activities.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
	High Groundwater Flood Hazard Area Permit	Review consistency of the project with chapter 17.15 of the Thurston County Code (TCC).	Northwest would apply for a high groundwater flood hazard area permit per TCC 17.15.870 and would comply with all permit stipulations including those for critical areas (TCC 17.15.315). Information on frequently flooded and flood hazard areas crossed by the Capacity Replacement Project is provided in section 4.3.2.1.
	Road Crossing Permits	Consider issuance of permits to cross county roads.	Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Information on the roads and highways crossed by the Capacity Replacement Project is provided in section 4.9.4.
	Shoreline Conditional Use Permit	Consider issuance of a permit to cross the Nisqually River.	Northwest would apply for a Shoreline Conditional Use Permit to cross the Nisqually River, which is covered by the SMA and designated as "Conservancy." The crossing of the Nisqually River is discussed in section 4.3.2. The SMA is also an enforceable policy under Washington's Coastal Program. Additional information on the CZMA and SMA is presented in section 1.5.1.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Special Use Permit	Review the project for consistency with the zoning code.	Northwest would apply for a Special Use Permit for work in Thurston County; however, the project is expected to be consistent with the zoning code because the facilities associated with the project in Thurston County would be located within Northwest's existing right-of-way and adjacent to existing aboveground facility sites. Additional information on the proposed facilities and their locations, land requirements, and land use is presented in sections 2.1, 2.2, and 4.8, respectively.
	Solid Waste Disposal	Consider approval to dispose of solid waste generated by construction.	Northwest would comply with all federal, state, and local statutes and regulations related to waste disposal. An analysis of the solid waste expected to be generated by the project is presented in section 4.9.3.
Lewis County	Building Permit	Consider issuance of a permit for modifications to the Chehalis Compressor Station.	Northwest would apply for a building permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with construction (see section 4.2.2).
	Critical Areas Ordinance	Review consistency of the project with the county Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Grading Permit	Consider issuance of a permit for excavation and grading activities.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
	Solid Waste Disposal	Consider approval to dispose of solid waste generated by construction.	Northwest would comply with all federal, state, and local statutes and regulations related to waste disposal. An analysis of the solid waste expected to be generated by the project is presented in section 4.9.3.
City of Lake Stevens (Snohomish County)	Critical Areas Ordinance	Review consistency of the project with the city Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Grading Permit	Consider issuance of a permit for excavation and grading activities within city limits.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
City of Redmond (King County)	Critical Areas Ordinance	Review consistency of the project with the city Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.

TABLE 1.5-1 (cont'd)

Major Permits, Approvals, and Consultations for the Capacity Replacement Project [a]

Agency	Permit/Approval/ Consultation	Agency Action	Statement of Compliance
	Grading Permit	Consider issuance of a permit for excavation and grading activities within city limits.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).
City of Sammamish (King County)	Critical Areas Ordinance	Review consistency of the project with the city Critical Areas Ordinance.	The Growth Management Act requires county and city governments to designate and protect critical areas. Information regarding the Growth Management Act and critical areas ordinances is provided in section 1.5.2.
	Grading Permit	Consider issuance of a permit for excavation and grading activities within city limits.	Northwest would apply for a grading permit and would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures, as well as its project-specific ECR Plan, to minimize impacts associated with grading (see section 4.2.2).

[a] Consultations with Native American tribes are discussed in section 4.10.3.

[b] Shoreline and road crossing permits are not required from Skagit County because no roads or waterbodies would be crossed by the Capacity Replacement Project within the county.

Under the Washington CZMP, activities that affect any land use, water use, or natural resource within the coastal zone must comply with six laws or enforceable policies. These six laws include:

- the Shoreline Management Act (SMA)
- the SEPA;
- the CWA;
- the Clean Air Act (CAA);
- the Energy Facility Site Evaluation Council (EFSEC); and
- the Ocean Resource Management Act (ORMA).

Additional information on these six laws and how they apply or do not apply to the proposed Capacity Replacement Project is provided below. Northwest, as the applicant for the activities that require federal approval, would review the project for compliance with the six laws and would prepare a "federal consistency certification." Northwest would submit its certification directly to the WDOE, which is the agency responsible for reviewing the project for consistency with the CZMP. In the event that Northwest seeks preemption from the local shoreline permit processes, Northwest would submit a document to the WDOE explaining how the project would comply with local agency shoreline policies and regulations. The analysis would help the WDOE issue the CZMP decision.

Shoreline Management Act

The SMA was started by citizen initiative and a revised version was later passed by the Washington State Legislature in 1971. The SMA establishes the foundation of Washington's federal CZMP.

The SMA is the principal means of regulating shoreline land and water uses throughout the coastal zone and requires cities and counties to develop Shoreline Master Programs (SMP). The WDOE reviews and formally adopts the SMPs. The SMPs contain specific regulations and polices that are locally determined to promote orderly and reasonable development of waterfront lands. Local SMPs must be consistent with statewide polices. The overall intent is to protect the resources and ecology of Washington's largest streams, lakes, and marine waters.

Shoreline permit decisions are made and issued by local governments; however, the WDOE reviews those decisions. In addition, for shoreline conditional use or variance permits, the WDOE is responsible for approving, denying, or approving with additional conditions the local decision. Shoreline permits may be appealed to the State Shorelines Hearings Board.

Advance consultation with WDOE field/technical staff regarding design parameters and regulatory interpretation is advisable. The WDOE provides technical assistance to local governments and applicants on request.

Based on a review of the SMPs within each local jurisdiction crossed by the project, local permits would be required for the loops to be installed across shorelines in Whatcom, Snohomish, Pierce, and Thurston Counties (see table 1.5-1). Detailed information on the designated shorelines crossed by the proposed loops is presented in section 4.3.2.1.

State Environmental Policy Act

SEPA supplements the authority of the SMA (WDOE, 2001a). SEPA requires government agencies to analyze the environmental impacts of activities they are asked to approve. As discussed in section 1.2.3, the WDOE has been designated the lead SEPA agency. Additional information on the

SEPA process and the WDOE's role as the lead SEPA agency for the Capacity Replacement Project is provided in section 1.2.3.

Clean Water Act

The federal CWA addresses the issue of managing coastal developments to improve, safeguard, and restore the quality of the nation's waters, including coastal waters, and to protect the natural resources and existing uses of those waters (WDOE, 2001a). The state Water Pollution Control Act authorizes the WDOE to participate fully in and meet the requirements of the federal CWA. The three primary objectives of the WDOE's water quality program include:

- protecting, preserving, and enhancing the quality of the state surface water and underlying sediments; ensuring the wise, environmentally sound use of the water;
- preventing generation of pollutants; and
- achieving a water-quality stewardship ethic and educated public (WDOE, 2001a).

The WDOE has the authority to administer section 401 Water Quality Certifications and National Pollutant Discharge Elimination System (NPDES) permits within the state, except for those activities on federal or tribal lands. As indicated in table 1.5-1, Northwest would apply for the permits necessary to comply with the CWA. The WDOE's section 401 Water Quality Certification would include effluent and mixing zone conditions to meet state water quality standards. An analysis of impacts on surface waters and Northwest's proposed mitigation measures to minimize impacts is presented in section 4.3.2.

Clean Air Act

The federal CAA combined with the Clean Air Washington Act is a comprehensive system that protects and enhances air quality. As discussed more fully in section 4.11.1, modifications at three of the five compressor stations associated with the Capacity Replacement Project would not affect air quality. The modifications at the Chehalis and Washougal Compressor Stations would be more significant modifications that would affect air quality. As previously discussed, the Chehalis and Washougal Compressor Stations are located in counties outside the coastal zone (i.e., Lewis and Clark Counties, respectively) and, therefore, are not subject to a federal Coastal Zone Consistency Review. However, Northwest would apply for the permits necessary to construct and operate the Chehalis and Washougal Compressor Stations after modifications (see table 1.5-1).

Energy Facility Site Evaluation Council

The EFSEC is a one-stop, state-local permitting system for large thermal energy facilities, oil refineries that process petroleum transported over marine waters, and petroleum and natural gas pipelines (WDOE, 2001a). Intrastate natural gas pipelines larger than 14 inches in diameter and greater than 15 miles in length are subject to review by the EFSEC. Because Northwest operates an interstate natural gas pipeline system under the jurisdiction of the FERC, the proposed facilities are not subject to review by the EFSEC.

Ocean Resource Management Act

Like SEPA, the ORMA supplements the SMA (WDOE, 2001a). However, unlike SEPA that applies statewide, the ORMA only applies to the Pacific Ocean extending from Cape Flattery south to

Cape Disappointment and beginning at the mean high tide line and running seaward for 200 miles. As a result, the Capacity Replacement Project is not subject to the ORMA.

1.5.2 Growth Management Act

The Growth Management Act was passed in 1990 to address what the Washington State Legislature referred to as uncoordinated and unplanned growth that posed a threat to the environment, sustainable economic development, and the quality of life in Washington. The Growth Management Act requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, and preparing comprehensive plans. Each of the local government jurisdictions crossed by the proposed loops has implemented a comprehensive plan and has critical areas ordinances in place. A summary of the jurisdictions crossed by the loops is provided in section 2.1.1.

Comprehensive Plans

A comprehensive plan is a land use document that provides the framework and policy direction for land use decisions. According to the Growth Management Act, the plans must contain information on land use, transportation, housing, capital facilities, utilities, shorelines, and rural areas (for counties). Chapters addressing economic development and parks and recreation also are required if state funding is provided. Comprehensive plans may also include information on conservation and energy. In general, because the majority of the facilities associated with the Capacity Replacement Project would be located within Northwest's existing permanent right-of-way (see section 2.2), no conflicts with county or city comprehensive plans are anticipated. A detailed discussion of land uses affected by the project facilities, including recreation uses, is presented in section 4.8. Section 4.9 contains information about impacts associated with the project on population, economy, housing, public services, and transportation.

Critical Areas Ordinances

As required by the Growth Management Act, all of the local government jurisdictions affected by the proposed project have critical areas ordinances. There are five critical areas identified in the Growth Management Act: geologically hazardous areas (including erosion hazard areas), areas with a critical recharging effect on aquifers used for potable water, frequently flooded areas, wetlands, and fish and wildlife habitat conservation areas (Washington State Department of Community, Trade, and Economic Development, 2003). Designated critical areas affected by the Capacity Replacement Project are identified and discussed in the applicable resource sections in section 4.0 of this EIS.

1.5.3 Puget Sound Water Quality Management Plan

In 1991 the EPA adopted the PSWQM Plan as the Comprehensive Conservation and Management Plan for Puget Sound under the National Estuary Program, which was established in section 320 of the CWA (WDOE, 2001a). The PSWQM Plan addresses the waters of Puget Sound and the Strait of Juan de Fuca and all waters flowing into them (i.e., Puget Sound Basin). Under the PSWQM Plan, the WDOE prepared the Stormwater Management Manual for the Puget Sound Basin. The manual contains best management practices (BMPs) to control runoff, erosion, sedimentation, and pollution from development sites. As discussed in more detail in sections 2.3 and 4.2.2, Northwest has prepared a project-specific *Erosion Control and Revegetation Plan* (ECR Plan) that addresses the WDOE's requirements for construction stormwater discharge.

2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 PROPOSED FACILITIES

Northwest proposes to modify its existing natural gas transmission pipeline system between Sumas and Washougal, Washington. The Capacity Replacement Project would involve the construction and operation of pipeline loops and appurtenant facilities, modifications at existing compressor stations, and activities to abandon existing facilities as described below. An overview map of the project location and facilities is provided on figure 2.1-1. Detailed maps showing the pipeline loops and aboveground facilities are contained in Appendix B.

2.1.1 Pipeline Facilities

Northwest's existing natural gas transmission system between Sumas and Washougal, Washington consists of two parallel 268-mile-long, 26-inch- and 30-inch-diameter pipelines and 27.8 miles of 36-inch-diameter pipeline in four separate loops adjacent to the 30-inch-diameter pipeline. The existing 36-inch-diameter loops were recently installed for Northwest's Evergreen Expansion Project (Docket No. CP02-04-000). The proposed pipeline facilities would consist of a total of 79.5 miles of new 36-inch-diameter pipeline in four separate loops in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties, Washington. The loops would be primarily adjacent to Northwest's existing 30-inch-diameter pipeline. After the new loops are installed, Northwest would abandon its existing 268-mile-long, 26-inch-diameter pipeline. The majority of the 26-inch-diameter pipeline would be abandoned in place; however, in some locations the pipeline would be removed (see section 2.2.1). Table 2.1.1-1 lists the proposed loops by name, milepost range, length, and county.

The MAOP of the proposed loops would be 960 psig, which is the MAOP of Northwest's existing system. Operating pressure on the existing 30-inch-diameter pipeline would not increase. Additional details of the pipeline design specifications are presented in section 4.12.1.

TABLE 2.1.1-1

Pipeline Facilities Associated with the Capacity Replacement Project

Facility	Milepost Range	Length (miles) [a]	County
Sumas Loop	1484.5 - 1461.8	22.7	Whatcom
Mount Vernon Loop	1431.3 - 1431.1	0.2	Skagit
	1431.1 - 1408.8	22.3	Snohomish [b]
		22.5	
Snohomish Loop	1393.9 - 1393.1	0.8	Snohomish
	1393.1 - 1382.0	11.1	King [c]
		11.9	
Fort Lewis Loop	1338.1 - 1324.3	13.7	Pierce
	1324.3 - 1315.6	8.7	Thurston
		22.4	
Project Total		79.5	

[a] Due to rounding, differences between mileposts may not equal the length.
[b] Within Snohomish County, the Mount Vernon Loop would cross land under the jurisdiction of the City of Lake Stevens at MP 1411.2 and between MPs 1410.0 and 1409.8.
[c] Within King County, the Snohomish Loop would cross land under the jurisdiction of the City of Redmond between MPs 1388.8 and 1387.4 and the City of Sammamish between MPs 1383.4 and 1382.0.

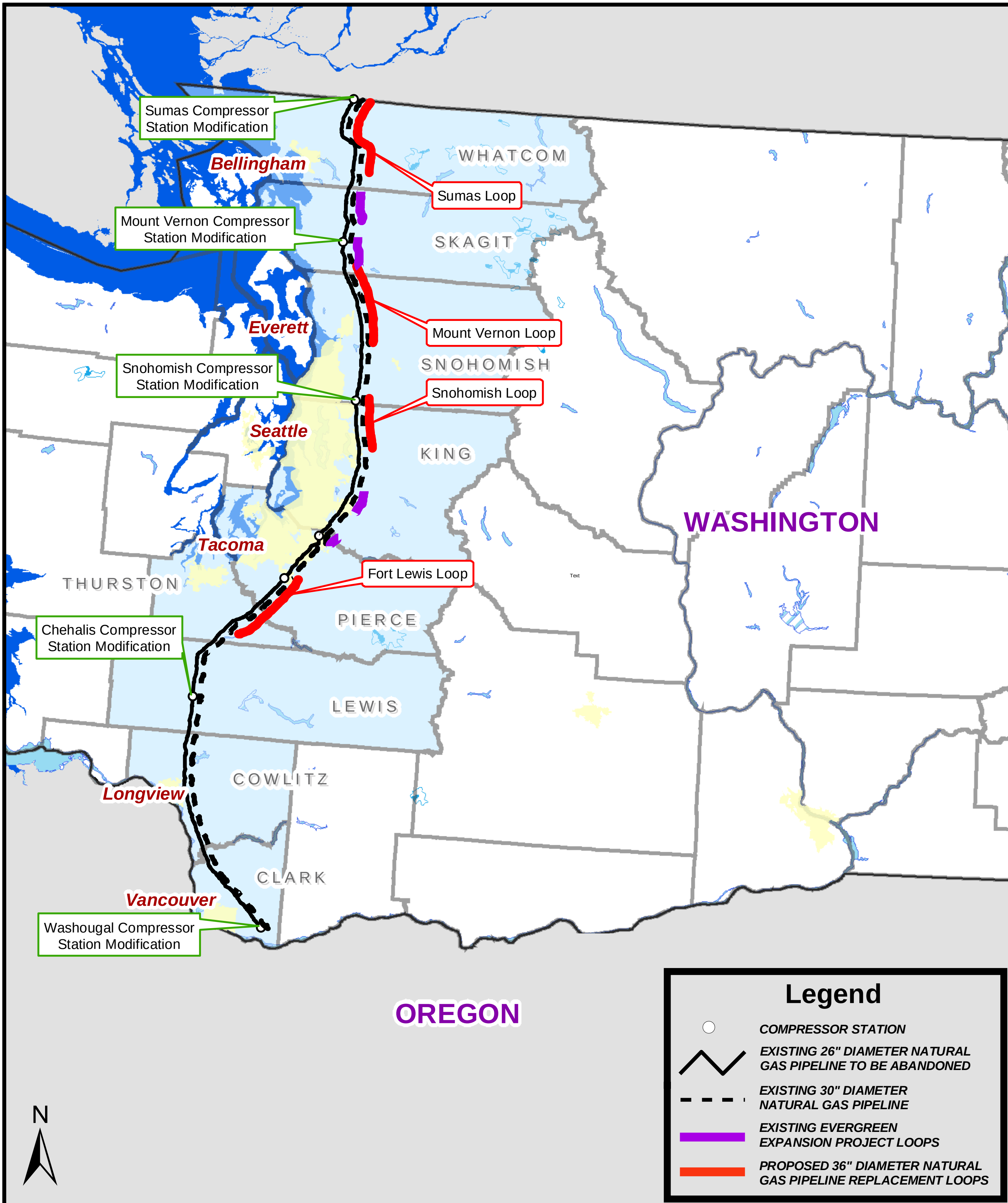


Figure 2.1-1

Capacity Replacement Project

Project Overview Map

2.1.2 Aboveground Facilities

Associated aboveground facilities proposed by Northwest include (see tables 2.1.2-1 and 2.1.2-2):

- modifications at 5 existing compressor stations, 1 each in Whatcom, Skagit, Snohomish, Lewis, and Clark Counties for a total of 10,760 net hp of new compression;
- installation of 3 pig launchers, 1 each at the beginning of the Sumas, Snohomish, and Fort Lewis Loops and collocated with proposed MLV sites;
- installation of 3 pig receivers, 1 each at the end of the Sumas, Snohomish, and Fort Lewis Loops and collocated with proposed MLV sites;
- relocation of 1 pig receiver from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop to the end of the proposed Mount Vernon Loop and collocated with a proposed MLV site;
- installation of 5 30-inch and 15 36-inch MLVs along the proposed loops (15 collocated with existing aboveground facilities, 4 collocated with proposed pig receiver sites, and 1 not collocated with other aboveground facilities); and
- installation of 6 30-inch MLVs along the existing Evergreen Expansion Project loops (all collocated with existing aboveground facilities).

Details of the aboveground facility design specifications and technical capabilities are presented in section 4.12.1.

TABLE 2.1.2-1

Compressor Station Modifications Associated with the Capacity Replacement Project

Facility	Modification	Existing Horsepower (ISO)	New/Uprated Horsepower (ISO)	Total Added Horsepower (ISO)	Milepost	County
Sumas Compressor Station	Reconfigure existing reciprocating compressors, modify piping, replace exhaust ducting and silencers	NA	NA	0	1484.5	Whatcom
Mount Vernon Compressor Station	Modify piping, replace exhaust ducting and silencers	NA	NA	0	1440.2	Skagit
Snohomish Compressor Station	Modify piping	NA	NA	0	1393.9	Snohomish
Chehalis Compressor Station	Install new Solar Taurus 70 compressor with a gas after cooler and fuel gas heater	NA	10,310	10,310	1289.4	Lewis
	Derate existing reciprocating compressor	6,350	4,800	-1,550		
	Remove Solar Saturn T1300 compressor from the station's operating permit	NA	NA	0		
	Modify piping	NA	NA	0		
Washougal Compressor Station	Uprate existing Solar Centaur 50 compressor to a Solar Taurus 60 compressor	5,700	7,700	2,000	1216.2	Clark
	Rewheel existing Solar C337 compressor	NA	NA	0		
Total Net Horsepower				10,760		

ISO = International Organization for Standardization.
NA = Not applicable.

TABLE 2.1.2-2

Pig Launcher/Receiver Facilities and Mainline Valves Associated with the Capacity Replacement Project

Loop/Aboveground Facility	Milepost	County
PIG LAUNCHERS/RECEIVERS		
Sumas		
Launcher	1484.5	Whatcom
Receiver [a]	1461.8	Whatcom
Mount Vernon		
Receiver [a, b]	1408.8	Snohomish
Snohomish		
Launcher	1393.9	Snohomish
Receiver	1382.0	King
Fort Lewis		
Launcher	1338.1	Pierce
Receiver	1315.6	Thurston
MAINLINE VALVES ALONG THE PROPOSED LOOPS[c]		
Sumas		
MLV (36-inch)	1484.5	Whatcom
MLV (36-inch)	1472.3	Whatcom
MLV (36-inch) [a]	1467.9	Whatcom
MLVs (30-inch and 36-inch) [a]	1461.8	Whatcom
Mount Vernon		
MLVs (30-inch and 36-inch)	1431.3	Skagit
MLV (36-inch)	1427.6	Snohomish
MLV (36-inch)	1411.3	Snohomish
MLVs (30-inch and 36-inch) [a]	1408.8	Snohomish
Snohomish		
MLV (36-inch)	1393.9	Snohomish
MLV (36-inch)	1387.5	King
MLV (36-inch)	1382.0	King
Fort Lewis		
MLVs (30-inch and 36-inch)	1338.1	Pierce
MLV (36-inch)	1335.1	Pierce
MLV (36-inch)	1324.7	Pierce
MLVs (30-inch and 36-inch)	1315.6	Thurston
MAINLINE VALVES ALONG THE EVERGREEN EXPANSION PROJECT LOOPS[c]		
Evergreen Sedro-Woolley		
MLV (30-inch)	1453.5	Skagit
Evergreen Mount Vernon		
MLV (30-inch)	1440.1	Skagit
Evergreen Covington		
MLV (30-inch)	1370.8	King
MLV (30-inch)	1364.0	King
Evergreen Auburn		
MLV (30-inch)	1355.2	King
MLV (30-inch)	1351.7	Pierce

[a] Not collocated with other existing aboveground facilities.

[b] Relocated from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop.

[c] The proposed 30-inch MLVs are necessary to isolate one pipeline during maintenance on the other parallel pipeline. This redundancy was previously provided by the 26-inch-diameter pipeline that would be abandoned.

2.1.3 Abandoned Facilities

After the proposed loops are placed in service, the 26-inch-diameter pipeline between Sumas and Washougal would be abandoned with the exception of a short segment within and between the existing Jackson Prairie Meter Station and the Chehalis Compressor Station. In order to abandon the 26-inch-diameter pipeline, Northwest would need to isolate it from other system components to prevent the potential for gas flow from the 26-inch-diameter pipeline to a meter station, or from the existing 30-inch-diameter pipeline and existing and proposed 36-inch-diameter loops into the abandoned 26-inch-diameter pipeline. The taps that feed the existing meter stations would be excavated and the valve isolated using a blind flange and welded cap. In addition, Northwest would excavate, cut, and cap the crossovers that currently tie the 26-inch-diameter pipeline to the 30-inch-diameter pipeline. The abandonment activities would occur at 24 locations along the proposed loops and at 48 other locations along the remainder of Northwest's existing system. Table 2.1.3-1 lists and describes the abandonment activities by facility name, milepost, and county.

Once the abandonment activities are completed, natural gas would be removed from the 26-inch-diameter pipeline and other facilities with nitrogen, an inert gas. Nitrogen would be allowed to flow into and continue down sections of the pipeline to displace all of the natural gas within that section. The facilities would then be isolated with the nitrogen in them and abandoned in place. No water would be used or discharged during purging activities.

2.2 LAND REQUIREMENTS

Table 2.2-1 summarizes the land requirements for the Capacity Replacement Project. A detailed description and breakdown of land requirements and use is presented in section 4.8.1. Construction of the Capacity Replacement Project would disturb approximately 1,238.5 acres of land, including the pipeline facilities, aboveground facility sites, abandoned facility sites, and pipe storage and contractor yards. Approximately 706.1 acres of the 1,238.5 acres used for construction would be required for operation of the project. Of this total, about 704.6 acres would be for the pipeline facilities and 1.5 acres would be for the aboveground facilities. The remaining 532.4 acres of land would be restored and allowed to revert to former use.

Approximately 13 percent of the land affected by construction and operation of the Capacity Replacement Project would be on federal lands associated with Fort Lewis (6 percent) and tribal lands (1 percent), the State of Washington (2 percent), and local governments (4 percent). The remainder of the land that would be affected (87 percent) is privately owned. A detailed description of land ownership is presented in section 4.8.2.

2.2.1 Pipeline Facilities

Of the approximately 1,238.5 acres of land disturbed during construction of the Capacity Replacement Project, about 877.0 acres would be disturbed by the pipeline right-of-way, 144.1 acres would be disturbed by temporary extra workspace, and 3.0 acres would be disturbed by access roads. Of the 877.0 acres disturbed by the pipeline construction right-of-way, about 687.6 acres or 78 percent is currently maintained as part of Northwest's existing permanent right-of-way. Operation of the pipeline facilities would require about 704.6 acres of land, consisting of 704.3 acres for the pipeline right-of-way and 0.3 acre for permanent access roads along the pipeline right-of-way.

TABLE 2.1.3-1

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
ABANDONMENT ACTIVITIES ALONG THE PROPOSED LOOPS		
Whatcom		
Sumas Loop		
Bellingham No. 2 Delivery Meter Station	1481.6	Install 12-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Lynden Delivery Meter Station	1478.6	Install 3-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Lawrence Delivery Meter Station	1473.5	Install 2-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Bellingham Line Interconnect	1472.3	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
6-inch Bellingham Line	1472.3	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Deming Delivery Meter Station	1469.9	Install 2-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
26-inch Crossover	1468.1	Disconnect the crossover between the 26-inch- and 30-inch-diameter pipelines; install new crossover between the 30-inch- and 36-inch-diameter pipelines.
Snohomish		
Mount Vernon Loop		
Stanwood Line	1429.8	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
26-inch Crossover	1427.6	Disconnect the crossover between the 26-inch- and 30-inch-diameter pipelines; install new crossover between the 30-inch- and 36-inch-diameter pipelines.
Latter Day Saint Delivery Tap	1424.0	Isolate from the 26-inch-diameter pipeline.
Arlington Delivery Meter Station	1422.6	Install 3-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Granite Falls Delivery Meter Station	1414.1	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Lake Stevens Delivery Meter Station	1409.8	Install 3-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Snohomish		
Snohomish Loop		
Echo Lake Meter Station	1394.0	Blind 1-inch tap valve and cap line at the 26-inch-diameter pipeline; isolate the 26-inch-diameter pipeline from the 30-inch crossover.
King		
Snohomish Loop		
Duvall-Cottage Lake Delivery Meter Station (Abandoned)	1391.4	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Novelty Hill Delivery Meter Station	1387.2	Install 8-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Redmond Delivery Meter Station	1385.4	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.

TABLE 2.1.3-1 (cont'd)

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
Redmond District Delivery Tap (Abandoned)	1383.9	Install 2-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Pierce		
Fort Lewis Loop		
Frederickson and Puget Power Delivery Meter Station	1338.1	Install 10-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Bethel Delivery Meter Station	1335.8	Install 4-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
26-inch Crossover, Valve 16-7AX-A,B (16-inch-diameter pipeline) 26-inch Crossover, Valve 16-7AX (26-inch-diameter pipeline)	1335.1	Disconnect the crossover between the 26-inch- and 30-inch-diameter pipelines; install new crossover between the 30-inch- and 36-inch-diameter pipelines.
16-inch Crossover	1324.7	Disconnect and reconnect crossover.
Thurston		
Fort Lewis Loop		
Yelm Delivery Meter Station	1322.9	Install 4-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Olympia/Grays Harbor Lateral	1315.6	Install 16-inch and 10-inch taps on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
ABANDONMENT ACTIVITIES IN LOCATIONS OUTSIDE THE PROPOSED LOOPS		
Whatcom		
Acme Meter Station	1461.2	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Skagit		
Fruitdale Block Valve	1450.7	Isolate from the 26-inch-diameter pipeline.
Sedro-Woolley Meter Station	1447.7	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline. Provide new connection to the 36-inch-diameter pipeline.
Anacortes Meter Station	1440.6	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Snohomish		
Machias Meter Station	1408.0	Blind 3-inch tap valve and cap line at the 26-inch-diameter pipeline.
Snohomish Meter Station	1402.5	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Grotto line Take-off	1401.0	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Bartelheimer Dairy Meter Station	1400.2	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
North Seattle Take-off	1397.1	Isolate both laterals from the 26-inch-diameter pipeline. Provide new connections to the 30-inch-diameter pipeline.
King		
North Bend Meter Station	1379.3	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
May Valley Meter Station	1372.7	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
South Seattle Take-off	1370.1	Blind both 10-inch tap valves and cap line at the 26-inch-diameter pipeline.
Lake Francis Meter Station	1368.6	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Covington Meter Station	1362.8	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.

TABLE 2.1.3-1 (cont'd)

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
Black Diamond Meter Station	1360.2	Blind 10-inch tap valve and cap line at the 26-inch-diameter pipeline.
Cameron Village East Auburn Tap	1356.1	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Enumclaw Buckley Meter Station	1356.0	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Pierce		
North Tacoma Take-off	1352.1	Isolate both 8-inch and 16-inch laterals from the 26-inch-diameter pipeline and make new connections to the 30-inch-diameter pipeline.
Sumner Compressor Station	1351.6	Piping modification.
Puyallup North Meter Station	1347.2	Blind 4-inch tap valve and cap line at the 26-inch-diameter pipeline.
Puyallup (Rainier Terrace) Meter Station	1343.3	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
South Tacoma Delivery Site	1339.2	Isolate from the 26-inch-diameter pipeline and tie-in blow-off valves.
Boeing and Fredrickson Delivery Meter	1338.9	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Scott Delivery Meter Station	1338.4	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Thurston		
26-inch Crossover, Valve 16-6XS	1309.9	Isolate valve from the 26-inch-diameter pipeline.
Lewis		
Centralia Line Take-off	1305.3	Isolate from the 30-inch-diameter interconnect.
Chehalis Meter Station	1298.2	Isolate from the 30-inch-diameter interconnect.
Berwick Lateral Tie-In	1297.2	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Mac Millan Rest Home Tap	1294.5	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Jackson Prairie Storage Facility	1289.3	Piping modification.
Winlock Meter Station	1286.8	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline. Verify the connection to the 30-inch-diameter pipeline.
Toledo Meter Station	1284.0	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Cowlitz		
Castle Rock Meter Station	1270.9	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline, remove 1-inch blow-off valve.
Kelso-Beaver Meter Station	1266.6	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Weyerhaeuser/Ostrander Meter Station	1265.5	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Kelso (Longview) Meter Station	1262.9	Blind 4-inch tap valves and cap two 4-inch-diameter lines at the 26-inch-diameter pipeline.
Longview South Meter Station	1258.4	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Kalama Farm Tap	1251.4	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Astoria Line Take-off	1249.3	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Woodland Meter Station	1243.7	Blind 4-inch tap valve and cap line at the 26-inch-diameter pipeline.

TABLE 2.1.3-1 (cont'd)

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
Clark		
Van Der Salm Bulb Farm Meter Station	1240.0	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline. Verify the connection to the 30-inch-diameter pipeline.
26-inch Crossover, Valve 16-1X	1239.4	Isolate valve from the 26-inch-diameter pipeline.
Ridgefield Meter Station	1237.7	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Portland Lateral Take-Off	1232.5	Remove input from the 26-inch-diameter pipeline, blind both 16-inch tap valves, cap 16-inch lines, isolate bypass, and disconnect interconnect to the 30-inch-diameter line.
Battleground District Office Meter Tap	1231.1	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline
Battleground Meter Station	1229.1	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline. Remove 1-inch vent.
North Vancouver Meter Station	1225.4	Blind 4-inch tap valve and cap line at the 26-inch-diameter pipeline. Remove 2-inch vent. Install isolation flange.
Camas Delivery Meter Station	1217.5	Isolate two 4-inch lines from the 26-inch-diameter pipeline. Install 4-inch blind flange on each tap. Cap each 4-inch pipeline connection. Maintain single 4-inch connection to the 30-inch-diameter pipeline.

TABLE 2.2-1

Summary of Land Requirements Associated with the Capacity Replacement Project

Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Pipeline Facilities		
Pipeline Right-of-Way		
Existing Permanent Easement	687.6	687.6
New Permanent Easement	16.7	16.7
Temporary Construction Right-of-Way	172.7	0.0
Pipeline Right-of-Way Subtotal	877.0	704.3
Temporary Extra Workspace	144.1	0.0
Access Roads	3.0	0.3
Pipeline Facilities Total	1,024.1	704.6
Aboveground Facilities		
Compressor Stations		
Sumas Compressor Station	0.0	0.0
Mount Vernon Compressor Station	0.0	0.0
Snohomish Compressor Station	0.0	0.0
Chehalis Compressor Station	7.7	1.5
Washougal Compressor Station	0.0	0.0
Compressor Station Subtotal	7.7	1.5
Pig Launchers and Receivers [a]	0.0	0.0
Mainline Valves		
Along the Proposed Loops [b]	0.0	0.0
Along the Evergreen Expansion Project Loops [c]	1.7	0.0
Mainline Valve Subtotal	1.7	0.0
Aboveground Facilities Total	9.4	1.5
Abandoned Facilities		
Along the Proposed Loops [d]	0.0	0.0
Along the Remainder of Northwest's System	14.4	0.0
Abandoned Facilities Total	14.4	0.0
Pipe Storage and Contractor Yards	190.6	0.0
Project Total	1,238.5	706.1

a The pig launcher at the beginning of the Sumas Loop (MP 1484.5) would be located within the existing Sumas Compressor Station and would not require any additional land during construction and operation. The other two pig launchers and two of the pig receivers would be collocated with other aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during construction and operation. The two pig receivers not collocated with other aboveground facilities would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with these facilities is included in the acreage calculations for the pipeline right-of-way.

b All but one of the MLVs along the proposed loops would be collocated with either existing aboveground facilities or proposed pig receiver sites within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during construction and operation. The one MLV not collocated with other aboveground facilities would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with this facility is included in the acreage calculations for the pipeline right-of-way.

C Of the six MLVs along the Evergreen Expansion Project loops, five would require about 0.3 acre each of land for construction and one would require about 0.2 acre of land for construction. All of these facilities would be collocated with existing aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation.

d The acreage of disturbance associated with the abandoned facilities along the proposed loops is included in the acreage calculations for the pipeline right-of-way.

The proposed loops would be generally installed within Northwest's existing permanent right-of-way using a standard 20-foot offset to the east of Northwest's existing 30-inch-diameter pipeline. At certain locations, however, the proposed route deviates from this standard offset configuration due to terrain, environmental features, or development. Table C-1 in Appendix C identifies the location and length of each non-standard parallel offset (including locations where the 26-inch-diameter pipeline would be removed and the 36-inch-diameter pipeline installed in the same trench) and route variations and provides Northwest's rationale for adopting them as part of the proposed route.

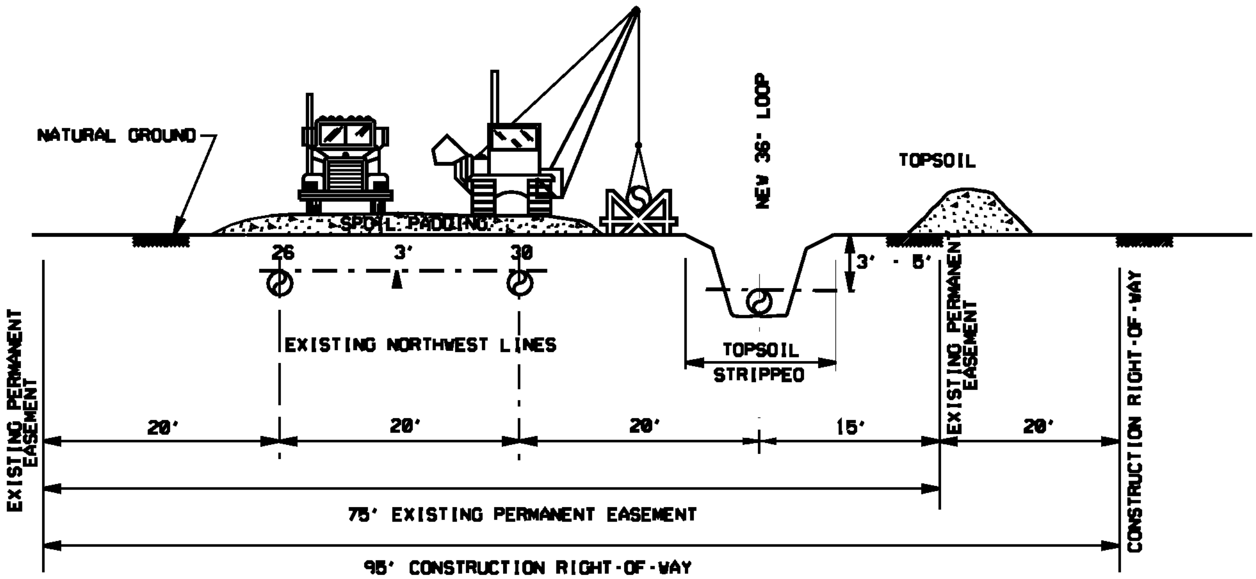
Of the 79.5 miles of proposed pipeline, approximately 78.4 miles (99 percent) would be constructed within or adjacent to Northwest's existing right-of-way and 1.1 miles (1 percent) would be constructed on newly created right-of-way that does not parallel existing rights-of-way. Of the 78.4 miles, 74.2 miles (93 percent of the total route) would be constructed within Northwest's existing right-of-way and would not require any additional permanent right-of-way for operation (51.6 miles using the standard 20-foot offset to the east of the existing 30-inch-diameter pipeline and 22.6 miles using a non-standard parallel offset). The remaining 4.2 miles (5 percent of the total route) would be located adjacent to and/or partially overlap Northwest's existing easement but would require additional permanent right-of-way for operation.

Northwest proposes to generally use a 95-foot-wide construction right-of-way, consisting of Northwest's existing 75-foot-wide maintained right-of-way and 20 feet of new temporary workspace. On the Snohomish Loop and in other areas where encroachment, development, or other limitations confine available workspace, Northwest would remove the 26-inch-diameter pipeline and place the 36-inch-diameter loop in the same trench using the full width of the existing right-of-way, which varies from 60 to 75 feet. In total, the 26-inch-diameter pipeline would be removed from about 14.6 miles along the proposed loops (11.9 miles along the Snohomish Loop, 1.8 miles along the Sumas Loop, 0.7 mile along the Mount Vernon Loop, and 0.2 mile along the Fort Lewis Loop). Northwest would generally use a 75-foot-wide construction right-of-way in wetland areas. In those areas where the proposed loop deviates from the existing right-of-way, Northwest would typically use a 95-foot-wide construction right-of-way. Figure 2.2.1-1, sheets 1 through 3, illustrates Northwest's typical right-of-way cross sections along the proposed loops. Northwest's actual breakdown of workspace within the construction right-of-way (e.g., spoil storage areas, equipment travel lanes) would vary depending on site-specific conditions.

Because the majority of the new loops would be installed within the existing 75-foot-wide right-of-way, no additional permanent right-of-way would be required. However, in some locations, Northwest retains only a 60-foot-wide permanent right-of-way. In these areas, Northwest states that it may request additional operational right-of-way to bring the easement up to 75 feet if space is available and the landowner is willing to expand the easement. In those areas where the proposed loop deviates from the existing right-of-way, Northwest would typically retain a 50-foot-wide new permanent right-of-way.

In addition to the construction right-of-way, Northwest has identified temporary extra workspaces that would be required for staging areas and construction at wetlands, waterbodies, and roads, and in areas of steep slopes and rugged terrain. The approximate locations and sizes of temporary extra workspaces identified by Northwest are listed in table D-1 in Appendix D.

Working Side Over the Existing Lines



Working Side Not Over the Existing Lines

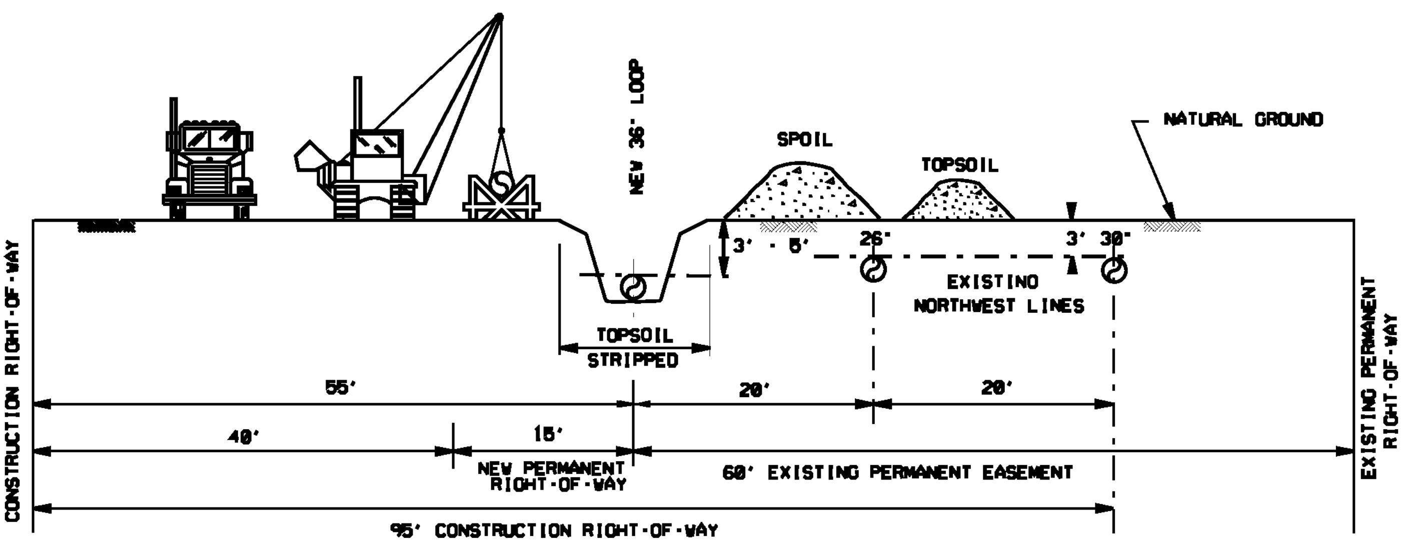
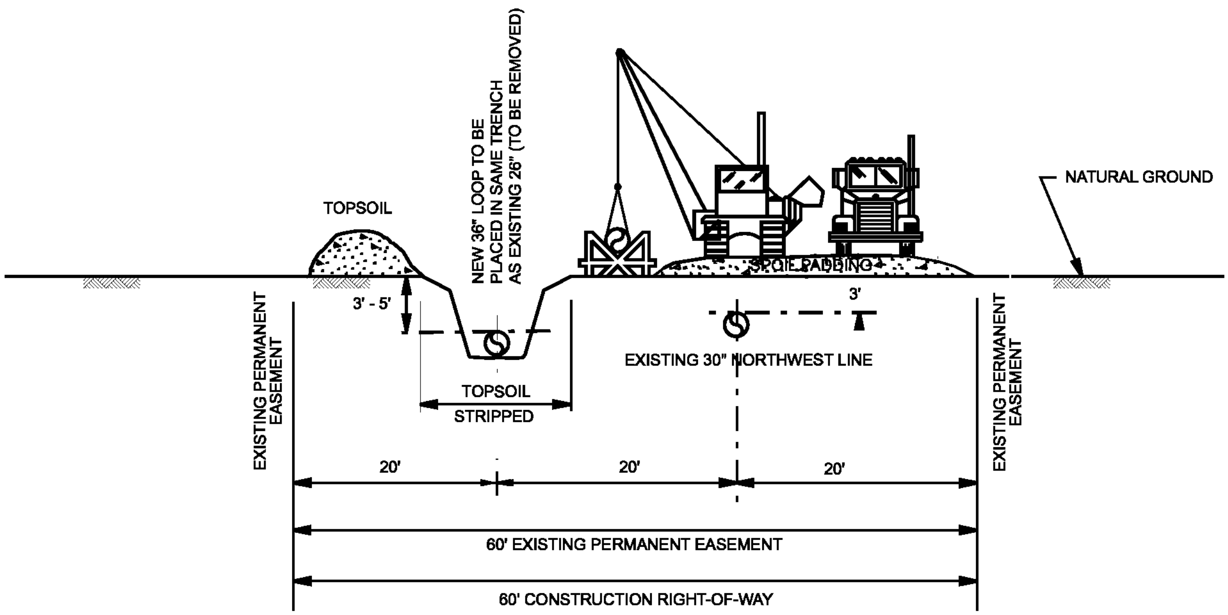


Figure 2.2.1-1

Capacity Replacement Project

Typical Right-of-Way Cross Sections

Same Trench Construction with 60-foot-wide Construction Right-of-Way



Same Trench Construction with 95-foot-wide Construction Right-of-Way

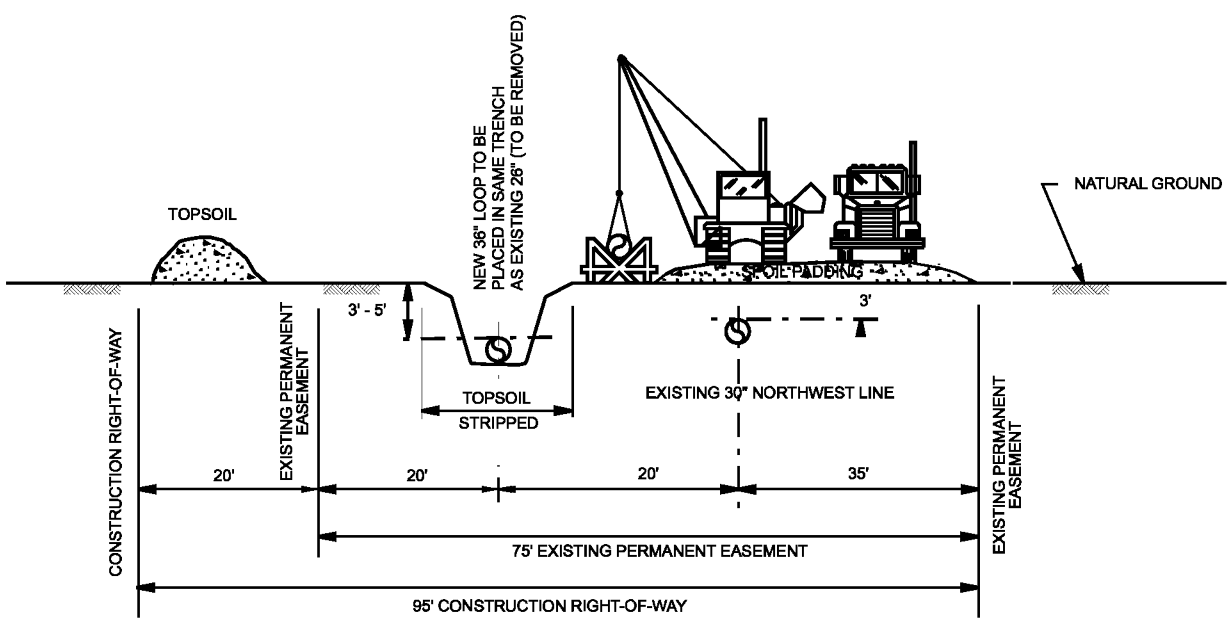


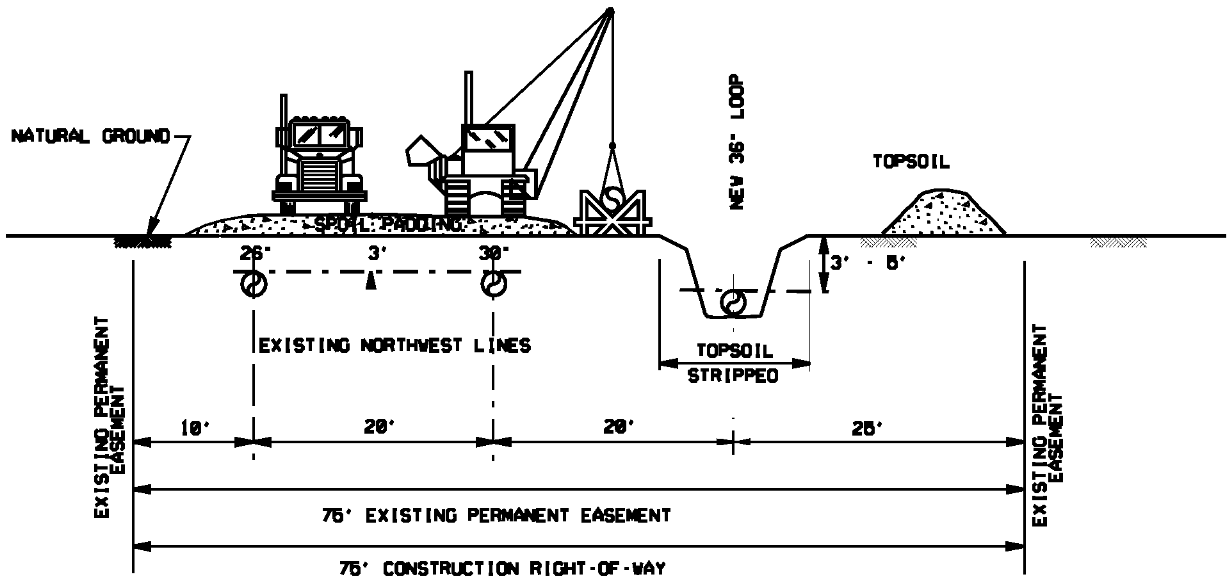
Figure 2.2.1-1

Capacity Replacement Project

Typical Right-of-Way Cross Sections

Sheet 2 of 3

Non-Agricultural Wetlands



Route Variations

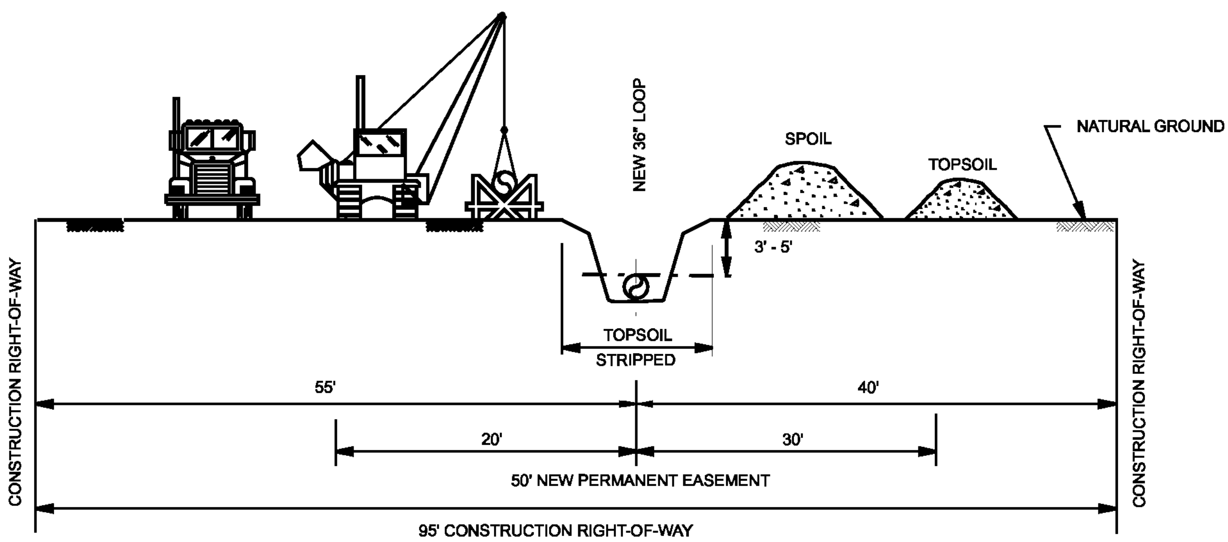


Figure 2.2.1-1

Capacity Replacement Project

Typical Right-of-Way Cross Sections

Northwest would utilize the same access roads that are currently used for operation of the existing easement to provide access to most of the construction right-of-way. Other roads recently constructed by public and private entities may also be used if they are suitable and landowner approval is received. Northwest indicates that the availability of existing public and private roads is sufficient to preclude the need to construct new roads to access the pipeline right-of-way; however, Northwest would need to construct nine temporary access roads along the construction right-of-way to avoid or minimize impacts on waterbodies and/or wetlands or to provide access to features in order to avoid major move-arounds of construction equipment. In addition, Northwest would construct two permanent access roads to provide operational access to two aboveground facility sites (see section 2.2.2). The locations of the identified access roads and proposed new access roads are listed in table D-2 in Appendix D.

2.2.2 Aboveground Facilities

Northwest proposes to use a total of about 9.4 acres of land for construction of aboveground facilities. Of this total, 1.5 acres would be retained during operation. Construction activities at four of the five compressor stations (Sumas, Mount Vernon, Snohomish, and Washougal) would occur within the existing buildings or on previously disturbed, graded, or graveled areas within the existing fenceline of the facilities. No additional land would be required or disturbed during the modifications to these stations. A total of approximately 7.7 acres of land would be required for construction activities at the Chehalis Compressor Station. Of the 7.7 acres, 1.5 acres would be permanently added to the existing facility (1.4 acres to expand the station's fenced area and 0.1 acre for a gravel road to an existing water supply well).

Three pig launchers and four pig receivers would be constructed as part of the Capacity Replacement Project. The three pig launchers would be installed at the beginning of the Sumas, Snohomish, and Fort Lewis Loops. Three of the pig launchers would be installed at the end of each of these loops and one pig receiver would be relocated from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop to the end of the proposed Mount Vernon Loop. The pig launcher at the beginning of the Sumas Loop (MP 1484.5) would be located within the existing Sumas Compressor Station and would not require any additional land during construction and operation. The other two pig launchers and two of the pig receivers would be collocated with other aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during construction and operation. The two pig receivers not collocated with other aboveground facilities (MPs 1461.8 and 1408.8) would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with these facilities is included in the acreage calculations for the pipeline right-of-way.

A total of 26 MLVs (5 30-inch and 15 36-inch MLVs associated with the proposed loops and 6 30-inch MLVs along the existing Evergreen Expansion Project loops) would be constructed as part of the project. All but one of the MLVs along the proposed loops would be collocated with either existing aboveground facilities or the proposed pig receiver sites at MPs 1461.8 and 1408.8 within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during construction and operation. The one MLV not collocated with other aboveground facilities (MP 1467.9) would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with this facility is included in the acreage calculations for the pipeline right-of-way. Of the six MLVs along the Evergreen Expansion Project loops, five would require about 0.3 acre each of land for construction and one would require about 0.2 acre of land for construction (1.7 acres total). All of these facilities would be collocated with existing aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation.

Northwest would construct two permanent access roads to provide operational access to the site of the pig receiver and two MLVs at the end of the Mount Vernon Loop at MP 1408.8 and the site of the pig receiver and two MLVs at the end of the Fort Lewis Loop at MP 1315.6. The access road to the site at MP 1408.8 would be about 266 feet long and would affect about 0.1 acre of land. The access road to the site at MP 1315.6 would be about 352 feet long and would affect about 0.2 acre of land.

2.2.3 Abandoned Facilities

The abandonment activities at the 24 locations along the proposed loops would occur within the construction right-of-way associated with each loop and would not require any additional land. Construction activities at the 48 abandoned facility sites located outside of the proposed loops would require about 14.4 acres of land within Northwest's existing permanent right-of-way. The locations and sizes of the temporary extra workspaces associated with these facilities are listed in table D-3 in Appendix D.

2.2.4 Pipe Storage and Contractor Yards

To support construction activities, Northwest proposes to use 13 pipe storage and contractor yards on a temporary basis. These yards would temporarily affect about 190.6 acres of land. The sizes and locations of the yards identified by Northwest are listed in table 2.2.4-1.

TABLE 2.2.4-1

Pipe Storage and Contractor Yards Associated with the Capacity Replacement Project

Facility	Size (acres)	Previously Disturbed	County	Section/Township/Range
Sumas Industrial Park Yard	6.0	Yes	Whatcom	Sec. 34, T41N, R4E
Jones Road Yard (Lots 1 and 2)	25.5	Yes [a]	Whatcom	Sec. 36, T41N, R4E
Bellingham GSX Yard				
Rail Siding	13.5	Yes	Whatcom	Sec. 8, 16, 17, 21, and 22, T40N, R1E
Staging Site	18.9	No		
Nooksack Yard	7.6	No	Whatcom	Sec. 29, T40N, R4E
Burlington Yard	14.8	Yes	Skagit	Sec. 29, T35N, R4E
Skagit Yard	4.5	Yes	Skagit	Sec. 24, T35N, R4E
Arlington Yard	16.4	Yes	Snohomish	Sec. 22, T31N, R5E
Second Arlington Yard	10.1	Yes	Snohomish	Sec. 14, T31N, R5E
Maltby 1a and 1b Yards	6.7	No	Snohomish	Sec. 24, T27N, R5E
Maltby 2a, 2b, and 2c Yards	9.7	No	Snohomish	Sec. 25, T27N, R5E
4647 – 192nd Yard	18.0	Yes	Pierce	Sec. 36, T19N, R3E
4667 – 192nd Yard	28.7	Yes	Pierce	Sec. 36, T19N, R3E
Yelm Yard	10.2	No	Thurston	Sec. 18 and 19, T17N, R2E
Total	190.6			

[a] The Jones Road Yard currently consists of plowed fields but has been used in the past by Northwest as a temporary construction work area so is considered previously disturbed.

2.3 CONSTRUCTION PROCEDURES

The pipeline facilities would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the DOT regulations in Title 49 CFR Part 192,[1] Transportation of

[1] Pipe design regulations for steel pipe are contained in subpart C, Part 192. Section 192.105 contains a design formula for the pipeline's design pressure. Sections 192.107 through 192.115 contain the components of the design formula, including yield strength, wall thickness,

Natural and Other Gas by Pipeline: Minimum Federal Safety Standards; and other applicable federal and state regulations, including U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) requirements. These regulations are intended to ensure adequate protection for the public and to prevent natural gas pipeline accidents and failures. Among other design standards, Part 192 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

To reduce construction impacts, Northwest would implement the January 17, 2003 versions of the FERC staff's *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures) (see Appendices E and F, respectively).[2] In some cases, variances to the Plan and Procedures have been requested. Variances are discussed in the following subsections and in section 4.0 as applicable. In addition to implementing the Plan and Procedures, Northwest has prepared a project-specific ECR Plan (see Appendix G) that incorporates many of the mitigation measures outlined in the Plan and Procedures as well as agency-recommended revegetation and erosion control procedures.

The intent of the FERC staff's Plan and Procedures is to assist applicants by identifying baseline mitigation measures for minimizing the extent and duration of disturbances on soils, wetlands, and waterbodies associated with projects under the FERC's jurisdiction throughout the country. As general guidelines, the Plan and Procedures may be less stringent than state guidelines that are based on local concerns and issues. For example, buffer zone widths, revegetation monitoring, and mitigation scope are all more rigorous under Washington state guidelines due to the critical habitat areas located in the state. Recent guidelines from Washington state agencies (e.g., the WDOE's August 2001 Stormwater Management Manual for Western Washington, the WDOE's April 2004 Guidance on Wetland Mitigation in Washington State, and the WDFW's 2002 Integrated Streambank Protection Guidelines) are increasingly emphasizing holistic, site-specific solutions that utilize "best available science" all the way from planning through construction, especially for critical areas. The WDOE is the agency with jurisdiction for the section 401 Water Quality Certification that would be required for this project. It is expected that the WDOE would require that Northwest conform to state guidelines as a condition of permit approval. Other agencies may impose additional requirements as part of their authorizations. Northwest would be required to adhere to the most stringent of its permit conditions during construction and operation of the Capacity Replacement Project.

To avoid or minimize the potential for harmful spills and leaks during construction, Northwest has developed a *Spill Prevention, Containment, and Countermeasures Plan* (SPCC Plan) (see Appendix H). Northwest's SPCC Plan describes spill prevention practices, emergency response procedures, emergency and personnel protection equipment, release notification procedures, and cleanup procedures.

Northwest has also prepared a *Horizontal Directional Drill Contingency Plan* (HDD Plan) (see Appendix I) for the proposed horizontal directional drill (HDD) crossings that identifies specific procedures and steps involved with pipeline installation as well as corrective actions and monitoring, cleanup, and agency notification procedures in the event of an inadvertent release of drilling fluid.

These plans are discussed in further detail in section 4.0.

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design factor, longitudinal joint factor, and temperature derating factor, which are adjusted according to the project design conditions, such as pipe manufacturing specifications, steel specifications, class location, and operating conditions. Pipeline operating regulations are contained in subpart L, Part 192.

2 The FERC staff's Plan and Procedures are a set of construction and mitigation measures that were developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general.

2.3.1 General Pipeline Construction Procedures

This section describes the general procedures proposed by Northwest for the construction of the pipeline facilities. Figure 2.3.1-1 shows the typical steps of cross-country pipeline construction. Northwest currently plans to use four general construction crews or "spreads" to build the pipeline over a period of approximately 8 months, with an average crew size of 300 workers and a peak crew size of 350 workers on each spread. The abandonment activities along the proposed loops would be completed by the construction spread for each loop. Separate crews would be used for construction of the aboveground facilities and abandonment activities along the remainder of Northwest's system as described in sections 2.3.3 and 2.3.4, respectively.

Standard pipeline construction is composed of specific activities that make up the linear construction sequence. These operations collectively include survey and staking of the right-of-way; clearing and grading; trenching; pipe stringing, bending, and welding; lowering the pipeline into the trench; backfilling the trench; hydrostatic testing; and cleanup and restoration. The procedures Northwest would follow to conduct these activities are described below. In addition, Northwest would use special construction techniques where warranted by site-specific conditions (see section 2.3.2).

Survey and Staking

The first step of construction would involve marking the limits of the approved work area (i.e., the construction right-of-way boundaries and temporary extra workspaces) and the pipeline centerline, and flagging the location of approved access roads. Affected landowners would be notified prior to surveying and staking activities. Wetland boundaries and other environmentally sensitive areas would be marked or fenced for protection. Underground utilities (i.e., cables, conduits, and pipelines) and agricultural drainages would be located and flagged to prevent accidental damage during construction. Fences would be braced and cut, and temporary gates and fences would be installed to limit public access or contain livestock, if present.

Clearing and Grading

A clearing crew would clear the work area of vegetation and obstacles (e.g., trees, logs, brush, and rocks). Timber would only be removed when absolutely necessary for construction purposes. Timber and other vegetative debris would be burned, chipped, or otherwise disposed in accordance with applicable local regulations. Burning would occur only if allowed by local authorities and air quality conditions permit. Appropriate fire prevention methods would be applied to minimize fire hazard and prevent heat damage to surrounding vegetation.

Once the right-of-way is cleared, it would be graded where necessary to create a reasonably level working surface to allow safe passage of equipment. Topsoil would be stripped and stockpiled along one side of the right-of-way in residential areas, agricultural lands, pastures, hayfields, and other areas at the landowner's request leaving the other side of the right-of-way to be used for access, material transport, and pipe assembly. In deep soils, Northwest would segregate the top 12 inches of topsoil. In areas where the topsoil layer is less than 12 inches, Northwest would make every effort to segregate the entire layer of topsoil. Northwest has requested a variance from the FERC staff's Plan to allow trenchline-only topsoil segregation. See section 4.2.2 for additional discussion of topsoil segregation, including the measures Northwest would implement to protect the topsoil on the working side of the right-of-way and return it to its original horizon after construction.

1) Survey and Staking
2) Clearing
3) Front-End Grading
4) ROW Topsoil Stripping
5) Restaking Centerline of Trench
6) Trenching (wheel ditcher)
7) Trenching (rock)
8) Padding Trench Bottom
9) Stringing Pipe
10) Field Bending Pipe
11) Line-Up, Initial Weld
12) Fill & Cap, Final Weld
13) As-Built Footage
14) X-Ray Inspection, Weld Repair
15) Coating Field Welds
16) Inspection & Repair of Coating
17) Lowering Pipe into Trench
18) As-Built Survey
19) Pad, Backfill, Rough Grade
20) Hydrostatic Testing, Final Tie-In
21) Replace Topsoil, Final Clean-Up, Full Restoration

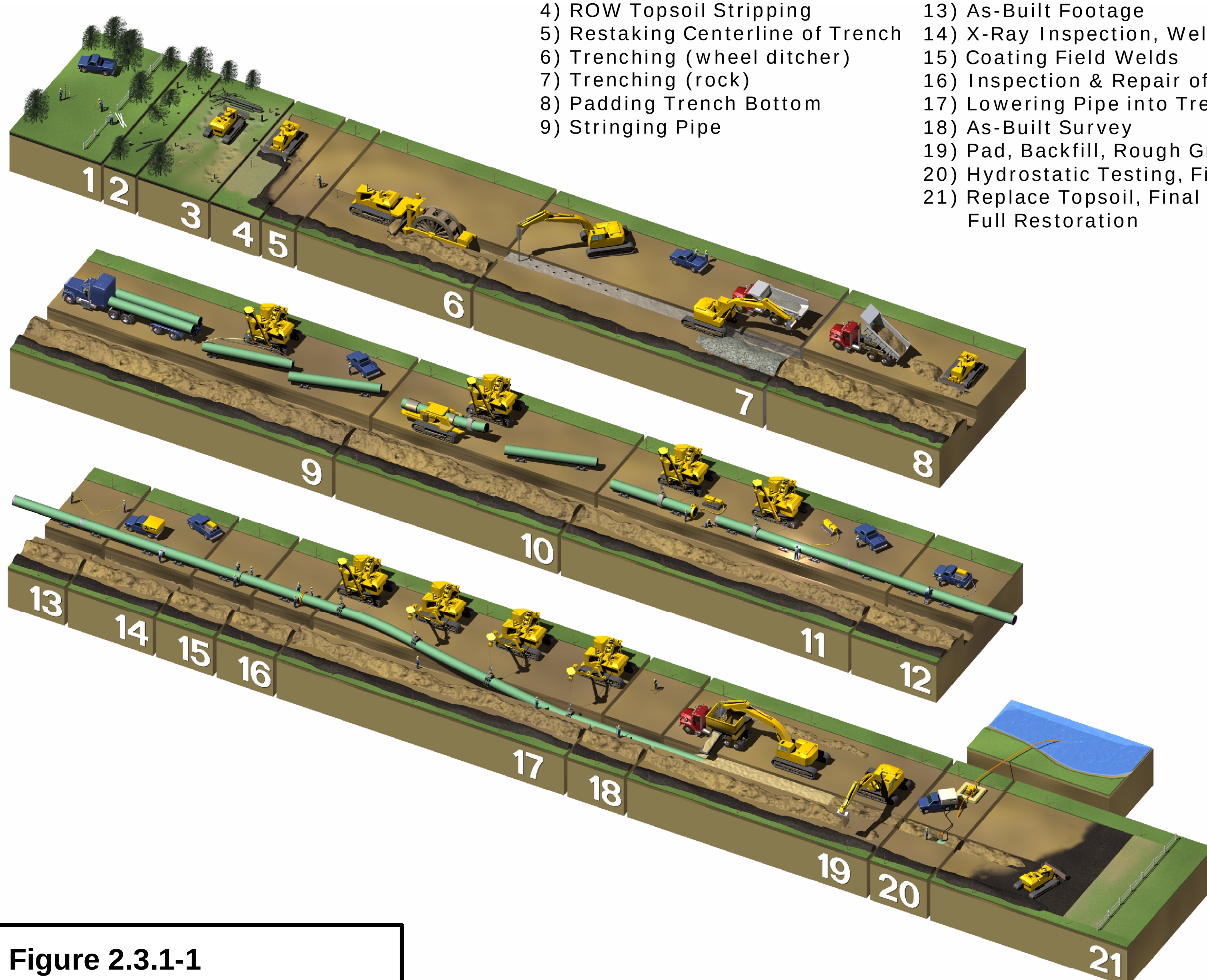

Figure 2.3.1-1
Capacity Replacement Project
Typical Pipeline Construction Sequence

Trenching

The trench would be excavated by rotary trenching machines, track-mounted backhoes, or other similar equipment. The trench would be excavated at least 12 inches wider than the diameter of the pipe at the bottom of the trench. The trench would be excavated to a sufficient depth to allow a minimum of 3 feet of soil cover between the top of the pipe and the final land surface after backfilling. In agricultural areas and at waterbody and road crossings, at least 5 feet of cover would be provided. As stated above, the excavated topsoil would be stockpiled along the right-of-way on the side of the trench away from the construction traffic and pipe assembly area. Northwest proposes to spread the trench subsoil over the working side of the right-of-way during construction in order to pad the existing lines and minimize the need for additional construction right-of-way width (see section 4.2.2).

Pipe Stringing, Bending, and Welding

Steel pipe for the pipeline would be procured in 40- or 80-foot lengths (also referred to as joints), protected with an epoxy coating applied at the factory (the beveled ends would be left uncoated for welding), and shipped to strategically located materials storage areas or pipe yards. The individual joints would be transported to the right-of-way by stringing truck and placed along the excavated trench in a single, continuous line on the working side of the trench.

The pipe would be delivered to the project site in straight sections. Some bending of the pipe would be required to enable the pipeline to follow natural grade changes and direction changes of the right-of-way. Selected joints would be field bent by track-mounted hydraulic bending machines as necessary prior to line-up and welding. Following stringing and bending, the joints of pipe would be placed on temporary supports adjacent to the trench for welding. Welding is one of the most crucial phases of pipeline construction because the overall integrity of the pipeline depends on this process. Each weld must exhibit the same structural integrity with respect to strength and ductility as the pipe. Only experienced welders highly proficient in pipeline welding and qualified according to applicable American Welding Society, American Society of Mechanical Engineers (ASME), and American Petroleum Institute (API) standards would be used. The ends would be carefully aligned and welded together using multiple passes, which would provide for a full penetration weld.

Each weld would be inspected by quality control personnel to determine the quality of the weld. Governmental regulations require non-destructive testing of all welds in areas such as inside railroad or public road rights-of-way and in certain other areas. Radiographic examination is a non-destructive method of inspecting the inner structure of welds and determining the presence of defects. Contractors specializing in radiographic inspection would be engaged. Radiographic inspections would be performed as outlined in Title 49 CFR Part 192. Welds that do not meet established specifications would be repaired or removed. Once the welds are approved, the previously uncoated ends of the pipe at the joints would be cleaned and epoxy coated. The coating on the remainder of the completed pipe section would be inspected and any damaged areas repaired.

Lowering-in and Backfilling

Before the pipeline is lowered in, the trench would be inspected to be sure it is free of rocks and other debris that could damage the pipe or protective coating. If water is present in the trench, dewatering may be necessary to allow for inspection of the trench. Where dewatering is required, water would be pumped from the trench and discharged to upland areas using a filter bag or straw bale dewatering structure as specified in Northwest's ECR Plan (see Appendix G, drawing number 1408.34-X-0013). In areas of rock, clean rock free padding or sandbags may be installed in the bottom of the trench to protect the pipeline. No topsoil would be used as padding material. After the pipe is lowered into the trench, the trench would be backfilled. Previously excavated materials would be pushed back into the trench using bladed equipment or backhoes. Where the previously excavated material contains large rocks or other materials that could damage the pipe and coating, clean fill or protective coating would be placed around the pipe prior to backfilling. Following backfilling in specified areas, a small crown may be left to account for any potential future soil settling.

Hydrostatic Testing

After burial, the pipeline would be tested to ensure the system is capable of withstanding the operating pressure for which it was designed. This procedure is called hydrostatic testing and is completed by pressurizing water in the pipeline. The loops would be divided into sections of pipeline to be tested individually. Each test segment would be determined based on water availability and terrain conditions. The water for hydrostatic testing would be obtained from municipal sources, except on the Fort Lewis Loop, where water would be obtained from the Centralia Canal. Water would not be withdrawn from other surface waters unless approvals are granted by the WDOE and the WDFW. Test water would contact only new pipe and no chemicals would be added to the test water. Internal test pressures and durations would be in accordance with Title 49 CFR Part 192. If leaks are found, the leaks would be repaired and the section of pipe would be retested until specifications are met.

Upon completion of a test on a pipe segment, the water would either be pumped to the next segment to be reused for hydrostatic testing purposes or would be discharged. Northwest's proposed hydrostatic test water discharge locations are shown on the maps in Appendix B. All discharges, including testing for potential contaminants, would be conducted in accordance with applicable requirements. The hydrostatic test water discharge would be directed into straw bale dewatering structures to dissipate energy and filter the test water. The dewatering structures would be located in upland areas at a significant distance from wetlands and waterbodies to promote infiltration and prevent sedimentation of wetlands, waterbodies, or other sensitive areas. No test water would be discharged directly to waterbodies. If it is not feasible to release water as described above, Northwest would need to submit alternative measures that would provide equal or better environmental protection and receive approval before use. The dewatering structures would be constructed in accordance with the Procedures (see Appendix F), Northwest's ECR Plan (see Appendix G, drawing number 1408.34-X-0012), and applicable state permit requirements.

The release of hydrostatic test water would be visually monitored to ensure no erosion or sedimentation occurs and that turbid water is not discharged to a waterbody. If turbidity is observed, the dewatering operation would be immediately adjusted to ensure that the discharge to a surface water is stopped and water quality standards are not exceeded. Once a segment of pipe has been successfully tested and dried, the test cap and manifold would be removed, and the pipe would be connected to the remainder of the pipeline. Additional discussion of hydrostatic testing, including Northwest's proposed measures to notify and protect the public during the tests, is included in sections 4.3.1.4 and 4.3.2.7.

Cleanup and Restoration

During cleanup, construction debris on the right-of-way would be disposed of and work areas would be finish graded. Original land contours would be restored to conform to adjacent areas. In agricultural and residential areas, compacted subsoil would be disked, and the segregated topsoil would be returned as nearly as possible to its original horizon. Private and public property, such as fences, gates, driveways, and roads disturbed by construction would be restored to original or better condition consistent with individual landowner agreements. Temporary and permanent erosion control measures, including revegetation of disturbed areas, would be implemented as specified in Northwest's ECR Plan (see Appendix G, drawing numbers 1408.34-X-0002, -0003, -0008, and -0009). Additional discussion of erosion control and revegetation measures is included in sections 4.2.2 and 4.5.2.

Markers showing the location of the pipeline would be installed at line-of-sight intervals, at public road and railroad crossings, and in other locations as necessary in accordance with DOT requirements. Pipeline markers would include the word "warning," "caution," or "danger;" identify the contents of the pipeline; and identify the operator and the emergency contact telephone number. Special markers providing information and guidance to aerial patrol pilots would also be installed as required in certain areas.

2.3.2 Special Pipeline Construction Procedures

Construction across roads; areas of steep terrain; wetlands and waterbodies; and residential, agricultural, and commercial/industrial areas would require special construction techniques. Special techniques would also be used if blasting is required. These techniques are discussed below.

Road Crossings

The pipeline would be buried to a depth of at least 5 feet below road surfaces and would be designed to withstand anticipated external loadings. Construction of the pipeline across major paved highways would usually be accomplished by boring under the roadbed. Boring requires the excavation of a pit on each side of the road, the placement of boring equipment in the pit, then boring a hole under the road at least equal to the diameter of the pipe. Once the hole is bored, a prefabricated pipe section would be pushed through the borehole. For long crossings, sections may be welded onto the pipe string just before being pushed through the borehole. There would be little or no disruption to traffic at road crossings that are bored.

Most smaller, unpaved roads and driveways would be open cut where permitted by local authorities or private owners. The open-cut method would require temporary closure of the road to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of the road being crossed would be kept open to traffic, except during brief periods when it is essential to close the road to install the pipeline. Most open-cut road crossings would be completed and the road resurfaced in 1 or 2 days. If an open-cut road crossing requires extensive construction time, provisions would be made for detours or other measures to permit traffic flow during construction.

Steep Terrain

Additional grading may be required in areas where the pipeline route crosses steep slopes. Steep slopes often need to be graded down to a gentler slope to accommodate pipe bending limitations. In such areas, the slopes would be cut away, and, after the pipeline is installed, reconstructed to their original contours during restoration. In areas where the pipeline route crosses laterally along the side of a slope, cut and fill grading may be required to obtain a safe, flat work terrace. Generally, on steep side slopes, soil from the high side of the right-of-way would be excavated and moved to the low side of the right-of-way to create a safe and level work terrace. After the pipeline is installed, the soil from the low side of the right-of-way would be returned to the high side, and the slope's original contours would be restored.

In steep terrain, temporary sediment barriers such as silt fence and straw bales would be installed during clearing to prevent the movement of disturbed soil off the right-of-way. Temporary slope breakers consisting of mounded and compacted soil or other materials such as silt fence, staked straw bales, or sandbags would be installed across the right-of-way during grading, and permanent slope breakers would be installed during cleanup. Following construction, seed would be applied to steep slopes and the right-of-way would be mulched in accordance with the recommendations of Northwest's ECR Plan (see Appendix G).

Wetland Crossings

Based on Northwest's field surveys, the proposed loops would cross 9.0 miles of wetlands in 264 jurisdictional wetland systems at 283 separate locations (see table J-1 in Appendix J). The majority of the wetlands that would be crossed (84 percent) are palustrine emergent wetlands that would revegetate within one growing season. The crossing of delineated wetlands would be in accordance with federal and state permits and following the measures in the FERC staff's Procedures except where variances to the Procedures are requested and approved by the FERC and other jurisdictional agencies (e.g., the COE, the WDOE, and local authorities) (see section 4.4.2). Wetland resources are discussed further in section 4.4.

Pipeline construction across wetlands would be similar to typical conventional upland cross-country construction procedures, with several modifications and limitations to reduce the potential for pipeline construction to affect wetland hydrology and soil structure. In non-agricultural wetlands, Northwest would typically use a 75-foot-wide construction right-of-way where the non-working side of the right-of-way and temporary extra workspace (topsoil storage area) would typically extend to the east 25 feet from the centerline of the proposed loop. The working side of the construction right-of-way would extend 50 feet to the west of the centerline of the proposed loop and would be over Northwest's existing 26-inch and 30-inch-diameter pipelines (see figure 2.2.1-1, sheet 3). Because the working side of the construction right-of-way would generally be located entirely within Northwest's existing permanent easement, most of the construction-related disturbance would occur to wetland areas that have been previously disturbed by past pipeline installation activities and are maintained in an emergent state.

Temporary extra workspaces may be required on both sides of wetlands to stage construction, fabricate the pipeline, and store materials. Temporary extra workspaces for wetland crossings would be located in upland areas a minimum of 50 feet from the wetland edge unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies. Where the loops cross disturbed emergent wetlands, such as agricultural areas (cropland, hayfields, and pastures), or where wetlands are confined to Northwest's existing permanent easement, Northwest proposes to use a 95-foot-wide construction right-of-way because those wetlands are degraded systems that are expected to fully recover within one full growing season. Use of a wider right-of-way in these disturbed systems would minimize the need for temporary extra workspaces in adjacent upland forested or shrub vegetation types that would require increased recovery times.

Construction equipment working in wetlands would be limited to that essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. In areas where there is no reasonable access to the right-of-way except through wetlands, non-essential equipment would be allowed to travel through wetlands only if the ground is firm enough or has been stabilized to avoid rutting. Otherwise, non-essential equipment would be allowed to travel through wetlands only once. However, the construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

Clearing of vegetation in wetlands would be limited to trees and shrubs, which would be cut flush with the surface of the ground and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trenchline. A limited amount of stump removal and grading may be conducted in other areas if dictated by safety-related concerns. Topsoil segregation over the trenchline would only occur if the wetland soils were not saturated at the time of construction.

During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained adjacent to wetlands and within temporary extra workspaces as necessary to minimize the potential for sediment runoff. Sediment barriers would be installed across the full width of the construction right-of-way at the base of slopes adjacent to wetland boundaries. Silt fence or straw bales installed across the working side of the right-of-way would be removed during the day when vehicle traffic is present and would be replaced each night. Alternatively, drivable berms may be installed and maintained across the right-of-way in lieu of silt fence or straw bales. Sediment barriers would also be installed within wetlands along the edge of the right-of-way, where necessary, to minimize the potential for sediment to run off the construction right-of-way and into wetland areas outside the work area. If trench dewatering is necessary in wetlands, silt-laden trench water would be discharged in upland areas at a significant distance from wetlands and waterbodies. The water would be discharged into an energy dissipation/sediment filtration device, such as a geotextile filter bag or straw bale structure, to minimize the potential for erosion and sedimentation. If it is not feasible to release trench water as described above, Northwest would need to submit alternative measures that would provide equal or better environmental protection and receive approval before use.

The method of pipeline construction used in wetlands would depend largely on the stability of the soils at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment on equipment mats or timber riprap, construction would occur in a manner similar to conventional upland cross-country construction techniques. In unsaturated wetlands, the top 12 inches of topsoil from the trenchline would be stripped and stored separately from subsoil. Topsoil segregation generally would not be possible in saturated soils.

Where wetland soils are saturated and/or inundated, the pipeline may be installed using the push-pull technique. The push-pull technique would involve stringing and welding the pipeline outside of the wetland and excavating the trench through the wetland using a backhoe supported by equipment mats. The water that seeps into the trench would be used as the vehicle to “float” the pipeline into place together with a winch and flotation devices, which would be attached to the pipe. After the pipeline is floated into place, the floats would be removed and the pipeline would sink into place. Most pipe installed in saturated wetlands would be coated with concrete or equipped with set-on weights to provide negative buoyancy. After the pipeline sinks to the bottom of the trench, the trackhoe, working on equipment mats would backfill the trench and complete cleanup. Northwest proposes to use the push-pull technique to cross two wetland complexes that are also considered waterbodies, Olson Lake and Evans Creek. Additional discussion of the push-pull technique is provided in the waterbody crossing section.

Because little or no grading would occur in wetlands, restoration of contours would be accomplished during backfilling. Prior to backfilling, trench breakers (polyurethane foam or bags of sand or bentonite chips) would be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil would be backfilled first followed by the topsoil. Topsoil would be replaced to the original ground level leaving no crown over the trenchline. In some areas where wetlands overlie rocky soils, the pipe would be padded with rock-free soil or sand before backfilling with native bedrock and soil. Equipment mats, timber riprap, and/or straw mats would be removed from wetlands following backfilling. After backfilling and major grading work are complete, any drivable berms would be removed and the ground surface returned to original contours. If a sediment control device is still needed at a location where a drivable berm was removed, a temporary sediment control device such as silt fencing would be installed.

Where wetlands are located at the base of slopes, permanent slope breakers would be constructed across the right-of-way in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers would be removed from the right-of-way and disposed of properly.

In non-agricultural wetlands where no standing water is present, the construction right-of-way would be seeded with Seed Mixture 4, which includes native species that occur in wetlands in the region, in accordance with the recommendations of the local soil conservation authorities. Agricultural wetlands that are dominated by introduced species would be seeded with Seed Mixture 3a as recommended by the WDOE for disturbed emergent wetlands. In the absence of specific recommendations, non-agricultural wetlands would be seeded with annual ryegrass at a rate of 40 pounds per acre. Annual ryegrass would provide temporary cover while allowing native herbaceous and woody vegetation to become re-established without excessive competition. Lime, mulch, and fertilizer would not be used in wetlands.

Waterbody Crossings

A total of 146 waterbodies, including 54 perennial waterbodies and 92 intermittent streams or ditches would be crossed by the loops associated with the Capacity Replacement Project. The waterbodies that would be crossed and Northwest's proposed crossing method for each are listed in table K-1 in Appendix K and include 6 major waterbodies (greater than 100 feet wide), 20 intermediate waterbodies (greater than 10 feet wide but less than or equal to 100 feet wide), and 120 minor waterbodies (less than or equal to 10 feet wide). Of these waterbodies, 48 perennial and 3 intermittent waterbodies are designated coldwater fishery resources. One additional intermittent waterbody would be crossed by the abandonment activities associated with the Portland Lateral Take-off. Surface water resources are discussed further in section 4.3.2; aquatic resources are discussed in section 4.6.2.

The waterbody crossings would be constructed in accordance with federal, state, and local permits and, for those waterbodies that have perceptible flow at the time of construction, in accordance with the FERC staff's Procedures except where variances to the Procedures are requested and approved by the FERC and other jurisdictional agencies (e.g., the COE, the WDOE, and the WDFW) (see section 4.3.2.2). Standard waterbody construction measures related to typical temporary extra workspace, temporary bridging, clearing of vegetation, sediment control, timing, and pipe burial depths are described below. Northwest has identified specific construction methods it would use at each waterbody, including the dry and wet open-cut, flume, dam and pump, HDD, aerial span, and push-pull construction methods. These construction methods are described below. Two other waterbody crossing methods, the diverted dry open-cut method and the bore method, are also described below. Although Northwest does not propose to cross any of the waterbodies using these methods, they are described because they are evaluated as potential alternatives to Northwest's proposed crossing methods in section 4.3.2.3.

Temporary extra workspaces would be required on both sides of all waterbodies to stage construction, fabricate the pipeline, and store materials. The amount of pipe required to cross a waterbody would be stockpiled in temporary extra workspaces on one or both sides of the waterbody. These temporary extra workspaces would be located a minimum of 10 feet from the waterbody edge in actively cultivated or rotated cropland or other disturbed land and 50 feet from the waterbody edge in other areas unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies.

To prevent sedimentation caused by construction and vehicular traffic crossing perennial waterbodies for access to the right-of-way, Northwest would install temporary equipment bridges to allow construction equipment to cross. Bridges may include clean rock fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatus, and other types of spans. Equipment bridges would be maintained throughout construction. Each bridge would be designed to accommodate normal to high streamflow and would be maintained to prevent soil from entering the waterbody and to prevent restriction of flow during the period of time the bridge is in use. Construction equipment would be required to use the bridges, except the clearing crew who would be allowed one pass through the waterbodies before the bridges are installed.

Clearing adjacent to waterbodies would involve the removal of trees and brush from the construction right-of-way and temporary extra workspaces. Woody vegetation within the construction right-of-way would be cleared to the edge of the waterbodies. The clearing crew would leave the root systems in place and not grade until the trench is dug to install the pipe.

Northwest would implement the Plan and Procedures and its ECR Plan and comply with NPDES stormwater permit conditions to minimize impacts from erosion and sedimentation. Sediment barriers would be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers would be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas.

Prior to initiating in-stream construction, the pipe segment for a crossing would be fabricated and stored in adjacent temporary extra workspaces. To minimize the possibility of construction interfering with fish migration and spawning in coldwater fisheries, in-stream construction would be conducted between the dates specified in table K-1 in Appendix K unless other time windows are permitted or required by the WDFW. In addition, in-stream construction activities would be limited to 24 hours in minor waterbodies and 48 hours in intermediate waterbodies. The intermittent streams and ditches are expected to be dry at the time of construction based on the proposed summer construction schedule. Generally, the perennial waterbodies would also be crossed during low flow periods, which would avoid and minimize the potential for impacts.

Northwest would install the pipeline in waterbodies with a minimum of 5 feet depth of cover from the top of the pipe to the bottom of the streambed. In waterbodies that have a potential for scour, Northwest would increase the depth of cover as necessary (see section 4.3.2.4).

<u>Dry Open-Cut Construction Method</u> – For the 83 intermittent waterbodies expected to be without flow at the time of construction (see table K-1 in Appendix K), Northwest would utilize the dry open-cut method, which involves the standard upland, cross-country construction methods described in section 2.3.1. One additional waterbody would also be crossed by this method if the proposed HDD crossing method at the waterbody failed (see section 4.3.2.3). This method would only be used when no flowing water is present in waterbodies. After backfilling, the streambanks would be reestablished to approximate preconstruction contours and stabilized, and erosion and sediment control measures would be installed across the construction right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody. Intermittent waterbodies that are flowing at the time of construction would be crossed using a “dry” stream crossing construction method (e.g., flume or dam and pump).

<u>Diverted Dry Open-Cut Construction Method</u> – The diverted dry open-cut method involves the temporary diversion of a portion of a waterbody to minimize contact between streamflow and excavation and backfill activities during pipeline installation. Diversion structures may consist of one or a combination of the following: imported riprap, concrete jersey barriers, water bladder portadams, and sandbags.

The diversion dams would be located on a site-specific basis at a certain distance upstream of the crossing and run from the bank on the side the work is to be performed diagonally downstream past the center of the waterbody. After reaching a point past the center of the waterbody, the dam would turn downstream and parallel the axis of the waterbody past the pipeline crossing. Once the necessary distance past the pipeline crossing, the dam would turn back to the bank of origin. The "dry" side of the river would then be excavated and a pipe section placed in the trench. Trench boxes or sheet pilings would be placed at the end of the pipe section in the middle of the streambed for the tie-in. The trench would then be backfilled except for the tie-in area.

A second dam would then be installed that would divert the water to the backfilled area. This second dam would converge with the first dam at the diversion origin. Segments of the first dam would be rearranged to divert the water to the second dam. Once the diversion is completed, excavation of the other half of the streambed would begin. Following excavation, the second pipe section would be carried in and tied-in to the first section and the trench backfilled. The area would be recontoured and revegetated following installation.

Northwest does not propose to use the diverted dry open-cut method at any of the waterbody crossings; however, it is evaluated as a potential alternative to Northwest's proposed crossing methods in section 4.3.2.3.

<u>Wet Open-Cut Construction Method</u> – The wet open-cut construction method involves trench excavation, pipeline installation, and backfilling in a waterbody without controlling or diverting streamflow (i.e., the stream would flow through the work area throughout the construction period). Figure 2.3.2-1 depicts the typical wet open-cut crossing method. Northwest proposes to use the wet open-cut method at two waterbodies that are coldwater fisheries. According to Northwest, these waterbodies cannot be feasibly crossed using any other method primarily because of their width, volume of water, streambed characteristics, and surrounding topographic constraints (see discussion in section 4.3.2.3). Three additional waterbodies would be crossed by this method if the proposed HDD crossing method at those waterbodies failed (see section 4.3.2.3). With the wet open-cut method, the trench would be excavated across the stream using trackhoes or draglines working within the waterbody, on equipment bridges, and/or from the streambanks. For smaller streams, the trench spoil would be typically stored in an upland area adjacent to the stream. For larger waterbodies where excavated spoil cannot be readily stored in an upland area, the excavated trench material would be stored within the stream on the downstream side of the trench to reduce additional handling or relaying of the spoil and minimize the duration of in-stream activities. The spoil would be stored in piles with breaks in between to allow for water passage. The stream substrate would influence the stability of the trench walls and directly affect the time required to adequately excavate the trench and complete the crossing.

Throughout in-stream excavation operations, typically a trench plug (consisting of compacted or unexcavated soil) would be left in place between the upland trench and the waterbody. This plug would prevent migration of water into upland portions of the pipeline trench and keep accumulated trench water out of the waterbody. The trench plugs would be left in place until the pipe is ready for installation.

Once trench excavation across the entire waterbody is complete, a prefabricated section of pipe would be promptly lowered into the trench. The trench would then be backfilled with the previously excavated material, and the pipe section tied-in to the pipeline. If dewatering is necessary to weld the tie-in, the trench water would be pumped out in a controlled manner and discharged to a straw bale structure typically located in an upland area where heavier sediments and suspended particles can be filtered before the discharge reaches the stream.

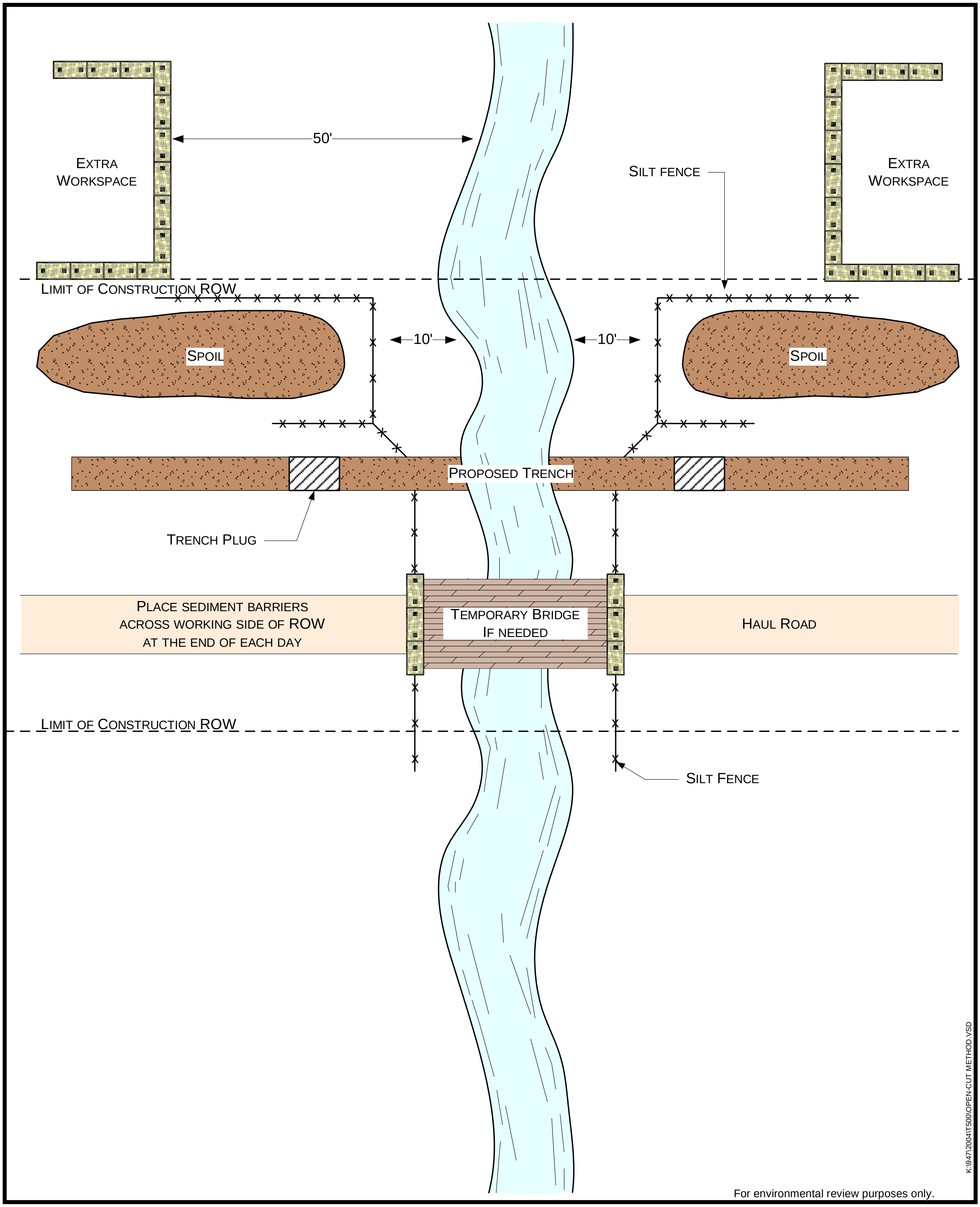

Figure 2.3.2-1

Capacity Replacement Project

Typical Wet Open-Cut Method

Waterbody Crossing

Following pipe installation and backfilling, the streambanks would be reestablished to approximate preconstruction contours and stabilized. Erosion and sediment control measures would be installed across the right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody.

Flume Construction Method – The flume method is a standard dry waterbody crossing construction method that involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. The typical flume crossing method is depicted on figure 2.3.2-2. Northwest proposes to use the flume method to cross 51 waterbodies, including 1 waterbody affected by the Portland Lateral Take-Off abandonment activities if they are flowing at the time of construction (see table K-1 in Appendix K). If these streams are not flowing at the time of construction, they would be crossed using the dry open-cut method described above. One additional waterbody would also be crossed by this method if the proposed HDD crossing method at the waterbody failed (see section 4.3.2.3). The first step in the flume crossing method would involve placing a sufficient number of adequately sized flume pipes in the waterbody to accommodate the highest anticipated flow during construction. Before the flume pipe is installed at the waterbody, it would be inspected to ensure it is free of dirt, grease, oil, or other pollutants. Excessive dirt would be removed. The pipe would be steam-cleaned, if necessary, to remove any oil or grease present before placement in the stream.

After placing the pipe in the waterbody, sand or pea gravel bags, water bladders, or metal wing deflectors would be placed in the waterbody upstream and downstream of the trench area. These devices would serve to dam the stream and divert the water flow through the flume pipes, thereby isolating the water flow from the construction area between the dams. Several measures would be taken to minimize short-term increases in turbidity during dam construction, including: 1) all in-stream work would be carried out on foot and no equipment would operate in the streambed; 2) sandbags would be filled with a non-leachable material such as clean, prewashed sand; 3) sandbags would be tied securely before they are installed; and 4) sheets of plastic would be interwoven between the layers of sandbags to ensure an effective seal. Leakage from the dams, or subsurface flow from below the waterbody bed, may cause water to accumulate in the isolated area. As water accumulates in this area, it may be periodically pumped out and discharged into energy dissipation/sediment filtration devices, such as a geotextile filter bag or straw bale structure, or into well-vegetated areas away from the water's edge.

Trackhoes located on both banks of the waterbody would excavate a trench under the flume pipe in the dewatered streambed. Spoil excavated from the waterbody trench would be placed or stored a minimum of 10 feet from the edge of the waterbody. Once the trench is excavated, the prefabricated segment of pipe would be installed beneath the flume pipes. The trench would then be backfilled with native spoil from the waterbody bed. Immediately following pipe installation and backfilling, and before removing the dams and flume pipes and returning flow to the waterbody channel, the streambanks would be reestablished to approximate preconstruction contours and stabilized. Erosion and sediment control measures would be installed across the construction right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody. Sediment barriers, such as silt fence and/or straw bales or drivable berms would be maintained across the right-of-way at all waterbody approaches until permanent vegetation is established. After backfilling and major grading work are complete, any drivable berms would be removed and the ground surface returned to original contours. If a sediment control device is still needed at a location where a drivable berm was removed, a temporary sediment control device such as silt fencing would be installed. Equipment bridges would be removed when construction and restoration are completed.

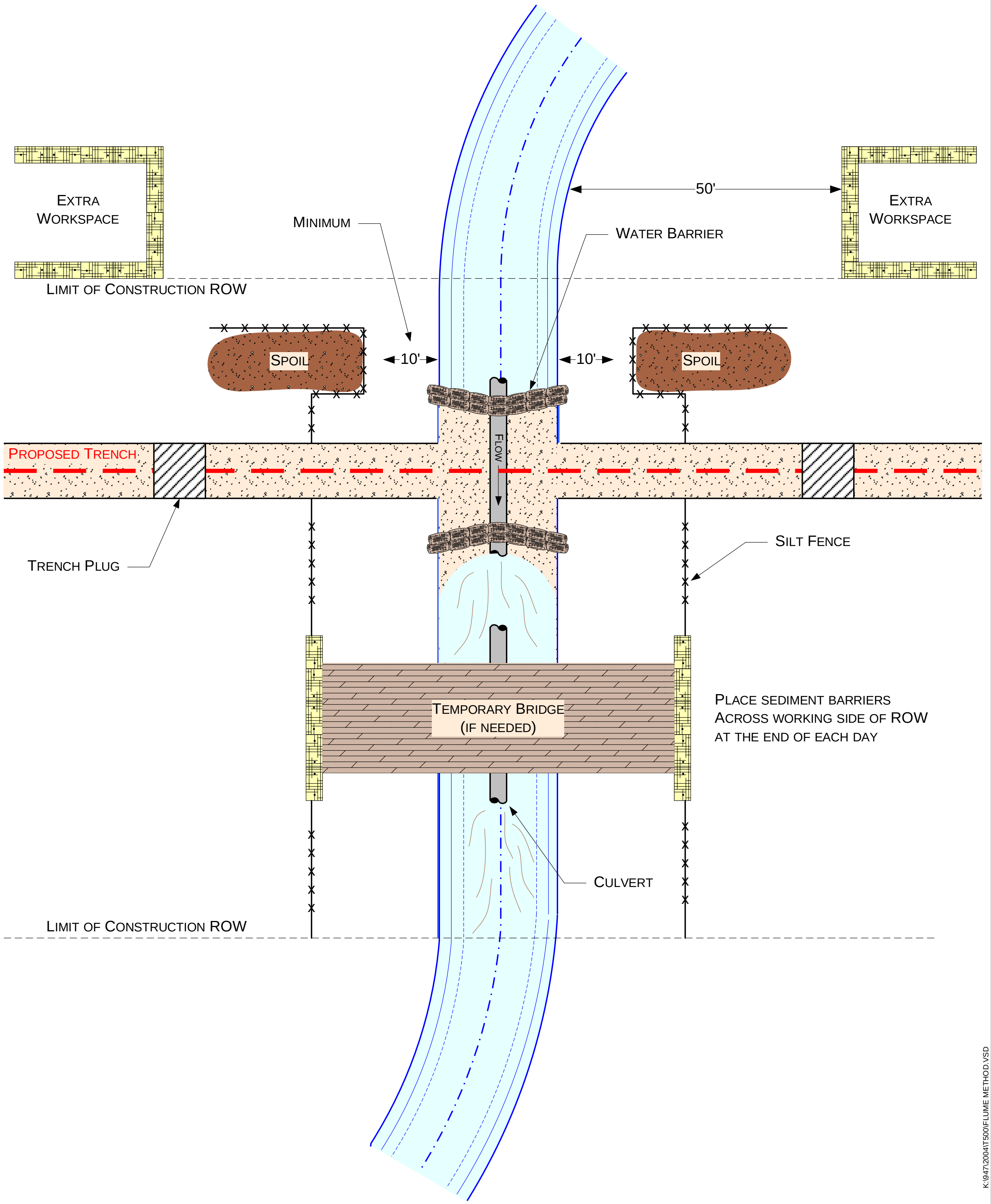

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Figure 2.3.2-2
Capacity Replacement Project
Typical Flume Method
Waterbody Crossing

Dam and Pump Construction Method – The dam and pump method is a standard dry waterbody crossing construction method that may be used as an alternative to the flume method for waterbodies less than 10 feet wide. Northwest proposes to use the dam and pump method at two waterbody crossings (see table K-1 in Appendix K). The typical dam and pump crossing method is depicted on figure 2.3.2-3. This method is similar to the flume crossing method except that pumps and hoses would be used instead of flumes to move water across the construction work area. The technique involves damming of the waterbody with sandbags and/or steel plates upstream and downstream of the trench area. Pumps would be set up at the upstream dam with the discharge line routed through the construction area to discharge water immediately downstream of the downstream dam. An energy-dissipation device would be used to prevent scouring of the streambed at the discharge location. Water flow would be maintained through all but a short reach of the waterbody at the actual crossing. The pipeline would be installed and backfilled. After backfilling, the dams would be removed and the banks restored and stabilized.

HDD Construction Method – Northwest proposes to cross three coldwater fisheries, the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers, using the HDD method. Two other small, non-coldwater fisheries would also be crossed by the HDD method because they are within the drilling radius (between the entry and exit points) of the North Fork Nooksack River HDD crossing.

The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging that hole through successive reamings until the hole is large enough to accommodate the pipe. The drill rig would be staged in a large extra workspace set back from the waterbody banks. Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through the drilled hole. Figure 2.3.2-4 shows a conceptual HDD waterbody crossing. As shown on figure 2.3.2-4, use of an HDD avoids disturbance to both the waterbody and the vegetation on both sides of the crossing.

Drilling a pilot hole is the first phase of the HDD and establishes the ultimate position of the installed pipeline. The head of the pilot drill string contains a pivoting head that can be controlled by an operator at the surface as the drill progresses. Typically, the pilot hole would be directed downward at an angle until the proper depth is achieved, then turned and directed horizontally for the required distance, and finally angled upward back to the surface. Tracking and steering of the drill head would be guided using two insulated wires (approximately 0.25 inch) laid on the ground surface. A probe located behind the drill bit would detect an electric current in the wires and utilize triangulation to locate the head of the drill bit to make steering adjustments. Throughout the process of drilling and enlarging the hole, a slurry made of naturally occurring, non-toxic bentonite clay and water would be pressurized and pumped through the drilling head to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry, referred to as drilling mud or drilling fluid, has the potential to be inadvertently released to the surface if fractures or fissures are encountered in the substrate during drilling.

The potential for an inadvertent release (also referred to as a frac-out) is generally greatest during drilling of the pilot hole when the pressurized drilling mud is seeking the path of least resistance. The path of least resistance is typically back along the path of the drilled pilot hole. However, if the drill path becomes temporarily blocked or encounters other areas such as large fractures or fissures that lead to the ground surface or waterbody, then an inadvertent release could occur. Northwest would monitor the pipeline route and the circulation of drilling mud throughout drilling for indications of an inadvertent release and would immediately implement corrective actions if a release is observed or suspected to be occurring. The corrective actions Northwest would implement are outlined in its HDD Plan (see Appendix I) and would range progressively from an initial temporary suspension of drilling and assessment of the cause and severity, to potentially a complete abandonment of the HDD based on the location and volume and Northwest's ability to contain and control the release.

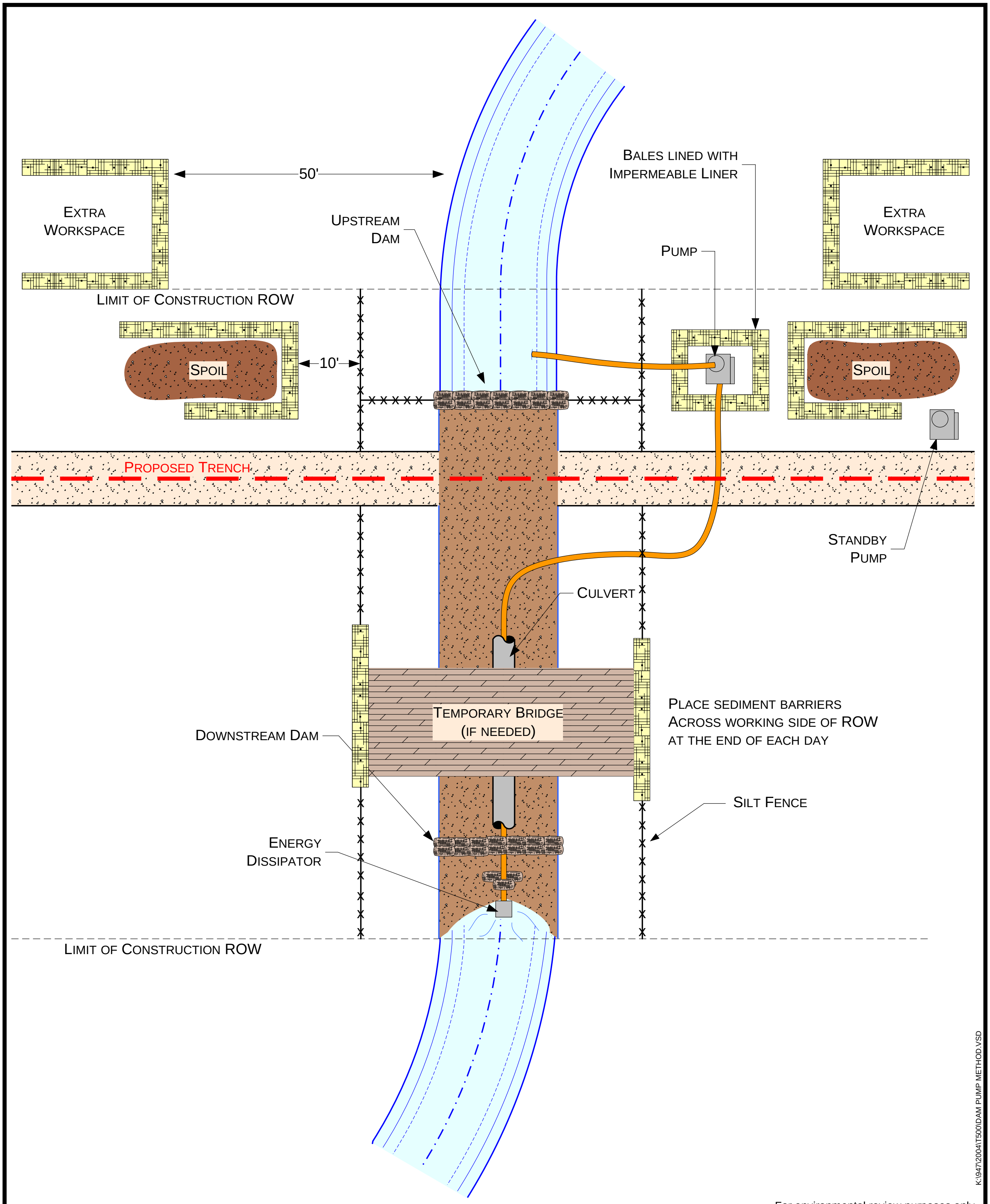

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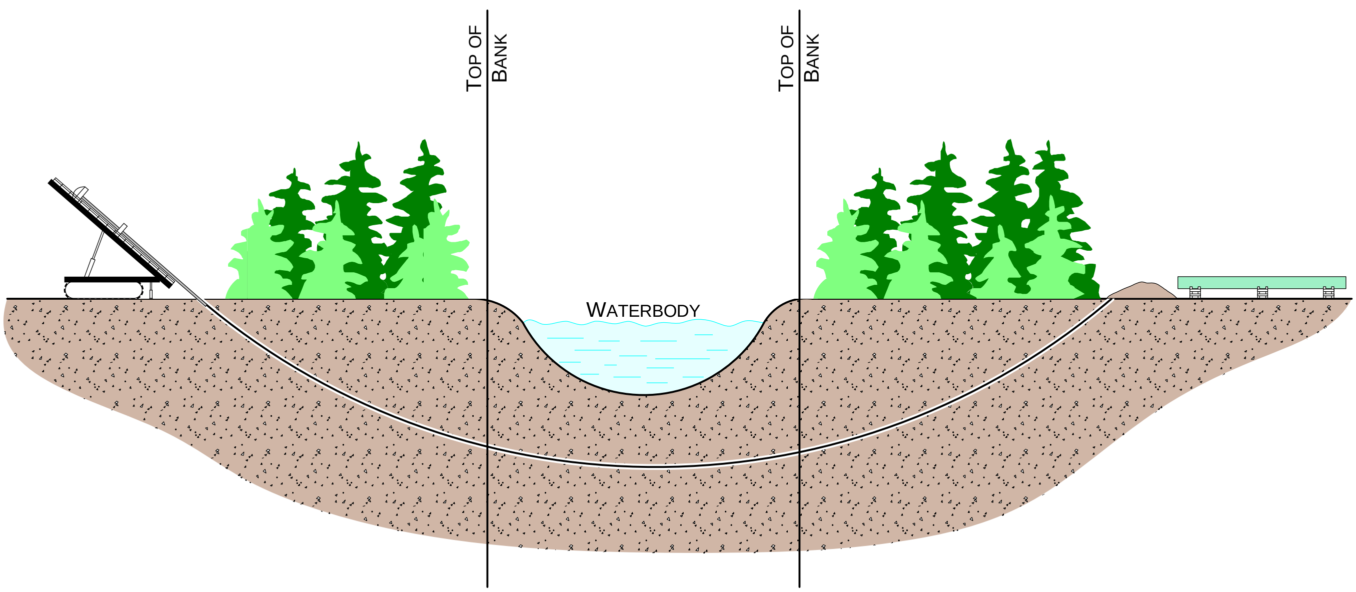
Figure 2.3.2-3
Capacity Replacement Project
Typical Dam and Pump Method
Waterbody Crossing



For environmental review purposes only.

Figure 2.3.2-4
Capacity Replacement Project
Conceptual Horizontal Directional Drill
Waterbody Crossing

Once the pilot hole exits in an acceptable location, the reaming operation is initiated. During the reaming phase, a reaming head would be attached to the drill pipe and pulled back through the pilot hole to enlarge it. Several reaming passes would be made with incrementally larger reaming heads to enlarge the hole to approximately 1.5 times the diameter of the pipeline. As the drill path becomes larger, the potential for an inadvertent release generally would decrease as the path of least resistance becomes increasingly well established. High-pressure drilling fluid would continue to be jetted through the reaming head to float out drill cuttings and debris, to cool the drilling head, and to provide a cake wall to stabilize the hole. Once the drill hole is enlarged to the proper diameter, the pipe would be pulled back through the reamed hole. The HDD at the North Fork Nooksack River is anticipated to take about 10 weeks. The HDDs at the North and South Fork Stillaguamish Rivers are anticipated to take about 5 weeks each.

Aerial Span Construction Method – Northwest proposes to use the aerial span method to cross two coldwater fisheries, Colin Creek and the Centralia Canal. The existing 26-inch- and 30-inch-diameter pipelines are spanned at those locations as well. The aerial span method is also proposed as an alternative crossing method at two additional coldwater fisheries, Pilchuck Creek and the Nisqually River, if the preferred crossing method (wet open cut) is not approved at those locations. Aerial span installations are generally only practical in selected locations where an existing structure is present or in narrow deeply incised ravines or in deep, narrow canyons where geologic and topographic conditions restrict other crossing techniques. The aerial span method involves constructing the pipeline aboveground by attachment to an existing structure (e.g., railroad or road bridge), developing a new structure for attachment (e.g., suspension or host bridge), or spanning a waterbody without support structures. There are no existing bridges at the potential aerial span crossings and support structures would be required; therefore, Northwest would span waterbodies by developing new structures.

There can be two types of support towers: rectangular frame or A-frame. The rectangular tower looks like a miniature version of the Golden Gate Bridge and the A-frame is an "A" shape truss that has two slanted columns connected at the top of the tower. The towers would be between 20 to 30 feet in height. The footprint of the towers would be approximately 20 feet wide between the two columns and 20 feet between the front legs and backstay legs or up to 100 feet between the front legs and the backstay cable anchors.

With the aerial span method, soil disturbance is typically limited to areas bordering the waterbody. Temporary extra workspace would be required on each bank between the tower and cable anchorage. Additional extra workspace would be required to weld up the pipe section and stage the equipment required to install the pipeline on the support structure. The towers and anchors would be constructed on the waterbody banks and the main cable needed to pull the pipe string across the waterbody to be installed on the support structure would be carried across the waterbody by boat. Therefore, no in-stream disturbance would occur. It is estimated that an aerial span crossing could take up to 60 days to construct, depending on the accessibility of the site.

Bore Construction Method – The bore method is similar to the HDD method in that the pipeline is installed beneath a feature without surface disturbance to the feature during the crossing. However, the bore method differs in that the path of the pipeline across the feature is straight and is not variable or directional as in an HDD where the path is curved or arched. The maximum length of a bore (hundreds of feet) is also much less than the maximum length of an HDD (thousands of feet). Boring is frequently utilized at paved road and railroad crossings and is not a common crossing method for waterbodies primarily because of the difficulty in managing groundwater during the installation. However, Fort Lewis has requested that Northwest use the bore method to cross two coldwater fisheries, Muck Creek and South Fork Muck Creek, on the military reservation (see section 4.3.2.3).

As described in section 2.3.3 for road crossings, boring requires excavation of pits on each side of the feature. Boring operations would require relatively large work areas, and well points or pumping for continuous dewatering operations, and may require continuous spoil/slurry processing throughout construction of the crossing. During a standard boring operation, spoil from the bore is carried into the pit as the crossing is being completed and then removed by trackhoes to provide room for the pipe to be welded and eventually pulled through the bore hole. The operator for the boring machine, welders, and several laborers would work in the bore pit. Trench boxes or sheet piling may be used to support the pit walls and to help cut off groundwater inflows. Dewatering systems using deep wells or well points are frequently employed. The specific type of bore (e.g., jack and bore, slick bore, hammer bore) that would be utilized in a given area depends on the construction site characteristics, the type of soils present, and the contractor's familiarity with available methods.

Push-Pull Construction Method – Northwest proposes to use the push-pull construction method to cross two waterbodies that are also considered wetland complexes, Olson Lake and Evans Creek. Using this construction method, the clearing equipment would work off equipment mats to provide a stable working surface and minimize disturbance. To minimize off right-of-way turbidity and to contain saturated spoil material on the construction right-of-way, silt fence would be installed on both sides of the construction work area. The pipe would be strung, welded, and coated on rollers in an upland area outside of the wetland complex. There would be a pull head on one end of the pipe section. Floats would be attached to the pipe section as it reaches the water. A trackhoe working on mats would begin excavation at one end of the wetland and work to the other end. Due to saturation, the topsoil and subsoil would not be segregated. The trench spoil would be placed on one side of the right-of-way, on the mowed vegetation. As the trackhoe progresses through the excavation, it would pull the floating prefabricated pipe section while the equipment at the other end would push. After the pipeline is floated into place, the floats would be released and the pipe would be allowed to sink to the bottom of the trench. The trackhoe, working on equipment mats, would then backfill the trench with native material that was excavated from the trench. As the trench is backfilled and the trench water is "pushed" ahead of the backfill, trench dewatering would occur as necessary to prevent any sediment-laden water from spilling over the top of the trench. There would be no need to lower the overall groundwater level in the area from its current level during trench dewatering. The trench water would be pumped to a straw bale/filter bag structure in an approved upland area where the silt would be removed and the water allowed to infiltrate back into the ground.

Residential Areas

Northwest's proposed construction work area (i.e., construction right-of-way and extra work areas) would be located within 50 feet of 222 residences and 22 other structures, including shops, barns, garages, trailers, and commercial buildings. Of the 244 residences and structures, 124 are located on the Snohomish Loop, 67 are located on the Fort Lewis Loop, 28 are located on the Mount Vernon Loop, and 25 are located on the Sumas Loop. Northwest has prepared site-specific residential construction mitigation plans that detail the specific measures that would be used when construction occurs near residences. The locations of these residences and the plans are discussed in detail in section 4.8.3.

In general, Northwest would reduce the pipeline offset or the width of the construction right-of-way where feasible to minimize impacts on residences. Because of the limited amount of workspace along the Snohomish Loop, Northwest would replace the existing 26-inch-diameter pipeline with the proposed 36-inch-diameter pipeline in the same trench along the entire loop. Northwest would notify landowners or tenants living in the houses before construction. During construction, the edge of the construction work area within 50 feet of a residence would be fenced. The fencing would extend 100 feet on either side of the residence and would be maintained throughout at least the trenching phase of construction. Mature trees and landscaping would be preserved to the extent possible while ensuring the safe operation of construction equipment. Northwest would maintain access to homes, particularly for emergency vehicles. Standard working hours would be Monday through Saturday from 7:00 AM to 7:00 PM and would comply with local noise ordinances. Litter and debris would be removed daily from the construction right-of-way and dust generated by construction activities would be controlled by watering of the disturbed area.

Following completion of major construction, the property would be restored as requested by the landowner provided it does not interfere with the easement rights granted to Northwest for construction and operation of the pipeline system and is compatible with existing regulations. Compensation for longer-term impacts would be negotiated between Northwest and the individual landowner. Northwest has established a Landowner Complaint Resolution Procedure that would be implemented to resolve problems or issues raised by landowners during construction (see section 2.5).

Several comments were received during the scoping process regarding impacts on residences in the Sammamish area crossed by the Snohomish Loop, in particular from residents in the Deer Park Subdivision. The developers in this neighborhood placed homes immediately adjacent to the right-of-way and the backyards extend into the easement in several locations. As a result, several homes are located within 50 feet of the construction work area and several fences would have to be temporarily removed during pipeline construction. Northwest has developed a site-specific *Residential Area Work Plan for the Deer Park Subdivision*. The additional mitigation measures identified in the *Residential Area Work Plan for the Deer Park Subdivision* include:

- constructing in sections throughout the neighborhood to minimize the construction time near any individual home;

- installing safety fencing that consists of 6-foot-high chain link sections on the edges of both sides of the construction right-of-way to create a continuous boundary that separates the work area from the homes. The fence would also serve as temporary fencing for any fences that would be removed for construction. The fence would be secure to keep children and pets out of the work corridor and all construction activities would be contained within the fencing; and

- posting a security guard within the work corridor during non-working hours.

Additional details of the plan and Northwest's proposed construction and mitigation measures for this area are discussed in section 4.8.3.1.

Agricultural Areas

Agricultural areas crossed by the project are identified in section 4.8.1. Northwest would conserve topsoil in all actively cultivated and rotated croplands, pastures, and hayfields. Northwest proposes to segregate a maximum of 12 inches of topsoil from over the trench in those areas and in other areas at the specific request of the landowner or land management agency. Where topsoil is less than 12 inches deep, the actual depth of the topsoil layer would be removed and segregated. The topsoil would be stored in separate windrows on the construction right-of-way. To ensure safety and integrity of the existing pipelines and to minimize the need for additional construction right-of-way width, Northwest proposes to spread the trench spoil over the existing pipelines for padding on the working side of the construction right-of-way. Use of the trenchline-only topsoil segregation method would require a variance from the FERC staff's Plan and is discussed in detail in section 4.2.2. The depth of the trench would vary with the stability of the soil, but in all cases it would be sufficiently deep to allow for at least 3 feet of cover over the pipe.

Blasting

Northwest's evaluation of soils information indicates there is no hard bedrock within expected trench depths. Therefore, no blasting is anticipated for the Capacity Replacement Project. However, in the event that unrippable rock is encountered, blasting for trench excavation may be necessary. In those areas, care would be taken to prevent damage to underground structures (e.g., cables, conduits, and pipelines) and to springs, water wells, or other water sources. Blasting mats or soil cover would be used as necessary to prevent the scattering of loose rock. All blasting would be conducted during daylight hours and in accordance with applicable federal, state, and local codes and ordinances. Northwest would develop a detailed *Blasting Plan* in accordance with applicable DOT and OSHA requirements. The *Blasting Plan* would include, among other things, the use of blasting mats or soil cover to prevent the scattering of loose rock, measures to prevent accidental detonations (e.g., Detcord or similar method), all necessary permits and authorizations, notification of nearby building owners, and seismic monitoring of the blasts to ensure vibration limits are not exceeded.

Commercial and Industrial Areas

Commercial and industrial areas crossed by the project are identified in section 4.8.1. Impacts on commercial and industrial areas would be minimized by coordinating with business owners to maintain access, decrease construction duration, and generally minimize impacts during periods when construction activities may inconvenience business owners, employees, and customers.

2.3.3 Aboveground Facility Construction Procedures

The aboveground facilities would be constructed in accordance with Northwest's construction standards and would follow industry-accepted practices and procedures. Construction activities and storage of construction materials and equipment would be confined within the compressor station sites. At the Chehalis Compressor Station, a laydown area adjacent to the station would also be used. Debris and wastes generated from the construction and abandonment of existing facilities would be disposed of appropriately, and all disturbed surface areas would be restored. No special construction methods would be required for the proposed station modifications. Typical construction activities associated with compressor installation are summarized below.

Excavation would be performed as necessary to accommodate the reinforced concrete foundation for the new compressors. Forms would be set, rebar installed, and the concrete poured and cured in accordance with applicable standards. Concrete pours would be randomly sampled to verify compliance with minimum strength requirements. Backfill would be compacted in place, and excess soil would be used elsewhere or distributed around the site. If there is reason to believe the soil is contaminated, it would be tested and handled in accordance with a protocol developed in consultation with the WDOE prior to use on or off site (see section 4.3.1.2). The compression, piping, and other equipment would be shipped to the site by truck. The compressors would be offloaded using cranes. The equipment would then be positioned on the foundation, leveled, grouted, and secured with anchor bolts.

Welders and welding procedures would be qualified in accordance with API Standards or the ASME Boiler and Pressure Vessel code. Welds in large diameter gas piping systems would be X-rayed (or by use of other non-destructive testing methods) to ensure compliance with code requirements. All aboveground piping surfaces would be sandblasted and painted in accordance with Northwest's construction specifications. Paint inspection and cleanup would be conducted in accordance with regulatory requirements and best engineering practices.

In most cases, MLVs would be installed within the existing compressor stations, or at existing MLV settings. The installation of the MLVs and pig launchers and receivers would meet the same standards and requirements established for the compressor station modifications and pipeline construction. The MLVs and pig receivers that would not be collocated with existing aboveground facilities would be painted to blend with the surrounding landscape (see section 4.8.6).

After the completion of start-up and testing, or as soon as weather permits thereafter, the disturbed areas would be final graded and paved or graveled. Cleanup and restoration would be completed as work on an area is finished.

2.3.4 Abandoned Facilities Construction Procedures

Abandonment activities for facilities along the proposed loops would be conducted by the construction workforce for each loop using the standard pipeline construction procedures discussed above. The abandonment activities along the remainder of Northwest's system would be completed by small, independent construction crews. The equipment of each of these crews would consist of a trackhoe, a welding rig, a crew cab, pick-up trucks, and some coating equipment. The width of disturbance would be limited to Northwest's existing right-of-way and long enough to accommodate equipment, personnel, materials, and spoil.

A trackhoe would be brought to each location by a lowboy trailer and offloaded. Welding rigs would also be driven to each location. Topsoil would be segregated where required to meet codes and permits. The tap valve from the 26-inch-diameter pipeline would be closed and the tap would be exposed. After the tap has been exposed, the lateral line that moves gas between the 26-inch-diameter pipeline and the meter station would be purged. Once purged, the lateral line would be unbolted from the tap valve and a blind flange would be bolted to the tap valve. A weld end cap would seal the lateral line. The valve, flange, and pipe would be recoated with a protective coating to prevent corrosion. The excavated area would then be backfilled, the topsoil replaced, and the disturbed area returned to original condition (e.g., fences, gravel) and reseeded with an approved seed mix.

The locations of the crossovers would be treated in the same way as the lateral isolations although the addition of stopple fittings may be necessary. Each location would be evaluated on a case-by-case basis to determine the valve location within the crossover. In situations where gas flow between the 26-inch- and the 30-inch-diameter pipelines cannot be isolated while still providing gas, a stopple fitting may be required. The stopple fitting would be installed to isolate gas from the crossover and provide a safe atmosphere for cutting the crossover into two pieces. The crossover would then be capped on the pipe side and a blind flange installed on the valve side. All other activities would occur as described above.

2.4 CONSTRUCTION SCHEDULE

Northwest has requested that HDD activities at three locations be authorized to begin in late 2005 if weather permits. Pipe, materials, and equipment for the remainder of the project would begin to be delivered in January 2006. Construction of the proposed loops, MLVs, and pig launchers and receivers is currently scheduled to begin around March 1, 2006. The loops would be constructed using four construction spreads and would take approximately 8 months to complete.

Modifications at the Chehalis Compressor Station are scheduled to begin in March 2006 and would take approximately 7 months to complete. The modifications at the Sumas, Mount Vernon, Snohomish, and Washougal Compressor Stations are scheduled to begin in May 2006 and would take approximately 3 months to complete at each location. The compressor station modifications would likely be conducted by a separate construction spread at each facility.

The abandonment activities are scheduled to begin in April 2006. The abandonment activities along the proposed loops would be completed by the construction spread for each loop. The abandonment activities along the remainder of Northwest's system would be completed by small, independent construction crews. Abandonment of the 26-inch-diameter facilities that are currently in service cannot be completed until the Capacity Replacement Project is placed in service; however, all abandonment activities would be completed on or before December 31, 2006.

The proposed facilities would be placed in service by November 1, 2006. After the proposed loops are in service and the abandonment activities are completed, the 26-inch-diameter pipeline would be isolated and filled with nitrogen.

2.5 ENVIRONMENTAL COMPLIANCE INSPECTION AND MITIGATION MONITORING

In preparing construction drawings and specifications for the project, Northwest would incorporate mitigation measures identified in its permit applications as well as additional requirements of federal, state, and local agencies. Northwest would provide the construction contractors with copies of applicable environmental permits as well as copies of "approved for construction" Environmental Construction Alignment Sheets and construction drawings and specifications.

Northwest would conduct training for its construction personnel regarding proper field implementation of the FERC staff's Plan and Procedures, the ECR Plan, and other project-specific plans and mitigation measures. Environmental training would be conducted before and during construction.

Northwest would be represented on each construction spread by a Chief Inspector, who would be responsible for quality assurance and compliance with mitigation measures, other applicable regulatory requirements, and company specifications. The Chief Inspector would be assisted by one or more Craft Inspector(s) and at least one full-time Environmental Inspector (EI). The EI would be on site during active construction and would have peer status with all other activity inspectors. The EI would have authority to stop activities that violate the measures set forth in the project documents and authorizations and would have the authority to order corrective action. At a minimum, the EI would be responsible for:

- ensuring compliance with the measures set forth in the ECR Plan, the requirements of the FERC staff's Plan and Procedures, and all other environmental permits and approvals, as well as environmental requirements in landowner agreements;
- identifying, documenting, and overseeing corrective actions as necessary to bring an activity back into compliance;
- verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;
- verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;
- verifying the location of drainage and irrigation systems;
- determining whether wetland snags would be removed by construction activities, noting their locations, and determining the need and placement of snag replacement logs after construction;

- identifying erosion/sediment control and stabilization needs in all areas;
- locating dewatering structures and slope breakers to ensure they would not direct water into known cultural resource sites or locations of sensitive species;
- verifying that trench dewatering activities are located such that water is allowed to infiltrate whenever possible; turbid water does not reach a water of the state; and dewatering does not result in the deposition of sand, silt, and/or sediment. If such deposition is occurring, the EI would stop the dewatering activity and take corrective action to prevent reoccurrence;
- testing subsoil and topsoil in agricultural and residential areas to measure compaction and determine the need for corrective action;
- advising the Chief Inspector when conditions (such as wet weather) make it advisable to restrict construction activities to avoid excessive rutting;
- approving imported soils for use in agricultural and residential areas and verifying that the soil is certified free of noxious weeds and soil pests;
- determining the need for and ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads. This would include evaluating erosion controls prior to a predicted storm event whenever possible and installing additional measures as needed to control stormwater and sediment;
- determining the need for and implementation of dust control measures;
- inspecting and ensuring the maintenance of temporary erosion control measures at least daily in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of each 0.5 inch or greater of rainfall. The inspections would be recorded and the records maintained for review upon request;
- ensuring restoration of contours and topsoil;
- determining the locations where slash or non-merchantable timber would be scattered across the right-of-way to be used for wildlife habitat;
- ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours after identification;
- keeping records of compliance with conditions of all environmental permits and approvals during active construction and restoration; and
- identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase.

The WDOE commented that the list of EI duties should be expanded to also include responsibilities related to testing and treatment of contaminated soils; determining the adequacy of Northwest’s proposed topsoil segregation method in wetlands; reporting of construction activities, permit violations, and situations when permit requirements need to be altered due to field conditions to the WDOE and other agencies; maintaining an "Environmental Agency Complaint Line" and publicizing it to agencies; and providing credentials of the EI to environmental agencies. The FERC staff's recommended mitigation measure number 8 (see section 5.0) requires Northwest to submit status reports to the FERC, the COE, the WDOE, and other federal and state agencies with permitting responsibilities upon request on a weekly basis until all construction-related activities, including restoration, are complete. While the FERC staff agrees that the remaining tasks should be performed during construction, some of these tasks may not necessarily need to be assigned to the EI. Therefore, **the FERC staff recommends that:**

- **Northwest prepare a revised ECR Plan that includes the following tasks in the list of EI responsibilities or specifies an alternative representative of Northwest's organization that would be assigned responsibility for each task:**

  a. implementing a soil sampling protocol when contaminated soils are discovered, including conducting soil samples and preparing samples for laboratory analysis or being responsible for overseeing specialists to conduct the samples and prepare them for analysis;

  b. determining the adequacy of Northwest's proposed topsoil segregation method in wetlands;

  c. notifying agencies of permit violations or when permit requirements need to be altered due to field conditions;

  d. maintaining an "Environmental Agency Complaint Line" and publicizing it to agencies; and

  f. providing credentials of the EI to appropriate state environmental agencies.

  Northwest should file the revised ECR Plan with the Secretary of the Commission (Secretary) for the review and written approval of the Director of the Office of Energy Projects (OEP) <u>before construction</u>.

The FERC staff's recommended mitigation measure number 6 (see section 5.0) requires Northwest to submit an Implementation Pla*n* for approval prior to the commencement of construction. The Implementation Plan must identify the number of EIs assigned per spread and describe how Northwest will ensure that sufficient personnel are available to implement the environmental mitigation. When the FERC staff reviews the Implementation Plan, it will consider the number and qualifications of the EIs identified by Northwest and determine whether they are appropriate for this project. If the FERC staff finds that the environmental inspection plan is not sufficient, the Director of OEP may be advised to either require a change in the number of EIs or individual personnel, or require that Northwest implement a Third-Party Compliance Monitoring Program for the project. In addition, the FERC staff would conduct periodic inspections of the project for compliance with the Commission's environmental conditions.

Northwest has developed a Landowner Complaint Resolution Procedure that would be implemented during construction of the Capacity Replacement Project. The components of Northwest's Landowner Complaint Resolution Procedure are described below.

- Before construction, Northwest would provide affected landowners and municipality offices with the telephone numbers and contact names for Northwest's local land representative(s), construction office(s), and a project "hotline" to Northwest's office in Salt Lake City, Utah and the FERC's Enforcement Hotline.

- In the event that a complaint arises due to project activities, the public would first be instructed to call the land representative as the first and primary means for initiating resolution of the issue. The land representatives would be available during construction and restoration activities from 7:00 AM to 5:00 PM Monday through Saturday.

- If the land representative does not provide a timely and/or satisfactory response or contact is necessary outside of business hours, the public would be instructed to leave a message at the Project Land Office. The Project Land Office would be staffed during normal business hours (7:00 AM to 5:00 PM) and the question/concern would be directed to the appropriate party. If the public leaves a message, a project representative would promptly return the call during the next business day to acknowledge receipt of the message and a response to the question/concern would be provided within 24 to 48 hours.

- If a satisfactory response/resolution to the question/concern is still not received, the public would be instructed to contact the Capacity Replacement Project Hotline. The hotline attendant would document each complaint received, including the date and time of the call; name, address, and telephone number of the caller; and a detailed description of the issue of concern. The hotline attendant would then determine the appropriate project personnel to address the issue and would designate responsibility to that person to resolve the issue. A response to the call could be expected within 24 to 48 hours.

- The responsible project personnel would investigate the issue and either resolve the issue or recontact the landowner/caller within 48 hours to further coordinate an acceptable solution. Following resolution of the issue, the responsible project personnel would contact the hotline attendant to "close out" the issue for the record, noting the date and means of resolution. All complaints received, and the status of their resolution would be documented in a weekly status report that would be submitted to the FERC.

- Northwest's goal is to resolve all complaints within 24 to 48 hours of receiving them. However, Northwest acknowledges that some issues would require more than 48 hours to resolve. In this event, Northwest recognizes that keeping the landowner informed of the progress and schedule for resolution is critical to maintaining good faith and satisfaction of the landowners.

- The hotline attendant would closely track the progress of each issue with the assigned responsible project personnel and would provide assistance and/or would facilitate resolution as needed during the process.

- Finally, if satisfactory response to the question/concern is still not received, the public would be provided with the FERC's Enforcement Hotline and instructed to provide FERC with the project number.

Northwest's Landowner Complaint Resolution Procedure adequately outlines procedures for landowners to contact a Northwest representative between the hours of 7:00 AM and 5:00 PM; however, construction is scheduled to occur from 7:00 AM until 7:00 PM. Because it is important for landowners to be able to reach a Northwest representative for the duration of the construction activities, t**he FERC staff recommends that:**

- **Northwest revise its Landowner Complaint Resolution Procedure to outline procedures for landowners to contact a Northwest representative between the hours of 7:00 AM and 7:00 PM each day that construction would occur. The revised Landowner Complaint Resolution Procedure should be filed with the Secretary for the review and written approval of the Director of OEP <u>before construction</u>.**

2.6 OPERATION, MAINTENANCE, AND SAFETY CONTROLS

Northwest would operate and maintain the proposed pipeline and aboveground facilities in compliance with DOT regulations provided in Title 49 CFR Part 192, the Commission's guidance at Title 18 CFR Part 380.15, and the maintenance provisions of the FERC staff's Plan and Procedures. No new permanent employees would be added to operate and maintain the new pipeline and aboveground facilities. Personnel from Northwest's existing staff would be available to assume operation and maintenance of the facilities as part of their routine workload.

Maintenance activities would include regularly scheduled gas-leak surveys and measures necessary to repair any potential leaks. All valves would be periodically inspected and greased. Vegetation on the permanent right-of-way would be maintained by mowing, cutting, and trimming. The right-of-way would be allowed to revegetate; however, large brush and trees would be periodically removed. The frequency of vegetation maintenance would depend upon the vegetation growth rate. Vegetation maintenance would not normally be required in agricultural or pasture areas.

The pipeline facilities would be clearly marked at line-of-sight intervals and at crossings of roads, railroads, and other key points. The markers would indicate the presence of the pipeline and provide a telephone number and address where a company representative could be reached in the event of an emergency or before any excavation in the area of the pipeline by a third party. Northwest participates in all "One-Call" programs. "One-Call" programs are used by public utilities and some private sector companies to provide information on the location of underground pipes, cables, and culverts. .

Periodic aerial and ground inspections by pipeline personnel would identify soil erosion that may expose the pipe; dead vegetation that may indicate a leak in the line; conditions of the vegetative cover and erosion control measures; unauthorized encroachment on the right-of-way, such as building and other substantial structures; and other conditions that could present a safety hazard or require preventive maintenance or repairs. The pipeline cathodic protection system would also be monitored and inspected periodically to ensure proper and adequate corrosion protection. Northwest would evaluate the existing cathodic protection system and design and install additional cathodic protection as required. A survey would then be performed to determine if adequate protection has been achieved and modifications to the cathodic protection system would be made accordingly.

Compressor station crews would perform operation and maintenance of the new and existing equipment. Station personnel would perform routine checks of the facilities including calibration of equipment and instrumentation, inspection of critical components, and scheduled and routine maintenance of equipment. Safety equipment, such as pressure relief devices, fire detection and suppression systems, and gas detection systems would be tested for proper operation. Corrective actions would be taken for any identified problem. Northwest would be required to submit maintenance records and report any malfunction or emergency to the WDOE.

Controls and safety devices would be a combination of electronic, pneumatic, and mechanical. The safety system would be designed to protect the equipment, personnel, and surrounding area from a dangerous situation. The existing stations are equipped with combustible gas and fire detection alarm systems and an emergency shutdown system, all of which would be expanded to include the new equipment. The gas detection system would sound an alarm upon detection of 25 percent of the lower explosive limit of natural gas in air. Automatic emergency shutdown of the compressors, evacuation or venting of gas from the station piping, and isolation of the station from the pipelines would occur following a fire detection alarm or the detection of a 50 percent lower explosive limit inside the station. The compressor stations are also equipped with relief valves or pressure protection devices to protect the station piping from overpressure if station or unit control systems failed. A telemetry system would notify personnel locally and at the gas control headquarters in Salt Lake City of the activation of safety systems and alarms, who would in turn instruct maintenance personnel to investigate and take proper corrective actions.

2.7 FUTURE PLANS AND ABANDONMENT

As discussed in section 1.1, the DOT has issued a CAO requiring Northwest to abandon the existing 26-inch-diameter pipeline because the pipeline is subject to stress corrosion cracking. Although technology does not currently exist that would allow the integrity of the pipeline to be demonstrated, new technology is being developed that can more accurately detect stress corrosion cracking. Northwest states that at some future date when the new technology becomes available, it hopes to utilize the new inspection tools to identify anomalies. Assuming that the anomalies could be identified and repaired and the integrity of the pipeline demonstrated, Northwest could possibly put the pipeline back in service if approved by the DOT. Northwest’s proposal to leave as much of the pipeline intact as possible would allow it to be put back in service for future gas deliveries with minimal environmental impact and disruption to landowners.

Northwest states that it has no definitive plans for either future expansion or abandonment of the new facilities proposed as part of the Capacity Replacement Project. Properly maintained, and assuming adequate gas supplies and markets, the proposed loops are expected to operate for 50 or more years. If and when Northwest abandons any of the proposed facilities, the abandonment would be subject to separate approvals by the FERC and other federal land management agencies. The FERC review would be conducted under section 7(b) of the NGA.

3.0 ALTERNATIVES

Several alternatives to Northwest's Capacity Replacement Project were evaluated to determine whether they would be reasonable and environmentally preferable to the proposed action. These alternatives included the no action or postponed action alternative; system alternatives, including other existing or alternative pipeline systems, new pipeline corridors, and alternative configurations of Northwest's system; route variations and non-standard parallel offsets; abandonment alternatives; and construction method alternatives.

The evaluation criteria for selecting potentially reasonable and environmentally preferable alternatives include whether they:

- are technically and economically feasible and practical;
- offer significant environmental advantage over the proposed project; and
- meet the project objectives of replacing the required delivery capacity of Northwest's existing 268-mile-long, 26-inch-diameter pipeline between Sumas and Washougal, Washington.

In conducting a reasonable analysis, it is important to recognize the environmental advantages and disadvantages of the proposed action to be able to focus the analysis on those alternatives that may reduce impacts and offer a significant environmental advantage. A detailed discussion of the environmental consequences of the project (both positive and negative) is included in section 4.0.

Using the evaluation criteria discussed above and subsequent environmental comparisons, each alternative was considered to the point where it was either clear that the alternative was not reasonable, would result in substantially greater environmental impacts that could not be readily mitigated, offered no potential environmental advantages over the proposed project, or could not meet the project's objectives. Those alternatives that appeared to offer environmental advantages or that would result in less than or similar levels of environmental impact were reviewed in greater detail.

The analysis was based on information provided by Northwest, field reconnaissance, aerial photographs, U.S. Geological Survey (USGS) topographic maps, other publicly available environmental data, agency consultations, and public scoping comments.

3.1 NO ACTION OR POSTPONED ACTION

The action triggering this environmental review was Northwest's application to the FERC for a Certificate. This environmental review will also satisfy the COE's NEPA responsibilities in considering issuance of section 404 and section 10 permits for activities associated with the project and the WDOE's responsibilities to consider alternatives under SEPA. The FERC, the COE, and the WDOE have three alternative courses of action in considering proposed projects. They may: 1) grant the approval with or without conditions; 2) deny the approval; or 3) postpone action pending further study.

If the FERC were to deny or postpone action on Northwest's application, Northwest would not be able to comply with the DOT's CAO unless it were to replace the entire existing 26-inch-diameter pipeline with a new 26-inch-diameter pipeline according to the phased schedule outlined in the CAO (see section 1.1). The entire 26-inch-diameter pipeline could be replaced without obtaining a FERC Certificate if Northwest were to either phase its construction into multiple, small projects that would remain within the provisions of the FERC's section 2.55 regulations or replace the entire 268 miles under those provisions.

However, if Northwest were to replace the 26-inch-diameter pipeline under the FERC's section 2.55 regulations, it would still need to obtain other federal, state, and local approvals. The cumulative environmental impact of a phased replacement of the entire 268 miles of 26-inch-diameter pipeline over a 10-year period would be greater than the impact of the 79.5-mile-long Capacity Replacement Project because it would involve more than three times the length of right-of-way and would be constructed in more than 1 year. Therefore, the likely outcome of the FERC, the COE, and the WDOE denying or postponing action on Northwest's applications for the Capacity Replacement Project would be the replacement of the entire 26-inch-diameter pipeline causing greater environmental impacts. Alternatively, if Northwest were to abandon the 26-inch-diameter pipeline without replacing its capacity, Northwest would not be able to meet its contractual obligations and Washington would lose a significant amount of its natural gas supply.

Northwest is currently the sole provider of interstate natural gas in the Interstate 5 corridor in western Washington. If Northwest could not meet its delivery contracts, its customers would likely seek natural gas from other sources. This could necessitate the construction of additional and/or new pipeline facilities in other locations (system alternatives) to transport natural gas to the markets Northwest serves. If other new natural gas pipeline facilities are approved and constructed, each project would result in specific environmental impacts that could be less than, similar to, or greater than those associated with the current proposal. Use of alternative pipeline systems to supply natural gas to Northwest's customers is discussed in section 3.2.1.

An insufficient supply of natural gas could cause many of Northwest's customers to use other fossil fuels, such as coal or oil, for its energy supplies. Many natural gas power plants have the option of switching to fuel oil if natural gas becomes unavailable or prohibitively expensive. However, increased use of other fossil fuels would lead to increased emissions of combustion byproducts, including sulfur oxides (SO_x), nitrogen oxides (NO_x), hydrocarbons, and carbon dioxide (CO_2) (see table 3.1-1).

TABLE 3.1-1

Estimated Air Emissions by Fossil Fuel Type for Electric Power Generation

Fossil Fuel Type	CO_2 (lb/kWh)	SO_X (lb/kWh)	NO_X (lb/kWh)
Coal	2.1	0.013	0.0076
Oil	1.6	0.011	0.0021
Natural Gas	1.0	0.000007	0.0018

Source: Estimated emissions are based on total emissions and total electrical power production for each fossil fuel type, as reported in the U.S. Environmental Protection Agency's Annual Energy Review 2003 (U.S. Department of Energy, 2003).
CO_2 = carbon dioxide
SO_x = sulfur oxides
NO_x = nitrogen oxides
lb/KWh = pounds per kilowatt hour

Compared to other fossil fuels, natural gas is a relatively clean and efficient fuel. Combustion of fuels, such as oil or coal, can generate 60 to 110 percent more CO_2 than natural gas. Other emissions from oil or coal combustion, including greenhouse gases, are also significantly higher than those from natural gas. The use of other fossil fuels in place of natural gas would not only increase atmospheric pollution, but would also result in secondary impacts associated with production (e.g., coal mining and oil drilling), transportation (e.g., oil tankers, rail cars, and pipelines), and refining. Under Northwest's proposed project, these increased emissions and secondary impacts would not occur and would actually decrease overall because the proposed project would result in slightly less delivery of natural gas and subsequent emissions, and would rely on the same production and transportation systems as the original (authorized) 26-inch-diameter pipeline system.

The use of renewable energy sources is currently infeasible because solar, wind, hydroelectric, and other energy sources such as geothermal or fuel cells are either not physically or commercially available in the market region or have not been developed to the point where they would be viable substitutes for the volume of natural gas that Northwest is required to provide. Moreover, their use if they were available would require major modifications to end-user facilities.

3.2 SYSTEM ALTERNATIVES

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the stated objectives of the project. A system alternative would make it unnecessary to construct all or part of the proposed project, although some modifications or additions to another existing pipeline system may be required to increase its capacity, or another entirely new system may need to be constructed. Such modifications or additions would result in environmental impact; however, the impact could be less than, similar to, or greater than that associated with construction of the proposed project.

Under the terms of the DOT's CAO, Northwest is required to replace the capacity of its existing 268-mile-long, 26-inch-diameter pipeline over a 10-year period. A number of system alternatives that could potentially be implemented by Northwest to comply with the CAO were evaluated. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the proposed facilities could be avoided or reduced while still allowing the stated objectives of the project to be met.

In order to be viable system alternatives to the Capacity Replacement Project, other systems or modified systems would have to meet two criteria: 1) they would need to provide transportation of natural gas from Sumas to Washougal, Washington from which the gas could then be transported via regional systems to the market delivery points; and 2) they would need to be able to provide the required volumes within the same general time frame as the proposed project.

3.2.1 Other Existing Pipeline Systems

Northwest's existing customers could seek natural gas from other existing pipeline systems if Northwest were released from its contractual obligations or if it were to abrogate its delivery contracts to its existing customers. However, because Northwest is the sole provider of interstate natural gas in the western Washington area, there are no other companies or existing systems that could meet Northwest's contractual delivery requirements without constructing new transmission facilities. In order for an alternative pipeline system to replace the proposed project, new facilities would need to be planned, proposed, constructed, and placed into service by December 18, 2006, and Northwest's existing customers would need to subscribe to the alternative pipeline system to receive the equivalent volumes of natural gas. To serve the same market as the Capacity Replacement Project, a new natural gas transmission system would likely require the construction of between 260 and 300 miles of new pipeline along with compression and related infrastructure to interconnect with the local distribution companies. Based on length alone, such a project would likely result in significantly greater environmental impact than the proposed action. Therefore, the use of an alternative pipeline system is not considered to be environmentally preferable to the proposed action and it was eliminated from further consideration.

Because no other existing pipeline systems currently exist or are proposed in western Washington that could duplicate the capacity of Northwest's 26-inch-diameter pipeline except for Northwest's own system, this analysis focuses on what appear to be the most reasonable modifications to Northwest's system to meet the project objectives. These system alternatives are evaluated below.

3.2.2 Northwest System Alternatives

3.2.2.1 New Pipeline Corridor Alternatives

Northwest's existing system between Sumas and Washougal, Washington consists of two parallel 26-inch- and 30-inch-diameter pipelines and 27.8 miles of adjacent 36-inch-diameter pipeline. Collocation of facilities is generally preferred by land management agencies, land use planners, and other regulatory agencies, and has several inherent engineering and environmental advantages. While the origin and delivery points of new pipeline corridor alternatives would generally be the same as for corresponding segments of an existing pipeline corridor, the route alternatives would follow different alignments and would impact new landowners and environmental features that are not currently impacted or were not impacted by construction of the original pipelines. In addition, from an engineering standpoint, it is much easier and more efficient to maintain facilities within the same corridor. Northwest has proposed to use its existing corridor to the maximum extent possible and to minimize the amount of additional permanent easement that would be required. Because of the significant advantages afforded by collocating with Northwest's existing corridor, the FERC staff believes that installing the proposed loops within or adjacent to the existing corridor would be environmentally preferable and eliminated an alternative using a new pipeline corridor from further consideration.

3.2.2.2 Alternative Configurations of the Northwest System

A number of potential alternative configurations of Northwest's system were evaluated to determine whether they would be technically and economically feasible and practical, environmentally preferable, and able to meet the project objectives. Some of these alternatives were identified by the public and various agencies during the scoping process. These alternative configurations include:

- permanently returning the existing 26-inch-diameter pipeline to service;
- constructing a new 26-inch-diameter pipeline to replace the existing 26-inch-diameter pipeline;
- using pipeline looping only;
- using compression only;
- installing an alternative pipeline size;
- installing the pipeline loops in alternative locations;
- replacing the existing 26-inch-diameter pipeline with the 36-inch-diameter loops in the same trench;
- maximizing use of the existing 30-inch-diameter pipeline;
- placing a smaller pipeline inside the existing 26-inch-diameter pipeline or using a pipe liner; and

- implementing a no turn back capacity alternative.

These alternatives are discussed below.

Permanently Returning the Existing 26-inch-diameter Pipeline to Service

In June 2004, Northwest was able to temporarily return approximately 111 miles of the existing 26-inch-diameter pipeline to service. The DOT approved the implementation of an integrity management program that involved identification and repair of pipeline anomalies and verification through pressure testing that the pipeline segment could be safely operated at its originally authorized pressure. In authorizing the return of this existing pipeline segment to temporary service, the DOT authorized Northwest to operate that segment of the pipeline only until the replacement dates required in the December 18, 2003 amended CAO. The DOT did not authorize permanent operation of that pipeline segment or provide a mechanism for permanent return to service of any portions of the existing pipeline beyond the mandated replacement dates. Therefore, a permanent return to service of the 26-inch-diameter pipeline is not considered to be a viable alternative and was eliminated from further consideration.

Like-kind Replacement of the 26-inch-diameter Pipeline

Replacing the entire 268 miles of existing 26-inch-diameter pipeline with a new 268-mile-long, 26-inch-diameter pipeline would be possible, and is authorized by the CAO to occur in three phases over 10 years. This alternative would consist of 65.5 miles of DOT Class 3 areas and HCAs in 52 separate sections that must be abandoned within 3 years, 79.0 miles of non-HCA DOT Class 2 areas in 44 separate sections that must be abandoned within 5 years, and the remaining 123.8 miles of non-HCA DOT Class 1 areas that must be abandoned within 10 years. Section 4.12.1 provides additional information on DOT class locations and HCAs. The alternative would involve staged replacements according to the DOT schedule and would require multiple internal inspections, hydrostatic tests, and associated repairs to temporarily restore full service capability as individual segments are abandoned and replaced, along with frequent follow-up testing until abandonment of the entire 268 miles of pipeline is complete. A like-kind replacement, as authorized in the CAO, would disturb 100 percent of the existing pipeline right-of-way over a much longer time frame (10 years) as compared to the proposed action, which would only disturb approximately 30 percent of the right-of-way during a period of less than 1 year. A like-kind replacement would also require significantly greater land disturbance, waterbody crossings, wetland crossings, vegetative clearing, and associated impacts on sensitive environmental resources and landowners compared to the impact of constructing 79.5 miles of 36-inch-diameter loops. In addition, installing 188.5 more miles of pipeline would greatly increase costs for both construction and materials. Therefore, a like-kind replacement alternative is not considered economically practical or environmentally preferable and was eliminated from further consideration.

Pipeline Looping-only Alternative

In the design of pipeline systems to deliver natural gas, there is a trade-off between installing pipeline loops and increasing compression. Pipeline loops are more reliable than compression because pipeline outages are generally predictable and can be planned. A large percentage of compressor outages are unplanned and, therefore, more likely to adversely affect system reliability and service to customers. Pipeline loops also increase service reliability by providing a redundant path for flow, thus allowing continued gas flow if a parallel section of pipe is removed from service. A pipeline also provides reliability by acting like a long storage bottle. This pipeline storage, or “line pack,” not only helps to mitigate the impacts of a compression outage, but can also help meet the non-uniform demands of natural gas customers that can occur near a large market like Seattle. For example, customers typically take a significant amount of gas between 6:00 AM and 11:00 AM when items such as water heaters and furnaces are in heavy use at homes, businesses, and schools. The storage provided by pipeline capacity helps to manage daily variation in demand. A pipeline loop enhances this reliability because it can provide an additional source of gas for customers to meet increases in peak demand.

The pipeline looping-only alternative (with minor modifications to some of the existing compressors) could potentially replace all of the necessary delivery capacity associated with the proposed project and would preclude the need for significant additional compression. However, in evaluating system flow hydraulics, approximately 166 miles of 36-inch-diameter loop would be needed to replace the capacity of the existing 26-inch-diameter pipeline without additional compression compared to the 79.5 miles of new 36-inch-diameter loop that would be needed for the proposed action. This alternative would more than double the length of the proposed project and, subsequently, would have greater impacts on the environment and landowners. In addition, installing 86.5 more miles of pipeline would increase costs for both construction and materials. Therefore, a pipeline looping-only alternative is not considered economically practical or environmentally preferable and was eliminated from further consideration.

Compression-only Alternatives

A compression-only alternative would entail increasing compression on the existing pipelines rather than adding loops to replace the capacity of the 26-inch-diameter pipeline. Compression facilities are key components in the hydraulic design of a pipeline system. Their suitability in supplementing pipeline capacity can be affected by a number of factors including concerns for system reliability and flexibility, potential environmental impacts, and technical issues such as pipeline design limitations. Compressor reliability is critical to meet peak flow demand periods. However, because compressors are either running or not running, and have finite upper and lower flow limits, they do not allow the flexibility of operation that is inherently present in pipeline facilities. In order to avoid compression breakdowns at critical times, compressors frequently need to be shut down to service the engines and equipment. Although shut downs are typically planned for low-use periods, compressor stations inherently limit system reliability.

<u>Existing Compressor Station</u> – Several commenters asked that Northwest consider installing additional compression instead of constructing new loops in residential areas. Northwest currently has four existing compressor stations between Sumas and Washougal that are spaced from 44 miles to 62 miles apart and are operating at or near the existing design limitations for the existing 30-inch- and 36-inch-diameter pipelines. The amount of compression that can be added to a pipeline system is limited by a number of technical parameters. For example, all pipelines are designed to withstand a limited amount of pressure; frictional losses in small diameter pipe can limit gas velocities and low suction pressure and volume can limit the discharge pressure that can be added. Pipelines are authorized to operate at an MAOP based on their design limitations and the pipeline integrity as demonstrated through pressure testing. Northwest's existing pipelines are being utilized at or near their MAOP.

Increasing compression using Northwest's existing compressor stations instead of installing pipeline loops is not considered a viable alternative for the following reasons:

- the MAOP of the existing lines would be exceeded;
- gas velocities would be too high without looping;
- compressor station suction pressures would be lower than acceptable;
- fuel usage at the compressor stations would increase significantly; and
- desired operational flexibility and reliability would not be achieved.

Because a compression-only alternative using the existing compressor stations would not be technically feasible or economically practical, it was eliminated from further consideration.

New Compressor Stations – Constructing new compressor stations at the approximate midpoints between the existing stations instead of installing loops would provide a moderate increase in flow capacity on the existing pipeline system and still remain within the MAOP, but would also create landowner, visual, noise, and air quality impacts associated with new permanent aboveground facilities. In addition, the abandonment of the existing 26-inch-diameter pipeline between Sumas and Washougal would create a significant loss of line pack, or storage, in Northwest's system and new intermediate compressor stations would further reduce the line pack on the remaining 30-inch-diameter pipeline by about half. This loss in storage would significantly reduce the system's reliability and Northwest's ability to manage daily variations in pressure and/or flow requirements within the Interstate 5 corridor. The variability in demand on Northwest's gas supplies within the Interstate 5 corridor supports the need for flexibility that would be provided by line pack on the proposed loops. In addition, gas discharge temperatures from each intermediate station would tend to be higher and may require the installation of additional gas coolers at existing stations and equivalently sized coolers at the new compressor stations. Gas coolers contribute to higher noise levels and have a negative impact on efficiency because the coolers themselves would require energy to operate, which would cause an additional pressure drop.

In terms of environmental efficiency, Northwest's proposed action would add 10,760 hp at two of its existing compressor stations to avoid construction, operation, and maintenance of new grassroots compressor stations. The proposed project would be a more compression-intensive design compared to the previously existing 26-inch-diameter pipeline system, make efficient use of existing facilities, and reduce environmental effects. The use of existing compressor stations and equipment would also minimize the long-term impacts on the natural and human environment associated with new facilities, including increased air emissions, noise, and permanent aboveground structures. The proposed pipeline and compression would also require less compressor fuel to transport an equivalent volume of gas because of efficiencies realized from the proposed loops that would reduce the total horsepower requirements for the project.

Because of the environmental and operational issues described above, the FERC staff believes that construction of new compressor stations instead of additional pipeline loop is not a viable alternative and it was eliminated from further consideration.

Alternative Pipeline Size

Numerous comments were received regarding the diameter of the proposed loops. Some commenters recommended that there be no change from the existing 26-inch-diameter pipeline size, and some requested justification why larger-diameter pipe could not be used to reduce the total length of the proposed loops. In the evaluation of pipeline size requirements, factors associated with hydraulic requirements, efficiency, constructability, configuration of the existing right-of-way, impacts on landowners, existing pipeline facilities, reliability, accessibility of aboveground facilities, and environmental effects were considered.

Landowners on the Snohomish Loop, principally within the Deer Park Subdivision, commented that larger diameter pipelines should be considered in an effort to avoid certain properties. Based on the assumption that the pipeline would begin at a point immediately downstream of the existing Snohomish Compressor Station, the required delivery capacity on the Snohomish Loop could be achieved with a 42-inch-diameter pipeline that is about 11 miles in length, or 0.9 mile less pipe than the proposed project. This would place the terminus of the loop at about MP 1382.9 between 19th Drive NE and 25th Way NE, which is within residential areas associated with the Deer Park Subdivision. Ending the loop at that location would require the purchase and demolition of one home on the west side of the right-of-way in order to install the DOT-required MLV and pig receiver within a fenced area about 75 feet wide by 150 feet long. In addition, installation of a 42-inch-diameter pipeline would require a minimum construction right-of-way width of 80 feet to safely accommodate the larger equipment and the deeper and wider trench needed to install larger diameter pipe. Because Northwest only has limited permanent right-of-way in many areas through the subdivision due to encroachment onto its existing easement, extra workspace would have to be purchased and the footprint of disturbance within the subdivision would be greater than that associated with the proposed project. For these reasons, installing a 42-inch-diameter pipeline on the Snohomish Loop is not considered a practical alternative.

If Northwest were to replace the Snohomish Loop with a new 26-inch-diameter pipeline, the loop length would be 15.8 miles versus the currently proposed 11.9 miles of 36-inch-diameter pipeline. Assuming that the same starting point was used immediately downstream of the Snohomish Compressor Station and that Northwest would use its existing easement, the terminus for a new 26-inch-diameter pipeline loop would be at MP 1378.0. This would represent an increase of 3.9 miles, of which 88 percent would be located in a DOT Class 3 area. Installation of a 26-inch-diameter pipeline would not significantly reduce construction impacts. Rather, the increased length of smaller-diameter pipeline would affect more landowners and sensitive environmental areas, such as the Queen's Bog wetland. Given these reasons, incurring an additional 3.9 miles of impact associated with installation of a 26-inch-diameter pipeline would not be environmentally preferable to the proposed action.

In summary, a 36-inch-diameter pipeline would offer advantages over other pipeline diameters for the following reasons:

- a larger diameter pipeline would require a wider construction right-of-way width, potentially greater pipeline offset, and larger construction equipment;
- a smaller diameter pipeline would require a substantially greater length in order to attain the same hydraulic capacity requirements of the 36-inch-diameter pipeline; and
- a 36-inch-diameter pipeline would meet the hydraulic capacity requirements and allow for installation within the existing right-of-way, thereby minimizing the need for new permanent right-of-way.

As a result, the alternative of using a different pipeline diameter was eliminated from further consideration.

Alternative Pipeline Loop Locations

Several comments were received concerning the basis for the proposed loop locations, specifically the Snohomish and Fort Lewis Loops. In all pipeline systems, the pressure decreases due to friction as the gas flows down the pipeline. Therefore, the location of the loops affects gas flow and pressure requirements. Hydraulic studies indicate that the proposed loops should generally be located immediately downstream of existing compressor stations to maximize compressor efficiency and should be strategically located to provide adequate line pack for the system to accommodate non-uniform loads. Placement of loops immediately downstream of compressor stations allows the gas to be at the highest pressure with the lowest velocity, thus minimizing the overall length of loop required. The Capacity Replacement Project would place the loops as near as possible to the discharge side of Northwest's existing compressor stations.

The locations of the Sumas and Snohomish Loops would take full advantage of the efficiency realized by constructing loops immediately downstream of compression facilities, as would the Mount Vernon Loop which is located immediately south of the existing 36-inch-diameter loop installed as part of the Evergreen Expansion Project. Pipeline hydraulics require that the Snohomish Loop be located between the Snohomish and Sumner Compressor Stations. Avoidance of populated areas would not be possible between these two compressor stations. Environmental and landowner impacts would increase if the pipeline loop were moved further from the Snohomish Compressor Station because of the need for additional total pipeline length and compression to compensate for the additional pressure drops. In addition, an alternative segment would not allow for collocation with existing aboveground facilities (e.g., launcher, receivers, MLVs); therefore, new aboveground facilities would need to be established and system operational reliability would be negatively affected. The installation of a loop along an alternative right-of-way that would be hydraulically equivalent to the proposed loop is also not possible without increasing the length of the pipeline and adding associated compression. This alternative would create greater impacts associated with an increased right-of-way and additional landowners. Operation and maintenance of the system would also be negatively impacted due to the physical addition of more miles of right-of-way to be monitored and maintained, and lost opportunities to cross over to the 30-inch-diameter pipeline at the intermediate MLVs, minimize blow down lengths needed for maintenance, and provide dual feeds into meter stations.

Northwest would install the Snohomish Loop within its existing permanent easement and through the Deer Park Subdivision in accordance with a site-specific *Residential Area Work Plan* (see section 4.8.3.1). With a few exceptions, the area disturbed by construction would be restored to preconstruction conditions. Because installing the loop in another location would decrease system efficiency, increase the pipeline length, and merely shift impacts from one set of landowners to another, an alternative location for the Snohomish Loop was eliminated from further consideration.

The Fort Lewis Loop would begin approximately 10 miles downstream of the Sumner Compressor Station and end at a point where Northwest's Grays Harbor and Olympia pipelines begin to provide increased reliability. This configuration would take advantage of existing MLV settings at both the start and end points and would allow for collocation with existing structures and minimization of new aboveground structures. Northwest has 75 feet of permanent right-of-way through the residential areas on this loop, and for the most part the right-of-way is currently clear with no encroachment. Most of the residents' fences are at the edge of the right-of-way and would not have to be removed for construction. Because installing the loop in another location would merely shift impacts from one set of landowners to another, an alternative location for the Fort Lewis Loop was eliminated from further consideration.

Replacement of 26-inch-diameter Pipeline with the 36-inch-diameter Loop in the Same Trench

Several comments were received asking why the proposed loops could not be placed in the same location as the existing 26-inch-diameter pipeline in order to decrease construction impacts and the need for new permanent right-of-way. While it is technically feasible to remove the existing 26-inch-diameter pipeline and place the 36-inch-diameter loop in the same trench, information provided by Northwest indicates that this alternative would not necessarily decrease construction right-of-way width or extra workspace requirements when compared to the proposed project. In order to place the new loop in the same trench, the existing pipeline would have to be excavated, cut into sections, and removed from the right-of-way before any work could begin on the new 36-inch-diameter loop. This process would require about the same construction right-of-way width as the proposed project. After the existing pipe was removed, the trench would be enlarged to accommodate the larger diameter pipe. The 36-inch-diameter pipeline would then be installed using normal pipeline construction procedures. Because of the additional work required to remove the 26-inch-diameter pipeline, placing the new loop in the existing trench would result in a substantially longer construction time. This alternative would not eliminate or significantly reduce the need for temporary extra workspace outside the existing right-of-way. Removing the existing pipe would require additional trucks traveling the right-of-way to haul away the old pipe, and the pipe storage yards would require additional space to store the 26-inch-diameter pipe.

In addition, removing and replacing the existing pipeline using the same trench in areas where the 26-inch-diameter pipeline is currently in service would require Northwest to take the pipeline out of service during construction. Because construction would take place during the summer months, when the system requires its peak capacity, this alternative would result in a reduction in delivery capacity and potential delivery disruptions to the customers subscribed to the system.

As discussed in section 2.7, Northwest would like to leave as much of the 26-inch-diameter pipeline in place as possible in the event that new technology is developed that can more accurately detect stress corrosion cracking. Northwest hopes to utilize the new technology to prove the integrity of the 26-inch-diameter pipeline and possibly put the pipeline back in service if approved by the DOT. Recent market studies confirm the long-term need for transmission capacity to be maintained and ultimately expanded in the Pacific Northwest to accommodate projected natural gas market growth. By leaving the 26-inch-diameter pipeline in place, Northwest would be able to provide additional reliability and may be able to address future increases in demand with little or no additional construction and disruption to landowners.

Site-specific conditions along the Snohomish Loop would require Northwest to remove the 26-inch-diameter pipeline and place the 36-inch-diameter loop in the same trench. There are locations within the 11.9-mile-long loop where Northwest only has 60 feet of permanent right-of-way instead of its typical 75 feet and residential developments have heavily encroached on both sides of Northwest’s easement. These constraints limit or completely eliminate any possible extra workspace for construction. The 26-inch-diameter pipeline is not currently operating in this area so it can be removed without affecting current gas deliveries. There are also select areas outside of the Snohomish Loop where encroachment, development, or other limitations confine available workspace so that Northwest would replace the existing 26-inch-diameter pipeline with the 36-inch-diameter loop in the same trench.

While it would be technically feasible to remove the existing 26-inch-diameter pipeline and install the new 36-inch-diameter loop in the same trench in all areas to be looped, this alternative would result in similar impacts, would not be environmentally preferable to the proposed action, and would preclude the future use of the pipeline. Therefore, this alternative was eliminated from further consideration.

Use of the Existing 30-inch-diameter Pipeline

Several commenters inquired whether Northwest could replace the delivery capacity of the 26-inch-diameter pipeline by adding compression to the existing 30-inch-diameter pipeline to transport the required natural gas volumes. This alternative is not hydraulically feasible due to design and operating pressure restrictions. The design of the Capacity Replacement Project already takes into account any available capacity in the existing infrastructure in order to minimize the construction of new facilities. For this reason, along with the limitations of adding compression described above for the compression-only alternatives, this alternative was eliminated from further consideration.

Inserting a Liner or Smaller Pipe Inside the 26-inch-diameter Pipeline

One comment was received asking for evaluation of an alternative that would replace the capacity of the 26-inch-diameter pipeline by inserting a smaller pipe within the existing pipe, or by installation of a liner or sealant that would allow continued use of the existing pipeline. Inserting a smaller diameter pipe in the existing pipeline, which has many bends and elevation changes, does not appear to be technically feasible at the scale of the proposed project. In addition, a smaller diameter pipeline would result in a hydraulic flow restriction and would not provide for the required gas flow volumes. Further, isolation between the two lines, or cathodic protection, would be difficult to maintain, which would threaten the ultimate integrity of the pipeline system.

Current technology of flexible liners is also limited, and is typically only used for smaller diameter and lower pressure gas pipeline distribution systems. Decreasing operating pressure would result in a hydraulic flow restriction and would not allow for the movement of the required gas volumes. Aside from the technological and hydraulic issues, the DOT has mandated that the 26-inch-diameter pipeline be retired and/or replaced. The use of these alternatives would not address the underlying issues that resulted in the CAO issued by the DOT. Therefore, the FERC staff does not believe these are viable alternatives and eliminated them from further consideration.

No Turn Back Capacity Alternative

As discussed in section 1.1, at the time of the CAO Northwest's system transportation capacity from Sumas to Washougal was fully contracted, with 360 Mdth/d of the contracted capacity dependent upon use of the existing 26-inch-diameter pipeline. However, in May and June 2004, Northwest held a reverse open season soliciting customer turn back of unneeded contract capacity. The reverse open season resulted in a commitment to turn back 13 Mdth/d that would affect the first 179 miles south of Sumas. Northwest's proposed action has assumed this turn back would be approved by the FERC. Without this reduction in required capacity, Northwest would need to construct 1.2 miles of additional 36-inch-diameter loop between the Sumner and Chehalis Compressor Stations and add about 2,000 hp of compression at both the Mount Vernon and Snohomish Compressor Stations. The additional 1.2 miles of loop would be added to the north end of the Fort Lewis Loop between MPs 1338.1 and 1339.3 as shown in Appendix B, figure B-4, sheet 1. The additional environmental impacts of this alternative are summarized in table 3.2.2-1.

The 1.2 miles associated with the No Turn Back Capacity Alternative would result in an additional 20.9 acres of land disturbance. Of the 20.9 acres, 15.6 acres would consist of developed land, 3.7 acres would consist of open land, and 1.6 acres would consist of forest land. A total of about 0.1 acre of scrub-shrub and emergent wetland would be affected. No surface waters would be crossed. The entire 1.2 miles would cross the EPA-designated Central Pierce County sole source aquifer, Clover Chambers Creek Groundwater Management Area (GMA), and aquifer recharge areas. The alternative would cross a carbon tetrachloride plume associated with a former ammunitions plant; however, groundwater at this location is 40 to 60 feet deep and construction activities would be unlikely to encounter the contaminant plume. The alternative would cross hydric soils susceptible to soil compaction and would cross areas with moderate to low seismic risk ratings. No additional threatened or endangered species would be affected by the additional 1.2 miles; one additional cultural resources site would be affected by the alternative. The increased compression would cause minor incremental increases in air emissions.

Because of the additional environmental impacts associated with the No Turn Back Capacity Alternative, it was determined that it was not environmentally preferable to the proposed action and was eliminated from further environmental analysis in this EIS. This alternative may be considered further during the FERC's non-environmental review of the Capacity Replacement Project.

3.3 ROUTE VARIATIONS AND NON-STANDARD PARALLEL OFFSETS

Route variations differ from system alternatives or major route alternatives in that they are identified to reduce impacts on specific localized features or to satisfy requests by a landowner. Northwest's standard design calls for installation of the new loops at a 20-foot offset to the east of the existing 30-inch-diameter pipeline. Non-standard parallel offsets would occur where the loop is installed at slightly wider or narrower separations than the standard 20-foot offset from the 30-inch-diameter pipeline, but is still located within Northwest's existing right-of-way. Some non-standard parallel offsets would leave or be located at the edge of Northwest's existing right-of-way but would still be located within 50 feet of either the existing 26-inch- or 30-inch-diameter pipelines (i.e., pull-out areas). Where the new loop is forced to leave the corridor entirely and would be located greater than 50 feet from the existing pipelines, a route variation would be established.

TABLE 3.2.2-1

Environmental Impacts Associated with the No Turn Back Capacity Alternative [a]

Environmental Factor	Unit	Impact
General		
Additional loop length	miles	1.2
Construction disturbance	acres	20.9
Permanent easement	acres	11.1
New permanent easement	acres	2.3
Temporary construction right-of-way	acres	2.3
Temporary extra workspace areas	number	11
Temporary extra workspace areas	acres	5.2
Parcels affected	number	14
Adjacent to existing pipeline	yes/no	yes (with one offset)
Shoreline crossed	miles	0
Land Use		
Developed land affected	acres	15.6
Open land affected	acres	3.7
Forest land affected	acres	1.6
Residences within 50 feet	number	1 (shed)
Commercial structures within 50 feet	number	3
Water Use and Quality		
Waterbody crossings	number	0
Sole source aquifers crossed (Central Pierce County EPA-designated)	miles	1.2
Wellhead protection areas crossed	miles	2.6 [b]
Groundwater Management Areas crossed (Clover Chambers Creek Groundwater Management Area)	miles	1.2
High Groundwater Flood Hazard Areas crossed	miles	0
Aquifer Recharge Areas crossed	miles	1.2
Areas of Groundwater Concern crossed	miles	0
Group A Public Supply Wells within 150 feet	number	0
Group B Public Supply Wells within 150 feet	number	0
Wetlands		
Temporary wetland disturbance	acres	0.1
Palustrine emergent wetlands affected	acres	0.01
Palustrine scrub-shrub wetlands affected	acres	0.08
Palustrine forested wetlands affected	acres	0.00
Total permanent wetland impact	acres	0.08
Soils (Spanaway Soil Association)		
Soils crossed with high water erosion potential	miles	0
Soils crossed with loss of vegetation erosion potential	miles	< 0.1
Soils crossed susceptible to soil compaction	miles	0
Hydric soils crossed susceptible to soil compaction	miles	0
Soils with large stones	miles	1.2
Prime farmland	miles	0

TABLE 3.2.2-1 (cont'd)

Environmental Impacts Associated with the No Turn Back Capacity Alternative [a]

Environmental Factor	Unit	Impact
Geological Resources		
Mass wasting areas crossed	miles	0
High seismic risk rating areas crossed	miles	0
Moderate seismic risk rating areas crossed	miles	0.9
Low seismic risk rating areas crossed	miles	0.3
Threatened and Endangered Species	NA	No difference
Cultural Resources	number	1 (historic railroad grade)
Air Quality and Noise		
Additional compression at the Mount Vernon Compressor Station	horsepower	2,000
Additional compression at the Snohomish Compressor Station	horsepower	2,000

[a] Summary of the additional impacts that would occur if the turn back of 13 Mdth/d of long-term capacity is not approved by the FERC (i.e., if 360 Mdth/d of capacity is required to be replaced between Sumas and Washougal, Washington).

[b] Three separate but overlapping wellhead protection areas would be crossed; therefore, total cumulative mileage exceeds the additional loop length.

NA = Not applicable.

Table C-1 in Appendix C identifies the location and length of each of these route adjustments and provides Northwest's reason for developing them. The areas where route variations create a new right-of-way and Northwest's rationale for adopting them are presented in table 3.3-1. The locations of these minor route variations are shown on the maps in Appendix B.

TABLE 3.3-1

Route Variations Where New Right-of-Way is Created by the Capacity Replacement Project

Facility	Mileposts	Length	Rationale for Route Variation
Sumas Loop	1470.8 - 1470.7	0.1	To avoid crossing Mitchell Creek at a poor location.
Mount Vernon Loop	1424.3 - 1423.4	0.9	To accommodate the HDDs of the North and South Forks Stillaguamish Rivers.
Snohomish Loop		- None -	
Fort Lewis Loop	1325.3 - 1325.1	0.1	To accommodate the State Highway 72 bore crossing.

As previously discussed, the collocation of facilities is generally preferred by land management agencies, land use planners, and other regulatory agencies and has several inherent engineering and environmental advantages. Perhaps the most important of the environmental advantages is that new land disturbance is minimized. By overlapping the construction right-of-way with other previously disturbed existing rights-of-way, the amount of new land disturbance can be reduced significantly. Because of these advantages, alternatives that deviate from the existing right-of-way are driven by issues such as where remaining adjacent to the existing right-of-way is impracticable for engineering reasons or would result in more environmental impact. For these reasons, the increased offsets and minor route variations proposed by Northwest were reviewed and determined to be warranted.

3.4 ABANDONMENT ALTERNATIVES

As part of the Capacity Replacement Project, Northwest has proposed to retain as much of the existing 26-inch-diameter pipeline in place as possible for potential future use. Several comments were received recommending that Northwest remove the existing 26-inch-diameter pipeline if it is to be taken out of service. Several alternatives to abandoning the existing pipeline in place are discussed in section 3.2.2.2. These include permanently returning the existing 26-inch-diameter pipeline to service, like-kind replacement of the 26-inch-diameter pipeline, and removing the 26-inch-diameter pipeline and placing the 36-inch-diameter loop in the same trench. In each case, it was concluded that abandoning the 26-inch-diameter pipeline in place would be environmentally preferable unless site-specific conditions (e.g., areas where encroachment, development, or other limitations confine available workspace) necessitate its removal and replacement with the 36-inch-diameter loop in the same trench. Furthermore, abandoning the 26-inch-diameter pipeline in place in the locations along the non-looped portions of Northwest's system would eliminate disturbance to 188.5 miles of the right-of-way with the exception of the activities that would occur at 48 locations to isolate the 26-inch-diameter pipeline from other system components (see section 2.1.3). These abandonment activities would temporarily disturb a total of 14.4 acres of land within Northwest's existing permanent right-of-way. If Northwest were to remove the 26-inch-diameter pipeline in the 188.5-mile-long unlooped portion of its system, a minimum of 1,714 acres of land would be disturbed.[1]

1 Based on a 75-foot-wide right-of-way. Northwest would likely need a wider right-of-way and temporary extra workspace in some locations.

Abandonment of the existing 26-inch-diameter pipeline in place would involve purging the pipeline to remove existing gas and accumulated materials such as condensates. As discussed in section 2.1.3, nitrogen, an inert gas, would be used to purge the pipeline. Water would not be used or discharged as part of the purging activities. After the pipeline is purged, it would be filled with nitrogen at a low pressure, capped, and maintained with cathodic protection over an indefinite period to minimize corrosion and degradation. Northwest is optimistic about the future of the 26-inch-diameter pipeline because new technology is being developed that may allow the pipeline to be put back into service for future gas deliveries. Assuming that the pipeline anomalies could be identified and repaired to meet DOT requirements, the existing pipeline could potentially provide a cost-effective and low impact alternative to address future gas demands as compared to constructing new facilities.

Because Northwest's proposal to leave as much of the pipeline in place as possible would reduce environmental impact and allow it to be put back into service for future gas deliveries with minimal environmental impact and disruption to landowners, other alternatives were eliminated from further consideration.

3.5 CONSTRUCTION METHOD ALTERNATIVES

As previously discussed, the Snohomish Loop has certain site-specific conditions that would require Northwest to remove the 26-inch-diameter pipeline and put the 36-inch-diameter loop in its place. During project planning, Northwest evaluated the alternative of doing multiple crossovers between laying the 36-inch-diameter loop east of the 30-inch-diameter pipeline and removing only certain sections of the 26-inch-diameter where the right-of-way was restricted. However, this option created operational and safety concerns because it is critical for Northwest Operations personnel to know exactly where the pressurized operating pipelines are located on the easement. A frequent change in the relative location of the pipelines would create a risk of not correctly identifying the pressurized lines. Because of the risk associated with frequent crossovers, it was determined that replacement of the 26-inch-diameter pipeline with the 36-inch-diameter loop in the same trench is the most reasonable construction alternative for the Snohomish Loop.

In response to a scoping comment, an evaluation of the feasibility of using the HDD method to install the 36-inch-diameter loop through the Deer Park Subdivision on the Snohomish Loop was conducted. The HDD method is described in section 2.3.2. To use the HDD method, Northwest would require temporary extra workspace at the entry and exit points and a long straight section at either end in order to assemble, x-ray, and pressure test the entire drill pipe string for pullback into the drilled hole. However, there is limited workspace in this area due to planned developments, roads, and residential structures. The HDD would need to extend over 10,000 feet to avoid the subdivision, which is not technically feasible because the longest drill lengths currently achieved with 36-inch-diameter pipe are approximately 6,500 feet.

An option to make the HDD shorter and still avoid the entire neighborhood could not be identified. On the north end of the subdivision, there is a steep hill that leads down to Evans Creek and a wetland area. Northwest could not set up a drilling operation in this wetland due to standing water and the associated environmental impacts on the wetland. Another option would be to stop the drill somewhere within the neighborhood, which would require adequate workspace for an exit pit. Under this option, assembly of the pipe section would block streets and interfere with access by local residents. The pipe assembly area could potentially be shortened by using a two-stage pullback; however, this method greatly increases the risk of HDD failure. Additionally, an HDD operation is noisy and would likely require 24-hour-a-day work schedules during the drilling, reaming, and pullback processes. Based on these reasons, crossing the Deer Park Subdivision using the HDD method would not be a technically practical or environmentally preferable alternative and it was eliminated from further consideration.

Although the HDD method may be infeasible for large residential areas, it is generally the preferred method to cross major and sensitive waterbodies because it avoids disturbance to both the waterbody and the vegetation on both sides of the crossing. Northwest proposes to cross the North Fork Nooksack River, North Fork Stillaguamish River, and South Fork Stillaguamish River using the HDD method. In the event an HDD cannot be completed, Northwest proposes to install the crossings using the wet open-cut method. The wet open-cut method is described in section 2.3.2. Because it is uncertain at this time whether an HDD would be successful, it is not possible to eliminate the alternative crossing method for these waterbodies from further consideration. As a result, an analysis of both the proposed and alternative crossing methods for these waterbodies is presented in the applicable resource discussions in section 4.0 (i.e., surface water resources; wetlands; vegetation; aquatic resources; land use, recreation and special interest areas, and visual resources; and cultural resources).

Use of the HDD method for crossing Pilchuck Creek and the Nisqually River was also evaluated by Northwest and determined not to be feasible based on the results of its geotechnical investigation. Therefore, Northwest proposes to cross these two waterbodies using the wet open-cut method. If Northwest is not able to obtain permits to use the wet open-cut crossing method at these two waterbodies, Northwest proposes to use the aerial span method. The aerial span method is described in section 2.3.2. Because it is uncertain at this time whether Northwest would be allowed to use the wet open-cut crossing method, it is not possible to eliminate the alternative crossing method for these waterbodies from further consideration. As a result, an analysis of both the proposed and alternative crossing methods for these waterbodies is presented in the applicable resource discussions in section 4.0 (i.e., surface water resources; wetlands; vegetation; aquatic resources; and land use, recreation and special interest areas, and visual resources).

4.0 ENVIRONMENTAL ANALYSIS

This section describes the affected environment as it currently exists and discusses the environmental consequences of constructing and operating the Capacity Replacement Project, including the associated abandonment activities. The environmental consequences of the proposed project would vary in duration and significance. Four levels of impact duration were considered: temporary, short term, long term, and permanent. Temporary impact generally occurs during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impact could continue for up to 3 years following construction. An impact was considered long term if the resource would require more than 3 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would not return to preconstruction conditions during the life of the project, such as with the construction of an aboveground facility.

Northwest, as part of its proposal, developed certain mitigation measures to reduce the impact of the project. In some cases, the FERC staff determined that additional mitigation measures could further decrease the project's impacts. The FERC staff's additional mitigation measures appear as bulleted, boldfaced paragraphs in the text of this section. The FERC staff will recommend to the Commission that these measures be included as specific conditions of the Certificate the Commission may issue to Northwest for this project.

The conclusions in this EIS are based on the FERC staff's analysis of the environmental impact and the following assumptions:

- Northwest would comply with all applicable laws and regulations;
- the proposed facilities would be constructed as described in section 2.0; and
- Northwest would implement the mitigation measures included in its application and supplemental filings with the Secretary.

4.1 GEOLOGY

4.1.1 Geologic Setting

Pipeline Facilities

The Capacity Replacement Project would be located within the Puget-Williamette Lowlands Subdivision of the Pacific Mountain Physiographic Division (Hammond, 1965). This subdivision extends from the Canadian border southward to Eugene, Oregon between the Coastal Ranges to the west and the Cascade Range to the east. The portion of the subdivision in which the project facilities would be located consists primarily of flat glacial plains, broad alluvial valleys, and gently rolling terrain interrupted by the complex bays and inlets of Puget Sound. Portions of the Sumas Loop would also cross the western flank of Sumas Mountain. Topography within each of the proposed loops is characterized below.

The Sumas Loop would cross flat to gently rolling land with elevations between 40 and 200 feet above mean sea level (amsl) as it traverses glacial plains and alluvial valleys along the western base of Sumas Mountain. As it crosses Sumas Mountain, the loop would encounter localized slopes in excess of 35 percent between MPs 1481.0 and 1479.0 and between MPs 1476.5 and 1473.0. The highest elevation along the Sumas Loop is approximately 590 feet amsl and occurs near MP 1480.5.

The topography along the Mount Vernon Loop comprises low-relief upland surfaces and rolling hills and valleys that trend northwest-southeast. The upland surfaces and rolling hills and valleys are deeply incised by the North and South Fork Stillaguamish Rivers and other small streams. Surface elevations along the loop range from 675 feet amsl near its beginning at MP 1431.3 to 60 feet amsl where the loop would cross the North and South Fork Stillaguamish Rivers near MPs 1424.3 and 1423.8, respectively. Localized slopes in excess of 40 percent exist along the Mount Vernon Loop.

The Snohomish Loop would cross gently rolling hills and valleys that are locally incised by small streams, where slopes approach 40 percent. Surface elevations along the loop range from 525 feet amsl near MP 1388.0 to 100 feet amsl near MP 1383.5.

Topography along the Fort Lewis Loop consists of flat uplands; gentle, elongate hills; and hummocky terrain dotted with numerous small ponds and lakes. The relief along the loop is approximately 200 feet, from an elevation of 510 feet amsl near MP 1316.7 to 310 feet amsl at the crossing of the Nisqually River near MP 1324.3.

The topography along the four loops is primarily the result of deposition of Quaternary glacial and fluvial sediments that have since been modified by fluvial and mass-wasting processes and by man. Large influxes of sediment as a result of volcanic activity in the Cascade Mountains have also modified area streams and valleys. For the Capacity Replacement Project, these include the Nooksack River, North Fork Stillaguamish River, and Nisqually River valleys. Much of the sediment near the surface in these valleys is largely the result of lahar deposition (mud and debris flows that originate on a volcano) and subsequent reworking by the rivers.

Published geologic maps, aerial photographic interpretation, aerial reconnaissance, and ground reconnaissance were used to prepare detailed maps depicting the surficial geology along the loops (Golder Associates Inc. (Golder), 2004b). These maps are included in a report titled *Capacity Replacement Project Geohazards, Whatcom, Skagit, Snohomish, Pierce, and Thurston Counties, Washington* (Golder, 2004b).[1] Approximately 75.2 miles (95 percent) of the route would be underlain by unconsolidated deposits primarily consisting of sand, silt, and gravel. The remaining 5 percent of the route, approximately 4.3 miles, would be underlain by sandstone, siltstone, and conglomerate, or metasedimentary and metavolcanic bedrock units (see table 4.1.1-1). Most of the route that would be underlain by surficial bedrock is associated with the Sumas Loop as it crosses Sumas Mountain.

TABLE 4.1.1-1

Surficial Bedrock Formations Crossed by the Loops Associated with the Capacity Replacement Project

Facility	Mileposts	Geologic Unit [a]	Age	Description
Sumas Loop	1480.9-1479.3	OEc(h)	Oligocene/Eocene	Huntingdon Formation (primarily conglomerate with sandstone and siltstone)
	1474.9-1474.1	OEc(h)	Oligocene/Eocene	Huntingdon Formation
	1474.1-1473.7	PMDhm(c)	Pennsylvanian Mississippian Devonian	Chilliwack Group (metavolcanic, metasedimentary, and volcanic sandstone)
	1472.7-1472.5	PMDhm(c)	Pennsylvanian Mississippian Devonian	Chilliwack Group
	1469.6-1469.5	Ec(cp)	Eocene	Padden Member of the Chuckanut Formation (pebbly sandstone, sandy conglomerate, mudstone, and minor coal)
Mount Vernon Loop	1430.7-1430.0	OEn(b)	Oligocene/Eocene	Rocks of Bulson Creek Formation (conglomerate, sandstone, and siltstone)
	1427.6-1427.4	OEn(b)	Oligocene/Eocene	Rocks of Bulson Creek Formation
Snohomish Loop		- None -		
Fort Lewis Loop	1316.9-1316.6	Eva(n)	Eocene	Northcraft Formation (andesite flows)

[a] Geologic Unit refers to the naming convention used on the maps included in Appendix A of Golder, 2004b.

The loops associated with the Capacity Replacement Project would be installed within Northwest's existing right-of-way except for short, minor deviations generally related to waterbody crossings that would be installed using the HDD construction method (see section 4.3.2.3). Therefore, construction and operation of the loops would not materially alter the existing geologic conditions of the project area and would not subject Northwest's existing system to an increased threat from geologic hazards (see section 4.1.3). Effects from construction could include disturbances to the natural topography along the right-of-way due to trenching and grading activities. Over most of the project area, natural topographic slope and contours would be temporarily altered by the small-scale grading of the construction right-of-way that is necessary to provide a level and safe work surface for equipment. After completion of construction, Northwest would restore topographic contours and drainage conditions as closely as feasible to their preconstruction condition.

The approximately 95 percent of the route that would be underlain by unconsolidated sediments would be excavated using conventional trenching techniques. In the remaining areas where bedrock is exposed at the surface (see table 4.1.1-1), it is expected to be soft enough that it could be excavated to trench depth using tractor-mounted mechanical rippers or rock trenchers. However, if unrippable rock is encountered, blasting would be required before excavation. Effects of blasting include hazards posed by

[1] This report is too voluminous to include in this EIS. It is available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions) and at the WDOE's regional offices. If you reside in Whatcom, Skagit, Snohomish, or King Counties, you can access this document at the WDOE's Northwest Regional Office in Bellevue by calling the Public Disclosure Coordinator at (425) 649-7190 or (425) 649-7239. If you reside in Pierce, Thurston, Lewis, Cowlitz, or Clark Counties, you can access this document at the WDOE's Southwest Regional Office in Lacey by calling the Public Disclosure Coordinator at (360) 407-6365.

uncontrolled fly-rock and nuisances caused by noise, increased dust, and venting of gases following blasts. If blasting is not controlled properly, it can also damage underground structures, cables, conduits, pipelines, and wells and could destabilize slopes in the area. For those areas where blasting cannot be avoided, Northwest would comply with all applicable federal, state, and local regulations. Northwest would develop a detailed *Blasting Plan* in accordance with applicable DOT and OSHA requirements. The *Blasting Plan* would include, among other things, the use of blasting mats or soil cover to prevent the scattering of loose rock, measures to prevent accidental detonations (e.g., Detcord or similar method), all necessary permits and authorizations, notification of nearby building owners, and seismic monitoring of the blasts to ensure vibration limits are not exceeded. Specific mitigation measures for water wells that could potentially be impacted by construction are discussed in section 4.3.1.2.

Aboveground and Abandoned Facilities

The aboveground and abandoned facilities associated with the Capacity Replacement Project would be located within the same general physiographic and geologic setting as the proposed loops. Construction activities at these sites would be largely confined to previously disturbed areas at existing facilities and would not materially alter the existing geologic conditions of the project area or subject the facilities to an increased threat from geologic hazards (see section 4.1.3). Blasting would not be required for activities at any of the aboveground or abandoned facilities.

4.1.2 Mineral Resources

Pipeline Facilities

Mining operations in western Washington have historically consisted of sand, gravel, stone, clay, and coal (Moen, 1978; Schasse, 1994; USGS, 2002a). Other mineral resources that occur in the area but to a lesser extent include gypsum and gemstones. In 2002, construction sand and gravel accounted for 74 percent of the non-fuel mineral income in Washington (USGS, 2002a). At that time, 215 sand and gravel mines were licensed for operation in the counties crossed by the Capacity Replacement Project, compared to 40 mines for all other mineral resources in those counties (McKay, 2001). The majority of sand and gravel mines in the project area are located near urban centers along the Interstate 5 corridor.

Coal mining in Washington has declined and now is conducted at only one surface mine, which is not located in the counties crossed by the Capacity Replacement Project (U.S. Department of Energy, 2003; McKay, 2001). Prior to the early 1970s, nearly all of the coal produced in Washington was from underground workings, including from mines in Whatcom, King, Pierce, and Thurston Counties. However, none of these former underground mines are within 1.5 miles of Northwest's pipeline right-of-way (Schasse, 1994).

Mineral resource areas, mines, quarries, and mineral plants in the general project area were identified by reviewing USGS topographic maps; published geologic maps; stereographic aerial photographs; mineral resource maps; mine hazard maps published by Whatcom, King, and Pierce Counties; and other published information. Based on this review, seven active quarries and gravel pits and two areas of abandoned gravel pits were identified within 1,500 feet of the construction right-of-way (see table 4.1.2-1).

TABLE 4.1.2-1 **Gravel Pits and Quarries within 1,500 Feet of the Loops Associated with the Capacity Replacement Project**			
Facility	Approximate Milepost	Mineral Resource	Approximate Distance and Direction from Construction Right-of-Way (feet)
Sumas Loop	1482.2	Gravel Pit	200 feet west
	1474.0	Stone Quarry	800 feet east (proposed expansion would bring quarry to within 600 feet)
	1461.9	Gravel Pit	100 feet east
Mount Vernon Loop	1424.4	Gravel Pit	350 feet west (proposed expansion would be across Northwest's right-of-way)
Snohomish Loop	1387.4	Gravel Pit	550 feet west
	1386.5	Abandoned Gravel Pits	Adjacent both east and west (inferred from topographic map)
Fort Lewis Loop	1336.8	Abandoned Gravel Pit	900 feet east
	1335.3	Gravel Pit	60 feet east
	1335.3	Gravel Pit	480 feet west

Pipeline projects have the potential to affect the production of mineral resources by restricting mineral production activities in the immediate vicinity of the pipeline right-of-way. While portions of the proposed loops would be located adjacent to or in close proximity to potentially extractable mineral deposits, 93 percent of the loops would be constructed within Northwest's existing permanent right-of-way, which already precludes surface mining operations. Therefore, construction and operation of the loops would not result in a significant, additional restriction to current or future mining operations in the area. The proposed expansions at MPs 1474.0 and 1424.4 are discussed in section 4.8.3.2. Because of the abundance of sand and gravel deposits in the area, construction and operation of the loops would not have a significant effect on the availability of sand and gravel in the region.

Underground mining operations pose potential hazards to pipelines and other surface structures. These hazards include ground subsidence or caving, contamination from mine tailings, and concentrations of potentially hazardous vapors. Based on the information reviewed, the loops would not cross or be located within 1,500 feet of any active or abandoned coal mines, or any other subsurface mines. Therefore, the loops would not be subject to hazards associated with underground mines.

Surface mining operations also pose potential hazards to pipelines due to encroachment on the pipeline by machinery or trucks, increasing slope instability by oversteepening slopes or by changing surface and groundwater conditions, and blasting. Nearby surface mining operations should not significantly affect the proposed loops provided they do not encroach onto the pipeline right-of-way. The potential for encroachment onto the pipeline right-of-way would be minimized because the majority of the loops would be located within Northwest's existing right-of-way, which was established in the 1950s and 1970s and the location of which is well documented. Northwest also participates in all One-Call systems and would mark the pipeline facilities at line-of-sight intervals and at crossings of roads and other key points.

Aboveground and Abandoned Facilities

Mineral resources, particularly sand and gravel, are widespread in the general project area. Therefore, the aboveground and abandoned facilities may be located in proximity to potentially extractable mineral resources. However, no apparent active mining operations within at least 300 feet of the aboveground or abandoned facilities were identified during a review of aerial photographs and USGS topographic maps. In addition, activities associated with construction of aboveground facilities would occur within or adjacent to existing sites and abandonment activities would occur within Northwest's existing right-of-way, both of which already preclude surface mining operations in the immediate vicinity of the facilities. Therefore, project activities at the aboveground and abandoned facilities would not result in additional potential restriction to current or future mining operations in the area and would not increase the potential for any mineral resource recovery operations to affect the aboveground or abandoned facilities.

Pipe Storage and Contractor Yards

The only pipe storage or contractor yard located near an area of extractable mineral resources is the 4667 – 192nd Street Yard in Pierce County. This yard is located adjacent to a gravel pit. Because the site is already graded and graveled and would only be used on a temporary basis, no impacts on this gravel pit are anticipated.

4.1.3 Geologic Hazards

Pipeline Facilities

Geologic hazards and geomorphic features are natural physical conditions that, if active, can result in damage to land and structures or injury to people. Construction projects have the potential to trigger a damaging geologic event, or exacerbate the damage caused by a geologic event. Geologic and geomorphic conditions along the proposed loops were identified and evaluated by collecting and reviewing available literature, data, geologic and topographic maps, critical areas ordinances, and previously completed reports for Northwest; analyzing and evaluating stereographic aerial photographs; conducting an aerial reconnaissance of the Sumas and Mount Vernon Loops; and conducting a ground reconnaissance of selected sites along the Sumas, Mount Vernon, and Snohomish Loops. The results of the geologic hazards evaluation are documented in a report titled *Capacity Replacement Project Geohazards, Whatcom, Skagit, Snohomish, Pierce, and Thurston Counties, Washington* (Golder, 2004b)[2] and are summarized below. Geologic hazards within 0.5 mile of the pipeline facilities are depicted on maps in Appendix L.

In general order of significance, geologic hazards that could affect the Capacity Replacement Project consist of mass wasting, erosion, earthquakes (and secondary effects including surface faulting and soil liquefaction), volcanism, and the presence of shallow groundwater. Geologic hazards in the project area are summarized below.

<u>Mass Wasting</u> – Mass wasting is the downward mass movement of soil and rock that can occur very rapidly or as a slow, ongoing process over years and centuries. The stability of a soil or rock slope is directly related to the physical characteristics and properties of the material, groundwater conditions, and slope angle. Temporal physical changes such as storms, earthquakes, undercutting by erosion and streams, and/or activities by man can also initiate mass wasting events. In general, susceptible soil and rock conditions for mass wasting exist throughout western Washington and are common on the relatively steep slopes within stream drainages.

Aerial photographs, geologic maps, previous reports, critical areas ordinances, and published materials were reviewed to assess the existence of or potential for mass wasting hazards along the route.

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[2] This report is too voluminous to include in this EIS. It is available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions) and at the WDOE's regional offices. If you reside in Whatcom, Skagit, Snohomish, or King Counties, you can access this document at the WDOE's Northwest Regional Office in Bellevue by calling the Public Disclosure Coordinator at (425) 649-7190 or (425) 649-7239. If you reside in Pierce, Thurston, Lewis, Cowlitz, or Clark Counties, you can access this document at the WDOE's Southwest Regional Office in Lacey by calling the Public Disclosure Coordinator at (360) 407-6365.

Aerial and field reconnaissance was also conducted to field check known and potential mass wasting hazards along the loops. Mass wasting hazard areas are depicted on the maps included in Appendix L and are summarized in table 4.1.3-1. The majority of mass wasting hazards occur along the Sumas Loop. Fewer mass wasting hazard areas occur along the Mount Vernon and Snohomish Loops, and no mass wasting hazards were identified along the Fort Lewis Loop.

TABLE 4.1.3-1

Mass Wasting Hazards Associated with the Loops for the Capacity Replacement Project

Facility	Approximate Mileposts	Hazard Type	Hazard Name
Sumas Loop	1480.6 – 1480.5	Steep Slope	NA
	1479.1 – 1477.2	Debris Flow	Swift Creek Landslide
	1475.9 – 1475.6	Debris Flow	Dale Creek
	1474.8 – 1474.4	Landslide Encroachment	Everson Landslide
	1473.7	Steep Slope	Lawrence Hillside
	1473.3	Debris Flow	NA
	1472.7	Landslide Encroachment	Deming Landslide
	1472.4 – 1472.0	Debris Flow	Smith Creek Landslide
	1471.7 – 1470.8	Debris Flow	Macaulay Creek Landslide/Unnamed Landslide to Northeast
	1470.2	Landslide Encroachment	Mitchell Creek Landslide
	1469.9	Landslide Encroachment	Marshall Hill Landslide
	1469.6 – 1469.5	Steep Slopes	NA
	1469.6 – 1468.9	Unstable Stratigraphy	Everson Glaciomarine Drift
	1468.1 – 1467.0	Landslide Runout	NA
Mount Vernon Loop	1428.9 – 1428.8	Steep Slope	NA
	1424.4	Steep Slope	NA
	1422.6	Potential Landslide	NA
	1421.3	Landslide Encroachment	Arlington Landslide
Snohomish Loop	1389.4	Steep Slope	NA
	1383.3	Steep Slope/Landslide Encroachment	NA
Fort Lewis Loop		- None -	

NA = Not assigned a specific name.

Landslides pose the most significant geologic hazard to the project. Landslide movement has ruptured Northwest's existing 26-inch-diameter pipeline at one location along the proposed Sumas Loop (the Everson Landslide) and has threatened the integrity of the pipeline in the past at a number of locations where the landslide risk has since been mitigated. Larger mass wasting hazards and those that have either damaged one of Northwest's existing pipelines or are being monitored by Northwest are described in the following paragraphs.

- *Swift Creek Landslide/Debris Flow* (Sumas Loop, between MPs 1479.1 and 1477.2). The Swift Creek Landslide is a large and active landslide located at the western base of Sumas Mountain. The landslide deposits large volumes of sediment into Swift Creek, to the extent that Whatcom County and the local landowner dredge the creek on an annual basis. A sustained, heavy rainfall or a rain-on-snow event at the Swift Creek Landslide could produce a large debris flow that would cross the pipeline right-of-way (McKenzie-Johnson, 2004).

- *Everson Landslide* (Sumas Loop, between MPs 1474.8 and 1474.4). Northwest's 26-inch-diameter pipeline was ruptured by the Everson Landslide on February 28, 1997. The landslide is believed to have been triggered by prolonged winter precipitation that was exacerbated by intense rainfall/snowfall events and clear cut logging of the surface of the landslide and surrounding slopes. The existing 26-inch- and 30-inch-diameter pipelines extended approximately 1,150 feet across the upper area of the slide and were subsequently rerouted above the head of the landslide. Piezometers, inclinometers, surveyed monitoring points, and strain gauges are used to monitor for any movement or deformation along the reroute. To date, no movement, ground deformation, or other signs of incipient slope movement have been observed along the reroute. Strain gauge data through May 24, 2004 indicate that the existing 26-inch- and 30-inch-diameter pipelines are not experiencing significant strain or patterns of strain change that would indicate slope movement. The Sumas Loop would be installed uphill of the existing pipelines, and further away from the known Everson Landslide area.

- *Deming Landslide* (Sumas Loop, MP 1472.7). The Deming Landslide was first noted in 1982 when the headscarp (i.e., the top or highest point affected) of the landslide was observed to cross the existing 26-inch-diameter pipeline. The landslide was then graded and the slope contours restored. Small landslide events were noted in the area in 1989. No evidence of more recent activity on the Deming Landslide was observed during field reconnaissance, and monitoring between 1996 and 2001 indicated that no further movement had occurred in the Deming Landslide area.

- *Mitchell Creek and Marshall Hill Landslides* (Sumas Loop, MP 1470.2 and MP 1469.9, respectively). The downhill leading edge (referred to as the "toe") of the Mitchell Creek and Marshall Hill Landslides encroach upon the Sumas Loop right-of-way. No recent indications of activity were observed on either landslide during field reconnaissance. Survey data indicate that the landslide moved less than 0.1 foot between February 1998 and July 2001, and the apparent movement may actually represent operator and/or equipment error. Based on field observations and survey data, the Mitchell Creek and Marshall Hill Landslides appear to be inactive.

- *Arlington Landslide* (Mount Vernon Loop, MP 1421.3). The Arlington Landslide is located downslope and about 30 to 40 feet from Northwest's existing 30-inch-diameter pipeline. The landslide has been mitigated and is monitored on an ongoing basis using strain gauges, survey points, and visual examination. No evidence of renewed movement was noted during the recent field reconnaissance. Strain gauge data through May 25, 2004 indicate that the existing 26-inch- and 30-inch-diameter pipelines are not experiencing significant strain or patterns of strain change that would indicate slope movement. The Mount Vernon Loop would be installed to the west of the existing pipelines, or uphill and farther from the former headscarp of the known Arlington Landslide area.

<u>Erosion</u> – Erosion hazards that may affect the loops include surface erosion of the right-of-way, scour and erosion at waterbody crossings, and subsurface erosion along the pipeline. The potential for surface erosion to occur in the right-of-way would generally be more pronounced in areas where the slope is steep, the underlying soil is loose, surface runoff is uncontrolled, and the surface vegetation has been removed or is sparse. The potential for erosion to occur due to the type of soil present in the right-of-way is discussed in section 4.2.1. The occurrence and potential effects of subsurface erosion are discussed in section 4.3.1.2. A stream scour analysis was conducted for the project and is discussed in section 4.3.2.4.

<u>Earthquakes</u> – Western Washington is characterized by relatively frequent low to moderate magnitude earthquakes. The seismicity of the region is the result of the convergence of the North American tectonic plate and the offshore Juan de Fuca plate, which is being subducted beneath the North American plate about 62 miles offshore of the Washington coast.

The majority of recorded earthquake epicenters occur in a north-south trending zone that extends through the area crossed by the Capacity Replacement Project. Focal depths for the recorded earthquakes in the area range from 6 to 42 miles, although the majority of earthquakes have occurred within the upper 18 miles of the surface (referred to as "crustal" earthquakes). The largest instrument-recorded crustal earthquakes in the area have been magnitude (M) 5.5 events (Zollweg and Johnson, 1989). Larger, less frequent earthquakes occur at depths of more than 24 miles (referred to as "intraplate" earthquakes). The 1949 Olympia earthquake (M 6.9), the 1965 Seattle earthquake (M 6.73), and the 2001 Nisqually earthquake (M 6.8) are the largest instrument-recorded and most damaging earthquakes that have occurred within about 95 miles of the center of any of the four proposed loops. These larger earthquakes, which were intraplate events (i.e., occurred within the interior of a tectonic plate), resulted in widespread damage in the Puget Sound area. Seismically induced slope failure and liquefaction were associated with each event, and some structures were damaged due to ground shaking. The largest historical earthquake to affect Washington is believed to have been the 1872 Cascade earthquake, with an estimated magnitude ranging from 6.8 to 7.4 (Bakun et al., 2002).

Seismic risk can be quantified by the motions experienced by the ground surface or structures during a given earthquake and is expressed in terms of the acceleration due to gravity (g). The USGS has developed a series of maps for the entire United States that describe the likelihood for shaking of varying degrees to occur in a given area. According to the USGS (2002b), there is a 10 percent probability of a seismic event occurring within the next 50 years (an approximate 475-year return period) in the project area. This would result in average peak ground accelerations (PGAs) ranging from 21 percent gravity (0.21 g) along the Sumas Loop, to 0.26 g along the Mount Vernon Loop, to 0.29 g along the Snohomish and Fort Lewis Loops. For reference, a PGA of 0.10 g is the approximate threshold for damage to older structures or structures not made to resist earthquakes (USGS, 2004).

Secondary seismic effects associated with earthquakes are often more serious than the shaking itself. Secondary seismic effects that have occurred in the project area and could occur in conjunction with future earthquakes include surface faulting and soil liquefaction.

The Capacity Replacement Project would cross at least three faults suspected of Holocene activity (from 11,000 years ago to today) and would be located near at least three other active faults or fault zones as discussed below.

The Sumas Loop would cross the Vedder Mountain Fault at about MP 1481.1. Numerous earthquakes have occurred near the trace of the Vedder Mountain Fault and the fault has topographic and geomorphic expression suggestive of relatively recent movement (Dragovich et al., 1997).

The Sumas Loop would cross the Macaulay Creek Thrust Fault at about MP 1470.0. The Macaulay Creek Thrust Fault has been correlated with earthquake activity as recently as 1990, and may be associated with a high incidence of landslides and other geomorphic features in the area (Dragovich et al., 1997).

The northern end of the Mount Vernon Loop would be located about 3 miles south of the Devils Mountain Fault Zone, a relatively broad zone of deformation that trends east-west through the area. The Devils Mountain Fault Zone is considered to be potentially active based on displacement of Quaternary sediments along the western projection of the fault zone in the Strait of Juan de Fuca and other factors (Gower et al., 1985; Johnson et al., 2001; Zollweg and Johnson, 1989; Villasenor et al., 1999).

The Snohomish Loop, north of approximately MP 1391.0, would be located within the more than 60-mile-long Southern Whidbey Island Fault, which has exhibited various evidence of Quaternary displacement. Paleoseismic studies suggest that the most recent significant movement on the fault occurred in conjunction with an estimated M 6.5 to 7.0 earthquake about 3,000 years ago, which may have resulted in as much as 13 feet of dip-slip displacement along the fault (Kelsey et al., 2003).

The northern trace of the Seattle Fault appears to be located within about 2.3 miles of the southern end of the Snohomish Loop. The most recent displacement on the Seattle Fault appears to have been about 1,100 years ago and was accompanied by up to 23 feet of movement (Booth et al., 2003; Nelson et al., 2000; Bucknam et al., 1999; Adams, 1992).

The northern end of the Fort Lewis Loop would be located about 12 miles south of the newly identified Tacoma Fault. Recently collected geologic evidence indicates that a large earthquake occurred on the Tacoma Fault about 1,000 years ago, which may have caused liquefaction of susceptible soils and up to 13 feet of vertical displacement (Sherrod et al., 2003).

Soil liquefaction is a physical process in which saturated, cohesionless soils temporarily lose their bearing strength when subjected to strong and prolonged shaking such as that experienced during earthquakes. Soil liquefaction can also lead to other ground failures including settlement and lateral spreading. A Seismic Risk Rating (SRR) system was developed to assess the relative potential for liquefaction (and other ground failures) to occur along the proposed loops. The SRRs considered available geological and engineering characteristics of local soils, depth to groundwater, and PGAs predicted for the project area. In general, high SRRs were assigned to geologically recent alluvial, peat, and bog deposits in areas with shallow groundwater. Soils with high SRRs are considered susceptible to liquefaction during strong seismic shaking events. Areas with high SRRs are detailed in the geologic hazards assessment (Golder, 2004b) but primarily include the floodplains of the South and North Forks of the Nooksack River, the Sumas River, and Saar Creek along the Sumas Loop; the floodplains of the North and South Fork Stillaguamish Rivers along the Mount Vernon Loop; and the floodplain of the Nisqually River along the Fort Lewis Loop. These areas encompass about 14.3 miles along the loops, of which about 12.4 miles are located along the Sumas Loop. Other limited areas of increased potential for soil liquefaction or lateral spreading to occur during seismic events were identified by Golder (2004b).

Volcanism – The Capacity Replacement Project would lie at the base of the foothills of the western Cascade Range, which is characterized by the occurrence of large Quaternary (last 1.6 million years) stratovolcanoes. There is no direct volcanic activity on or near the project facilities. The closest potential sources of volcanic activity to the project would be Mount Baker, Glacier Peak, and Mount Rainier. At their closest points, the Sumas Loop would be about 17 miles west of Mount Baker; the Snohomish Loop would be about 45 miles west of Glacier Peak; and the Fort Lewis Loop would be about 35 miles northwest of Mount Rainier. For reference, Mount St. Helens, which erupted in 1980 and has recently been active, is about 52 miles south-southeast of the southern end of the Fort Lewis Loop.

No major eruptions of Mount Baker, Glacier Peak, or Mount Rainier have occurred during the last 200 years, the approximate extent of the historical record for the region. The most recent significant eruption of Mount Baker occurred approximately 6,600 to 6,800 years ago. Large eruptions of Glacier Peak occurred approximately 6,000 years ago, and several other eruptions have occurred in the last 2,000 years. The most recent significant eruption of Mount Rainier was approximately 2,600 years ago.

The loops associated with the Capacity Replacement Project would be sufficiently distant from the active Cascade Range volcanoes to be removed from any direct impact of near-source activity such as lava flows, pyroclastic flows, or lateral blasts. However, all of the referenced volcanoes have spawned numerous lahars (volcanic mud and debris flows) that have traveled distances up to tens of miles, and in some instances, all the way to Puget Sound. Lahars are typically confined within the river valleys that drain the areas around the volcanoes. As depicted on the geologic hazards maps in Appendix L, the proposed loops would cross a number of areas that are underlain by lahar deposits and could be affected by future lahar flows associated with major eruptions in the Cascade Range. Approximately 9 miles, or 11 percent, of the loops would be located in areas potentially susceptible to lahars. Tephra-falls (volcanic ash falls) may also reach the proposed project area.

<u>Shallow Groundwater</u> – In the context of geologic hazard analysis, the term "shallow groundwater" refers to groundwater that is above the bottom of the pipeline trench, or is shallow enough to contribute to other geologic hazards. Shallow groundwater can create difficulties during pipeline construction and can cause or contribute to other adverse effects after installation, including flotation and subsurface erosion. Shallow groundwater can also strongly contribute to soil liquefaction and mass wasting events; earthquake-induced liquefaction of soil cannot occur unless the soil is saturated, and mass wasting events can be triggered by rising groundwater because shallow groundwater reduces the strength of steep slopes.

In general, as depicted on the maps in Appendix L, shallow groundwater would likely be encountered in alluvial and wetland deposits associated with waterbodies. The occurrence of shallow groundwater and the potential impacts on the Capacity Replacement Project are described in section 4.3.1.

Impact and Mitigation

In general, the proposed loops would avoid areas with potential geologic hazards. However, due to routing constraints, the loops cannot avoid some high potential mass wasting, seismic, and volcanic hazard areas identified by Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties in their critical areas ordinances, or other areas identified by Northwest. These geologic hazards have the potential to damage the loops should they become active during construction or operation. The potential for significant damage to the loops from geologic hazards would generally be mitigated through implementation of BMPs and ongoing monitoring that is part of Northwest's formal Geotechnical Hazards Monitoring Program, which includes:

- annual aerial reconnaissance by a professional geologist experienced in geologic hazard recognition;
- hazard recognition and mitigation training of Northwest's field, engineering, and environmental personnel; and
- the use of inclinometers, strain gauges, piezometers, and surveys to monitor the stability of known landslide areas under *Monitoring and Mitigation Plans* that are submitted to appropriate county jurisdictions.

In addition, Northwest would respond immediately in accordance with its Geotechnical Hazards Monitoring Program should a geologic or natural event with a significant potential to damage the pipeline occur. In such an event, Northwest would immediately analyze information obtained in real-time, such as supervisory control and data acquisition (SCADA) operations data and strain gauge data, which are monitored by gas control operators who staff the gas control center 24 hours a day. Field personnel and contractors would travel to the affected area immediately to assess the situation. Northwest personnel from various departments (i.e., Gas Control, Management, Pipeline Safety, Pipeline Integrity, and Operations) would all work closely together to determine what steps should be taken to protect the public and maintain the integrity of the pipeline. These actions could include monitoring, additional field reconnaissance, or shutting down a section of the pipeline.

Also, by implementing good construction practices and erosion control measures, construction and operation of the loops should not increase the likelihood of damaging geologic events to occur.

The following paragraphs summarize the potential impacts associated with geologic hazards in the project area, and the options that would be available to mitigate geologic hazards during construction and operation of the project. Based on specific conditions encountered in the field, Northwest would implement those options that provide the greatest degree of geologic hazard risk reduction to the project.

Mass wasting has the potential to adversely impact both the construction and operation of the loops. Potential impacts include severe erosion and exposure of the pipeline from debris flows, movement that could result in rupture or damage of the pipeline, movement of soil into excavations during construction, and burial of the pipeline after construction. As a BMP, the loops would avoid areas with known potential for mass wasting, where possible. Where the loops descend or climb steep slopes, they would typically parallel the fall line of the slopes, thereby reducing the amount of pipe exposed transversely to the slope and lowering the hazard to the pipeline from potential mass wasting events. All of the known landslides and steep slopes crossed by the existing pipelines that would also be crossed by the proposed loops were re-evaluated by Northwest for the Capacity Replacement Project. The known landslides and steep slopes have either been mitigated by Northwest (i.e., Deming and Arlington Landslides) or the existing pipelines have been rerouted around the landslide and the proposed loops would be installed uphill of the existing pipelines (i.e., Everson Landslide). Other areas where slope movement has been indicated in the past, including the Mitchell Creek and Marshall Hill Landslides, do not exhibit evidence of recent slope movement. Northwest would utilize various methods to monitor all areas that could pose a landslide risk to the proposed loops, including real-time strain gauges, survey data, and periodic surveillance. In addition, Northwest would implement the following actions to further reduce the potential to trigger mass wasting events or reduce the effects of a mass wasting event, should it occur:

- restore damaged slope breakers (e.g., water bars) on the existing permanent easement where the loops parallel the existing pipelines;
- install slope breakers to control surface water on the construction right-of-way;
- install trench breakers to control groundwater flow in the pipe trench;
- route discharge of surface water away from the slope breakers, and divert or collect surface water coming onto the construction right-of-way to pipes in an outflow below the slope;
- route discharged groundwater from the trench breakers away from the slopes;
- adhere strictly to erosion control and revegetation measures required by federal, state, and local authorities;
- bury the pipeline deeper than normal or place armor above it in areas of potential debris flow hazards; and
- continue monitoring as part of Northwest's formal Geotechnical Hazards Monitoring Program.

Northwest would also respond immediately and take any appropriate action to address any perceived slope instability in the vicinity of the pipeline right-of-way.

Surface and subsurface erosion could expose the loops or leave the pipelines with insufficient support. Pipeline exposure from erosion generally poses a minimal risk for rupture or damage and, due to their strength and ductility, modern steel pipelines are capable of expanding considerable distances unsupported. For example, the 36-inch-diameter loop would be able to safely operate with an unsupported span of approximately 114 feet assuming no other outside forces are acting on the pipe. As described in sections 4.2.2, 4.2.3, and 4.3.1.2, BMPs would be implemented to reduce the potential for surface and subsurface erosion to occur. Impacts associated with erosion would be further mitigated through continued implementation of Northwest's Geotechnical Hazards Monitoring Program. Impacts and associated mitigation measures for stream scour erosion are discussed in section 4.3.2.4.

Major earthquakes would result in strong and prolonged ground shaking that could pose a serious hazard if one were to occur during construction of the loops. However, strong earthquakes generally have return periods of tens to thousands of years and, therefore, are unlikely to occur during construction of the project. After construction, the buried pipeline should generally have a low vulnerability to damage from ground shaking due to the strength and flexibility of the pipe. Soil liquefaction could develop during a strong earthquake and could cause flotation, relatively large lateral displacements, or sagging due to the temporary loss of load-bearing strength. To mitigate potential buoyancy concerns, Northwest would install concrete-weighted or coated pipe in areas of shallow groundwater that are susceptible to liquefaction. As previously discussed, these include the floodplains of the South and North Forks of the Nooksack River, the Sumas River, and Saar Creek along the Sumas Loop; the floodplains of the North and South Fork Stillaguamish Rivers along the Mount Vernon Loop; and the floodplain of the Nisqually River along the Fort Lewis Loop. The strength and ductility of the loops would further reduce the potential impacts associated with sagging and other displacements that could accompany liquefaction. Surface faulting could also accompany a major earthquake. Due to the strength and flexibility of modern steel pipelines, the loops would be able to withstand some degree of displacement across an active surface fault trace, but could potentially rupture in the event of a severe offset. Options to mitigate the potential impacts associated with surface faulting include:

- varying the orientation of the pipeline with respect to the fault trace to induce tensile stresses (i.e., tension) and reduce compressive stresses during fault rupture;
- increasing the pipe wall thickness and specifying favorable steel characteristics;
- enhancing the unanchored length to allow greater flex of the pipeline during a fault rupture;
- using multiple layers of geotextile around the pipeline to reduce pipe-soil friction, thereby enhancing the unanchored length in proximity to a fault trace; and/or
- in accordance with its Geotechnical Hazards Monitoring Program, conducting a physical reconnaissance and investigation of geologic conditions along the pipeline route following a large seismic event, and responding accordingly to mitigate any impacts associated with ground shaking, liquefaction, or surface faulting.

The loops would be far enough away from the Cascade Range volcanoes to be removed from direct volcanic hazards, such as pyroclastic flows, lava flows, and lateral blasts (Scott et al., 2000; Waitt et al., 1995; Hoblitt et al., 1998). However, the loops could experience lahars and ash falls. The primary effects of a lahar include rapid erosion and/or thick sediment deposition. Erosion associated with lahars is caused by scour and is generally limited to the main drainage channels such as the channels of the North Fork Nooksack River, the North Fork Stillaguamish River, and the Nisqually River. Lahar erosion could potentially expose shallowly buried pipelines. As the velocity of the lahar decreases, erosion by the lahar would typically be followed by deposition. The depth of sediment burial would vary but could be more than 100 feet based on past lahars in the region. The added burial of the pipeline due to lahar deposition would likely result in little or no direct or immediate damage to the pipeline, although access to the pipeline by conventional trenching methods would be prevented in instances of deep burial. The most effective method of protection against a large lahar is deep burial at river crossings using the HDD construction method, which is proposed at the North Fork Nooksack River, the North Fork Stillaguamish River, and the South Fork Stillaguamish River. If the HDD fails and the alternative wet open-cut method were used at these river crossings, the pipeline would be installed beneath the scour depth for a 100-year flood event (see section 4.3.2.3). This burial depth would reduce the effects of erosion associated with lahars. If a volcanic ash fall were to occur during construction, a temporary work stoppage would likely be necessary to protect worker health and equipment. However, an ash fall would not impact the integrity of the loops during construction or operation.

Aboveground and Abandoned Facilities

With the exception of the Chehalis Compressor Station, proposed modifications to major aboveground facilities would occur within the existing facility and, therefore, would not subject the compressor stations to an increased threat from geologic hazards. In the event of an ash fall, compressor stations would be temporarily shut down to protect worker health and operating equipment.

The Chehalis Compressor Station is located in an area of generally flat topography and would not be susceptible to impacts associated with mass wasting. Although the location is susceptible to ground shaking associated with earthquakes, the likelihood of ground movement sufficient to cause soil liquefaction would be low due to the short duration of the work. The site is not located in an area of historic lahars, nor is it located near faults with recent movement. Ash fall is possible in this area and could affect operation of the Chehalis Compressor Station, as well as the other compressor stations. The Chehalis Compressor Station is the only compressor station located within an area of shallow groundwater. Dewatering would be conducted as necessary during excavations for new reinforced compressor foundations to protect workers and equipment.

The geologic hazards with the potential to affect the work at the abandoned facility locations outside of the proposed loops would be similar to those discussed above for construction of the loops. However, the work at the abandoned facilities would occur within the existing right-of-way, and excavations would be only as deep and as long as necessary to expose a small section of the existing 26-inch-diameter pipeline. These excavations would be relatively shallow (likely less than 5 feet deep), the area of disturbed soil would be very limited, and no blasting would be necessary. Therefore, the abandonment activities would be unlikely to trigger a geologic event such as a slope movement. As necessary, the same measures described above for the construction of the loops would be used to mitigate impacts due to mass wasting and erosion. Because the work at each abandoned facility would be of short duration, the chances of a geologic event such as a volcanic eruption or earthquake occurring during construction would be very low. The abandoned facilities are covered by the existing Geotechnical Hazards Monitoring Program, which further mitigates the potential effects of any geological hazards on the operation of the facilities.

Pipe Storage and Contractor Yards

The yards proposed for pipe storage and contractor use would be located in relatively flat areas. With the possible exception of minor grading activities and surfacing, the topography and soils at these sites would not be disturbed. In addition, these facilities would be temporary and operated only as long as needed for construction. Therefore, no significant impact on geologic resources would be anticipated. Furthermore, none of the activities at these facilities would be likely to trigger geologic hazards. Because the pipe storage and contractor yards are temporary, a geologic event that could cause a significant impact is unlikely to occur during the time the facilities are in use. If such an event were to occur, the facility could be taken out of operation temporarily.

4.1.4 Paleontological Resources

Pipeline Facilities

The Capacity Replacement Project would be primarily underlain by Pleistocene glacial deposits such as lodgment till and outwash, and by Holocene alluvial deposits. Because these sediments are deposited fluvially or from melting glacial ice, fossils are unlikely to be preserved or discovered in these sediments, except for isolated pieces of wood and similar organic detritus. Fossils, if they are present, would most likely be encountered in the relatively limited bedrock exposures crossed by the Capacity Replacement Project (see table 4.1.1-1).

The Sumas Loop would cross bedrock exposures of the sedimentary Huntingdon and Chuckanut Formations, as well as outcrops of the metamorphosed Chilliwack Group. Of the 22.7 miles crossed by the Sumas Loop, about 2.4 miles of the Huntingdon Formation, 0.1 mile of the Chuckanut Formation, and 0.6 mile of the Chilliwack Group would be crossed. Dragovich et al. (1997) do not describe any fossils in the Huntingdon Formation. They note that the member of the Chuckanut Formation that would be crossed by the Sumas Loop contains Oligocene age warm-temperate plant fossils, and state that the Chilliwack Group often contains a variety of Mississippian and Devonian marine and terrestrial fossils, including crinoids, radiolarians, leaf imprints, and tree trunks.

The Mount Vernon Loop would cross two scattered outcrops of the Rocks of Bulson Creek Formation, a sedimentary unit totaling 0.9 mile out of the total loop length of 22.5 miles. Because the Rocks of Bulson Creek Formation contains coal bearing seams, it may contain plant fossils. No surficial bedrock would be crossed by the Snohomish Loop. The Fort Lewis Loop would cross a small outcrop of andesite between MPs 1316.9 and 1316.6. Andesite is a volcanic rock and therefore would not contain fossils.

Because the total length of rock formations likely to contain fossils along the loops would only be about 1.6 miles and the entire 1.6 miles would be located within Northwest's existing right-of-way that has been previously disturbed, fossils are not expected to be uncovered during construction of the pipeline facilities.

Aboveground and Abandoned Facilities

Fossils are not expected to be uncovered during project-related activities at the aboveground and abandoned facilities because these activities would all occur within previously disturbed areas.

Pipe Storage and Contractor Yards

With the possible exception of minor grading activities and surfacing, soils at the pipe storage and contractor yards would not be disturbed. As a result, fossils are not expected to be uncovered during temporary construction activities at these sites.

4.2 SOILS

4.2.1 Existing Soil Resources

Information contained in U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) county soil survey reports was used to identify existing soil types that occur in the project area, with the exception of the portion of the Fort Lewis Loop that would cross Fort Lewis between MPs 1335.2 and 1330.6. Information for Fort Lewis is not included in the soil survey for Pierce County. For this area, soil information was obtained from the Fort Lewis *Final Integrated Natural Resources Management Plan*, which contains general descriptions of existing soil resources on the military reservation. The State Soil Geographic (STATSGO) database was also reviewed for this area. In addition, general assumptions have been made based on the soil limitations encountered outside the boundaries of Fort Lewis within Pierce County. Information from the soil surveys, Fort Lewis *Final Integrated Natural Resources Management Plan*, and STATSGO database was combined to assess soil limitations for pipeline construction and potential impacts of construction and operation on soils.

The soils in the project area are diverse and include glacial tills and outwash, river and slope alluvium, colluvium derived from glacial drift and sandstone, volcanic ash, loess, glaciomarine drift, and glaciolacustrine sediment. The project area has widely varying topography, ranging from nearly level to very steep (see section 4.1.1). Slopes that exceed 35 percent are mainly limited to the Sumas Mountain area, located between MPs 1481.0 and 1479.0 and between MPs 1476.5 and 1473.0, and incisions caused by waterbodies. Soils in the project area support a variety of vegetation types, although the dominant cover type along the proposed loops is shrubland.

Pipeline Facilities

The soils along the loops were evaluated to identify prime farmland and major soil limitations that could affect construction or increase the potential for construction-related soil impacts. The soil limitations evaluated were:

- erosion potential from water or loss of vegetation;
- compaction potential;
- flooding hazard;
- hydric soils/high water table; and
- large stones/shallow bedrock.

Table 4.2.1-1 summarizes the soil limitations and prime farmland along the loops. The information available on soil limitations within Fort Lewis was not as detailed as the soil survey information used for the other areas affected by the project. Because soil surveys are at a smaller scale, they allow for a more site-specific assessment of soil limitations affected by the project. As a result, only the general presence or absence of a specific soil limitation is provided for the portion of the route that crosses Fort Lewis. The nature and prevalence of each limitation are discussed below.

TABLE 4.2.1-1

Soil Limitations Along the Loops Associated with the Capacity Replacement Project

		Estimated Potential Impact (miles) [a]									
Facility/County	Total Length Crossed	Erosion from Water [b]	Erosion from Vegetation Loss	Soil Compaction	Flooding Hazard	Hydric Soils	High Water Table	Large Stones	Shallow Bedrock	Prime Farmland [c]
Sumas Loop										
Whatcom County	22.7	0.9	2.7	10.7	11.2	11.2	17.1	4.7	3.1	11.8
Mount Vernon Loop										
Skagit County	0.2	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Snohomish County	22.3	0.4	4.1	2.9	1.4	1.3	18.3	17.7	0.0	4.5
Snohomish Loop										
Snohomish County	0.8	0.0	0.8	0.0	0.0	0.0	0.8	0.8	0.0	0.4
King County	11.1	0.7	10.8	0.3	0.0	0.3	8.9	10.8	0.0	1.0
Fort Lewis Loop										
Pierce County	9.1	0.2	7.5	1.1	1.1	1.1	4.5	8.0	0.0	1.1
Fort Lewis [d]	4.6	Yes	Yes	Unknown	Unknown	Yes	Yes	Yes	Unknown	Unknown
Thurston County	8.7	0.0	2.1	5.3	0.4	0.0	5.9	1.4	0.0	0.0
Project Total	79.5	2.1	28.2	20.3	14.1	14.4	55.7	48.7	3.1	23.2

[a] Potential soil impacts are based on individual soil mapping units crossed by each loop within each of the general soil associations and are as defined in county soil surveys.

[b] Includes soil mapping units that have a high to severe water erosion hazard.

[c] Includes all prime farmland soil categories.

[d] Information excluded from the county soil survey. Only the general presence or unknown status of a specific limitation is available from various sources, including the Fort Lewis *Final Integrated Natural Resources Management Plan*, the STATSGO database, and general assumptions based on the soil limitations encountered outside the boundaries of Fort Lewis.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

Erosion Potential from Water or Loss of Vegetation – Erosion is an ongoing, natural process that can be accelerated by human disturbance. Factors such as soil texture, structure, slope, vegetative cover, rainfall intensity, and wind intensity can influence the severity of erosion. Soils most susceptible to erosion by water are typified by bare or sparse vegetative cover, non-cohesive soil particles, and moderate to steep slopes. Soils most likely to be susceptible to erosion from vegetation loss have droughty characteristics, such as coarse texture and excessively drained. Soils typically more resistant to erosion include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. The soils along 38 percent of the loops are highly to moderately susceptible to erosion. Of these, 35 percent are more susceptible to erosion due to loss of vegetation and approximately 3 percent are more susceptible to water erosion. In general, relatively level topography and the presence of permeable, coarse-textured soils indicates a low potential for significant natural erosion to occur within Fort Lewis. Erosion potential is mainly confined to steeper slopes (CH_2M Hill, 1994). Within Fort Lewis, the Fort Lewis Loop would cross Muck Creek and South Fork Muck Creek, where steeper slopes have been incised by the streams. The potential impacts associated with wind erosion are considered to be minimal for this project. The average wind speed (8 to 10 miles per hour (mph)) is highest in the winter, but the wet conditions during the winter minimize the erosive potential of the wind (NRCS, 1973, 1979, 1989, 1990, and 1992).

Compaction Potential – Soil compaction modifies the soil structure by decreasing the size of pores between soil particles. This decreases the infiltration into and drainage from the compacted layer and creates problems with soil aeration. Soil compaction increases the amount of force that must be exerted by roots to penetrate the soil. The degree of compaction is dependent on moisture content and soil texture. Fine-textured soils with poor internal drainage are the most susceptible to compaction. Approximately 26 percent of the soils crossed by the loops are susceptible to soil compaction. Based on the information available, it is unknown whether the soils crossed within Fort Lewis are prone to compaction. However, hydric soils, which are more prone to compaction, could potentially be encountered within Fort Lewis (see discussion below).

Flooding Hazard – Soils are rated for potential flooding hazard based on flood frequency, duration, and the most likely period for flooding to occur. On average, about 25 to 30 percent of the annual precipitation in the project area falls between April and September. Although approximately half of the yearly thunderstorms in the project area occur during the summer, the most likely period for flooding is the winter months when storms sometimes bring heavy rains. Soils along approximately 18 percent of the loops have the potential to be affected due to flooding. Based on the information available, it is unknown whether the soils crossed within Fort Lewis are prone to flooding hazards.

Hydric Soils – Hydric soils are defined as soils that are sufficiently wet in the upper portion so that anaerobic conditions develop during the growing season (Federal Register, 1994). Disturbed soils, such as those that are artificially drained or protected from flooding, are still considered hydric if the soil in its undisturbed state would meet the definition of a hydric soil. Because they may be saturated for extended periods, hydric soils would be more prone to compaction and rutting than other soil types. About 18 percent of the soils crossed by the loops are considered hydric soils. Soils within Fort Lewis developed from glacial deposits and consist mainly of well-drained to excessively drained soils. However, there is the potential to encounter muck and peat soils that would be classified as hydric. These soils developed in shallow depressions and are saturated for most of the year (ENSR, 2000).

Many areas containing hydric soils along the loops also contain drain tiles and are actively cropped. Drain tiles are subsurface structures used to improve soil productivity through drainage. Northwest has identified preliminary locations of drain tiles within the existing operational right-of-way for the existing 26-inch and 30-inch-diameter pipelines that could be affected by the proposed loops. Based on Northwest's preliminary estimates, drain tiles would be crossed in 58 locations along the Sumas Loop, 2 locations along the Mount Vernon Loop, 3 locations along the Snohomish Loop, and 8 locations along the Fort Lewis Loop. Northwest is continuing to work with landowners to determine the locations of drain tiles that could be affected by construction.

High Water Table – Soils are described as having a high water table if there is the potential for encountering groundwater in the construction trench, or a depth of approximately 6 to 8 feet. A high water table, or shallow groundwater, can create buoyancy hazards for the pipeline (see section 4.3.1). About 70 percent of the soils crossed by the loops are considered to have a high water table. Some areas within Fort Lewis contain Tenino gravelly loam, which can contain a hardpan layer at depths of 25 to 40 inches below the surface (ENSR, 2000). Moderate permeability above the hardpan and very slow permeability in the hardpan leaves the potential for encountering a perched water table in these areas.

Large Stones and Shallow Bedrock – Stony soils are identified as soils that contain greater than 5 percent (weight basis) of stones larger than 3 inches in diameter in the subsoil. Trenching of stony soils has the potential to bring large rocks to the surface, which could interfere with agriculture and reestablishment of vegetation on the right-of-way. Approximately 61 percent of the soils crossed by the loops are described as stony. The Spanaway soil series, which occurs within Fort Lewis, contains some soils described as stony sandy loam. The potential exists to introduce large stones from these soils to the surface layer during construction through the military reservation.

Soils were evaluated to identify areas with hard bedrock within 5 feet of the soil surface that were defined as containing shallow bedrock. Based on NRCS county soil surveys, less than 4 percent of the soils crossed by the loops contain shallow bedrock, all of which are found along the Sumas Loop in Whatcom County. Based on geologic studies conducted in the area, another 1.5 percent of the route contains soils with shallow bedrock along the Mount Vernon (1.1 percent) and Fort Lewis Loops (0.4 percent). No soils with shallow bedrock were identified on the Snohomish Loop.

Prime Farmland – The NRCS (2003) defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops." This designation includes cultivated land, pasture, woodland, or other lands that are either used for food or fiber crops, or are available for these uses. Urbanized land, built-up land, and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks; has an adequate and dependable water supply; is permeable to water and air; is not excessively erodible or saturated with water for long periods; and is not subject to frequent, prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., artificially drained or irrigated). Approximately 29 percent of the soils crossed by the loops are designated prime farmland, including areas considered prime if irrigated or drained. Although some areas within Fort Lewis were used for agricultural purposes before acquisition by the Army, the poor water-holding capacity along with gravelly texture provides relatively low fertility for agricultural uses. No areas within the military reservation are currently in agricultural production.

Aboveground Facilities

With the exception of the Chehalis Compressor Station, proposed modifications to major aboveground facilities would occur within the existing facility sites that have been graveled and fenced. As a result, no new impacts on soils would occur. Construction activities at the Chehalis Compressor Station would occur on 7.7 acres of land, most of which would be located outside the existing site. In some instances, the new pig launchers or receivers and MLVs that would be collocated with existing aboveground facilities would require the permanent expansion of the existing footprint of the facility. The expansions would occur within the pipeline right-of-way and would only incrementally add to the existing aboveground facility footprint, which would not have a significant new impact on soils. However, there would be three locations where pig receivers and MLVs would not be collocated with existing aboveground facilities. Table 4.2.1-2 summarizes the soil limitations for those facilities that would be new aboveground facility sites and for the Chehalis Compressor Station.

Northwest would construct two new permanent roads to provide operational access to the site of the pig receiver and two MLVs at MP 1408.8 and the site of the pig receiver and two MLVs at MP 1315.6. The soils crossed by these roads do not have limitations for use as access roads and are not considered hydric or prime farmland.

Abandoned Facilities

The majority of the workspaces associated with the 48 abandoned facility sites located outside of the looped areas would overlap with existing aboveground facility sites that are graveled and fenced. Soils in these areas have all been previously disturbed.

TABLE 4.2.1-2										
Soil Limitations at New Aboveground Facilities and the Chehalis Compressor Station Associated with the Capacity Replacement Project										
		Potential Impact								
Loop/Facility	Size (acres)	Erosion from Water	Erosion from Vegetation Loss	Soil Compaction	Flooding Hazard	Hydric Soils	High Water Table	Large Stones	Shallow Bedrock	Prime Farmland [a]
Sumas Loop										
MLV (MP 1467.9)	0.2 [b]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pig receiver and two MLVs (MP 1461.8)	0.3 [b]	No	No	Yes	Yes	Yes	Yes	No	No	Yes
Mount Vernon Loop										
Pig receiver and two MLVs (MP 1408.8)	0.2 [b]	No	No	No	No	No	Yes	Yes	No	No
Compressor Station										
Chehalis (MP 1289.4)	7.7 [c]	No	No	Yes	No	Yes	Yes	No	No	Yes

[a] Includes all prime farmland soil categories.

[b] This facility would be located within the pipeline right-of-way and would not require any additional land during construction and operation; however, the footprint of the site would permanently convert this acreage to an industrial use (i.e., graveled and fenced).

[c] Construction of the expanded Chehalis Compressor Station would affect 7.7 acres of land; however, only 1.5 acres would be retained for operation of the expanded facility (1.4 acres to expand the station's fenced area and 0.1 acre for a gravel road to an existing water supply well).

Pipe Storage and Contractor Yards

Of the 13 proposed pipe storage and contractor yards, 8 have been previously disturbed during industrial activities and some have been graveled and/or paved. The remaining five yards have not been previously disturbed. Table 4.2.1-3 summarizes the soil limitations for these five yards.

TABLE 4.2.1-3										
Soil Limitations at the Pipe Storage and Contractor Yards That Have Not Been Previously Disturbed [a]										
		Potential Impact								
Facility	Size (acres)	Erosion from Water	Erosion from Vegetation Loss	Soil Compaction	Flooding Hazard	Hydric Soils	High Water Table	Large Stones	Shallow Bedrock	Prime Farmland [b]
Bellingham GSX Yard (Staging Site)	18.9	No	No	Yes	No	No	No	No	No	No
Nooksack Yard	7.6	No	No	Yes	Yes	Yes	Yes	No	No	Yes
Maltby 1a and 1b Yards	6.7	No	Yes	No	No	No	Yes	Yes	No	Yes
Maltby 2a, 2b, and 2c Yards	9.7	No	Yes	No	No	No	Yes	Yes	No	Yes
Yelm Yard	10.2	No	No	No	No	No	No	No	No	No

[a] The Jones Road Yard currently consists of plowed fields but has been utilized in the past by Northwest as a temporary construction work area so is considered previously disturbed.

[b] Includes all prime farmland soil categories.

4.2.2 General Impact and Mitigation

Pipeline construction such as clearing, grading, trench excavation, backfilling, and the movement of heavy construction equipment along the construction right-of-way may result in adverse impacts on soil resources. Clearing activities remove the protective cover and expose the soil to the effects of wind, sun, and precipitation. This exposure can lead to movement of sediment to sensitive areas. Grading and equipment traffic have the potential to compact soil, reducing porosity and infiltration rates, which could lead to increased runoff potential, difficulty in revegetating, or decreased agricultural productivity. Trench excavation and backfilling could lead to a mixing of the soil layers, bringing potentially less productive subsoil to the surface or introducing rocks from deeper horizons to the soil surface. The soils could also potentially be impacted due to contamination from spills or leaks of fuels, lubricants, and coolants from construction equipment.

In general, potential impacts on soil would be less during the construction of the Capacity Replacement Project than for a new pipeline because the majority of the construction would occur within Northwest's existing permanent operational right-of-way. The general measures that Northwest would implement to avoid or minimize the potential effects of construction on soils are described below. A more detailed site-specific discussion is provided in section 4.2.3.

Erosion Control and Revegetation Measures

To reduce the impacts of construction on soils, Northwest would implement the January 17, 2003 versions of the FERC staff's Plan and Procedures (see Appendices E and F, respectively). In addition, Northwest has developed a project-specific ECR Plan (see Appendix G) that incorporates many of the mitigation measures outlined in the Plan and Procedures as well as agency-recommended revegetation and erosion control procedures. The ECR Plan also addresses the WDOE's requirements for construction stormwater discharges. Northwest's ECR Plan includes measures to control erosion and sedimentation during construction and to ensure proper revegetation for erosion control following construction. Relevant mitigation measures specified in the ECR Plan are described below.

- Restrict the construction right-of-way width to 95 feet in most areas to minimize overall impacts. Northwest would limit the construction right-of-way width to 75 feet in wetlands and would use a 60- to 75-foot-wide construction right-of-way along the Snohomish Loop to minimize impacts on residential areas.

- Segregate topsoil over the trenchline. In deep soils, segregate the top 12 inches of topsoil. In areas where the topsoil layer is less than 12 inches, make every effort to segregate the entire layer of topsoil.

- Identify agricultural drainage systems before and during construction to ensure their restoration if affected by construction activities. Restore drain tile systems to their original condition prior to backfilling using qualified specialists for testing and repairs. Repairs of damaged drain tiles in wetland areas would be limited to replacement of the original size and depth. Approval from appropriate regulatory agencies would have to be obtained before any expansion of drain tile systems in wetland areas could be conducted.

- Establish temporary erosion control measures, such as temporary slope breakers and mulch, during construction and provide permanent erosion control measures (e.g., permanent slope breakers, trench breakers, revegetation of the disturbed areas) following construction.

- Install sediment barriers, such as silt fencing and/or straw bales or drivable berms, before ground-disturbing activities to prevent sediment flow from construction areas into waterbodies, wetlands, and roads. After backfilling and major grading work are complete, any drivable berms would be removed and the ground surface returned to original contours. If a sediment control device is still needed at a location where a drivable berm was removed, a temporary sediment control device such as silt fencing would be installed.

- Minimize soil compaction during construction by use of additional ground cover (e.g., trench spoil, mats) and mitigate compaction following construction and right-of-way restoration activities through final grading activities.

- Remove excess rocks from the right-of-way brought to the surface during construction activities and restore the construction work area to preconstruction conditions using the same size, density, and distribution of rocks as found in adjacent areas.

- Ensure revegetation of all areas disturbed by project-related activities by following seed recommendations made by local NRCS authorities and the WDNR. Implement appropriate temporary erosion control measures to stabilize the work area following seeding.

- Provide post-construction monitoring of mitigation practices to ensure their successful implementation. Revegetated areas would be monitored for at least 2 years following construction to ensure successful restoration. If vegetative cover and density are not successfully restored after two full growing seasons, determine the need for additional restoration measures upon consultation with a professional agronomist. Extend monitoring in wetland areas planted with woody vegetation to meet objectives and performance standards identified in an approved wetland mitigation plan (see section 4.4.4).

- Provide measures to minimize the establishment of noxious weeds in disturbed areas, including using weed-free straw bales, clearing existing priority noxious weeds in a manner that limits seed distribution, and inspecting for noxious weed establishment during post-construction monitoring.

- Implement the SPCC Plan to minimize the chance of a spill or, if a spill does occur, respond appropriately to protect sensitive resources.

- Utilize EIs to ensure implementation of the practices outlined above.

Two of the mitigation measures for upland construction included in Northwest's ECR Plan differ significantly from those in the FERC staff's Plan. Table 4.2.2-1 summarizes these different measures (variances) and provides the FERC staff's conclusions regarding whether each variance is acceptable. As shown in table 4.2.2-1, the FERC staff would allow the two proposed variances with stipulations. The FERC staff further stipulates that both variances are acceptable only if the landowner does not object. Therefore, **the FERC staff recommends that:**

- **Northwest file a revised ECR Plan that incorporates the FERC staff's stipulations regarding the variances in table 4.2.2-1 with the Secretary for the review and written approval of the Director of OEP <u>before construction</u>.**

TABLE 4.2.2-1

Northwest's Proposed Variances from the FERC Staff's Plan

Section	Variance Request	Conclusion and Approval Status
IV.B.1	Northwest's ECR Plan includes a measure to conduct trenchline-only topsoil segregation in nonsaturated wetlands, residential areas, croplands, hayfields, and other areas at the landowner's request. Segregated topsoil would be stored separately from subsoil. Because construction would occur over its existing pipelines, Northwest is proposing to spread the subsoil excavated from the trench over the unstripped topsoil on the working side of the right-of-way where its existing pipelines are located to provide additional protection for the pipelines from the tracking of construction equipment. Working over the trench spoil would also minimize the construction right-of-way width. In an effort to maintain separation between the topsoil and subsoil layers, Northwest would mow the construction right-of-way before trenching, and leave the cut vegetation in place. During soil replacement activities, this layer would serve as a visual barrier to differentiate the topsoil left in place from the excavated subsoil layers used for pipeline protection. Northwest states that this technique would minimize impacts on adjacent parcels by allowing the construction work to take place over the existing pipelines without compromising their integrity.	The FERC staff's Plan specifies that topsoil would be stripped from either the full work area or from the trench and subsoil storage area (in this case the working side of the right-of-way) in actively cultivated or rotated croplands and pastures, residential areas, hayfields, and other areas at the landowner's or land management agency's request. The WDOE has recommended approval of this variance with the following conditions: 1) if the EI determines that the mowed vegetation layer would not allow adequate segregation of topsoil from subsoil in wetland areas, timber mats or other suitable barriers should be used to accomplish topsoil and subsoil segregation; and 2) straw is not considered a suitable barrier in wetlands. Because the topsoil segregation method proposed by Northwest would allow work to be conducted over Northwest's existing pipelines thereby reducing the amount of new disturbance required, and because separation between the trench spoil and the existing topsoil layer would be maintained through the use of a vegetative layer, it is believed the Northwest's topsoil segregation proposal would adequately protect topsoil resources. As such, **unless the landowner objects to this variance it is acceptable with the stipulation that the WDOE's conditions are adhered to.**
IV.F.1.3.e	Northwest's ECR Plan includes a measure to spread up to 3 tons of wood chips per acre during restoration activities. Northwest has consulted with the local NRCS and has adopted its recommendation to scatter the material to cover no more than 50 percent of the ground surface so as not to hinder revegetation efforts. In addition, based on the NRCS' recommendation, Northwest would increase the amount of nitrogen applied, to maintain a 15:1 carbon to nitrogen ratio, based on a laboratory analysis of soil samples taken from the areas where the wood chips would be used and the recommendations from the soil testing laboratory.	The FERC staff's Plan specifies that no more than 1 ton of wood chips per acre be used and that the equivalent of 11 pounds per acre of nitrogen be applied. The WDOE has recommended approval of this variance with the following conditions: 1) no invasive plant material should be allowed in the mulch (i.e., Himalayan blackberry or Scot's broom); 2) mulch should be placed no more than 4 inches deep where Northwest uses wood chips as surface mulch around woody species installed to restore native woody vegetation in disturbed wetlands or uplands associated with temporary extra workspaces; 3) no mulch should be placed in wetlands; and 4) the spreading of wood chips over areas that would be seeded to restore grasses and/or emergent vegetation should be limited to the rate recommended by the NRCS, including fertilizer rate recommendations, and should meet conditions 1 and 2. By following the recommendations of the WDOE and the local NRCS, it is believed that Northwest's proposal to increase the density of wood chips spread on the right-of-way, limit the coverage of the wood chips to no more than 50 percent of the ground surface, and adjust the fertilization rate in these areas to maintain a 15:1 carbon to nitrogen ratio would not hinder revegetation of the right-of-way. As such, **unless the landowner objects to this variance it is acceptable with the stipulation that the WDOE's conditions are adhered to.**

4.2.3 Site-Specific Impact and Mitigation

Pipeline Facilities

The loops would cross approximately 2.1 miles of soils with a high potential for water erosion, and 28.2 miles of soils with a high potential for erosion from vegetation loss. Clearing and grading activities expose soils to wind and precipitation, increasing the potential for erosion. Areas where vegetation is difficult or slow to establish can further expose soils to the elements. Increased erosion can lead to reduced soil fertility and impaired revegetation. Unless adequately protected, erosion from construction activities could result in discharge of sediment to wetlands and waterbodies. Steep slopes along waterbodies make topsoil and soil piles especially susceptible to water erosion. Northwest would implement measures identified in the FERC staff's Plan (see Appendix E) and its ECR Plan (see Appendix G) to minimize impacts associated with erosion. Soils with droughty characteristics, such as coarse texture and excessively drained, are considered to have a potential for erosion impacts due to difficulty of revegetation. Although 28.2 miles of the loops were identified as having droughty characteristics, the climate of the project area and project reclamation schedule should minimize potential impacts on these soils. Follow-up inspections of all disturbed areas would be conducted after the first and second growing seasons to evaluate the success of revegetation efforts.

The Snohomish Loop would cross critical areas designated as Erosion Hazard Areas by the King County and City of Sammamish critical areas ordinances. Some of the specific measures identified for these areas include area-specific guidelines for installation of BMPs, restrictions regarding when clearing and grading activities can occur, and area-specific site stabilization standards. Northwest has addressed critical areas in preparing its ECR Plan and has committed to complying with all local level plans and permits. Some erosion hazard areas along the loops are identified as geologic hazards. These critical areas and measures to reduce potential impacts on these areas are addressed in section 4.1.3.

Discharge from trench dewatering and hydrostatic testing activities could also cause erosion. Where these activities are required, the water would be discharged to a stable upland area a significant distance from wetlands and waterbodies. Northwest would minimize the potential for erosion through the use of energy-dissipating devices that would disperse and slow the velocity of any discharges and straw bale dewatering structures or sediment bags to promote infiltration and prevent sedimentation of wetlands, waterbodies, or other sensitive areas. The dewatering structures would be constructed in accordance with the FERC staff's Procedures (see Appendix F), Northwest's ECR Plan (see Appendix G), and applicable state permit requirements. Northwest's EI would visually monitor the release of hydrostatic test water to ensure that no erosion or sedimentation occurs and that turbid water does not reach any surface waters. If it is not feasible to release trench and hydrostatic test water as described above, Northwest would need to submit alternative measures that would provide equal or better environmental protection and receive approval before use.

The susceptibility of soils to wind erosion could result in potential dust hazards. The highest average wind speed in the project area is about 10 mph and occurs during the winter months. Because construction would occur mainly during the summer months, when the wind speeds are lower, the potential for impacts associated with wind erosion is low. However, the potential exists for impacts associated with fugitive dust along the right-of-way, especially in residential areas. Dust control measures, in the form of watering, would be implemented as directed by the EI. Watering trucks would use water obtained from a municipal source to control any fugitive dust. Water would be sprayed only to the extent necessary to control dust, without generating run-off from the operation. To control dust on paved roadways, sweeping would be carried out and water would be added as necessary to control dust generated from the sweeping activities.

Construction equipment traveling over wet soils has the potential to disrupt soil structure, cause rutting, reduce pore space, and increase runoff potential. These impacts are most likely to occur during periods when soils are moist or saturated. The potential impacts on pipeline construction and operation associated with hydric or wet soils include difficulty of equipment movement during construction and pipe buoyancy during construction and operation. The pipeline would cross about 20.3 miles of soils highly susceptible to compaction, 14.4 miles of hydric soils, and 55.7 miles of soils with the potential for a high water table. Compaction and rutting would be minimized by scheduling the majority of construction activities for the driest portion of the year, to the extent practical. Additionally, the added ground cover provided by Northwest's proposed topsoil segregation variance discussed in section 4.2.2 would provide additional protection against compaction and rutting. Northwest would implement corrective actions to mitigate soil compaction if it were to occur, including the use of ripping or chisel plowing, as deemed necessary by the EI. Ripping and chisel plowing would be used during dry periods to promote shattering of compacted layers and would be conducted before replacement of the topsoil. As discussed in sections 4.1.3 and 4.3.1.2, Northwest would install concrete-coated or weighted pipe to alleviate buoyancy hazards during pipeline operation.

As specified in its ECR Plan, Northwest would test for soil compaction in residential and agricultural areas. These comparative tests would be conducted on similar soils and under similar moisture conditions. These tests would allow the EI to implement site-specific decompaction efforts appropriate for the identified levels of compaction. Scarification would be performed, as deemed necessary by the EI, to loosen compacted layers affected by construction equipment. Northwest does not anticipate the need for scarification in wetland areas because traffic would be limited to one pass through the wetland and equipment mats would be used in wetlands where soil is saturated or standing water is present. The EI would determine the need for wetland scarification, and it would not be carried out in areas where wetland hydrology would be adversely affected.

Approximately 14.1 miles of the loops have the potential for flooding hazards. In an effort to minimize the potential for impacts associated with flooding, construction would not occur during the winter months, which is the most likely period for flooding to occur. Additional information on flood hazards is presented in section 4.3.2.1.

Trenching through stony/rocky soils could bring rocks to the surface, which could interfere with agricultural practices and hinder revegetation of the right-of-way. About 48.7 miles of the loops have the potential for this impact based on the presence of soils with a textural class modifier indicating stony, cobbley, or bouldery, or having greater than 5 percent stones larger than 3 inches in diameter in the surface or subsoil layers. Northwest proposes to segregate topsoil over the trenchline in cultivated areas, hayfields, and residential areas as previously described and use rock pickers where necessary to remove excess rock from the top 12 inches of soil, to the extent practical. Waste rock would be hauled to an approved landfill, commercial quarry, or disposed of in an upland area with landowner approval.

Ripping and blasting of shallow bedrock could also introduce rock fragments and stones into the topsoil. The soil type information analyzed for the project indicates that approximately 3.1 miles of the loops would cross areas with shallow bedrock. According to geologic studies conducted in the area, however, up to 4.3 miles could contain surficial bedrock (see section 4.1.1). Northwest does not anticipate that blasting would be required during construction of the project facilities; however, if blasting becomes necessary, Northwest would prepare a detailed *Blasting Plan* (see section 4.1.1).

Of the total distance crossed by the loops, approximately 23.2 miles would be considered prime farmland, either under current conditions or if drained or irrigated. Potential impacts on prime farmland from pipeline construction include interference with and/or damage to agricultural drainage or irrigation systems, the mixing of topsoil and subsoil, the potential loss of topsoil, and compaction/rutting. These impacts would be primarily associated with trench excavation and backfilling, as well as equipment and vehicle traffic along the right-of-way. As described above, Northwest would implement the FERC staff's Plan and its ECR Plan to minimize these potential impacts. Northwest would probe drain tiles affected by project construction activities beyond the limits of the trench to determine if damage has occurred. Northwest would restore any damaged tiles to their original condition using trained personnel. Northwest would also test for soil compaction in agricultural and residential areas to determine if additional, site-specific mitigation measures would be required. Most impacts on prime farmland from pipeline construction would be short term and would not result in the permanent conversion of prime farmland to non-agricultural uses.

All of the soils crossed by the loops would be susceptible to contamination from spills or leaks of fuels, lubricants, and coolants from construction equipment. These impacts would typically be minor because of the low frequency and volumes of these occurrences. However, the introduction of these contaminants to soils can adversely affect productivity. Northwest's project-specific SPCC Plan specifies cleanup procedures to minimize the potential for soil contamination from spills or leaks of fuels, lubricants, and coolants (see Appendix H).

In addition to contamination from spills or leaks associated with construction equipment, pre-existing soil contamination could be encountered during pipeline construction. The WDOE has indicated that Northwest would be required to contact the WDOE's Environmental Report Tracking System Coordinator if contaminated soil and/or groundwater are found during construction. The WDOE and Northwest are working together to address pre-existing soil contamination through a Voluntary Cleanup Program Agreement. Additional information on measures that would be taken in the event pre-existing contamination is found during construction is presented in section 4.3.1.2.

If it is necessary to remove contaminated soils from the right-of-way, either from an accidental spill of materials during construction or if pre-existing contamination is encountered, Northwest would replace the contaminated material with clean, uncontaminated soil. Northwest would verify that the replacement soil is clean before its use by sampling the soil at its source. The soil would be sampled for total petroleum hydrocarbons gasoline range organics, total petroleum hydrocarbons diesel range organics, volatile organic compounds (VOC), semi-VOC, polychlorinated biphenyls (PCBs), and Resource Conservation Recovery Act metals in accordance with EPA testing methods. Soils would be considered clean if the concentrations of all analytes are below the Method A Soil Clean-up levels for unrestricted use listed in table 740-1 of the Washington Model Toxics Control Act Clean-up Regulations (WAC 173-340).

During the scoping process, concern was expressed regarding potential asbestos contamination along the existing pipeline. In areas where asbestos may be encountered, Northwest would notify the contractor in advance and require the contractor to submit a plan to remove and dispose of the material in accordance with state and local requirements, and to ensure worker health. Additional information on hazardous waste sites and landfills located within 0.25 mile of the loops is presented in section 4.8.5.

Northwest consulted with the noxious weed control boards for each of the counties affected by the loops, as well as the NRCS for recommendations to prevent the introduction or spread of noxious weeds and soil pests (see section 4.5.4).

Aboveground Facilities

Impacts and mitigation associated with the aboveground facilities would be similar to those described for construction of the pipeline facilities; however, impacts at these locations would be permanent. For the modifications at the Chehalis Compressor Station, a total of approximately 7.7 acres of new area outside of the existing fenceline would be disturbed; however, most of this area would be used as temporary extra workspace and would be allowed to revert to former uses following construction. Approximately 1.5 acres would be permanently added to the Chehalis Compressor Station for operation of the facility (1.4 acres to expand the station's fenced area and 0.1 acre for a gravel road to an existing water supply well. The soils in this area are designated as hydric, and their main limitations would be seasonal wetness and a high perched water table between November and April. Northwest has scheduled the majority of the work at this location with these limitations in mind, which would minimize potential soil-related impacts.

The three aboveground facility sites where new disturbance would occur would be located within the pipeline right-of-way; however, the sites would permanently convert a total of 0.7 acre of land to an industrial use. Two of the sites are designated as prime farmland, with one of those actively used as a hayfield. Mitigation measures implemented at the aboveground facility sites would be limited to erosion and sediment control measures as described in the FERC staff's Plan and Northwest's ECR Plan. Soil impacts at the aboveground facility sites, although not fully mitigated, would not be considered significant due to the relatively small amount of soils involved. See section 2.3.3 for an additional discussion of construction procedures at aboveground facility sites.

The WDOE has expressed concern over possible mercury, PCB, petroleum hydrocarbons, and asbestos contamination at existing aboveground facility sites. Northwest reviewed its internal files and WDOE files to determine the status of cleanup efforts at existing contaminated surface facilities. A database screening and field reconnaissance study was also performed to assess known contaminated sites. Northwest would enter into a Voluntary Cleanup Program Agreement with the WDOE to address cleanup of sites along the Northwest system. Additional information on these sites is provided in section 4.8.5.

Abandoned Facilities

Soil disturbance associated with the abandoned facilities at the locations outside of the looped areas would be temporary and short term. The abandonment activities would involve isolating the existing 26-inch-diameter pipeline through excavation. Topsoil would be segregated in accordance with the FERC staff's Plan. Temporary sediment control measures would be installed to prevent sediment movement to adjacent properties or sensitive areas. The original contours that existed prior to construction would be restored to the extent possible, and site restoration and revegetation techniques would be implemented as described in the ECR Plan.

Pipe Storage and Contractor Yards

With the possible exception of minor grading activities and surfacing, soils at the pipe storage and contractor yards would not be disturbed. If soil compaction is observed, scarification would be performed to loosen compacted layers.

4.3 WATER RESOURCES

4.3.1 Groundwater Resources

4.3.1.1 Existing Groundwater Resources

Hydrogeologic Setting

The Capacity Replacement Project would be located within the Puget Sound lowland of the Puget-Willamette Trough regional aquifer system. The principal aquifers in the Puget Sound lowland consist of unconsolidated deposits primarily comprising glacial sediments that are as much as 3,000 feet thick near Seattle. Portions of the Sumas and Mount Vernon Loops and all of the Snohomish and Fort Lewis Loops would overlie unconsolidated deposit aquifers. Most of the groundwater in these aquifers discharges to springs and seeps that feed streams draining the lowland. Some of the larger springs are sources of water for public supply. Numerous wells draw water from the unconsolidated deposit aquifers, and artesian wells with large yields are common. Most wells range from 50 to 300 feet in depth (USGS, 1994). Concentrations of dissolved solids in the unconsolidated deposit aquifers generally are less than 500 milligrams per liter (i.e., suitable for drinking) but can be higher locally.

Parts of the Sumas and Mount Vernon Loops would also overlie aquifers in pre-Miocene volcanic, igneous, metamorphic, and sedimentary rock units. These aquifers generally yield fresh water but can yield salt water locally. Yields from wells within these bedrock aquifers are lower than yields from wells completed in the unconsolidated sediments, and the wells are primarily used for domestic and commercial purposes.

Designated Groundwater Resource Protection Areas

The WAC (173-200-020(4)) defines the beneficial uses of state groundwater to include drinking water, stock watering, industrial, agricultural, fish and wildlife maintenance and enhancement, and the preservation of environmental and aesthetic values, among others. In general, drinking water is considered to require the highest standard of groundwater quality (WAC 173-200-040). Groundwater quality in the project area is protected by the EPA, the State of Washington, and local government units through the establishment of special groundwater resource protection areas and through establishment of enforcement limits for human impacts.

The EPA defines a sole source aquifer as the “sole or principal source” of drinking water for a given service area. In other words, it is an aquifer that is needed to supply 50 percent or more of the drinking water for that area and for which there are no reasonably available alternative sources should the aquifer become contaminated. The loops would cross or pass near EPA-designated sole source aquifers as listed below (Washington Department of Health (WDOH), 2004a).

- The Mount Vernon Loop would pass about 0.6 mile west of the Newberg aquifer.
- The Snohomish Loop would cross the Cross Valley aquifer for 0.8 mile between MPs 1393.9 and 1393.1.
- The Fort Lewis Loop would cross the Central Pierce County aquifer for 13.7 miles between MPs 1338.1 and 1324.4.

A GMA is a specific geographic area designated in accordance with WAC 173-100 in order to protect groundwater quality, ensure groundwater quantity, and provide for efficient management of water resources for meeting future needs while recognizing existing water rights. The loops would cross the GMAs listed below (WDOE, 2001b).

- The Sumas Loop would overlie the Lynden, Everson, Nooksack, and Sumas (LENS) GMA for 15.6 miles between MPs 1484.5 and 1468.9.
- The Mount Vernon Loop would cross the West Snohomish GMA for 22.3 miles between MPs 1431.1 and 1408.8.
- The Snohomish Loop would cross four contiguous GMAs for 11.9 miles between MPs 1393.9 and 1382.0.
- The Fort Lewis Loop would cross the Clover-Chambers Creek GMA for approximately 4.3 miles between MPs 1338.1 and 1333.8.

Wellhead protection areas (WPAs) are established through state wellhead protection programs as required by the Safe Drinking Water Act. WPAs are delineated around a public water supply well field on the basis of groundwater travel times. The loops would cross WPAs as listed below (WDOH, 2004b).

- The Sumas Loop would cross the Mount Baker School District-Demming Well #1 WPA for 0.3 mile between MPs 1470.2 and 1469.9.
- The Mount Vernon Loop would cross three overlapping WPAs for 4.2 miles between MPs 1426.1 and 1421.9.
- The Snohomish Loop would cross three WPAs that are close to each other but do not overlap for 5.6 miles between MPs 1386.6 and 1381.0.
- The Fort Lewis Loop would cross six overlapping WPAs in Pierce County for 2.4 miles between MPs 1338.1 and 1335.7 and one WPA in Thurston County for 0.4 mile between MPs 1324.0 and 1323.6.

The aboveground facilities do not overlie any sole source aquifers, GMAs, or WPAs, with the following exceptions:

- the Snohomish Compressor Station overlies the Cross Valley aquifer and the West Snohomish GMA (WDOH, 2004a; WDOE 2001b);
- the Sumas Compressor Station overlies the LENS GMA; and
- the Washougal Compressor Station overlies the Clark County GMA (WDOE, 2001b; Pierce County, 2001).

In addition to the GMAs and WPAs described above, some counties and cities within the project area have established critical areas ordinances relative to groundwater resource protection. These designated areas are referred to as “aquifer recharge areas” and/or “critical aquifer recharge areas,” depending on the jurisdiction. These areas may also include EPA-designated sole source aquifers and WPAs. Aquifer recharge areas that have been identified in relation to the Capacity Replacement Project, and that are not already listed above, are:

- the entire Sumas Loop would cross designated aquifer recharge areas in Whatcom County (Whatcom County, 2004); and

- the Fort Lewis Loop would cross five aquifer recharge areas in Pierce County for 13.8 miles between MPs 1338.1 and 1324.3. In Thurston County, the Fort Lewis Loop would cross aquifer recharge areas continuously for 8.7 miles between MPs 1324.3 and 1315.6.

No special permits, approvals, notifications, or other requirements would apply to the Capacity Replacement Project relative to the critical areas ordinances, with the following exceptions:

- the critical areas ordinance in King County is currently under revision for critical aquifer recharge areas. When the new ordinance is passed, required mitigation measures may apply to construction in these areas (Johnson, 2004); and

- Thurston County requires permits for fuel pipeline projects such as the Capacity Replacement Project. Applicants are required to provide a drainage and erosion control plan and a hydrogeological report; however, the requirement for the hydrogeological report may be waived, or the required scope of the report limited, depending on the nature of the project and known project impacts and proposed mitigation (Thurston County, 1996). A list of the permits required for the project is provided in section 1.5.

Shallow Groundwater

Shallow groundwater may be encountered along portions of the loops during construction. Shallow groundwater may represent the regional water table or perched groundwater conditions. Perched groundwater is a discontinuous saturated layer or lens with unsaturated conditions above and below. In western Washington, perched groundwater conditions typically vary seasonally, with higher perched water tables during the wet winter months and lower or nonexistent perched water tables in the drier summer and fall months. The regional water table would also exhibit seasonal variations in depth, although typically to a lesser degree. The regional water table is the surface above the zone of continuously saturated conditions and generally coincides with the surface of lakes and streams. In general, the activities associated with the Capacity Replacement Project would be expected to encounter shallow groundwater in areas adjacent to lakes and ponds, areas adjacent to or crossing wetlands, and at large waterbody crossings. Specific locations along the loops with shallow groundwater conditions are identified in table 4.3.1-1 and depicted on the geologic hazards maps in Appendix L. The Chehalis Compressor Station is the only aboveground facility located in an area with shallow groundwater.

Potential Contaminated Groundwater

Northwest did not identify any known areas of contaminated groundwater along the Sumas Loop in Whatcom County; however, the loop may cross areas of groundwater with elevated nitrate concentrations resulting from agricultural activities in this area (Miller, 2004). The Fort Lewis Loop would cross a portion of Fort Lewis, which has an active federal Superfund site as well as other areas of documented groundwater contamination. However, none of these sites are located near the proposed construction right-of-way.

TABLE 4.3.1-1

Potential Areas of Shallow Groundwater Crossed by the Loops Associated with the Capacity Replacement Project

Facility	Milepost Range	Nearest Major Surface Waterbody
Sumas Loop	1484.5-1482.2	Saar Creek/Sumas River
	1473.7-1472.7	Nooksack River
	1472.5-1471.7	Nooksack River
	1470.8-1469.6	Nooksack River
	1468.9-1468.1	North Fork Nooksack River
	1467.0-1466.5	South Fork Nooksack River
	1466.0-1461.8	South Fork Nooksack River
Mount Vernon Loop	1424.3-1424.2	North Fork Stillaguamish River
	1423.9-1422.6	South Fork Stillaguamish River
	1419.6-1419.3	Olson Lake
	1416.4	Possible Isolated Wetland
	1411.1-1411.0	Little Pilchuck Creek
	1410.7-1410.5	Little Pilchuck Creek
	1409.6-1409.5	Catherine Creek
Snohomish Loop	1386.1-1385.9	Wetland Associated with Tributary to Evans Creek
	1383.8-1383.3	Evans Creek Wetland
	1381.6-1381.4	Wetland Associated with Tributary to Evans Creek
Fort Lewis Loop	1328.7-1328.6	Lacamas Creek
	1324.3-1323.9	Nisqually River

The only other known areas with groundwater contamination in the vicinity of the loops are associated with two sites near the Fort Lewis Loop in Pierce County. The first site is a former ammunitions plant with a carbon tetrachloride plume located more than 1 mile north of the north end of the proposed Fort Lewis Loop. The second site is a gasoline release site located approximately 3,000 feet west of the Fort Lewis Loop near MP 1335.5 (Harp, 2004). Because of the distance of these release sites from the Fort Lewis Loop, it is highly unlikely that groundwater contaminants would reach the pipeline construction area. No known areas of groundwater contamination are located in the vicinity of the compressor station sites. Additional information on contamination at existing aboveground facility sites is provided in section 4.8.5.

4.3.1.2 General Impact and Mitigation

Construction of the pipeline and aboveground facilities could affect groundwater in several ways. Clearing of vegetation, grading, trenching, dewatering, and soil mixing and compaction could temporarily alter overland flow and groundwater recharge. Spills and leaks of petroleum and hazardous material could contaminate aquifers. Most potential impacts on groundwater would be avoided or minimized by the use of both standard construction techniques and compliance with the FERC staff's Procedures. In addition, Northwest would comply with all applicable regulations and requirements associated with the critical areas ordinances of King and Thurston Counties. By implementing the FERC staff's Procedures, complying with local critical areas ordinances, and adhering to its *Groundwater Monitoring and Mitigation Plan* (see section 4.3.1.3), Northwest would preserve the current and future beneficial uses of groundwater of the state as defined in WAC 173-200-020.

In addition to project impacts on groundwater resources, potential groundwater-related impacts on the facilities associated with the Capacity Replacement Project must be considered. These include pipe uplift caused by shallow groundwater and subsurface erosion caused by preferential groundwater flow along the pipeline.

Potential impacts and mitigation measures are discussed in more detail in the following sections. While this discussion focuses on the pipeline and aboveground facilities, much of it would also apply to the proposed work at the abandoned facility locations outside of the loops. In fact, the work at the abandoned facilities would have even less potential to affect groundwater resources because the excavations would be only as deep and as long as necessary to expose a small section of the existing 26-inch-diameter pipeline. These excavations would be unlikely to encounter groundwater, and the area of disturbed soil would be very limited.

Clearing and Grading

Vegetation would be cleared only where necessary. Upon completion of construction, Northwest would restore the ground surface as closely as practicable to original contours and allow vegetation to regenerate (with certain controls) to provide restoration of preconstruction overland flow and recharge patterns. In forested areas, water infiltration that is normally enhanced by vegetation would be affected until vegetation is reestablished.

Trench Excavation and Dewatering

In locations where groundwater is close to the land surface (6 to 8 feet deep), the trench excavation could intersect the water table. In these areas, trench dewatering may be required. Localized, minor changes to the water table could occur as a result of these activities dependent on the rate of pumping. However, because pipeline construction at a given location would be completed within a short period of time (typically several days), potential impacts from dewatering would be temporary.

As previously indicated, no known areas of groundwater contamination would be crossed by the loops. However, unanticipated, pre-existing contaminated groundwater could be encountered during construction. The WDOE has indicated that Northwest would have to contact the WDOE's Environmental Report Tracking System Coordinator if contaminated soil and/or groundwater are found during construction. According to Northwest, potentially contaminated groundwater would be recognized during daily inspections of the pipeline excavation where observations for the presence of groundwater would be made and recorded. If groundwater is observed in the excavation, additional observations for the presence of a chemical sheen, free product, and chemical odor would be made and recorded.

In the event that contaminated groundwater is encountered, Northwest has indicated that it would stop work and consult with the WDOE on a plan to proceed. The plan would include provisions for characterizing the contaminants, appropriate health and safety measures for workers, and proper discharge of the groundwater. Because similar commitments have not been made to implement these or other measures in the event that pre-existing soil contamination and/or contaminated sediments are found during construction and to ensure that potential impacts associated with the discovery of pre-existing contaminated soils, sediments, and groundwater are minimized, **the FERC staff recommends that:**

- **Northwest consult with the WDOE and prepare a plan for the discovery and management of contaminated soils, sediments, and groundwater. The plan should include specific protocols for the testing, handling, and reporting of pre-existing contaminated soils, sediments, and groundwater encountered during construction as well as the contact names and telephone numbers of appropriate state and local agency personnel. The plan should be filed with the Secretary <u>before construction</u>.**

Trenching and dewatering could affect springs and wetlands by disrupting the water supply. Generally these impacts are temporary and water levels would be quickly reestablished when backfilling is complete. However, alteration of the natural soil strata could potentially result in new groundwater migration pathways away from surface waterbodies. Northwest's implementation of the FERC staff's

Procedures, which require the use of trench breakers or installation of trench plugs at the edges of waterbodies, should eliminate these potential impacts.

Water supply wells located within 200 feet of the construction right-of-way have the potential to be affected by construction activities, particularly trench dewatering (see section 4.3.1.3).

Soil Mixing and Compaction

To avoid long-term changes in water table elevation and groundwater flow patterns, excavated topsoil and subsoils would be segregated as described in sections 4.2.2 and 4.2.3 and returned as nearly as possible to their original soil horizon. Compaction of soils from the passage of heavy machinery could reduce the ability of the soil to absorb or retain water, which could increase surface runoff and the potential for ponding. However, the impact would be localized and temporary and would not significantly affect groundwater resources and groundwater quality. Additional information on measures Northwest would implement to mitigate impacts associated with compaction is presented in section 4.2.3.

Petroleum and Hazardous Material Spills

Unconfined aquifers and shallow groundwater areas could be vulnerable to contamination caused by inadvertent surface spills of petroleum or hazardous materials used during construction. Accidental spills and leaks of hazardous materials associated with equipment trailers; the refueling or maintenance of vehicles; and the storage of fuel, oil, and other fluids pose the greatest risk to groundwater resources. If not cleaned up, contaminated soils could continue to leach and add pollutants to groundwater long after a spill has occurred.

Northwest developed an SPCC Plan to address preventive and mitigative measures that would be used to avoid or minimize the potential impact of petroleum or hazardous material spills during pipeline construction (see Appendix H). Some pertinent measures in Northwest's SPCC Plan include:

- proper storage and handling of containers and tanks;
- restricted areas for liquid transfer, vehicle and equipment washing, and refueling within 100 feet of wetlands and waterbodies, 200 feet of water supply wells, and 400 feet of municipal or community water wells or protected wellhead or watershed areas;
- training of all employees on the contents of the SPCC Plan;
- maintaining emergency spill kits in all service vehicles;
- periodic inspection of vehicles and equipment for leaks;
- established release notification and emergency response procedures; and
- proper disposal of contaminated materials and soils and replacement of excavated contaminated soil with clean soil.

The FERC staff has reviewed Northwest's SPCC Plan and find that it adequately addresses the storage and transfer of hazardous materials and the response to be taken in the event of a spill. The WDOE has indicated that it would also review and approve the SPCC Plan as part of its permitting process before construction. Therefore, by implementing the approved SPCC Plan, the potential for the project to contaminate local aquifers would be minimal.

Pipe Uplift by Shallow Groundwater

Shallow groundwater can affect the buoyancy of a pipeline by causing it to float. To mitigate potential buoyancy (floating) concerns and/or flexure of the pipe, Northwest would install concrete-coated or weighted pipe in areas of shallow groundwater, as necessary. In accordance with the FERC staff's Procedures, Northwest would not conduct concrete coating activities within 100 feet of a waterbody.

Preferential Groundwater Flow along Pipeline

Subsurface erosion and subsequent sinkhole development is caused by preferential flow of groundwater along pipe trench backfill that is more permeable than the surrounding native soils. If the groundwater flow in the trench is uncontrolled and the backfilled trench soil is susceptible to erosion, soil "piping" can happen. Soil piping occurs as soil in the subsurface is transported by groundwater movement and deposited at the surface in a downslope location. This subsurface erosion results in the formation of voids that eventually collapse and may break to the surface, forming sinkholes. The pipe may then lose foundation support and become exposed. The conditions needed for soil piping and sinkhole development are present at numerous locations along the proposed loops. However, trench design and construction, including the installation of trench breakers, would serve to mitigate preferential groundwater flow along the pipeline and subsequent subsurface erosion.

4.3.1.3 Water Supply Wells and Springs

Northwest completed a preliminary survey of water supply wells and springs in the project area by contacting state, county, and local agencies and searching the water well database maintained by the WDOE (2004a). A total of 59 public water supply wells were identified as potentially located within 400 feet of the proposed construction right-of-way, 39 of which are along the Snohomish Loop. No public water supply wells were identified within 400 feet of the compressor stations. More than 800 private water supply wells were identified as potentially being located within 200 feet of the construction right-of-way. Because the location data within the water well database are only specified to within a 1-square-mile section, the actual number of wells within 200 feet of the construction right-of-way is likely far fewer. No private water supply wells or springs are located within 200 feet of the compressor stations.

Northwest would determine the specific locations of wells and springs within the vicinity of the pipeline right-of-way through field investigations and contacts with landowners before construction. Groundwater supply wells and potable springs located within 200 feet of the construction work area (construction right-of-way and temporary extra workspaces) would be considered potentially susceptible to impacts from proposed construction activities. Potential impacts could include localized decreases in groundwater recharge rates, changes to overland water flow, contamination due to hazardous materials spills, decreased well yields, decreased water quality (such as an increase in turbidity or odor in the water), interference with well mechanics, or complete disruption of the well. These impacts could result from trenching, trench dewatering, blasting, or equipment traffic.

To minimize impacts on water supply wells and springs within 200 feet of the construction right-of-way, Northwest has prepared a *Groundwater Monitoring and Mitigation Plan* for the Capacity Replacement Project (see Appendix M). Each well would be marked and avoided by equipment during construction. In addition, water supply wells and springs within 200 feet of the construction work area would be monitored, contingent on approval of and cooperation by the landowner. Monitoring would include pre- and post-construction measurements of well yields and basic water quality parameters such as dissolved or suspended solids. If a water supply well or spring is adversely affected by the project, Northwest would notify and work with the landowner to ensure a temporary supply of water and, if necessary, Northwest would permanently replace a water supply.

A number of comments were received from area residents expressing concern that the project would adversely affect their water supply wells or nearby springs. To document that nearby wells and springs within 200 feet of the construction work area are located and the mitigation described in Northwest's *Groundwater Monitoring and Mitigation Plan* for each of these areas would be adequate, **the FERC staff recommends that:**

- **Before construction, Northwest file with the Secretary and the WDOE the location of all wells and springs within 200 feet of the construction work area.**

Based on a review of bedrock types and depths, Northwest does not anticipate that blasting would be required during construction of the project facilities. However, if blasting would be required, temporary changes in water level and turbidity could locally affect groundwater quality and nearby wells. If blasting is required, Northwest would use special techniques that act to limit fracturing to the immediate vicinity of detonation (Siskind and Fumanti, 1974). As discussed in section 4.1.1, Northwest would develop a detailed *Blasting Plan* in accordance with applicable DOT and OSHA requirements.

The potential for contaminating wells or springs due to spills of petroleum or hazardous materials is generally low because of the relatively small volume of such materials present during construction. The potential for impacts would be further reduced by implementation of Northwest's SPCC Plan as described in section 4.3.1.2.

4.3.1.4 Groundwater Uses During Construction

Northwest would verify the integrity of the pipeline before placing it into service by conducting a series of hydrostatic tests. These tests involve filling the pipeline with water, pressurizing it, and then checking for pressure losses due to pipeline leakage. Northwest would undertake measures to ensure public awareness and safety during the hydrostatic tests. Northwest would provide written notification to landowners located along the construction right-of-way before initiating hydrostatic testing activities. If time permits, a letter would be mailed notifying landowners that hydrostatic testing would be taking place during certain dates and what precautions they should take as well as a contact telephone number. If letters cannot be mailed, Northwest's Land Representatives would notify landowners using written door hanger informational pamphlets and/or a personal visit. In residential areas, the pipeline right-of-way would already be fenced for safety during construction (see section 4.8.3.1). The fence would remain in place for the duration of hydrostatic testing activities. In addition, warning signs would be placed at road crossings during the testing activities.

Northwest would require approximately 21,380,000 gallons of water to hydrostatically test the loops (see table 4.3.1-2). Of this total, up to 6,060,000 gallons of water would be withdrawn from a surface water source (i.e., the Centralia Canal) for the Fort Lewis Loop (see section 4.3.2.7). The remaining 15,320,000 gallons of water would be obtained from municipal sources. Hydrostatic testing activities would make a one-time, temporary demand on these municipal sources.

TABLE 4.3.1-2 Summary of Potential Hydrostatic Test Water Sources and Volumes for the Capacity Replacement Project		
Facility	Source	Volume (gallons)
Sumas Loop	Sumas Water District	3,030,000
	City of Acme Water District	3,030,000
Mount Vernon Loop	City of Arlington	3,030,000
	Snohomish Public Utility District	3,030,000
Snohomish Loop	Hydrant at the Snohomish Compressor Station	3,200,000
Fort Lewis Loop	Centralia Canal	6,060,000
		21,380,000

After completion of a test section, the water used would be pumped to another section for reuse to test another loop whenever possible and then discharged. As discussed in section 2.3.1 all discharges, including testing for potential contaminants, would be conducted in accordance with applicable requirements. The hydrostatic test water would be discharged into dewatering structures to dissipate energy and filter the test water. The dewatering structures would be located in upland areas adjacent to the construction right-of-way at a significant distance from wetlands and waterbodies. Northwest would not discharge the water directly into surface waters. If it is not feasible to release water as described above, Northwest would need to submit alternative measures that would provide equal or better environmental protection and receive approval before use. Table 4.3.1-3 lists the proposed hydrostatic test water discharge locations associated with the Capacity Replacement Project. These discharge locations are shown on the maps in Appendix B.

During the scoping process, the WDOE expressed concern that there would be a potential for chlorine contamination resulting from using municipal sources for hydrostatic test water. Because the water would be discharged to an upland area and not into surface waters, the potential for chlorine contamination would be minimal.

Water used for dust control would also be obtained from municipal sources. Northwest estimates that approximately 16,000 gallons per day of water would be used on each loop during construction. The impacts on groundwater supplies from this minor volume of water would be negligible.

4.3.2 Surface Water Resources

4.3.2.1 Existing Surface Water Resources

Pipeline Facilities

The Capacity Replacement Project would cross seven Water Resource Inventory Areas (WRIA); however, waterbodies would only be crossed in five of these WRIAs. The WRIAs refer to the state's major watershed basins and are generally associated with USGS hydrologic unit code (HUC) classifications. The WRIAs crossed by the loops include the Nooksack Basin (WRIA 1), the Stillaguamish Basin (WRIA 5), the Snohomish Basin (WRIA 7), the Cedar-Sammamish Basin (WRIA 8), the Nisqually Basin (WRIA 11), the Chambers-Clover Basin (WRIA 12), and the Deschutes Basin (WRIA 13). Table 4.3.2-1 identifies the approximate milepost range where the seven WRIAs and corresponding HUCs would be crossed by each loop.

TABLE 4.3.1-3

Summary of Hydrostatic Test Water Discharge Locations Associated with the Capacity Replacement Project

Facility	Discharge Location (Milepost)	Description and Distance/ Direction from the Construction Right-of-Way
Sumas Loop	1484.4	Upland, 200 feet west
	1482.3	Upland, 800 feet east
	1480.4	Upland, 100 feet west
	1479.6	Upland, 50 feet west
	1476.9	Upland, 130 feet west-northwest
	1473.9	Upland, 50 feet west
	1473.5	Upland, 160 feet west
	1471.4	Upland, 100 feet south
	1469.0	Upland, 180 feet south
	1468.9	Upland, 140 feet southwest
	1467.7	Upland, 130 feet west
	1466.5	Upland, 170 feet west
	1461.8	Upland, 500 feet east
Mount Vernon Loop	1431.3	Upland, 350 feet east
	1430.1	Upland, 380 feet east
	1429.1	Upland, 50 feet west
	1428.4	Upland, 50 feet west
	1425.4	Upland, 250 feet west
	1424.7	Upland, 50 feet east
	1424.5	Upland, 50 feet east
	1423.2	Upland, 140 feet east
	1422.7	Upland, 130 feet east
	1421.6	Upland, 30 feet east
	1417.4	Upland, 40 feet east
	1414.7	Upland, 60 feet east
	1412.8	Upland, 80 feet east
	1408.8	Upland, 110 feet east
Snohomish Loop	1393.9	Upland, 70 feet west
	1383.9	Upland, 150 feet east
Fort Lewis Loop	1323.9	Upland, 200 feet southeast

TABLE 4.3.2-1

Water Resource Inventory Areas (WRIA)/Basins and Corresponding Hydrologic Unit Code (HUC) Classifications Crossed by the Loops Associated with the Capacity Replacement Project

Facility	WRIA Number/Basin Name (Corresponding HUC)	Approximate Milepost Range
Sumas Loop	WRIA 1 / Nooksack Basin (17110001/Fraser and 17110004 / Nooksack)	1484.4 – 1461.8
Mount Vernon Loop	WRIA 5 / Stillaguamish Basin (17110008 / Stillaguamish)	1431.3 – 1418.9
	WRIA 7 / Snohomish Basin (17110011 / Snohomish)	1418.9 – 1408.8
Snohomish Loop	WRIA 8 / Cedar-Sammamish Basin (17110012 / Lake Washington)	1393.9 – 1381.9
Fort Lewis Loop	WRIA 12 / Chambers-Clover Basin [a] (17110013/ Duwamish)	1338.1 – 1333.9
	WRIA 11 / Nisqually Basin (17110013/ Duwamish)	1333.9 – 1316.6
	WRIA 13 / Deschutes Basin [a] (17110015 / Nisqually)	1316.6 – 1315.6

[a] Small portions of this WRIA would be crossed by the Fort Lewis Loop, but no waterbodies would be crossed within the WRIA.

Within these watershed basins, the loops would cross a total of 146 waterbodies including perennial and intermittent streams and jurisdictional wetland and upland ditches. These waterbodies were identified using Northwest’s aerial photo-based Environmental Construction Alignment Sheets, USGS topographic maps, WDNR geographic information system (GIS) stream data, and field surveys conducted in the spring of 2004. All of these waterbodies, except those in the Fraser hydrologic unit (17110001), drain to Puget Sound and are designated as critical habitat in the Chinook Puget Sound Evolutionarily Significant Unit (ESU) because they are considered accessible to chinook salmon. Waterbodies in the Fraser hydrologic unit drain to Canada and are not considered critical habitat. Aquatic resources are discussed in detail in section 4.6.2.

Groundwater and surface water supplies contribute equally to public potable water supplies in the areas surrounding the Sumas and Snohomish Loops, but surface water is the primary source of potable water on the Mount Vernon and Fort Lewis Loops (USGS, 2004). No potable water intake sources are located within 3 miles downstream of any of the waterbody crossings (WDOE, 2004b) and none of the waterbodies receive effluent from municipal or industrial wastewater treatment facilities within a 3-mile radius of the crossing locations (EPA, 2004). Table 4.3.2-2 summarizes the number and types of waterbodies that would be crossed by each loop including flow regime, water quality, and fisheries habitat classifications. Appendix K provides a detailed listing of each waterbody crossing including the name, milepost location, flow type, crossing width, fishery and state water quality classification, WDNR stream type, proposed crossing method, and allowable work window for in-stream construction. Water quality classifications are described further below.

Aboveground Facilities

There are no surface waters within or immediately adjacent to the boundaries of the aboveground facility sites.

TABLE 4.3.2-2 **Summary of Waterbodies Crossed by the Loops Associated with the Capacity Replacement Project**							
	Number of Waterbodies						
Facility	Total Crossings	Perennial	Intermittent	WDOE Water Quality Classifications	303(d)-Listed Waters [a]	Coldwater Fisheries	WDNR Stream Types
Sumas Loop	78	24	54	2 – Class AA 76 – Class A	0	22	3 – Type 1 1 – Type 2 25 – Type 3 2 – Type 4 14 – Type 5 33 – NA
Mount Vernon Loop	33	12	21	1 – Class AA 32 – Class A	3	12	6 – Type 1 2 – Type 2 4 – Type 3 0 – Type 4 7 – Type 5 14 – NA
Snohomish Loop	20	13	7	5 – Class AA 15 – Class A	1	11	0 – Type 1 0 – Type 2 12 – Type 3 2 – Type 4 2 – Type 5 4 – NA
Fort Lewis Loop	15	5	10	15 – Class A	1	6	1 – Type 1 2 – Type 2 3 – Type 3 0 – Type 4 2 – Type 5 7 – NA
Total	146	54	92	8 – Class AA 138 – Class A	5	51	10 – Type 1 5 – Type 2 44 – Type 3 4 – Type 4 25 – Type 5 58 – NA

[a] Based on the 1998 section 303(d) list of impaired waterbodies.
NA = Not assigned a stream type.

Abandoned Facilities

At MP 1232.5, the Portland Lateral Take-off would cross an intermittent ditch that drains to a tributary of the East Fork Lewis River. This waterbody is not a coldwater fishery and has not been identified as a section 303(d) Impaired Water (i.e., it has not been given a Water Quality Assessment Category rating of 4 or 5). It is classified as a WDNR Type 3 Water.

Pipe Storage and Contractor Yards

Activities at the proposed pipe storage and contractor yards are not expected to affect surface waters. However, one unnamed, tree-lined creek is located within the proposed Nooksack Yard (Sumas Loop, Whatcom County). Northwest would not clear any of the trees or conduct construction activities near the creek, and the yard would be accessible from existing roads.

Surface Water Quality Standards and Classifications

Washington Water Quality Standards – The WDOE is responsible for water quality standards for all surface waters within the state as required under section 303(c) of the CWA. The WDOE has developed a classification system to describe the highest designated use(s) and associated minimum water quality requirements for surface waters in Washington. The purpose of the WDOE's Water Quality Standards for Surface Waters (WAC 173-201A) is to establish water quality standards consistent with public health and public enjoyment, and the propagation and protection of fish, shellfish, and wildlife. The water use and quality standards are established in conformance with present and potential uses of the surface waters and in consideration of natural water quality potential and limitations. The Water Quality Program in WAC 173-201A refers to "existing and designated uses" of waterbodies. Existing uses are defined as "those uses actually attained in fresh or marine waters on or after November 28, 1975, whether or not they are designated uses. Introduced species that are not native to Washington, and put-and-take fisheries comprised of nonself-replicating introduced native species, do not need to receive full support as an existing use." Designated uses are defined as "those uses specified in this chapter (WAC 173-201A) for each water body or segment, regardless of whether or not the uses are currently attained." Designated uses for those waterbodies crossed by the Capacity Replacement Project for which there are designated uses listed include aquatic life uses, recreational uses, water supply uses, and miscellaneous uses (wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics).

According to the WDOE (Hicks, 2005), in writing the water quality standards in WAC 173-201A, the word "beneficial" was not used to avoid confusion with the WDOE Water Resources Program. The WDOE Water Resources Department implements a state water program that provides a process for making decisions on future water resource allocations and uses. According to WAC 173-500, beneficial use is defined as "uses of water for domestic, stock watering, industrial, commercial, agricultural, irrigation, hydroelectric power production, mining, fish and wildlife maintenance and enhancement, recreational, and thermal power production purposes, and preservation of environmental and aesthetic values, and all other uses compatible with the enjoyment of the public waters of the state."

The WDOE recently revised the Water Quality Standards for Surface Waters for the state. The revised standards were finalized in August 2004, and are a use-based system rather than a class-based system. The classes for waterbodies under the new standards consist of Class AA (extraordinary), Class A (excellent), Class B (good), and Class C (fair). The waterbodies crossed by the proposed loops are all either Class AA or A waters, including 8 designated as Class AA and 138 as Class A (see table K-1 in Appendix K). The waterbody crossed by the abandoned Portland Lateral Take-off is designated Class A.

State of Washington 303(d) List – Section 303(d) of the CWA requires that states periodically prepare a list of all surface waters in the state for which beneficial uses, such as for drinking, recreation, aquatic habitat, and industrial use, are impaired by pollutants. This list is prepared by the WDOE and typically provided biennially to the EPA as required under section 305(b) of the CWA. The surface waters are classified according to the most beneficial existing and potential future uses of the waterbody and to provide protection for a variety of uses. Water quality is classified as impaired if it exceeds the state-designated total maximum daily load (TMDL) for various pollutants such as fecal coliform, temperature, pH, and dissolved oxygen-consuming compounds. A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet the intended or designated water quality use standards. The current section 303(d) list for Washington is the 1998 list, which simply lists impaired waters and does not further categorize other waters in the state. The 1998 list is the most recent list that was approved by the EPA. The WDOE has been working on a revised list (2002/2004 section 303(d) list) that divides all waters of the state into one of five Water Quality Assessment Categories as follows:

- Category 1 - Meets tested standards for clean waters
- Category 2 - Waters of concern
- Category 3 - No data
- Category 4 - Polluted waters that do not require a TMDL
- Category 5 - Polluted waters that require a TMDL

The 2002/2004 section 303(d) list cannot be used for federal actions under the CWA until it is approved by the EPA. Therefore, the current 303(d) list is the 1998 list. Because the 2002/2004 section 303(d) list is expected to be approved in the near future, this analysis provides designations based on both lists.

Of the waterbodies crossed by the Capacity Replacement Project, five are on the current section 303(d) list and seven are on the proposed 2002/2004 section 303(3) list. On the Sumas Loop, no waterbodies that would be crossed are on the current section 303(d) list; however, two waterbodies (Saar Creek and the North Fork Nooksack River) are on the proposed 2002/2004 section 303(d) list. The other three loops would cross waterbodies that are on both the 1998 and 2002/2004 lists including three waterbodies on the Mount Vernon Loop (Pilchuck Creek, North Fork Stillaguamish River, and South Fork Stillaguamish River), one waterbody on the Snohomish Loop (Evans Creek), and one waterbody on the Fort Lewis Loop (Nisqually River) (WDOE, 2004c). Table 4.3.2-3 summarizes the section 303(d)-listed waterbodies and their status relative to each list, including the water quality parameters that are considered impaired in each waterbody.

<u>WDNR Stream Typing</u> – To protect water quality, provide fish and wildlife habitat, protect capital improvements, and ensure that harvested areas are reforested, the WDNR Forest Practices Division, in cooperation with the WDFW and the WDOE, and in consultation with affected Native American tribes, has classified the state’s streams, lakes, and ponds and has prepared maps showing the locations and types of streams (Washington Forest Practices Board, 2000). The WDNR stream types are defined below.

- Type 1 Water – Includes all waters, within their ordinary high-water mark, as inventoried as “shoreline of the state” under RCW Chapter 90.58 and the rules promulgated pursuant to RCW Chapter 90.58, but not including those waters’ associated wetlands as defined in RCW Chapter 90.58.

- Type 2 Water – Includes segments of natural waters that are not classified as Type 1 Water and have a high fish, wildlife, or human use.

- Type 3 Water – Includes segments of natural waters that are not classified as Type 1 or 2 Waters and have a moderate to slight fish, wildlife, or human use.

- Type 4 Water – Includes segments of natural waters within the bankfull width of defined channels that are not classified as Type 1, 2, or 3 Waters and which are perennial waters of nonfish-bearing streams.

- Type 5 Water – Includes segments of natural waters within the bankfull width of defined channels that are not classified as Type 1, 2, 3, or 4 Waters and which are seasonal nonfish-bearing streams.

- Type 9 Designation – Because most stream typing for the state was done with photos, any streams or drainages showing up on the photos, but which have not yet been designated because field evaluation is still pending, are listed as Type 9. Most Type 9-designated streams are usually designated as Type 5 Waters once they have been field evaluated.

TABLE 4.3.2-3

Summary of Section 303(d)-Listed Waterbodies Crossed by the Loops Associated with the Capacity Replacement Project

Facility	Waterbody Name	Milepost Location	1998 Section 303(d) Listed Status	1998 Listed Impairments	2002/2004 Section 303(d) Proposed List Categories [a]	2002/2004 Proposed Listed Impairments	Proposed Crossing Method
Sumas Loop	Saar Creek	1483.1 1482.8	Not Listed	None	4, 5	Fish Habitat In-stream Flow	Dam and pump
	North Fork Nooksack River	1468.2	Not Listed	None	4, 5	Fish Habitat In-stream Flow	HDD
Mount Vernon Loop	Pilchuck Creek	1428.6	Listed	Dissolved Oxygen Temperature	4, 5	Temperature Fecal Coliform Fish Habitat In-stream Flow	Wet open cut
	North Fork Stillaguamish River	1424.3	Listed	Fecal Coliform Temperature	4, 5	Temperature Fecal Coliform Turbidity Fish Habitat In-stream Flow	HDD
	South Fork Stillaguamish River	1423.8	Listed	Fecal Coliform pH Temperature	4, 5	Temperature Fecal Coliform Fish Habitat In-stream Flow	HDD
Snohomish Loop	Evans Creek	1383.7	Listed	Fecal Coliform Mercury	4, 5	Temperature Fecal Coliform Dissolved Oxygen In-stream Flow	Push-pull
Fort Lewis Loop	Nisqually River	1324.3	Listed	Fecal Coliform	4, 5	Fecal Coliform Fish Habitat Invasive Exotic Species	Wet open cut

[a] These listings and categories have been proposed by the WDOE but cannot be used for federal actions until approved by the EPA.
Category 4 = polluted waters that do not require a TMDL.
Category 5 = polluted waters that require a TMDL.

The WDNR is in the process of adopting a new stream typing system, but until the pending fish habitat water type maps are available, the above system would be used (Washington Forest Practices Board, 2001). The waterbodies crossed by the proposed loops are designated, in descending order of prevalence, as follows: 44 Type 3, 25 Type 5, 10 Type 1, 5 Type 2, and 4 Type 4 (see table K-1 in Appendix K). The remaining 58 waterbodies crossed by the loops are not designated. The waterbody crossed by the abandoned Portland Lateral Take-off is designated Type 3.

<u>Designated Shorelines</u> – As discussed in section 1.5.1, the SMA requires cities and counties to develop SMPs that regulate development along larger streams, lakes, and marine waters. The areas regulated include lands within 200 feet of a shoreline. The general management designation for shorelines in the state include: Natural, Rural and/or Conservancy, Aquatic, High-intensity, Urban Conservancy, and Shoreline Residential. Individual cities and counties may have slightly modified designations. A summary of the designated shorelines that would be affected by the Capacity Replacement Project is provided in table 4.3.2-4.

TABLE 4.3.2-4

Designated Shorelines Crossed by the Loops Associated with the Capacity Replacement Project

Facility/County [a]	Begin MP	End MP	Waterbody	Shoreline Designation
Sumas Loop				
Whatcom County	1484.5	1483.9	Floodplain of Saar Creek and Sumas River	Rural
	1483.1	1483.1	Saar Creek	Rural
	1482.9	1482.8	Saar Creek	Rural
	1468.9	1468.4	North Fork Nooksack River	Conservancy
	1466.1	1465.2	South Fork Nooksack River	Rural
	1464.7	1462.7	South Fork Nooksack River	Rural
Mount Vernon Loop [b]				
Snohomish County	1428.6	1428.5	Pilchuck Creek	Conservancy
	1424.4	1424.2	North Fork Stillaguamish River	Rural
	1424.2	1424.2	North Fork Stillaguamish River	Conservancy
	1423.9	1423.8	South Fork Stillaguamish River	Conservancy
	1423.5	1422.7	South Fork Stillaguamish River	Rural
	1411.1	1410.9	Little Pilchuck Creek	Rural
	1410.6	1410.5	Little Pilchuck Creek	Rural
	1409.7	1409.6	Catherine Creek	Rural
Fort Lewis Loop				
Pierce County	1324.3	1324.3	Nisqually River	Conservancy
Thurston County	1324.3	1323.8	Nisqually River	Conservancy

[a] There are no designated shorelines crossed by the Snohomish Loop.

[b] There are no designated shorelines crossed by the Mount Vernon Loop in Skagit County.

According to the Whatcom County SMP, utility development is permitted within the shorelines designated as Rural subject to policies and regulations. A Shoreline Substantial Development Permit would be required from Whatcom County for those areas of the Sumas Loop that cross Rural-designated shorelines. Fuel pipelines are considered a conditional use within shorelines designated as Conservancy. Therefore, both a Shoreline Substantial Development Permit and a Shoreline Conditional Use Permit would be required from Whatcom County for crossings of Conservancy-designated shorelines.

Utilities are a permitted use within shorelines designated as Rural and Conservancy in Snohomish County but are subject to regulatory controls. A Shoreline Substantial Development Permit would be required from Snohomish County for the areas where the Mount Vernon Loop crosses shorelines designated as Rural or Conservancy.

According to the Pierce County SMP, permitted uses within shorelines designated as Conservancy are the same as those for the Urban-designated shorelines. Utilities are permitted in these environments subject to general regulatory standards. The crossing of the Nisqually River would require a Shoreline Substantial Development Permit from Pierce County. In Thurston County, the crossing would require a Shoreline Conditional Use Permit. The Thurston County SMP indicates that utility distribution and transmission lines are allowed within shorelines designated as Conservancy through a conditional use permit.

Critical Areas Ordinances – As discussed in section 1.5.2, the Growth Management Act requires local governments to identify and protect critical areas, including frequently flooded areas. Some local government jurisdictions also call these areas flood hazard areas. Frequently flooded and flood hazard areas include, at a minimum, the 100-year floodplain designations of the Federal Emergency Management

Agency (FEMA) and the National Flood Insurance Program (Washington State Department of Community, Trade, and Economic Development, 2003). Floodplain permits are specifically required wherever the pipeline crosses a mapped floodplain, which is referred to as a Special Flood Hazard Area on the FEMA maps. In some instances, the floodplain permit is administered through the Frequently Flooded Areas Section of the Critical Areas Ordinance, while in others it may be separate from the critical areas ordinance and governed by a stand-alone flood chapter of the county code. A floodplain permit is required for all development, which is defined to include: "Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials." Placement of a pipeline is included in this definition. A summary of the frequently flooded and flood hazard areas crossed by the Capacity Replacement Project is provided in table 4.3.2-5.

4.3.2.2 General Impact and Mitigation

Pipeline construction could affect surface waters in several ways. Clearing and grading of streambanks, in-stream trenching, backfilling, trench dewatering, and in-stream blasting (if required) could affect waterbodies through modification of aquatic habitat, increased sedimentation, increased turbidity, decreased dissolved oxygen concentrations, stream warming, releases of chemical and nutrient pollutants from sediments, or introduction of chemical contamination such as fuel and lubricants.

The greatest potential impact on surface waters would result from the temporary suspension of sediments caused by in-stream construction or by erosion of cleared streambanks and rights-of-way. The extent of the impact would depend on the construction methods, timing and duration; and streamflow velocity, sediment loads, bank composition, and exposed sediment particle sizes. These factors would determine the density and downstream extent of sediment migration.

In-stream construction, particularly under flowing conditions, could cause the dislodging and transport of channel bed sediments, which could cause changes in downstream bottom contours, essential fish habitat (EFH), and streamflow dynamics that could cause additional erosion and downstream sedimentation. Turbidity resulting from suspension of sediments could reduce light penetration and photosynthetic oxygen production. Resuspension of deposited organic material and inorganic sediments could cause an increase in biological and chemical use of oxygen, resulting in a decrease of dissolved oxygen concentrations in the affected area. Lower dissolved oxygen concentrations could cause temporary displacement of motile organisms and may kill non-motile organisms within the affected area. In-stream work could also cause movement of chemical and nutrient pollutants to new locations downstream if pollutants are present in the sediments at the crossing location.

The highest levels of sediment would be generated by use of the wet open-cut method. It is estimated that the downstream zone of influence for the wet open-cut method would be as follows: 0.002 mile (13 feet) for gravel, 0.008 mile (43 feet) for fine gravel, 0.03 mile (134.5 feet) for coarse sand, 0.08 mile (440 feet) for sand, and 1.4 miles (7,392 feet) for fine sand (Gas Research Institute, 1998). The highest peak of turbidity usually occurs during trench excavation and backfilling. These peaks decline rapidly when the streambed disturbance ceases (Reid and Anderson, undated). Therefore, although the project may likely exceed state water quality standards, in general, impacts on water quality and existing, designated, and beneficial uses would be temporary and short term. Long-term effects could occur from altered stream geomorphology, resulting in modified erosion or depositional patterns.

TABLE 4.3.2-5

Frequently Flooded and Flood Hazard Areas Crossed by the Loops Associated with the Capacity Replacement Project

Facility/County [a]	Begin MP	End MP	Critical Areas Ordinance Designation	Flood Insurance Rate Maps (FIRMs) Panels Affected [b]
Sumas Loop				
Whatcom County	1484.5	1483.9	Frequently Flooded Area	530198 0755D
	1483.1	1483.1	Frequently Flooded Area	530198 0755D
	1478.9	1478.8	Frequently Flooded Area	530198 0745D
	1477.7	1477.6	Frequently Flooded Area	530198 0745D
	1473.3	1473.0	Frequently Flooded Area	530198 1235D
	1468.9	1468.2	Frequently Flooded Area	530198 1255D/ 530198 1265D
	1466.1	1465.2	Frequently Flooded Area	530198 1265D
	1464.8	1462.7	Frequently Flooded Area	530198 1265D/ 530198 1705D
Mount Vernon Loop [c]				
Snohomish County	1425.7	1425.6	Flood Hazard Area	535534 0385E
	1424.4	1424.2	Flood Hazard Area	535534 0405E
	1423.9	1422.8	Flood Hazard Area	535534 0405E/ 535534 0415E
	1411.1	1411.0	Flood Hazard Area	535534 0743E
	1410.5	1410.5	Flood Hazard Area	535534 0743E
Snohomish Loop [d]				
King County	1383.7	1383.5	Flood Hazard Area	530071 0395F
Fort Lewis Loop				
Pierce County	1332.4	1332.3	Flood Hazard Area	530138 0575C
	1332.1	1332.1	Flood Hazard Area	530138 0575C
	1328.7	1328.7	Flood Hazard Area	530138 0851C
	1327.9	1327.9	Flood Hazard Area	530138 0875C
	1325.7	1325.7	Flood Hazard Area	530138 0835C
	1324.4	1324.3	Flood Hazard Area	530188 0370C
Thurston County [e]	1324.0	1323.9	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0370C/ 530188 0365D
	1322.6	1322.5	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0365D
	1332.2	1321.9	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0365D
	1320.8	1320.5	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0365D
	1319.5	1319.3	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0365D
	1319.3	1319.3	High Groundwater Flood Hazard Area	530188 0365D/ 530188 0526C
	1319.3	1319.1	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0526C
	1318.9	1318.8	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0526C/ 530188 0507C
	1318.7	1318.5	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0507C
	1317.3	1317.2	High Groundwater Flood Hazard Area (300-foot buffer)	530188 0507C
	1317.2	1317.1	High Groundwater Flood Hazard Area	530188 0507C
	1317.1	1317.1	High Groundwater Flood Hazard Area (300-foot buffer)	530198 0755D

[a] No frequently flooded and/or flood hazard areas would be crossed within the jurisdictional boundaries of the City of Lake Stevens, City of Redmond, or the City of Sammamish.

[b] FEMA issued Flood Maps (http://www.fema.gov).

[c] There are no frequently flooded areas crossed by the Mount Vernon Loop in Skagit County.

[d] There are no flood hazard areas crossed by the Snohomish Loop in Snohomish County.

[e] Thurston County has designated special management areas that include high groundwater flood hazard areas. High groundwater flood hazard areas are areas where high groundwater flooding occurs when subsurface geologic conditions prevent recharging water from moving downward or laterally as fast as it enters the groundwater system. The result is a rise in the groundwater table and accumulation of water on the surface that persists over protracted periods of time. The special management areas also include the area 300 feet from the actual high groundwater flood hazard area (i.e., 300-foot buffer).

Construction using the HDD method could result in an inadvertent release of drilling mud (also referred to as a frac-out) directly or indirectly into the waterbody. Drilling mud may leak through previously unidentified fractures in the material underlying the riverbed, in the area of the mud pits or tanks, or along the path of the drill due to unfavorable ground conditions. Although drilling mud consists of naturally occurring nontoxic materials, such as bentonite clay and water, the release of large quantities of drilling mud into a waterbody could affect fisheries or other aquatic organisms by settling and temporarily inundating the habitats used by these species. This impact would be less likely in fast moving water, which would disperse the drilling mud over a large area.

Clearing and grading of streambanks would expose large areas of soil to erosional forces and would reduce riparian vegetation along the cleared section of the waterbody. The use of heavy equipment for construction would cause compaction of near-surface soils, an effect that could result in increased runoff into surface waters. The increased runoff could transport additional sediment into the waterbodies, resulting in sedimentation and increased turbidity levels in the receiving waterbody.

Refueling of vehicles and storage of fuel, oil, or other hazardous materials near surface waters could also create a potential for contamination in waterbodies. If a spill were to occur, immediate downstream users of the water could experience degradation in water quality. Acute and chronic toxic effects on aquatic organisms could also result from such a spill.

Several federal, state, and local agencies regulate construction activities within waterbodies, including the COE, the EPA, the WDOE, the WDNR, the WDFW, and the counties and municipalities where surface water resources are crossed (e.g., under the SMA and critical areas ordinances). In addition, because many of the waterbodies that would be crossed also support fisheries resources and EFH that are listed under the ESA and regulated under the MSA, the FWS and NOAA Fisheries are also involved in evaluation of the project (see sections 4.6.2 and 4.7). Northwest would construct all waterbody crossings in accordance with federal, state, and local requirements. As part of the state permitting process, Northwest would identify how much, when, and how long the project would be out of compliance with water quality standards; how the impact would be minimized; what mitigation would be offered for temporal losses to existing, designated, and beneficial uses; and when the project would be back in compliance. The WDOE's section 401 Water Quality Certification would include effluent and mixing zone conditions to meet state water quality standards. The specific procedures that Northwest would implement to avoid or minimize potential impacts on surface waters are discussed below.

Waterbody Construction and Mitigation Procedures

The primary crossing methods Northwest would use are the dry open-cut method and the flume method. The dry open-cut method involves standard upland cross-country construction techniques and would be used to cross waterbodies that do not have flow at the time of construction. The majority of flowing waterbodies would be crossed using the flume method. As described in section 2.3.2, the flume method is a dry-crossing technique that uses dams and flumes to isolate streamflow from the construction work area, thereby avoiding in-stream activities. The flume method can significantly reduce the amount of sediment released into the water column during construction, and thus reduce the overall impact on the waterbody. In some cases, Northwest may use the dam and pump method to cross waterbodies less than 10 feet wide as an alternative to the flume method. The dam and pump method is similar to the flume method except that pumps are used instead of flumes to move water across the construction work area. The flume and dam and pump methods are considered standard dry crossing methods.

Use of dry waterbody crossing methods in flowing streams would reduce exposure of waterbodies to erosion and sedimentation, and would provide the best conditions for excavating the trench, installing and backfilling the pipe, and restoring streambed contours and banks. However, in some cases, a dry waterbody crossing method cannot be implemented due to site-specific conditions and/or constraints. These conditions may include the size of the waterbody, volume of water flow, physical constraints (e.g., buildings, roads, railroads, canals), and/or agency requirements. In the locations where the standard dry waterbody crossing methods cannot be used, Northwest would utilize a specialized dry waterbody crossing method (i.e., HDD, aerial span, bore) or a wet waterbody crossing method (e.g., push-pull or wet open cut).

The specific waterbody crossing construction methods Northwest proposes to implement at each waterbody are identified in Appendix K. Of the 146 waterbodies that would be crossed by the loops, 91 percent (133 waterbodies) are expected to be dry at the time of construction or would be crossed using standard dry waterbody crossing methods (i.e., flume or dam and pump). Additionally, the waterbody crossed by the abandonment activities at the Portland Lateral Take-off would be crossed by the flume method. Nine waterbodies are major waterbodies (greater than 100 feet wide) or are considered sensitive and would be crossed by alternative methods. Northwest proposes to flume two additional sensitive waterbodies; however, Fort Lewis has requested that these two waterbodies be crossed using an alternative method (bore). Two waterbodies are not major or sensitive waterbodies but would be included in the HDD crossing of the North Fork Nooksack River. These 13 waterbodies are discussed in section 4.3.2.3.

During construction across waterbodies, Northwest would implement the mitigation procedures described in the FERC staff's Plan and Procedures (see Appendices E and F, respectively), its ECR Plan (see Appendix G), and its SPCC Plan (see Appendix H). Northwest would also implement additional specific procedures and protective and restoration measures where required by site-specific conditions or permitting agencies. Northwest would develop and follow BMPs for in-stream work as well as develop and follow BMPs for upland work adjacent to waterbodies. Similarly, Northwest would develop and implement a water quality monitoring strategy for measuring in-stream impacts as well as develop and implement a water quality monitoring strategy for measuring upland construction impacts. Northwest's implementation of these mitigation measures would reduce impacts on surface water resources. Some of the relevant mitigation measures pertaining to waterbody crossings that are specified in the FERC staff's Procedures or which are included in Northwest's proposed plans include:

- limiting the size of extra workspaces to the minimum needed to construct the waterbody crossing;
- locating extra workspaces at least 50 feet back from waterbody boundaries unless a reduced setback is requested on a site-specific basis and a variance is issued by the FERC and other applicable agencies;
- limiting clearing of vegetation between extra work areas and the edge of the waterbody to preserve riparian vegetation;
- allowing only clearing equipment and equipment necessary for installation of equipment bridges to cross waterbodies before bridge installation and limiting the number of such crossings of each waterbody to one per piece of clearing equipment;
- requiring temporary erosion and sediment control measures to be installed across the entire width of the construction right-of-way after clearing and before ground disturbance to prevent the flow of spoil or heavily silt-laden water into any waterbody;
- maintaining adequate flow rates throughout construction to protect aquatic life and prevent the interruption of existing downstream uses;

- restricting spoil placement near surface waters to the construction right-of-way at least 10 feet from the water’s edge or in additional extra workspaces placed at least 50 feet from the water’s edge, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land;

- maintaining and marking waterbody buffers (e.g., extra work area setbacks, refueling restrictions) in the field with signs and/or highly visible flagging until construction-related ground-disturbing activities are complete;

- limiting the use of equipment operating in the waterbody to that needed to construct the crossing;

- requiring construction to be completed across minor waterbodies (i.e., less than or equal to 10 feet wide) within 24 hours and across intermediate waterbodies (i.e., greater than 10 feet wide but less than or equal to 100 feet wide) within 48 hours to mitigate the duration and degree of sedimentation and turbidity;

- developing site-specific construction procedures for each major waterbody crossing (i.e., greater than 100 feet wide at the crossing location);

- requiring construction to be completed during low-flow and non-spawning time windows specified in the Procedures or required by applicable permits to minimize impacts on sensitive aquatic resources;

- requiring maintenance of temporary erosion and sediment control measures throughout construction until streambanks and adjacent upland areas are stabilized;

- providing proper training for employees handling fuels, restricting storage and refueling activities near surface waters, including requiring fuel trucks to travel only on approved access roads, and implementing an SPCC Plan if a spill or leak occurs during construction;

- requiring bank stabilization and reestablishment of bed and bank contours after construction;

- placing 12 inches of clean gravel over the trenchline in all waterbodies with fisheries resources before returning flow to the construction work area;

- installing large woody debris (LWD) on streambanks and within stream zones as prescribed by the WDFW to mitigate the loss of habitat and shading at open-cut stream crossings;

- limiting the application of riprap to only those areas where it currently exists and avoiding placement of riprap below the ordinary high water mark and/or within the 100-year floodplain of any waterbody;

- revegetating disturbed riparian areas with conservation grasses and legumes or native plant species, preferably woody species;

- installing a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody;

- planting riparian tree and shrub species across the entire right-of-way within 50 feet of all fish-bearing streams and at other streams where riparian vegetation was present before construction (see section 4.5.3);

- planting fast-growing native tree species (e.g., black cottonwood, red alder, big-leaf maple, vine maple, river birch) at selected locations for rapid canopy development to provide shading over waterbodies supporting fisheries; and

- limiting post-construction maintenance of vegetated buffer strips adjacent to streams.

Requested Variances to the FERC Staff's Procedures

At selected waterbodies, Northwest has requested variances to the FERC staff's Procedures relative to the location of temporary extra workspaces and construction right-of-way widths. Northwest depicted these locations on aerial photo-based Environmental Construction Alignment Sheets and site-specific plans and provided a site-specific explanation of the conditions that would require a wider right-of-way and prevent a 50-foot setback. The FERC staff reviewed the Environmental Construction Alignment Sheets and Northwest's explanations to make determinations whether to approve or deny each variance requested. Based on this review, most of the variances appear to be reasonable and adequately justified. Northwest's specific variance requests and the status of the FERC staff's approval or denial are provided in Appendix N. Northwest would also submit these variance requests to other applicable agencies (e.g., the COE, the WDOE, and the WDFW) as part of its permit applications. Northwest's implementation of variances approved by the FERC would need to be consistent with its permits from the other jurisdictional agencies.

4.3.2.3 Major and Sensitive Waterbodies

Waterbodies may be considered sensitive to pipeline construction for a number of reasons including, but not limited to, the width of the crossing; the presence of coldwater aquatic habitat, fisheries, and imported or special status species; the presence of high-quality recreational, visual resource, or historic value; or the presence of impaired water or contaminated sediments. Waterbodies may also be considered sensitive if they are of special interest to a land management agency or Native American tribe.

Eleven of the waterbodies that would be crossed by the loops are considered major and/or sensitive. Two additional waterbodies are located adjacent to one of the major waterbodies and would be included in the same crossing. Northwest has proposed both a preferred and alternative crossing method to install the pipeline at each of these crossings, where practicable. Table 4.3.2-6 identifies the preferred and alternative waterbody crossing methods at each of these 13 waterbody locations and provides a brief summary of site-specific conditions or constraints at the crossing locations. The waterbody crossing methods are described in section 2.3.2.

The crossings identified in table 4.2.3-6 include six major waterbodies (i.e., greater than 100 feet wide). These are the North Fork Nooksack River, North Fork Stillaguamish River, South Fork Stillaguamish River, Olson Lake, Evans Creek, and the Nisqually River. All of these waterbodies are considered sensitive because they provide coldwater habitat and EFH and also support special status species. Two federally listed aquatic species (chinook salmon and bull trout) were identified as potentially being affected by the proposed project as a result of construction across these waterbodies (see section 4.7).

TABLE 4.3.2-6

Major and Sensitive Waterbodies Crossed by the Loops Associated with the Capacity Replacement Project

Facility	Waterbody Name	Milepost Location	Crossing Width (feet)	Proposed Crossing Method	Site-Specific Conditions/Constraints	Alternative Crossing Method
Sumas Loop	Jim Creek	1468.7	10	HDD [a]	Located within drill path for North Fork Nooksack River	Flume
	Tributary to North Fork Nooksack River	1468.4	20	HDD [a]	Located within drill path for North Fork Nooksack River	Dry open-cut
	North Fork Nooksack River	1468.2	580	HDD	580-foot-wide major waterbody, high streamflow volume, cobble/boulder streambed	Wet open-cut
Mount Vernon Loop	Pilchuck Creek	1428.6	75	Wet open-cut	75-foot-wide waterbody, high streamflow volume, steep adjacent topography, cobble/boulder streambed	Aerial span
	North Fork Stillaguamish River	1424.3	275	HDD	275-foot-wide major waterbody, high streamflow volume, cobble/boulder streambed, adjacent roads/railroad	Wet open-cut
	South Fork Stillaguamish River	1423.8	200	HDD	200-foot-wide major waterbody, high streamflow volume	Wet open-cut
	Olson Lake	1419.3	1,500	Push-pull	1,500-foot-wide major waterbody/wetland complex	NA
Snohomish Loop	Colin Creek	1389.4	14	Aerial span	Existing pipelines span the creek	NA
	Evans Creek	1383.7	950	Push-pull	950-foot-wide major waterbody/wetland complex	NA
Fort Lewis Loop	Muck Creek	1332.4	20	Flume [b]	Land management agency requested use of a trenchless method to avoid streamflow loss along the trenchline	Bore
	South Fork Muck Creek	1332.1	25	Flume [b]	Land management agency requested use of a trenchless method to avoid streamflow loss along the trenchline	Bore
	Nisqually River	1324.3	160	Wet open-cut	160-foot-wide major waterbody	Aerial span
	Centralia Canal	1323.9	40	Aerial span	Existing pipelines span the creek	NA

[a] These waterbodies are not considered sensitive but would be crossed as part of the North Fork Nooksack River HDD.
[b] Northwest proposes to flume these waterbodies; however, Fort Lewis has requested that they be bored. The final crossing method has not yet been determined.
NA = Not applicable. No alternative crossing method is proposed.

Two of the major waterbodies, Olson Lake and Evans Creek, would be crossed by use of the push-pull method due to the size and low flow (e.g., inundated wetland) characteristics at these crossing locations. The push-pull method is described in section 2.3.2. Additional discussion of the Olson Lake and Evans Creek crossings is included in section 4.4.3.

In the spring of 2004, Northwest completed a geotechnical investigation of the remaining major waterbodies (North Fork Nooksack River, North Fork Stillaguamish River, South Fork Stillaguamish

River, and Nisqually River) to determine whether the HDD method would be feasible. Northwest included Pilchuck Creek in its geotechnical investigation due to its relatively large size and importance as a coldwater fishery. The investigation is documented in a report titled *Capacity Replacement Project, HDD Geotechnical and Feasibility Assessment, Whatcom, Skagit, Snohomish, Pierce and Thurston Counties, Washington* (Golder, 2004a).[3]

The HDD method is a specialized crossing method that has the potential to avoid impacts on waterbodies but requires suitable geology, topography, and space (distance) to accommodate the bending radius of the pipe. The HDD method is generally the preferred method to cross major and sensitive waterbodies because it would avoid in-stream construction and riparian impacts and would provide good depth through the floodplain and beneath the waterbodies, which would eliminate potential scour and buoyancy problems. Based on the results of the geotechnical investigation, Northwest has determined that the probability of completing a successful HDD of the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers is 60 percent, 50 percent, and 80 percent, respectively. Northwest proposes to cross these waterbodies using the HDD method. Because the geotechnical investigation determined that there was a high likelihood of failure at Pilchuck Creek (75 percent) and an HDD of the Nisqually River would be infeasible, Northwest does not propose to attempt an HDD crossing of either of these waterbodies. Northwest proposes to cross these two waterbodies using the wet open-cut method. Additional discussion of these five waterbody crossings, including a description of the crossing characteristics, the rationale for selection of the crossing methods and elimination of alternative methods, and a description of the mitigation measures that would be implemented to minimize construction-related impacts is provided below.

Of the other waterbodies listed in table 4.2.3-6, four are considered sensitive coldwater fisheries (Colin Creek, Muck Creek, South Fork Muck Creek, and the Centralia Canal). Colin Creek and the Centralia Canal are crossed by the existing pipelines using aerial spans; therefore, the proposed loops would also span these waterbodies. No in-stream work would be required for the aerial spans.

Northwest proposes to cross Muck Creek and South Fork Muck Creek using the flume method. Fort Lewis has requested that these creeks be crossed using the bore method, if feasible. The concern is that these creeks have sections that are "gaining" and "losing" water, and that the "losing" sections (which this project would cross) are sensitive. A stream "gains" water when the groundwater table is high enough to intersect with the streambed, allowing groundwater to flow into the stream. A stream "loses" water when the water table is below the streambed and water flows out of the stream down into the water table.

Because the groundwater table fluctuates during the seasons, in an area of normally high groundwater, the water table can temporarily lower below a shallow streambed so that water from the stream would drain down into the groundwater table. This happens with South Fork Muck Creek in the summer months when the groundwater table is just below the bottom of the creek. The creek dries out because there is not enough surface water to continue flowing in the creek and it drains through the permeable soils to the groundwater table.

Northwest conducted a geotechnical investigation of Muck Creek and South Fork Muck Creek in December 2004. The investigation is documented in a report titled *Capacity Replacement Project Geotechnical Investigation of the Muck Creek and South Creek Crossings, Pierce County, Washington*

[3] This report is too voluminous to include in this EIS. It is available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions) and at the WDOE's regional offices. If you reside in Whatcom, Skagit, Snohomish, or King Counties, you can access this document at the WDOE's Northwest Regional Office in Bellevue by calling the Public Disclosure Coordinator at (425) 649-7190 or (425) 649-7239. If you reside in Pierce, Thurston, Lewis, Cowlitz, or Clark Counties, you can access this document at the WDOE's Southwest Regional Office in Lacey by calling the Public Disclosure Coordinator at (360) 407-6365.

(Golder, 2005).[4] The subsurface investigation determined that the geology is glacial outwash deposit consisting of loose, non-cohesive gravel, with sand and cobbles. This material caved during vertical drilling and it is anticipated that there is a high potential for the borehole to collapse if the bore method were attempted such that the streambed would collapse into the bore. Further, sufficient cobbles are present in the material to impede the bore and affect the directional steering.

In addition to unfavorable geology, groundwater was encountered near the surface. Once the test borings advanced beyond the top of the groundwater table, the water began to cascade into the borehole suggesting that the outwash material is highly permeable. If the bore method were attempted, it would be necessary to lower the water table approximately 10 feet. Based on field observations, this would require several weeks of continuous pumping from high capacity wells, influencing an area several thousand feet from the bore. It is possible that even this duration of continuous pumping may not effectively dewater the bore pits. If the groundwater table is lowered for construction reasons, both Muck and South Fork Muck Creeks could lose water and flow down to the groundwater. Therefore, while Northwest is attempting to dewater the bore pits, Muck and South Fork Muck Creeks could potentially be drained as well because the soils are extremely permeable.

Finally, Northwest's field investigation did not locate a confining layer that would cause either creek to lose water. Given the geotechnical findings, and Northwest's previous experience of installing the two existing pipelines, Northwest believes that the flume method would be the most practical method for these crossings.

Fort Lewis requested that, if a bore proves infeasible and trenched crossings are required, a seal material be placed within the excavated area to a depth of at least 6 inches at both creek crossings. Fort Lewis further requested that flow data for both creeks be taken before construction of the crossings to establish baseline flow data above and below the crossing locations, and that the flow data continue to be collected for 1 year following completion of the crossings. If, after 1 year, the data indicate a net loss of flow, Fort Lewis requests that Northwest commit to remedial actions to prevent continued flow losses. If permitted to use the flume method at these crossings, Northwest would obtain the flow data requested by Fort Lewis and place approximately 6 inches of crushed limestone over the trenchline to prevent water loss.

Fort Lewis has stated that it will review the geotechnical report when it is received and continue to work with Northwest to develop the final crossing method for Muck and South Fork Muck Creeks (Johnston, 2005).

The remaining two waterbodies listed in table 4.2.3-6 (Jim Creek and the Tributary to North Fork Nooksack River) are not designated coldwater fisheries or otherwise sensitive but would be crossed as part of the HDD for the North Fork Nooksack River. If an HDD is not feasible for this crossing, both Jim Creek and the Tributary to North Fork Nooksack River would be crossed using dry waterbody construction methods.

North Fork Nooksack River (including Jim Creek and Tributary to North Fork Nooksack River), North Fork Stillaguamish River, and South Fork Stillaguamish River

The North Fork Nooksack River would be crossed by the Sumas Loop at about MP 1468.2. The North and South Fork Stillaguamish Rivers would be crossed by the Mount Vernon Loop at MPs 1424.3 and 1423.8, respectively. These three waterbodies are designated as WDNR Type 1 Streams and are

4 This report is available for viewing on the FERC's Internet website (http://www.ferc.gov). Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., PF04-10 and CP05-32). Be sure to select an appropriate date range.

classified as coldwater fisheries and considered EFH. The rivers support anadromous species such as chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead, bull trout, and cutthroat. Of the fish species, bull trout and chinook salmon are federally listed species (see section 4.7.1). As discussed in section 4.10.3, the Stillaguamish Tribe expressed concerns about potential impacts on water quality and chinook salmon at the North and South Fork Stillaguamish Rivers. The Tulalip Tribe also expressed concerns about impacts on these rivers as well as potential impacts on the North Fork Nooksack River.

The North Fork Nooksack River is a braided waterbody located in an active floodplain that is approximately 4,000 feet wide. The active channel is about 580 feet wide although the water surface is only about 100 feet wide. The river has a large flow volume. At the crossing location of the North Fork Stillaguamish River, the river is approximately 275 feet wide and has a large flow volume. The South Fork Stillaguamish River is approximately 200 feet wide at the crossing location and has a large flow volume.

Based on the results of Northwest's geotechnical investigation, Northwest would attempt an HDD crossing of the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers but also proposes to obtain permits for an alternative wet open-cut crossing at each of the three rivers should the HDD fail.

Northwest estimates that the HDD of the North Fork Nooksack River would take about 10 weeks and the HDDs of the North and South Fork Stillaguamish Rivers would each take about 5 weeks. A successful HDD crossing would minimize impacts on these three waterbodies and their adjacent wetlands/riparian habitat because no in-stream disturbance would occur and the staging areas for the drill rig and entry and exit points would be set back from the waterbody banks. The primary impact that could occur is an inadvertent release of drilling mud (also referred to as a frac-out) directly or indirectly into the waterbody. As discussed in section 4.3.2.2, drilling mud may leak through previously unidentified fractures in the material underlying the riverbed, in the area of the mud pits or tanks, or along the path of the drill due to unfavorable ground conditions. Although drilling mud consists of naturally occurring nontoxic materials, such as bentonite clay and water, the release of large quantities of drilling mud into a waterbody could affect fisheries or other aquatic organisms by settling and temporarily inundating the habitats used by these species. The probability of an inadvertent release is greatest when the drill bit is working near the surface (i.e., near the entry and exit points). Because the staging areas for the HDDs would be set back from the banks of the waterbodies, the potential for an inadvertent release to occur in the water would be minimized.

Northwest's HDD Plan (see Appendix I) describes how the drilling operations would be conducted and monitored to minimize the potential for inadvertent drilling mud releases as well as procedures for cleanup of drilling mud releases and for sealing the hole if a drill cannot be completed. The criteria for determining whether the HDD could be successfully completed or whether it would be abandoned are also outlined in Northwest's HDD Plan. During the HDD process, Northwest would provide on-site inspection to keep adequate documentation, daily progress reports, and as-built information so it would be able to describe the events leading up to an HDD failure. If an HDD fails, Northwest would submit this documentation to the appropriate agencies notifying them of the failure and Northwest's schedule for implementing the approved alternative crossing method. Northwest would not implement the alternative crossing method until it has received confirmation that appropriate agencies have received the documentation of HDD failure.

Due to the width and the volume of water at the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers, Northwest considers the wet open-cut method, which was used to install the two existing pipelines, to be the only practical method to install these crossings in the event an

HDD is unsuccessful. In using the wet open-cut method at the North Fork Nooksack River, the centerline of the new loop would be installed 60 feet east (upstream) of the nearest existing pipeline for safety reasons during the excavation. At the North and South Fork Stillaguamish Rivers, the centerline of the new loop would be installed 20 feet west (downstream) of the nearest existing pipeline. At all three crossings, additional temporary extra workspaces ranging between 130 and 400 feet wide would be required on both sides of the river, and in the river, in order to excavate the trench, temporarily store trench spoil, fabricate and install the pipeline, complete tie-in welds, and backfill the trench. This method would require that trackhoes, sidebooms, and bulldozers work in the river. If the river is too deep for the equipment to work in, or if the riverbed is too soft to support their weight, a dragline operating from the riverbank would be used for trench excavation, pipe installation, and backfilling. However, trackhoes would be preferred because they would be more efficient at excavating boulders or bedrock and could be fitted with a rock hammer if needed. Due to the velocity of the water at these three crossings, downstream turbidity curtains are expected to be ineffective and would not be installed by Northwest.

Northwest estimates that the duration of construction at each waterbody would be 2 weeks. The in-stream work would be expected to take about 5 days depending on the type of rock that is encountered during the trenching operation. To excavate the trench, two trackhoes would start in the middle of the river and would work in opposite directions. The scour depth for the North Fork Nooksack River is 10 feet in a 25-year flood event and 13 feet in a 100-year flood event. The scour depths for both the North and South Fork Stillaguamish Rivers are 7 to 9 feet in a 25-year flood event and 10 feet in a 100-year flood event. Northwest would make every effort to get below the scour depth provided major boulders or rock formations do not hinder excavation depth. If rock formations are encountered during excavation, it is assumed that scour would not continue beyond that depth. Northwest would install concrete-coated pipe for protection against both buoyancy and exposure.

Trench spoil would be placed in the rivers on the downstream side of the trench in piles with breaks in between to allow for water passage. The section of pipe for the river crossings would be welded in temporary extra workspaces on the banks of the rivers. Once the trench is completed, the pipe would be carried across on the upstream side of the trench with sidebooms and then lowered into place. After the pipe is lowered into place, bulldozers would backfill the trench and the tie-in points would be welded to upland segments of the new loop on each side of the river. During tie-in welding, site dewatering would be anticipated.

The primary impact of a wet open-cut crossing of these three rivers would be increased disturbance to riparian vegetation on the banks of the rivers and a temporary increase in turbidity during construction, mainly due to the excavation and backfill activities. The turbidity level would decline rapidly when the streambed disturbance ceases.

The WDFW expressed concerns regarding use of the wet open-cut crossing method at these three waterbodies if the HDD should fail and stated that a channel diversion, which would minimize contact between streamflow and the excavation and backfill activities, or other “dry” method would be required. Northwest evaluated the feasibility of other dry crossing methods, including the flume, dam and pump, bore, diverted dry open-cut, and aerial span methods. These crossing methods are described in section 2.3.2. The feasibility and environmental impacts of these methods are discussed below and summarized in comparison with the HDD and wet open-cut methods in table 4.3.2-7.

TABLE 4.3.2-7

Summary of Potential Crossing Methods for the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers [a]

Factor	Crossing Method: HDD (Northwest's Preferred Method)	Wet Open-Cut (Northwest's Proposed Alternative Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span
NORTH FORK NOOKSACK RIVER							
Construction Feasibility	Feasible. Total length is 3,900 feet. Likelihood of success is 60 percent due to cobbles/ boulders and weak soils that may collapse.	Feasible. Total length of in-stream work would be 580 feet.	Feasibility dependent on water volume and velocity but would not likely be feasible at the time of construction. Depth of cover to reach scour depth also limits this method.	Not feasible. Water volume, depth, and velocity preclude this method.	Not feasible because of excessive pit depths, constant dewatering, safety risks, subsurface conditions, and length of the bore.	Feasible only with a major riverbed reconfiguration.	Feasible but would require an extensive suspension system. Total length of span would be 1,100 to 1,400 feet. Suspension system would be at least 140 feet above the water surface.
Resource Impacted (Duration and Intensity)	Construction duration 10 weeks; no in-stream work.	Construction duration 2 weeks; 5 days of in-stream work.	Construction duration 2 weeks; 4 days of in-stream work.	NA	NA	Construction duration 10 days; 4 to 5 days of in-stream work.	Construction duration 2 months; no in-stream work.
Construction							
Riparian Vegetation [b]	6.3 acres would be cleared for setting up drill rig and entry/exit points.	17.2 acres would be cleared for right-of-way and extra workspace.	Same as wet open-cut method.	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
In-stream Disturbance	None.	6.4 acres of workspace would be needed for in-stream work.	Same as wet open-cut method.	NA	NA	11.4 acres of workspace would be needed for in-stream work.	None.
Water	No direct impacts. Potential for inadvertent release of drilling mud.	Open water trenching would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction, mainly due to excavation and backfill.	Creek can continue to flow during construction. Turbidity may increase for a short period during the installation and removal of the flume pipe.	NA	NA	Installation, rearrangement, and removal of the diversion dams would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction.	Cable would have to be carried across the water either by boat or walked across with equipment.

TABLE 4.3.2-7 (cont'd)

Summary of Potential Crossing Methods for the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers [a]

Factor	Crossing Method: HDD (Northwest's Preferred Method)	Wet Open-cut (Northwest's Proposed Alternative Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span
Beneficial Uses	No direct impacts. Potential for inadvertent release of drilling mud.	Increased turbidity during time required for installation.	Minor and short-term increase in turbidity.	NA	NA	Increased turbidity during time required for installation.	Potential minor, temporary increase in turbidity during time required for installation.
Operation							
Riparian Vegetation [b]	1.9 acres would be disturbed within the existing and new easement, 1.6 acres of shrub vegetation would be restored, and 0.3 acre of forested vegetation would be converted to shrub vegetation.	9.3 acres would be disturbed within the existing and new easement (6.4 acres of shrub vegetation would be restored and 2.9 acres of forested vegetation would be converted to shrub vegetation).	Same as wet open-cut method.	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
Visual	None.	None.	None.	NA	NA	None.	Aerial span would be visible from adjoining properties and the general public traveling on Rutsatz Road. The right-of-way must remain cleared over the pipelines around the span supports.
Security	Buried pipelines are more protected from intentional damage.	Buried pipelines are more protected from intentional damage.	Buried pipelines are more protected from intentional damage.	NA	NA	Buried pipelines are more protected from intentional damage.	Exposed pipeline is more vulnerable to intentional damage and vandalism.
Beneficial Uses	None.	None.	None.	NA	NA	None.	None.

TABLE 4.3.2-7 (cont'd)

Summary of Potential Crossing Methods for the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers [a]

	Crossing Method						
Factor	HDD (Northwest's Preferred Method)	Wet Open-cut (Northwest's Proposed Alternative Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span
NORTH FORK STILLAGUAMISH RIVER							
Construction Feasibility	Marginally feasible. Total length is 2,865 feet. Likelihood of success is 50 percent due to large elevation change, cobbles, boulders, and weak soils that may collapse.	Feasible. Total length of in-stream work would be 275 feet.	Feasibility dependent on water volume and velocity but would not likely be feasible at the time of construction.	Not feasible. Water volume and velocity preclude this method.	Not feasible because of excessive pit depths, constant dewatering, safety risks, subsurface conditions, and length of the bore.	Feasible only if the area is experiencing a very dry season at the time of construction.	Feasible but would require an extensive suspension system. Total length of span would be 300 feet. Suspension system would be at least 50 feet above the water surface.
Resource Impacted (Duration and Intensity)	Construction duration 5 weeks; no in-stream work.	Construction duration 2 weeks; 5 days of in-stream work.	Construction duration 2 weeks; 4 days of in-stream work.	NA	NA	Construction duration 7 days; 3 to 4 days of in-stream work.	Construction duration 2 months; no in-stream work.
Construction							
Riparian Vegetation [b]	None.	6.2 acres would be cleared for right-of-way and extra workspace.	Same as wet open-cut method.	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
In-stream Disturbance	None.	1.2 acres of workspace would be needed for in-stream work.	Same as wet open-cut method.	NA	NA	2.8 acres of workspace would be needed for in-stream work.	None.
Water	No direct impacts. Potential for inadvertent release of drilling mud.	Open water trenching would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction, mainly due to excavation and backfill.	Creek can continue to flow during construction. Turbidity may increase for a short period during the installation and removal of the flume pipe.	NA	NA	Installation, rearrangement, and removal of the diversion dams would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction.	Cable would have to be carried across the water either by boat or walked across with equipment.
Beneficial Uses	No direct impacts. Potential for inadvertent release of drilling mud.	Increased turbidity during time required for installation.	Minor and short-term increase in turbidity.	NA	NA	Increased turbidity during time required for installation.	Potential minor, temporary increase in turbidity during time required for installation.

TABLE 4.3.2-7 (cont'd)

Summary of Potential Crossing Methods for the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers [a]

Factor	Crossing Method						
	HDD (Northwest's Preferred Method)	Wet Open-cut (Northwest's Proposed Alternative Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span
Operation							
Riparian Vegetation [b]	None.	2.3 acres would be disturbed within the existing and new easement (1.8 acres of shrub/wetland vegetation would be restored and 0.5 acre of forested vegetation would be converted to shrub vegetation).	Same as wet open-cut method.	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
Visual	None.	None.	None.	NA	NA	None.	Aerial span would be visible from surrounding properties and the general public traveling on State Route 530. Also potentially visible from various view points within the town of Arlington. The right-of-way must remain cleared over the pipelines around the span supports.
Security	Buried pipelines are more protected from intentional damage.	Buried pipelines are more protected from intentional damage.	Buried pipelines are more protected from intentional damage.	NA	NA	Buried pipelines are more protected from intentional damage.	Exposed pipeline is more vulnerable to intentional damage and vandalism.
Beneficial Uses	None.	None.	None.	NA	NA	None.	None.

TABLE 4.3.2-7 (cont'd)

Summary of Potential Crossing Methods for the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers [a]

	Crossing Method						
Factor	HDD (Northwest's Preferred Method)	Wet Open-cut (Northwest's Proposed Alternative Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span
SOUTH FORK STILLAGUAMISH RIVER							
Construction Feasibility	Feasible. Total length is 3,800 feet. Likelihood of success is 80 percent. Boulders and soil type at entrance may challenge the success.	Feasible. Total length of in-stream work would be 200 feet.	Feasibility dependent on water volume and velocity but would not likely be feasible at the time of construction.	Not feasible. Water volume and velocity preclude this method.	Not feasible because of excessive pit depths, constant dewatering, safety risks, subsurface conditions, and length of the bore.	Marginally feasible only if the area is experiencing a very dry season at the time of construction.	Feasible but would require an extensive suspension system. Total length of span would be 400 feet. Suspension system would be at least 60 feet above the water surface.
Resource Impacted (Duration and Intensity)	Construction duration 5 weeks; no in-stream work.	Construction duration 2 weeks; 5 days of in-stream work.	Construction duration 2 weeks; 4 days of in-stream work.	NA	NA	Construction duration 7 days; 3 to 4 days of in-stream work.	Construction duration 2 months; no in-stream work.
Construction							
Riparian Vegetation [b]	2.4 acres would be cleared for setting up drill rig and entry/exit points.	3.3 acres would be cleared for right-of-way and extra workspace.	Same as wet open-cut method.	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
In-stream Disturbance	None.	0.9 acre of workspace would be needed for in-stream work.	Same as wet open-cut method.	NA	NA	1.4 acres of workspace would be needed for in-stream work.	None.
Water	No direct impacts. Potential for inadvertent release of drilling mud.	Open water trenching would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction, mainly due to excavation and backfill.	Creek can continue to flow during construction. Turbidity may increase for a short period during the installation and removal of the flume pipe.	NA	NA	Installation, rearrangement, and removal of the diversion dams would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction.	Cable would have to be carried across the water either by boat or walked across with equipment.
Beneficial Uses	None.	Increased turbidity during time required for installation.	Minor and short-term increase in turbidity.	NA	NA	Increased turbidity during time required for installation.	Potential minor, temporary increase in turbidity during time required for installation.

TABLE 4.3.2-7 (cont'd)

Summary of Potential Crossing Methods for the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers [a]

	Crossing Method						
Factor	HDD (Northwest's Preferred Method)	Wet Open-cut (Northwest's Proposed Alternative Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span
Operation							
Riparian Vegetation [b]	2.0 acres would be disturbed within the existing and new easement, 1.8 acres of shrub/wetland vegetation would be restored, and 0.2 acre of forested vegetation would be converted to shrub vegetation.	2.4 acres would be disturbed within the existing and new easement (1.8 acres of shrub/wetland vegetation would be restored and 0.6 acre of forested vegetation riparian would be converted to shrub vegetation).	Same as wet open-cut method.	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
Visual	None.	None.	None.	NA	NA	None.	Aerial span would be visible from surrounding properties and the general public traveling on State Route 530. Also potentially visible from various view points within the town of Arlington. The right-of-way must remain cleared over the pipelines around the span supports.
Security	Buried pipelines are more protected from intentional damage.	Buried pipelines are more protected from intentional damage.	Buried pipelines are more protected from intentional damage.	NA	NA	Buried pipelines are more protected from intentional damage.	Exposed pipeline is more vulnerable to intentional damage and vandalism.
Beneficial Uses	None.	None.	None.	NA	NA	None.	None.

[a] Estimates of likelihood of success, construction duration, lengths, and acreage are approximate.
[b] Includes wetland and upland vegetation.
NA = Not applicable.

Northwest does not expect the flume method to be feasible at any of the three crossings because currently all of the rivers are too large and the water volumes and velocities are too high. However, should the stream channels and velocities be greatly reduced at the time of construction, Northwest would implement the flume method rather than the wet open-cut method as its preferred alternative crossing method. Northwest estimates that each crossing would take about 2 weeks to complete, including 4 days of in-stream work. Workspace requirements for this method would be the same as for the wet open-cut method. There would be a minor and short-term increase in turbidity during the installation and removal of the flume pipe.

The dam and pump method would not be feasible because the rivers are too large and the water volumes and velocities are too high. Northwest states that the bore method would not be feasible because the surrounding topography would require excessive pit depths, constant dewatering, and unacceptable safety risks. The limiting geologic factors that would cause an HDD to fail would also likely cause the bore to fail. Furthermore, the bore length necessary to cross the ordinary high water mark of the rivers would be in excess of the limits for this technology.

Northwest states that the diverted dry open-cut method would not be feasible at the North Fork Nooksack River without a major riverbed configuration and would only be feasible and marginally feasible at the North and South Fork Stillaguamish Rivers, respectively, if the area is experiencing a very dry season at the time of construction. The crossings would disturb the same amount of riparian vegetation for the right-of-way and temporary extra workspace as the wet open-cut method; however, approximately twice the amount of workspace would be needed in the rivers for the diverted dry open-cut method. Due to the presence of boulders in the riverbeds, the use of sheet piling would be questionable. The diversion dams would consist of one of or a combination of imported riprap, concrete jersey barriers, water bladder portadams, or sandbags. At the North Fork Nooksack River, the crossing would take a minimum of 10 days to complete, including 4 to 5 days of in-stream work required to install, rearrange, and remove the diversion dams. At the North and South Fork Stillaguamish Rivers, the crossings would take a minimum of 7 days to complete, including 3 to 4 days of in-stream work. Turbidity would occur during this time and while the water is diverted to the backfilled areas.

Northwest states that by restricting the area in these locations, and given the same volume, the velocity of the water in these locations would increase and create more disruption to the banks and streambeds. Silt screens were considered but the current water volume and velocity conditions would likely overpower the screens (Elastec, 2005). Additionally the screens would need to be placed and cleaned, which would add equipment and time to the overall impact. Given the questionable feasibility of the diverted dry open-cut method at these river crossings and the additional impacts that would result from attempting to divert streamflow, this method is not considered practical or preferable to the wet open-cut method.

Use of the aerial span method to cross the North Fork Nooksack and North and South Fork Stillaguamish Rivers would be technically feasible. Currently, support structures for an aboveground pipeline to span these rivers within the proposed project corridor do not exist and would need to be constructed. Based on the width of the rivers and the constraints of the surrounding terrain and floodplains, significant suspension systems would be needed. At the North Fork Nooksack River, the total length of the span would be 1,100 to 1,400 feet and the suspension system would be at least 140 feet above the water surface. The anchor blocks would be about 40 feet by 40 feet by 20 feet. At the North Fork Stillaguamish River, the total length of the span would be 300 feet and the suspension system would be at least 50 feet above the water surface. At the South Fork Stillaguamish River, the total length of the span would be 400 feet and the suspension system would be at least 60 feet above the water surface. For the North and South Fork Stillaguamish Rivers, the anchor blocks would be about 20 feet by 20 feet by 10 feet. The towers and anchor blocks would be constructed on the waterbody banks but would be placed back from the riparian zones. Therefore, the crossings would disturb the same amount of riparian vegetation for the right-of-way and temporary extra workspaces as the wet open-cut method.

Northwest estimates that each crossing would take up to 60 days to construct. Due to the design of the suspension system, no support structures would need to be installed in any of the rivers and the main cable needed to pull the pipe string across each river to be installed on the suspension system would be carried across the river by boat. Therefore, no in-stream disturbance would occur during construction of the aerial spans. In the event the water level at the time of installation is too low to carry the cable across by boat, Northwest would request approval for equipment to walk the cable across the river, which would result in a minor, temporary increase in turbidity during the installation.

Northwest has expressed concern that the active floodplains at the North Fork Nooksack and South Fork Stillaguamish Rivers would prove challenging to install the suspension structures. Additionally, safety of the pipeline and the structures would be a concern in a floodplain. A substantial guard system would need to be erected around the support structures to protect the pipeline and towers from debris in flood events. Northwest has also expressed concern about increased maintenance costs, such as visual inspections, coating inspections and repair, and maintaining pedestrian guards on the pipe. In addition, an exposed span would increase the pipeline's vulnerability to third-party damage, which is the major cause of pipeline ruptures. Furthermore, a spanned crossing would create a new permanent and significant visual impact on a currently rural, open setting. For all of these reasons, the aerial span method is not considered to be a practical method to cross the North Fork Nooksack and North and South Fork Stillaguamish Rivers.

Pilchuck Creek

Pilchuck Creek would be crossed by the Mount Vernon Loop at MP 1428.6. Pilchuck Creek is a WDNR Type 1 Stream, is classified as a coldwater fishery, and is considered EFH. The creek supports anadromous species such as chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead, bull trout and cutthroat. Of the species, bull trout and chinook salmon are federally listed species (see section 4.7.1). As discussed in section 4.10.3, the Stillaguamish Tribe expressed concerns about potential impacts on water quality and chinook salmon at Pilchuck Creek. The creek is approximately 75 feet wide at the crossing location with large streamflow volumes.

Borings conducted during Northwest's geotechnical investigation indicated that the crossing location is underlain by a sequence of very dense, cohesive and non-cohesive glacially deposited soils that overlie sedimentary bedrock consisting of sandstone, siltstone, and conglomerate, with scattered thin coal seams that would be encountered by the drill path. Boulders and cobbles occur on the side that would be used for the entry point. Because of the topography in the area, there would be approximately 145 feet of elevation difference between the entrance and exit points, which would leave approximately 700 feet of the HDD largely unsupported by drilling mud.

Based on these results, Northwest concludes that there is a 75 percent likelihood of failure of an HDD crossing of Pilchuck Creek and does not propose to attempt one. Instead, Northwest proposes to use the wet open-cut method, which was used to install the two existing pipelines, to cross Pilchuck Creek. In using the wet open-cut method, Northwest would remove the existing 26-inch-diameter pipeline and expand that trenchline because it has already been substantially dug and is expected to have fewer boulders than a new trench.

Temporary extra workspace up to 80 feet wide would be required through the creek and large amounts of additional extra workspace would be needed on both sides. The pipe section for the creek crossing would be welded on the right-of-way on the flat top of the terrace north of the creek. Trackhoes would remove the spoil from the top of the 26-inch-diameter pipeline, beginning in the middle of the creek and working in opposite directions. The spoil would be placed in the creek on the downstream side of the trench. The spoil would be stacked in piles with gaps between them to allow for water passage. When the trackhoes reach the higher ground on each side of the creek, they would excavate the entire pipe so that the section of the 26-inch-diameter pipeline in the streambed could be removed and replaced with the 36-inch-diameter pipeline. After the existing pipeline is removed, the trackhoes would clean the existing trench out and excavate it deeper for the larger pipe. The new trench would be dug deep enough to provide 5 feet of cover. Once the trench is completed, the section of pipe would be carried in with sidebooms and lowered into place. The stream section of the trench would then be backfilled with a bulldozer or a trackhoe. The ends of the pipe section outside of the limits of the creek would be left open for the tie-in with the rest of the loop. This method requires that the trackhoes, bulldozer, and sidebooms work in the stream. Due to the velocity of the water at this crossing, downstream turbidity curtains are expected to be ineffective and would not be installed. Northwest estimates that the crossing would take about 2 weeks to complete, including 5 days of in-stream work.

The primary impact of a wet open-cut crossing of Pilchuck Creek would be disturbance to riparian vegetation on the banks of the creek and a temporary increase in turbidity during construction, mainly due to the excavation and backfill activities. The turbidity level would decline rapidly when the streambed disturbance ceases.

The WDFW expressed the same concerns regarding the proposed wet open-cut crossing of Pilchuck Creek as were expressed for the North Fork Nooksack and North and South Fork Stillaguamish Rivers and stated that a channel diversion or other “dry” method would be required. Northwest evaluated the feasibility of other dry crossing methods, including the flume, dam and pump, bore, diverted dry open-cut, and aerial span methods. The feasibility and environmental impacts of these methods are discussed below and summarized in comparison with the HDD and wet open-cut methods in table 4.3.2-8.

The flume and dam and pump methods would not be feasible because Pilchuck Creek is too large and the water volumes and velocities are too high. In addition, the terrain and streambed quality preclude the ability to create an adequate seal on the dam. The bore method would not be feasible because the creek banks rise abruptly on each side of the creek, the bore pits would be 30 to 40 feet deep and a minimum of 20 feet wide and 40 feet long, and the cobble and boulders in the area would restrict sheet pile driving. Furthermore, the limiting geologic factors that would make the HDD highly likely to fail would also likely cause the bore to fail.

The use of the diverted dry open-cut method would require Northwest to place equipment within the stream to install, maintain, and ultimately remove the diversion structures. The diversion dams would consist of one or a combination of imported riprap, concrete jersey barriers, water bladders, porta dams, and sandbags. Streambottom preparation for the diversion dams (boulder relocation) would be required. In addition, extra workspace would be needed to divert streamflow. Northwest states that the relatively narrow width of the creek bed and steep banks on each side render the useable workspace too small for this construction method and there is no floodplain where water could be diverted. Additionally, each section of pipe would have to be welded together in the stream channel requiring the placement of additional equipment in the channel and increasing the amount of time required to install the crossing. An in-stream tie-in would be required and would require trench dewatering within the stream channel while the welds are being made. The crossing would disturb the same amount of riparian vegetation for the right-of-way and temporary extra workspace as the wet open-cut method; however, more workspace would be needed in the creek for the diverted dry open-cut method.

TABLE 4.3.2-8

Summary of Potential Crossing Methods for Pilchuck Creek [a]

Factor	Crossing Method						
	HDD	Wet Open-cut (Northwest's Preferred Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span (Northwest's Proposed Alternative Method)
Construction Feasibility	Marginally feasible. Total length would be 2,840 feet. Likelihood of success is 25 percent due to large elevation change, cobbles, boulders, weak sands, and soft rock.	Feasible. Total length of in-stream work would be 75 feet.	Not feasible. Water volume and velocity preclude this method.	Not feasible. Water volume and velocity preclude this method.	Not feasible due to topography, excessive depth of the bore pits, and subsurface conditions.	Feasibility is questionable due to inadequate workspace.	Feasible. Total length of span would be 250 feet. Suspension system would be 20 to 30 feet above water surface.
Resource Impacted (Duration and Intensity)	Construction duration 5 weeks; no in-stream work.	Construction duration 2 weeks; 5 days of in-stream work.	NA	NA	NA	Construction duration 6 to 8 days; 3 to 4 days of in-stream work.	Construction duration 2 months; no in-stream work.
Construction							
Riparian Vegetation [b]	None.	0.6 acre would be cleared for right-of-way and extra workspace.	NA	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
In-stream Disturbance	None.	0.3 acre of workspace would be needed for in-stream work.	NA	NA	NA	0.4 acre would be needed for in-stream work.	None.
Water	No direct impacts. Potential for inadvertent release of drilling mud.	Open water trenching would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction, mainly due to excavation and backfill.	NA	NA	NA	Installation, rearrangement, and removal of the diversion dams would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction.	Cable would have to be carried across the water either by boat or walked across with equipment.

TABLE 4.3.2-8 (cont'd)

Summary of Potential Crossing Methods for Pilchuck Creek [a]

Factor	Crossing Method: HDD	Wet Open-cut (Northwest's Preferred Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span (Northwest's Proposed Alternative Method)
Beneficial Uses	No direct impacts. Potential for inadvertent release of drilling mud.	Increased turbidity during time required for installation.	NA	NA	NA	Increased turbidity during time required for installation.	Potential minor, temporary increase in turbidity during time required for installation.
Operation							
Riparian Vegetation [b]	None.	0.3 acre would be disturbed within the existing and new easement (0.3 acre of shrub vegetation would be restored and < 0.01 acre of forested vegetation would be converted to shrub vegetation).	NA	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
Visual	None.	None.	NA	NA	NA	None.	Aerial span would be visible from adjoining properties but not the general public. The right-of-way must remain cleared over the pipelines around the span supports.
Security	Buried pipelines are more protected from intentional damage.	Buried pipelines are more protected from intentional damage.	NA	NA	NA	Buried pipelines are more protected from intentional damage.	Exposed pipeline is more vulnerable to intentional damage and vandalism.
Beneficial Uses	None.	None.	NA	NA	NA	None.	None.

[a] Estimates of likelihood of success, construction duration, lengths, and acreage are approximate.

[b] Includes wetland and upland vegetation.

NA = Not applicable.

The alignment of the new 36-inch-diameter pipeline would be 20 feet west of the 26-inch-diameter pipeline. Trying to remove the existing 26-inch-diameter pipeline and severing it in the streambed under these conditions would be time-consuming. Northwest estimates that a diverted dry open-cut crossing would require 6 to 8 days, including 3 to 4 days of in-stream work to install, relocate, and remove the diversion dams. Turbidity would occur during this time and while the water is diverted to the backfilled areas. Given the inadequate workspace and the additional impacts that would result from attempting to divert streamflow, this method is not considered practical or preferable to the wet open-cut method.

Northwest evaluated the feasibility of crossing Pilchuck Creek using the aerial span method. The new 36-inch-diameter pipeline cannot span an unsupported distance greater than approximately 80 feet. Pilchuck Creek is 75 to 100 feet wide at the crossing location, which precludes the option for an unsupported span. Currently, support structures for an aboveground pipeline to span Pilchuck Creek within the proposed project corridor do not exist and would need to be constructed. The most appropriate crossing would exit and enter the bank with a span of nearly 250 linear feet. This is not an acceptable design length without additional support. Therefore, a suspension support system with adequate footings would be required. Initial design of a suspension system indicates that 300 linear feet approaches the limits of this design. The support structures would be between 20 and 30 feet in height and have a footprint of approximately 20 square feet plus up to 100 feet for backstay cable anchors. Temporary extra workspaces would be required on each bank between the towers and cable anchorage. Additional extra workspace would be required to weld up the pipe section and stage the equipment required to install the pipeline on the support structures. The towers and anchors would be constructed on the waterbody banks but would be placed back from the riparian zone. Therefore, the crossing would disturb the same amount of riparian vegetation for the right-of-way and temporary extra workspaces as the wet open-cut method.

Northwest estimates that the crossing would take up to 60 days to construct. No support structures would need to be installed in the creek and the main cable needed to pull the pipe string across the creek to be installed on the support structures would be carried across the creek by boat. Therefore, no in-stream disturbance would occur during construction of the aerial span. In the event the water level at the time of installation is too low to carry the cable across by boat, Northwest would request approval for equipment to walk the cable across the creek, which would result in a minor, temporary increase in turbidity during the installation.

Northwest states that adequate subsoils to support the necessary span are questionable and has expressed concern about the permanent visual impact of the spanned crossing and increased maintenance costs, such as visual inspections, coating inspections and repair, and maintaining pedestrian guards on the pipe. An exposed span would also increase the pipeline's vulnerability to third-party damage, which is the major cause of pipeline ruptures. The visual impact of the aerial span at Pilchuck Creek is discussed in section 4.8.6.

Although the aerial span method is not preferred, it would be technically feasible. Northwest proposes to use an aerial span crossing if it is not permitted to use the wet open-cut method at Pilchuck Creek.

Nisqually River

The Nisqually River would be crossed by the Fort Lewis Loop at MP 1324.3. The Nisqually River is a WDNR Type 1 Stream, is classified as a coldwater fishery, and is considered EFH. The river supports anadromous species such as chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead, and cutthroat. Of these species, chinook salmon is a federally listed species (see section 4.7.1). The river also supports resident populations of cutthroat trout and whitefish. At the crossing location, the river is approximately 160 feet wide and composed of a cobble and gravel streambed within a defined channel. Flow is controlled upstream by Alder Dam.

Borings conducted during Northwest's geotechnical investigation indicated the presence of alluvial or glacial outwash sediments, consisting predominantly of sandy gravel and cobbles that reached to depths of approximately 80.5 feet or greater in the floodplain. Glacial outwash, sandy gravel, and cobbles with boulders were encountered on the terraces on the north and south sides of the river. Some weathering of the gravels and cobbles to sand, silt, and clay was observed throughout the units, as well as broken cobble-size fragments, which may be indicative of the presence of boulders. Boulders up to 4 feet in diameter were observed on the surface on the north side of the river, presumably excavated when the existing pipelines were installed. During the geotechnical investigation, one of the borings could not penetrate the formation to the planned depth and the drillers reported significant mud circulation loss in the formation. This loss was attributed to the high permeability of subsurface soils indicating open work cobbles and gravel. Based on the topography of the area, the exit point would be approximately 40 feet higher than the entrance point; therefore, there would be no drilling mud to support the HDD along the final 125 feet. Due to the substrate, it would be difficult to maintain the HDD without drilling mud, which could cause the HDD to collapse near the exit point because of the lack of support. In addition, because of the presence of a road that could not be blocked during the pullback, the pullback would need to be completed in two stages. Completing the pullback in two stages would increase the risk of HDD failure because the pipe could become lodged in the hole during the time the pullback is stopped to weld the second half of the pipe string onto the first half. Based on the above, Northwest concludes that an HDD of the Nisqually River at the proposed crossing location adjacent to the existing right-of-way would be infeasible.

Northwest investigated moving the HDD to another location. However, geological mapping of a 1-mile radius around the proposed crossing location of the Nisqually River shows that the same soil substrates extend significantly up and downstream of the existing right-of-way (Golder, 2004a). Therefore, moving the HDD crossing location would not improve the technical feasibility of the HDD. Furthermore, any reroute would create a new corridor a minimum of 2 miles in length. This would impact at least 23 acres more land during construction and create a minimum of 18.2 acres of operational right-of-way. Furthermore, moving the crossing location would affect more landowners.

For all of these reasons, Northwest proposes to cross the Nisqually River within the existing pipeline corridor using the wet open-cut method, which was used to install the existing pipelines. This method would involve installation of the loop approximately 35 feet east (upstream) of the nearest existing pipeline. Northwest does not propose to remove the existing 26-inch-diameter pipeline across the Nisqually River because its removal would cause additional in-stream disturbance. Temporary extra workspace up to 100 feet wide would be required through the river and large amounts would be needed on each bank. The pipe segment for the river crossing would be welded in the workspace on the south side of the river. The trenching and installation procedures would be similar to those described for the North Fork Nooksack and North and South Fork Stillaguamish Rivers. Due to the velocity of the water at this crossing, downstream turbidity curtains are expected to be ineffective and would not be installed. Northwest estimates that the crossing would take about 2 weeks to complete, including 2 to 3 days of in-stream work. Although the Nisqually River is wider than Pilchuck Creek, the duration of in-stream work would be less than the duration of in-stream work required for a wet open-cut crossing at Pilchuck Creek because the existing 26-inch-diameter pipeline would not be removed at the Nisqually River.

The COE questioned the need for the large temporary extra workspaces Northwest is proposing on the north side of the river. From the top of the riverbank on the north side to the bottom is a steep incline of approximately 105 feet. This area would be needed for temporary extra workspace to store spoil. The riverbank would be graded to allow equipment to access the river. The trench is expected to be deep and wide, partly due to the large cobble rocks in this area, and also due to the depth needed for proper cover in the middle of the river. Therefore, a large amount of spoil must be moved and stored until the pipe has been installed. Trench excavation would require at least two large trackhoes and a bulldozer. Going north from the toe of the slope, the right-of-way would be graded for equipment to safely access the river. For safety reasons, Northwest is not proposing to work over the existing pipelines on this incline. The spoil moved to create the needed grade would be transported to the top of the slope and stored over the existing pipelines. The right-of-way grade must allow large sidebooms to carry a section of pipe approximately 250 feet long down the incline. Access for welding rigs to make tie-ins would also be required. The section of pipe would be tied into the section that has been placed across the river. At the top of the slope where the terrain levels out, Northwest would resume working over the existing pipelines in the typical 95-foot-wide construction right-of-way.

The primary impact of a wet open-cut crossing of the Nisqually River would be disturbance to riparian vegetation on the banks of the river and a temporary increase in turbidity during construction, mainly due to the excavation and backfill activities. The turbidity level would decline rapidly when the streambed disturbance ceases.

The WDFW expressed the same concerns regarding the proposed wet open-cut crossing of the Nisqually River as were expressed for Pilchuck Creek and the other major waterbodies. Northwest evaluated the feasibility of other dry crossing methods, including the flume, dam and pump, bore, diverted dry open-cut, and aerial span methods. The feasibility and environmental impacts of these methods are discussed below and summarized in comparison with the HDD and wet open-cut methods in table 4.3.2-9.

The flume and dam and pump methods would not be feasible because the Nisqually River is too large and the water volumes and velocities are too high. The bore method would not be feasible because the surrounding topography would require excessive pit depths, constant dewatering, and unacceptable safety risks. The limiting geologic factors that would make an HDD infeasible would also likely cause the bore to fail. Furthermore, the bore length necessary to cross the ordinary high water mark of the river would be in excess of the limits for this technology.

Northwest considered the use of the diverted dry open-cut method to minimize contact between streamflow and the excavation and backfill activities. The structures would be jersey barriers, bladder dams, and/or sandbags. Northwest would need to place equipment within the river to install, maintain, and ultimately remove the diversion structures. Additionally, each section of pipe would have to be welded together in the stream channel requiring the placement of additional equipment in the channel and increasing the amount of time required to install the crossing. An in-stream tie-in would be required and would require trench dewatering within the stream channel while the welds are being made. The crossing would disturb the same amount of riparian vegetation for the right-of-way and temporary extra workspace as the wet open-cut method; however, more workspace would be needed in the river for the diverted dry open-cut method.

Northwest estimates that a diverted dry open-cut crossing would require up to 8 days, including 4 days of in-stream work to install, relocate, and remove the diversion dams. Turbidity would occur during this time and while the water is diverted to the backfilled areas. Northwest states that the river is too narrow to build the diversion and do work in the dry section. Given the inadequate workspace and additional impacts that would result from attempting to divert streamflow, this method is not considered practical or preferable to the wet open-cut method.

TABLE 4.3.2-9

Summary of Potential Crossing Methods for the Nisqually River [a]

	Crossing Method						
Factor	HDD	Wet Open-cut (Northwest's Preferred Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span (Northwest's Proposed Alternative Method)
Construction Feasibility	Not feasible. Total length would be 4,400 feet. Geotechnical study indicates very high likelihood of failure due to cobble and boulders.	Feasible. Total length of in-stream work would be 75 feet.	Not feasible. Water volume and velocity preclude this method.	Not feasible. Water volume and velocity preclude this method.	Not feasible because of excessive pit depths, constant dewatering, safety risks, subsurface conditions, and length of the bore.	Feasibility is questionable because the river is too narrow to build the diversion and work in the dry section.	Feasible. Total length of span would be 300 feet. Suspension system would be 30 feet above water surface.
Resource Impacted (Duration and Intensity)	NA	Construction duration 2 weeks; 2 to 3 days of in-stream work.	NA	NA	NA	Construction duration up to 8 days; 4 days of in-stream work.	Construction duration 2 months; no in-stream work.
Construction							
Riparian Vegetation [b]	NA	2.6 acres would be cleared for right-of-way and extra workspace.	NA	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
In-stream Disturbance	None.	0.8 acre would be needed for in-stream work.	NA	NA	NA	1.3 acres would be needed for in-stream work.	None.
Water	NA	Open water trenching would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction, mainly due to excavation and backfill.	NA	NA	NA	Installation, rearrangement, and removal of the diversion dams would result in short-term displacement of existing habitat and a temporary increase in turbidity during construction.	Cable would have to be carried across the water either by boat or walked across with equipment.
Beneficial Uses	NA	Increased turbidity during time required for installation.	NA	NA	NA	Increased turbidity during time required for installation.	Potential minor, temporary increase in turbidity during time required for installation.

TABLE 4.3.2-9 (cont'd)

Summary of Potential Crossing Methods for the Nisqually River [a]

Factor	Crossing Method: HDD	Wet Open-cut (Northwest's Preferred Method)	Flume	Dam and Pump	Bore	Diverted Dry Open-cut	Aerial Span (Northwest's Proposed Alternative Method)
Operation							
Riparian Vegetation [b]	NA	1.2 acres would be disturbed within the existing and new easement (0.7 acre of shrub/wetland vegetation would be restored and 0.5 acre of forested vegetation would be converted to shrub vegetation).	NA	NA	NA	Same as wet open-cut method.	Same as wet open-cut method.
Visual	NA	Permanent cleared right-of-way would be 60 feet wider on upland bank on north side.	NA	NA	NA	None.	Aerial span would be visible from surrounding properties and the general public traveling on 82nd Avenue and Cook Road from various viewpoints. The right-of-way must remain cleared over the pipelines around the span supports.
Security	NA	Buried pipelines are more protected from intentional damage.	NA	NA	NA	Buried pipelines are more protected from intentional damage.	Exposed pipeline is more vulnerable to intentional damage and vandalism.
Beneficial Uses	NA	None.	NA	NA	NA	None.	None.

[a] Estimates of likelihood of success, construction duration, lengths, and acreage are approximate.
[b] Includes wetland and upland vegetation.
NA = Not applicable.

If Northwest is not permitted to use the wet open-cut crossing method at the Nisqually River, the aerial span method would be used. Similar to Pilchuck Creek, there are no existing support structures for an aboveground pipeline to span the river within the proposed project corridor. Based on the width of the river and the terrain change, a significant structure would be needed. The span supports would be approximately 20 feet off the top of the slope on each side of the river, resulting in an aerial span length of about 300 feet. The span would be approximately 30 feet above the water surface. The support structures would be between 20 and 30 feet in height and have a footprint of approximately 20 square feet plus up to 100 feet for backstay cable anchors. Temporary extra workspaces would be required on each bank between the towers and cable anchorage. Additional extra workspace would be required to weld up the pipe section and stage the equipment required to install the pipeline on the support structures. The towers and anchors would be constructed on the waterbody banks but would be placed back from the riparian zone. Therefore, the crossing would disturb the same amount of riparian vegetation for the right-of-way and temporary extra workspaces as the wet open-cut method.

Northwest estimates that the crossing would take up to 60 days to construct. No support structures would need to be installed in the river and the main cable needed to pull the pipe string across the river to be installed on the support structures would be carried across the river by boat. Therefore, no in-stream disturbance would occur during construction of the aerial span. In the event the water level at the time of installation is too low to carry the cable across by boat, Northwest would request approval for equipment to walk the cable across the river, which would result in a minor, temporary increase in turbidity during the installation.

Northwest has expressed the same concerns about the permanent visual impact of the spanned crossing, the increased vulnerability to third-party damage, and increased maintenance costs as were expressed for the other aerial span crossings. The visual impact of the aerial span at the Nisqually River is discussed in section 4.8.6.

Although the aerial span method is not preferred, it would be technically feasible. Northwest proposes to use an aerial span crossing if it is not permitted to use the wet open-cut method at the Nisqually River.

Mitigation Measures

The HDD and aerial span methods would avoid or minimize in-stream disturbance and associated impacts; therefore, additional mitigation measures are not proposed. Northwest would minimize impacts associated with a wet open-cut crossing at the North Fork Nooksack River, Pilchuck Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, and Nisqually River by installing the pipe during allowable in-stream construction windows specified by the WDFW. Work areas would be restored as near as practical to preconstruction contours, including replacement of the gravel and cobble streambed. Northwest would plant riparian tree and shrub species across the entire right-of-way within 50 feet of all fish-bearing streams and at other streams where riparian vegetation was present before construction. Fast growing native trees would be planted close to the top of the bank to provide the most rapid canopy recovery possible to shade and overhang the river. Plantings would conform to the FERC staff’s Procedures (section VI.D.1), which advise that trees exceeding 15 feet tall grow no closer than 15 feet to the pipeline.

Northwest would install LWD at appropriate areas in the waterbody within the construction right-of-way to mitigate for potential short-term impacts on aquatic species due to the wet open-cut crossing. Additionally, Northwest would salvage pieces of LWD during clearing of the construction right-of-way to provide for off-site in-stream habitat enhancement. Pieces of LWD with attached root wads and tree-trunk lengths specified by the WDFW or other regulatory agencies would be collected, transported, and stockpiled at designated locations. Northwest would donate this LWD to the WDFW and/or other conservation organizations to be used in other stream restoration and salmon recovery projects that are being implemented within the WRIAs that would be affected by this project. The LWD stockpile site would be located in a secured area to prevent damage/degradation by woodcutters. The effectiveness of LWD as a mitigation measure and additional details regarding Northwest's proposed placement of LWD in streams and on streambanks are discussed in section 4.6.2.3.

Alternatively, Northwest would participate in an appropriate off-site mitigation project or bank in support of salmon recovery in the WRIA. Northwest is in the process of contacting various conservation groups, trusts, wetland mitigation banks, and local agencies in the various WRIAs the project would cross to identify potential mitigation opportunities in which Northwest could participate. To date, Northwest has contacted the Whatcom Land Trust, Nooksack Salmon Enhancement Association, Whatcom County Public Works, Lummi Nation, Nooksack Tribe, Whatcom County Conservation District, Ducks Unlimited, Washington Trout, and Wildlands of Washington, Inc. for the Sumas Loop. For the Mount Vernon Loop, Northwest has contacted the Snohomish County Surface Water Management, Snohomish County Parks and Recreation Department, Stilly Snohomish Fisheries Enhancement Task Force, Cascade Land Conservancy, Stillaguamish Tribe, Habitat Bank, Ducks Unlimited, and Washington Trout. For the Snohomish Loop, the Snohomish County Surface Water Management, King County Natural Resources, Ducks Unlimited, Cascade Land Conservancy, and Washington Trout have been contacted. For the Fort Lewis Loop, Northwest has contacted the Nisqually River Basin Land Trust, Nisqually Tribe, Cascade Land Conservancy, Capital Land Trust, Ducks Unlimited, Washington Trout, and the Heernett Foundation.

Summary

In accordance with the FERC staff's Procedures, Northwest has filed site-specific crossing plans for Olson Lake and Evans Creek. Northwest has also filed site-specific crossing plans for the proposed and alternative crossing methods for the North Fork Nooksack River, Pilchuck Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, and the Nisqually River. The FERC staff has reviewed these plans and generally finds them to be acceptable. While use of the HDD method would be preferable and result in the least environmental impacts, if the HDD method is not feasible or fails, the FERC staff believes that the short-term impact of a wet open-cut crossing would be preferable to the permanent visual impact, increased operational costs, and increased vulnerability of the pipeline to third-party damage that would result from use of an aerial span.

Northwest is still in the process of consulting with other federal and state agencies and applicable Native American tribes to finalize its site-specific crossing plans and specific mitigation requirements. The FWS and NOAA Fisheries may impose additional mitigation as well as part of their Biological Opinions (see section 4.7). Therefore, **the FERC staff recommends that:**

- **Northwest continue to consult with the COE, the FWS, NOAA Fisheries, the WDOE, the WDFW, other applicable agencies, and appropriate Native American tribes to finalize its site-specific waterbody crossing plans and prepare a conceptual waterbody crossing mitigation plan. This plan should include details regarding the amount, location, and types of mitigation proposed. Northwest should file any revised site-specific crossing plans and the conceptual waterbody crossing mitigation plan <u>before the end of the draft EIS comment period</u> for review and analysis in the final EIS.**

4.3.2.4 Scouring, Channel Profile Changes, and Channel Migration

NOAA Fisheries has expressed concerns regarding the depth of the existing pipelines under waterbodies. The WDOE also expressed concern related to the potential for the pipeline to be exposed if not properly buried below channel migration zones. Sediments composing the substrate below active stream channels and along their banks are susceptible to scour during flood conditions. Even normal streamflows result in some degree of scour, continuously redepositing sediments downstream. Stream bottom scour could remove surface cover from the pipeline and could expose the pipe if scour depths exceed pipe burial depths. Stream scour could expose the pipeline to excessive lateral forces from flood currents, resulting in a shifting of the channel, which could result in unsupported spans of pipe. Scour potential depends largely on flood flow characteristics and grain size of the bottom sediments.

In the spring of 2004, Northwest conducted an evaluation of scour and erosion potential in the waterbodies that would be crossed by the proposed loops. The evaluation is documented in a report titled *Capacity Replacement Project, Stream Crossing Scour and Erosion Assessment, Whatcom, Skagit, Snohomish, Pierce, and Thurston Counties, Washington* (Golder, 2004c).[5] This evaluation resulted in the designation of waterbodies as having either low, medium, or high potential for scour and/or lateral erosion. Of the waterbodies crossed by the loops, 2 have high scour potential, 21 have medium scour potential, and the remaining 123 have low scour potential. Northwest would design the project to protect the integrity of the loops, which includes installing the pipeline in waterbodies with a minimum of 5 feet depth of cover from the top of the pipe to the bottom of the streambed. Some of the counties that would be crossed by the project may have regulations that differ from this criterion. Where warranted by site-specific conditions or required by local regulations, Northwest would increase the depth of cover to more than the 5-foot minimum to accommodate the potential for long-term scour and profile changes, and bank stabilization to deter channel migration. During detailed pipeline design, each waterbody crossing would be evaluated using the information in the scour and erosion assessment. The depth of cover for waterbody crossings that require more than 5 feet of cover, and additional lateral setbacks, would be determined at that time. These measures would minimize the potential for scour of the streambed or banks to expose the pipeline in the future.

4.3.2.5 Blasting

Northwest does not anticipate that blasting would be necessary to remove bedrock during in-stream construction.

4.3.2.6 Contaminated Sediments

In general, pollution of waterbodies along the Northwest route is derived from nonpoint sources such as agricultural runoff, septic systems, and runoff from residential/commercial construction areas. Of the waterbodies crossed by the Capacity Replacement Project, five are identified on the current section 303(d) impaired waters list and two additional waterbodies are identified on the proposed 2002/2004 section 303(d) list (see section 4.3.2.1). Of those section 303(d)-listed waterbodies, the basis for the listing is primarily due to non-sedimentary-related impairments such as temperature, dissolved oxygen, fecal coliform, and pH. Only Evans Creek on the Snohomish Loop is identified with an impairment (i.e., mercury) that could potentially be present in sediments. However, the basis for the current Evans Creek 303(d)-listing is from two samples at a monitoring station several miles downstream from the proposed

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[5] This report is too voluminous to include in this EIS. It is available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions) and at the WDOE's regional offices. If you reside in Whatcom, Skagit, Snohomish, or King Counties, you can access this document at the WDOE's Northwest Regional Office in Bellevue by calling the Public Disclosure Coordinator at (425) 649-7190 or (425) 649-7239. If you reside in Pierce, Thurston, Lewis, Cowlitz, or Clark Counties, you can access this document at the WDOE's Southwest Regional Office in Lacey by calling the Public Disclosure Coordinator at (360) 407-6365.

crossing location taken in 1988 and 1990. In addition, mercury is not identified as a potential impairment for Evans Creek on the proposed 2002/2004 section 303(d) list. Therefore, the project would not impact any waterbodies known to have contaminated sediments.

In rural areas, potential sources for sediment contamination include agricultural fields, which receive fertilizers and pesticides, and feed lots and sanitary fields, where contaminants could migrate. In urban areas, contaminated stormwater runoff, wastewater discharges, erosion, or contaminants from industrial sites, such as mineral processing or mining, petroleum refining, or treatment plants, and landfills, are potential sources of contamination. Pipeline construction could disturb and suspend existing sediments in the waterbody, temporarily degrading water quality and redistributing any contaminants downstream. This could impact aquatic and benthic species, and downstream water uses. These impacts would be localized and temporary. To minimize resuspension of any potentially contaminated sediments in waterbodies crossed by the project, Northwest would cross streams during low-flow periods to the extent possible, minimize handling of sediments, limit the duration of in-stream disturbance for trench excavation and backfilling; and incorporate any federal- or state-stipulated permit conditions regarding handling of potentially contaminated sediments into its construction plans.

To further minimize the potential for contaminant suspension, Northwest would prevent water flow between the excavated trench on the adjacent right-of-way and the waterbody by leaving hard or soft soil plugs in place until construction across the waterbody commences. Sack breakers, loam, or other types of trench breakers would be installed after pipeline installation across waterbodies to restrict water flow between the excavated trench and the waterbody. Depending on the contours, erosion control devices such as hay bales or silt fences would be installed to prevent sediment from entering the stream from the disturbed right-of-way. In addition, all surplus materials and equipment would be removed when in-stream construction and restoration are complete, and trash, litter, and debris would be collected for disposal in an approved solid waste disposal facility. Under no circumstances would refuse be discarded in waterbodies, in trenches, or along the right-of-way.

Although none of the current or proposed section 303(d)-listed waterbodies is expected to have contaminated sediments at the proposed crossing locations, Northwest's crossings of all five of the current section 303(d)-listed waterbodies would be in compliance with applicable regulations. Northwest proposes to cross two of the five waterbodies using the HDD method (see table 4.3.2-3). Therefore, any contaminants at those two waterbody crossings would not be disturbed by construction activities. Northwest proposes to cross two of the remaining three waterbodies using the wet open-cut method. Because the impairment at those two waterbodies includes temperature, dissolved oxygen, and fecal coliform, using the open-cut crossing method would not likely increase the waterbodies' impairment. The remaining section 303(d)-listed waterbody, Evans Creek, is currently listed as impaired by mercury and fecal coliform, and would be crossed using the push-pull method due to low flow conditions at the crossing location. Using the push-pull method would not likely increase the impairment of Evans Creek because any sediments that would be disturbed would tend to resettle in the immediate vicinity due to the low flow conditions.

Although the project is not expected to affect any waterbodies known to have contaminated sediments, it is possible that unanticipated pre-existing contaminated sediments could be encountered during construction. The FERC staff has recommended in section 4.3.1.2 that Northwest file a plan for the discovery and management of contaminated sediments that includes specific protocols for the testing, handling, and reporting of pre-existing contaminated sediments encountered during construction as well as the contact names and telephone numbers of appropriate state and local agency personnel.

4.3.2.7 Surface Water Uses During Construction

As discussed in section 4.3.1.4, Northwest would verify the integrity of the pipeline before placing it into service by conducting a series of hydrostatic tests. These tests involve filling the pipeline with water, pressurizing it, and then checking for pressure losses due to pipeline leakage. Northwest would require approximately 21,380,000 gallons of water to hydrostatically test the loops (see section 4.3.1.4). Of this total, up to 6,060,000 gallons of water would be withdrawn from a surface water source (i.e., the Centralia Canal) for the Fort Lewis Loop (see section 4.3.2). The remaining 15,320,000 gallons of water would be obtained from municipal sources.

Northwest would minimize the potential effects of hydrostatic testing on surface water resources by adhering to the measures in its ECR Plan (see Appendix G). These measures include screening intake hoses to prevent the entrainment of fish and other aquatic organisms and regulating the rate of withdrawal of hydrostatic test water to avoid adverse impact on aquatic resources or downstream flows (see section 4.6.2.3). Northwest would be testing only new pipe and no chemicals would be added to the water during hydrostatic testing**.** Northwest would acquire the necessary permits from state agencies before withdrawing hydrostatic test water, including specific approvals from applicable resource agencies. As discussed in section 4.3.1.4, Northwest would notify landowners located along the construction right-of-way before initiating hydrostatic testing activities. In residential areas, the pipeline right-of-way would already be fenced for safety during construction (see section 4.8.3.1). The fence would remain in place for the duration of hydrostatic testing activities. In addition, warning signs would be placed at road crossings during the testing activities.

All discharges, including testing for potential contaminants, would be conducted in accordance with applicable requirements. Northwest would discharge all hydrostatic test water to upland locations at a significant distance from wetlands and waterbodies. Northwest would not discharge the water directly into surface waters. If it is not feasible to release water as described above, Northwest would need to submit alternative measures that would provide equal or better environmental protection and receive approval before use. Northwest’s proposed hydrostatic test water discharge locations are listed in table 4.3.1-3 and shown on the maps in Appendix B.

4.4 WETLANDS

4.4.1 Existing Wetland Resources

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of wetland vegetation adapted for life in saturated soil conditions (COE, 1987). Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing wildlife habitat, recreational opportunities, flood control, and naturally improving water quality.

Wetlands in the project area are regulated at the federal, state, and local levels. On the federal level, the COE has authority under section 404 of the CWA to review and issue permits for activities that would result in the discharge of dredged or fill material into waters of the United States, including wetlands. In Washington, wetlands are also regulated at the state level by the WDOE, and at the local level by the counties and some cities. For example, wetlands are considered critical areas and included in critical areas ordinances in each of the local jurisdictions crossed by the project. Section 401 of the CWA requires that proposed dredge and fill activities under section 404 be reviewed and certified by the designated state agency, in this case the WDOE, that the proposed project would meet state water quality standards. The WDOE also has authority to regulate wetlands under two state laws, the State Water Pollution Control Act and the SMA. The WDOE provides technical assistance to other state agencies that regulate wetlands under separate statutes, such as the Hydraulic Code (WDFW) and the Forest Practices Act (WDNR). Additionally, the WDOE provides assistance to local governments under the Growth Management Act, including assistance in developing comprehensive plans, policies, and development regulations and in implementing local wetland regulations. Finally, the WDOE uses the SEPA process as a mechanism to identify potential wetland-related concerns. While the WDOE can use substantive authority under SEPA to require additional wetland protection, the SEPA process is used primarily as a means of identifying impacts that are regulated under other statutes (WDOE, 2004d, e, f).

Northwest conducted wetland delineations in the spring of 2004 along the proposed loops, including temporary extra workspaces and temporary and permanent access roads. Proposed pipe storage and contractor yard sites, aboveground facility sites, and abandoned facility sites were also surveyed for the presence of wetlands. Delineations were conducted in accordance with federal and state regulations and methodologies (COE, 1987; WDOE, 1997). Northwest also conducted functional assessments for each wetland and established WDOE wetland category ratings, WDNR wetland types, as well as city and county wetland ratings as established in critical areas ordinances (where applicable) for each wetland. These data are presented in Northwest's *Stream and Wetland Delineation Report* (The Coot Company, 2004).[6] During two field visits conducted in October and November 2004, the COE inspected selected wetlands along the proposed loops and verified Northwest's wetland delineation methodologies.

Pipeline Facilities

Based on Northwest's field surveys, the proposed loops would cross 264 wetlands at 283 locations for a total distance of about 9.0 miles. Of the 9.0 miles, 4.5 miles would be crossed by the Sumas Loop, 1.8 miles would be crossed by the Mount Vernon Loop, 0.9 mile would be crossed by the Snohomish Loop, and 1.8 miles would be crossed by the Fort Lewis Loop. Table J-1 in Appendix J lists the wetlands crossed by the project, including milepost location, wetland field ID number, National

[6] This report is too voluminous to include in this EIS. It is available for public inspection at the FERC's Public Reference Room in Washington, DC (call (202) 502-8317 for instructions) and at the WDOE's regional offices. If you reside in Whatcom, Skagit, Snohomish, or King Counties, you can access this document at the WDOE's Northwest Regional Office in Bellevue by calling the Public Disclosure Coordinator at (425) 649-7190 or (425) 649-7239. If you reside in Pierce, Thurston, Lewis, Cowlitz, or Clark Counties, you can access this document at the WDOE's Southwest Regional Office in Lacey by calling the Public Disclosure Coordinator at (360) 407-6365.

Wetlands Inventory classification, WDOE wetland category, length of crossing, and approximate acreage affected by construction and operation. A summary of the wetlands that would be crossed by each loop is presented in table 4.4.1-1. The wetlands that would be crossed by the proposed loops, in descending order of prevalence, consist of palustrine emergent (84 percent), palustrine scrub-shrub (10 percent), and palustrine forested (3 percent) wetlands. The remaining 3 percent of wetlands consist of palustrine open water, palustrine aquatic bed, and riverine wetlands.

Palustrine emergent wetlands are seasonally flooded and temporarily flooded areas with emergent vegetation. Most emergent wetlands along the loops consist of cleared land disturbed by either agricultural activities or past pipeline installation. These disturbed emergent communities are dominated by a mix of native and non-native invasive vegetation, primarily reed canarygrass (*Phalaris arundinacea*), but include soft rush (*Juncus effuses*) and creeping buttercup (*Ranunculus repens*). Undisturbed native emergent wetlands are uncommon along the loops, but where they occur, they generally support cattail (*Typha latifolia*) and slough sedge (*Carex obnupta*).

Palustrine scrub-shrub wetlands are seasonally and/or temporarily flooded areas with woody shrubs dominating the vegetation. Scrub-shrub wetlands along the loops consist of two primary vegetation groups, depending on the extent of disturbance. Disturbed areas associated with the existing pipeline easement or other similar earthwork activities tend to support hardy invasive species such as Douglas spirea (*Spiraea douglasii*) and Evergreen blackberry (*Rubus discolor*) around wetland fringes. Less disturbed, native scrub-shrub wetlands generally support a mixture of species including pacific willow (*Salix lasiandra*), red-osier dogwood (*Cornus stolonifera*), and salmonberry (*Rubus spectabilis*).

Palustrine forested wetlands are seasonally and/or temporarily flooded areas dominated by tree species. Almost all forested wetlands along the proposed loops support western red cedar (*Thuja plicata*), red alder (*Alnus rubra*), or black cottonwood (*Populus trichocarpa*), or a combination of these tree species. However, along the southern portion of the Fort Lewis Loop, Oregon ash (*Fraxinus latifola*) and quaking aspen (*Populus temuloides)* also occur on occasion as dominant tree species. Western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*) are both uncommon components, and generally occur only as incidental species. The understory of these forested wetlands commonly supports skunk-cabbage (*Lysichiton americanum*) and salmonberry.

Other palustrine wetland types that would be crossed by the loops include palustrine open water and palustrine aquatic bed wetlands. Many riverine wetlands also occur along the proposed loops.

For the Capacity Replacement Project, Northwest has classified all wetlands that would be affected within actively cultivated croplands or pastures as farmed wetlands. Northwest did not pursue Prior Converted (PC) cropland determinations with the COE because although many of these sites are in active agricultural use and have a long history of crop production, they are generally assumed to comprise flat landscapes with hydric soils, and being located within the high precipitation zone of the project these systems would likely sustain shallow surface water conditions for 15 consecutive days in the early growing season (March) during a year of normal rainfall. Thus, none of these sites would technically qualify as PC cropland. The COE would not regulate wetlands within PC cropland; however, because PC cropland determinations were not pursued, these farmed wetlands would be regulated by the COE as well as the WDOE and other local regulatory agencies. Had these farmed wetlands been determined to be PC cropland they would still be regulated by the WDOE and other local agencies.

TABLE 4.4.1-1

Summary of Wetlands Crossed by the Loops Associated with the Capacity Replacement Project

Facility	NWI Classification [a]	Total Crossing Length (feet)	Temporary Construction Impact (acres)	Permanent Impact [b]
Pipeline Facilities				
Sumas Loop	PFO	118.5	5.3	0.4
	PSS	564.6	0.9	0.1
	PEM	22,703.3	45.5	0.0
	POW	0.0	0.1	0.0
	PAB	0.0	0.0	0.0
	R	490.9	1.2	0.0
Sumas Loop Subtotal		23,877.3	53.0	0.5
Mount Vernon Loop	PFO	1,158.2	1.7	0.8
	PSS	1,503.9	5.3	0.3
	PEM	6,425.4	15.2	0.0
	POW	156.9	0.2	0.0
	PAB	30.7	0.4	0.0
	R	205.7	0.5	0.0
Mount Vernon Loop Subtotal		9,480.8	23.3	1.1
Snohomish Loop	PFO	24.7	1.2	< 0.1
	PSS	2,408.2	5.0	0.3
	PEM	1,781.2	3.7	0.0
	POW	0.0	< 0.1	0.0
	PAB	36.5	< 0.1	< 0.1
	R	265.0	0.3	0.0
Snohomish Loop Subtotal		4,515.6	10.3	0.4
Fort Lewis Loop	PFO	32.4	0.8	< 0.1
	PSS	150.6	0.4	< 0.1
	PEM	9,204.0	18.5	0.0
	POW	42.0	< 0.1	0.0
	PAB	0.0	< 0.1	0.0
	R	214.8	1.0	0.0
Fort Lewis Loop Subtotal		9,643.8	20.7	0.1
Pipeline Facilities Subtotal		47,517.5	107.3	2.0
Aboveground Facilities				
	PFO	0.0	0.0	0.0
	PSS	0.0	0.0	0.0
	PEM	0.0	2.6	0.7
	POW	0.0	0.0	0.0
	PAB	0.0	0.0	0.0
	R	0.0	0.0	0.0
Aboveground Facilities Subtotal		0.0	2.6	0.7

TABLE 4.4.1-1 (cont'd)

Summary of Wetlands Crossed by the Loops Associated with the Capacity Replacement Project

Facility	NWI Classification [a]	Total Crossing Length (feet)	Temporary Construction Impact (acres)	Permanent Impact [b]
Abandoned Facilities				
	PFO	0.0	0.0	0.0
	PSS	0.0	0.0	0.0
	PEM	0.0	0.2	0.0
	POW	0.0	0.0	0.0
	PAB	0.0	0.0	0.0
	R	0.0	< 0.1	0.0
Abandoned Facilities Subtotal		0.0	0.2	0.0
Project Total		47,517.5	110.2	2.7

[a] Wetland types according to Cowardin et al. (1979):
PFO = palustrine forested
PSS = palustrine scrub-shrub
PEM = palustrine emergent
POW = palustrine open water
PAB = palustrine aquatic bed
R = riverine

[b] Permanent wetland vegetation type conversion impacts are associated with scrub-shrub and forested wetlands. Operational requirements (corrosion/leak surveys) allow a 10-foot-wide corridor centered over the pipeline to be maintained in an herbaceous state and allow trees within 15 feet of the pipeline that are greater than 15 feet in height to be selectively cut from the right-of-way. To determine permanent conversion impacts on scrub-shrub wetlands, a 10-foot-wide corridor centered over the pipeline was assessed. A 30-foot-wide corridor centered over the pipeline was assessed for forested wetlands.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

The FERC does not typically require special wetland construction and mitigation procedures for farmed wetlands. The requirements outlined in the FERC staff's Procedures (see Appendix F) do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including topsoil segregation requirements, as outlined in the FERC staff's Plan (see Appendix E) would apply to these agricultural wetlands. However, as stated above, the COE, the WDOE, and other local regulatory agencies do regulate farmed wetlands and may require specific wetland construction and mitigation procedures for the farmed wetlands affected by the project.

Aboveground Facilities

The expansion of the Chehalis Compressor Station would affect approximately 2.6 acres of disturbed, emergent wetlands surrounded by gravel roads and compacted fill. About 0.6 acre of this wetland area would be permanently affected by operation of the expanded facility. No wetlands would be affected by modifications at the other compressor station sites or during construction and operation of the other aboveground facilities (i.e., MLVs, pig launchers, pig receivers) associated with the proposed loops.

One of the six MLVs that would be installed along the Evergreen Expansion Project loops would affect wetlands. Less than 0.1 acre of a previously disturbed emergent wetland would be permanently filled by the expansion of the gravel pad that would surround the MLV at MP 1440.1.

Abandoned Facilities

Northwest would avoid impacts on wetlands at all but two of the abandoned facility locations. The Portland Lateral Take-Off site (MP 1232.5) and the Acme Meter Station site (MP 1461.2) would affect riverine and emergent wetlands, respectively. The existing Portland Lateral Take-Off site has an excavated ditch that connects to an unnamed tributary to the East Fork Lewis River. This ditch is not a channelized native stream, but rather appears to be a drainage ditch, excavated to drain an off-site wetland feature. This riverine wetland ditch sustains good winter flows, but is probably seasonal due to the lack of any elevated ground within the potential watershed. The channel would likely be dry during the time of construction (summer) and fish would not likely be present.

The existing Acme Meter Station site is located in the floodplain of the South Fork Nooksack River in a planted hayfield. A potential depressional wetland was identified during field review at the site. Soils at this site have strong hydric characteristics, but agricultural activities appear to have effectively diverted or drained the historic water source to some or all of the wetland within the proposed workspace associated with abandonment activities. Northwest surveyed the site during the dry season (late June) and was unable to determine whether the site would meet the hydrology criterion for a wetland. Because the site is an actively managed, planted hayfield, site work performed during the summer may temporarily affect the area, but, because it would likely be dry, wetland vegetation or functions would probably not be affected.

Pipe Storage and Contractor Yards

Project activities at the proposed pipe storage and contractor yards would not affect wetlands. Although an unnamed, tree-lined creek (possible riverine wetland) runs through the proposed Nooksack Yard, Northwest does not propose to clear any trees from the site and construction activities would not occur near the creek. The yard would be accessed by two separate roads from Highway 9, each on opposite sides of the creek, and neither the creek nor any associated adjacent wetlands would be affected.

4.4.2 General Impact and Mitigation

Construction of the loops, aboveground facilities, and work associated with the abandoned facilities would affect about 110.2 acres of wetlands, including 85.8 acres of emergent wetlands, 11.6 acres of scrub-shrub wetlands, 9.0 acres of forested wetlands, 3.1 acres of riverine wetlands, 0.4 acre of aquatic bed type wetlands, and 0.3 acre of open water wetlands.

The primary impact of pipeline construction and right-of-way maintenance activities on wetlands would be the temporary and permanent alteration of wetland vegetation. These effects would be greatest during and immediately following construction. Generally, the wetland vegetation community would eventually transition back into a community with functionality similar to that of the wetland before construction. In emergent wetlands, the herbaceous vegetation would regenerate quickly (typically within 1 to 3 years). However, scrub-shrub wetlands could take several years to reach functionality similar to preconstruction conditions depending on the age and complexity of the system. In forested wetlands, the impact of construction would be extended due to the longer period needed to regenerate a forest community. Given the species that dominate the forested wetlands crossed by the proposed loops, regeneration may take up to 30 years and in certain cases regeneration may not occur at all. Following revegetation, there would be little permanent impact on emergent wetland vegetation in the maintained right-of-way because these areas naturally consist of and would remain as an open and herbaceous community. Herbaceous wetland vegetation in the pipeline right-of-way is not generally mowed or otherwise maintained, although the FERC staff's Procedures allow annual maintenance of a 10-foot-wide strip centered over the pipeline. In addition, trees within 15 feet of the pipeline centerline that are greater than 15 feet tall may be selectively cut and removed. By limiting revegetation of a portion of forested and scrub-shrub wetlands, some of the functions (primarily habitat) of these forested and scrub-shrub wetlands would be permanently altered.

Other types of impacts associated with construction of the pipeline could include temporary changes in wetland hydrology and water quality. During construction, failure to segregate topsoil over the trenchline in non-saturated wetlands could result in the mixing of the topsoil with the subsoil. This disturbance could result in altered biological activities and chemical conditions in wetland soils and could affect the reestablishment and natural recruitment of native wetland vegetation after restoration. In addition, inadvertent compaction and rutting of soils during construction could result from the movement of heavy machinery and the transport of pipe sections. The resulting alteration of the natural hydrologic patterns of the wetlands could inhibit seed germination or increase the potential for siltation. Construction clearing activities and disturbance of wetland vegetation could also temporarily affect the wetland's capacity to buffer flood flows and/or control erosion. The procedures that Northwest would implement to avoid or minimize these impacts are discussed below.

Most of the permanent wetland impacts associated with the Capacity Replacement Project would be in areas where new permanent easement is required. Within the easement (newly requested and existing), the wetlands would be maintained for the life of the project as emergent/shrubby communities to facilitate corrosion/leak surveys. Approximately 1.2 acres of forested and 0.7 acre of scrub-shrub wetlands would be permanently affected by vegetation type conversions. Although permanent impacts on forested and scrub-shrub wetlands would occur as a result of the proposed project, they would be primarily impacts on the structure of the wetlands (i.e., result in more herbaceous vegetation and fewer trees and shrubs), but would not greatly reduce the existing wetland functions or amount of wetlands in the project area. However, about 0.7 acre of wetlands would be permanently filled as a result of the project (see section 4.4.3).

General Wetland Construction and Mitigation Procedures

In general, wetland impacts would be minimized by avoidance, mitigation of impacts, and compensation in accordance with federal, state, and local regulations.

Northwest's proposal to replace its existing 268-mile-long, 26-inch-diameter pipeline with 79.5 miles of 36-inch-diameter loop and abandon the majority of the 26-inch-diameter pipeline in place would avoid impacting wetlands along 70 percent of the Northwest system. Impacts on wetlands from construction of the Capacity Replacement Project would further be avoided and minimized by Northwest's proposal to install the loops 20 feet east of Northwest's existing 30-inch-diameter pipeline and work over the existing 26-inch- and 30-inch-diameter pipelines. Northwest's existing easement was previously disturbed during installation of the 26-inch- and 30-inch-diameter pipelines and is maintained (periodically mowed) in a general herbaceous state for operation of the facilities. Northwest would use the existing permanent easement for the majority of the project's construction footprint (i.e., construction right-of-way and temporary extra workspaces). Therefore, most of the construction-related disturbance (about 73 percent) would occur in emergent wetland areas that have been previously disturbed by past pipeline installation activities. In addition, Northwest would further avoid wetland impacts by limiting the width of the construction right-of-way to 75 feet in most wetlands and locating extra workspaces at least 50 feet back from most wetland boundaries, consistent with the FERC staff's Procedures.

Typical wetland construction methods are described in section 2.3.2. Northwest would mitigate construction-related impacts by implementing the FERC staff's Procedures as discussed below and by complying with the COE's section 404 and WDOE's section 401 permit conditions. In order for the COE to determine whether practicable alternatives have been taken, Northwest is required to avoid wetland impacts to the maximum extent possible. Northwest must also demonstrate that it has taken appropriate and practicable steps to minimize wetland impacts in compliance with the COE's section 404(b)(1) guidelines that restrict discharges of dredged or fill material where a less environmentally damaging alternative exists. When unavoidable wetland impacts are proposed, the COE and the WDOE would require that all practicable actions be taken to mitigate those impacts. This is consistent with the CEQ's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (Title 40 CFR Part 1508.20), which defines mitigation to include the following criteria:

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

According to preliminary information provided by Northwest, 244 (108.8 acres) of the 264 wetlands crossed by the loops would fall under the jurisdiction of the COE. In October 2004, the FERC staff accompanied the COE to review a number of Northwest's wetland and waterbody crossings in the field. The COE conducted an additional field review in November 2004. For all of the wetland crossings visited, the COE confirmed and agreed with Northwest's determinations on farmed, isolated, and other jurisdictional wetlands. Northwest would minimize impacts on jurisdictional wetlands by complying with the COE's section 404 permit conditions. Northwest would further minimize impacts on wetlands by complying with the WDOE's section 401 water quality certifications. Additionally, farmed and isolated wetlands are regulated by the WDOE and other local regulatory agencies and, therefore, would be subject to additional wetland construction and mitigation procedures.

FERC Staff's Wetland and Waterbody Construction and Mitigation Procedures

Northwest would implement the wetland construction and restoration measures contained in the FERC staff's Procedures except where a site-specific variance has been requested and approved by the FERC and other jurisdictional agencies (see discussion below). These Procedures would apply to all wetlands crossed by the loops with the exception of wetlands located in actively cultivated or rotated croplands as previously discussed.

Northwest has proposed wetland mitigation that is intended first to avoid wetland impacts to the greatest extent possible and then to minimize the area and duration of wetland disturbance, reduce the disturbance of wetland soils, and enhance wetland revegetation following construction. Some of the measures pertaining to wetland crossings specified in the Procedures and/or to which Northwest has committed, include:

- limiting the width of the construction right-of-way to 75 feet, unless a wider right-of-way is requested on a site-specific basis and a variance is issued by the FERC and other applicable agencies;
- locating extra workspaces at least 50 feet back from wetland boundaries unless a reduced setback is requested on a site-specific basis and a variance is issued by the FERC and other applicable agencies;
- limiting the operation of construction equipment within wetlands to that equipment essential for clearing, excavation, pipe installation, backfilling, and restoration;
- segregating topsoil from the trenchline in non-saturated wetlands and returning it to the top of the trench, which would promote reestablishment of wetland species by preserving the vegetative propagules (e.g., seeds, tubers, rhizomes, bulbs) in the soil;
- limiting grading in wetlands to the area directly over the trenchline, except where necessary to ensure safety;
- avoiding compaction of wetland soils by using low ground weight construction equipment and/or operating equipment off of prefabricated timber mats in saturated or standing water wetlands;
- installing trench breakers or trench plugs at the boundaries of wetlands as needed to prevent draining of a wetland and to maintain original wetland hydrology;
- installing temporary and permanent erosion and sediment control measures, such as silt fence, hay bales, slope breakers, interceptor diversion dikes, energy dissipation devices, and reestablishment of vegetative cover on adjacent upland areas to minimize erosion and sedimentation into wetlands;
- removing stumps only from areas directly over the trench or where they would create a safety hazard to facilitate reestablishment of woody species by enabling sprouting from existing root systems;

- returning wetlands to their preconstruction contours to the extent practicable and sealing the trench bottom, where necessary, to maintain hydrologic characteristics;

- prohibiting storage of hazardous materials, chemicals, fuels, and lubricating oils within a wetland or within 100 feet of a wetland boundary;

- prohibiting parking and/or fueling of equipment within a wetland or within 100 feet of a wetland boundary, unless the EI determines that no reasonable alternative exists and appropriate steps, including secondary containment structures, are taken to prevent spills and provide for prompt cleanup in the event of a spill;

- consulting with the appropriate land management or state and local agencies to develop plans for revegetating wetlands, and, where necessary, preventing the invasion or spread of undesirable exotic vegetation;

- reseeding non-agricultural wetlands with an agency-recommended and/or approved native seed mix where commercially available;

- limiting post-construction maintenance of vegetation within wetlands to removal of trees that are greater than 15 feet in height and within 15 feet of the pipeline centerline, and maintenance of a 10-foot-wide strip of vegetation centered over the pipeline in herbaceous vegetation; and

- monitoring the success of wetland revegetation annually for a period of 3 years after construction, or until the wetland is successfully revegetated.

In addition to complying with the COE's section 404 and the WDOE's section 401 permit conditions, and the FERC staff's Procedures, Northwest would further minimize construction-related impacts on wetlands by implementing the following measures:

- applying wetland seed mixes to disturbed wetland areas to promote revegetation (see section 4.5.2); and

- extending the monitoring period in scrub-shrub and forested wetlands to 10 years as required by the WDOE.

Requested Variances to the FERC Staff's Procedures

In accordance with the Procedures, Northwest submitted requests for areas where a wider right-of-way and reduced extra workspace setbacks in wetlands would be necessary based on site-specific conditions. Northwest depicted these locations on aerial photo-based Environmental Construction Alignment Sheets and provided a site-specific explanation of the conditions that would require a wider right-of-way and prevent a 50-foot setback for extra workspace in wetlands. The FERC staff has reviewed the Environmental Construction Alignment Sheets and Northwest's explanations to make determinations whether to approve or deny each variance requested. Based on the FERC staff's review, most of the variances appear to be reasonable and adequately justified. Northwest's specific variance requests and the status of the FERC staff's approval or denial are provided in Appendix N. Northwest would also submit these variance requests to other applicable agencies (e.g., the COE, the WDOE, and local authorities) as part of its permit applications. Northwest's implementation of variances approved by the FERC would need to be consistent with its permits from the other jurisdictional agencies.

The total acreage of wetland impacts presented in table 4.4.1-1 and Appendix J reflect the total amount of wetlands that would be affected if all of Northwest's requested variances were approved.

However, because a decision on some of the variance requests cannot be made until Northwest provides additional justification, the actual amount of wetland disturbance could be less than the totals presented.

4.4.3 Site-Specific Impact and Mitigation

The largest forested wetland that would be affected by the project is associated with a tributary to Black Slough on the Sumas Loop (MPs 1465.0 and 1464.7). As is the case with the other forested and scrub-shrub wetlands crossed, a narrow strip of vegetation (typically 20 feet) would be cleared along one edge of the existing right-of-way. As a result, the project would only incrementally add to the width of the existing visible corridor and would not create a new, visible corridor through disturbed vegetation.

Two of the largest and most complex wetlands that would be affected by the project are Olson Lake (MP 1419.3) and Evans Creek (MP 1383.7). Northwest proposes to install both of these wetland crossings using the push-pull method (see section 2.3.2). The FERC staff visited both of these wetlands with the COE during its wetland field review in October 2004. The existing 26-inch and 30-inch-diameter pipelines at both of these locations were installed using the push-pull method in the 1950s and 1970s, respectively, and now it is not possible to discern where the pipelines are located in either of these wetlands (i.e., there is no observable difference between the existing pipeline right-of-way and the surrounding wetland vegetation). Subsequent to the previous pipeline installation across Olson Lake, beavers that inhabit the lake have built dams that have significantly altered the drainage characteristics of the wetland causing increased inundation over longer periods of time. However, by mid to late summer, Olson Lake typically drains to the point where the wetland could potentially be crossed under non-inundated conditions. Annual historical precipitation and streamflow data for both Olson Lake and Evans Creek indicate that rainfall and streamflows are typically low during mid to late summer. Although Northwest plans to cross these wetlands during the late summer, Northwest has assumed the crossings would occur under inundated conditions due to the unpredictable weather patterns in the region.

Both Olson Lake and Evans Creek may provide juvenile rearing habitat for coho salmon and habitat for resident cutthroat trout as well as three-spine sticklebacks, sculpins, and possibly introduced warmwater species. If the wetlands are inundated at the time of crossing, construction would increase turbidity in the area by disturbing the wetland soils. Increased turbidity could affect local distributions of invertebrate scrapers and filter feeders (fish forage) and may impair fish abilities to detect those prey items. Turbidity may also adversely influence amphibians such as western or boreal toads, Pacific treefrogs, and red-legged frogs; however, these species would complete egg laying before construction would begin at both sites. Construction disturbance could also mobilize certain toxic compounds that, if present, could contribute to deformities during embryological development. Northwest would limit the impacts associated with the disturbance of sediments and increased turbidity to the construction right-of-way by installing silt fence at the edge of the right-of-way. Northwest would also minimize impacts associated with increased turbidity by implementing the mitigation procedures described in the FERC staff's Plan and Procedures (see Appendices E and F, respectively) and its project-specific ECR Plan (see section 4.3.2.2).

The introduction of petroleum products (fuels and lubricants) as a result of spills or leaking equipment could also adversely affect these wetlands. Northwest would minimize the potential for spills by implementing its SPCC Plan. Specifically, Northwest would limit the refueling of equipment within 100 feet of the wetlands, inspect all equipment and vehicles for leaks before entering the wetlands, and wash all equipment and vehicles to remove any residual petroleum material before construction within the wetlands.

Both wetlands are currently vegetated with spirea, willows, and cattails that, with the exception of plants over the pipeline trench, would be mowed and not removed. Because these are hardy species resilient to disturbance and inundation, they would be expected to resprout following construction. For these reasons, the FERC staff would expect that another push-pull crossing of these large wetland systems could be completed with similar long-term results as the previous crossings. As part of the state permitting process, Northwest may be required to have various detailed amphibian, fish, and invertebrate surveys and/or studies conducted by professional wildlife biologists and provide an assessment of potential construction impacts on the species identified by the surveys**.**

Northwest investigated the feasibility of using the HDD method to cross both the Olson Lake and Evans Creek wetland complexes. As described in section 2.3.2, the HDD method involves drilling beneath a feature and the adjacent vegetation using staging areas on both sides of the crossing. Olson Lake is bounded by a hard glacial till substrate that would need to be avoided to improve the potential for a successful HDD crossing. To avoid the glacial till layer, the drill would need to be between 70 and 100 feet below the surface, which would affect the entrance and exit angle and the total crossing distance necessary to complete the drill. Because of the depth required, Northwest estimates that an HDD crossing of Olson Lake would be between 2,600 and 3,600 linear feet depending on the final design. Additionally, the right-of-way bends on the south side of Olson Lake. To avoid attempting to route the HDD through bends and angles, which would increase the potential for drill failure, Northwest would be required to establish a new operational right-of-way and increase impacts on landowners not currently encumbered by the pipeline right-of-way. An HDD crossing would also require more temporary extra workspace than a push-pull crossing and would require the clearing of an additional 1.4 acres of land, of which 0.5 acre would be forest land. The duration of the crossing would increase to almost 60 days compared to the 10 days that would be required for the push-pull method. Furthermore, the operation of the drilling equipment and the construction traffic required to service the drilling operation would increase noise and traffic impacts on the adjacent areas. For these reasons, an HDD crossing of the Olson Lake wetland complex is not considered practical.

Northwest states that an HDD crossing of Evans Creek would not be feasible due to the size of the wetland complex and the lack of available workspace on either side of the complex to stage the drill and fabricate the pipe string. On the south side of the Evans Creek wetland complex there is another wetland (Tributary to Evans Creek) and a steep forested hill that leads up to the Deer Park Subdivision. The terrain between the Tributary to Evans Creek and the Deer Park Subdivision would be too steep to be used for the staging area for the drill rig and the entry point. It is possible that the staging area for the drill rig and entry point could be located in the forested area between Evans Creek and the Tributary to Evans Creek although a staging area in this location may not allow the entry point to be set back a sufficient distance from Evans Creek to achieve the necessary drill alignment. A staging area in this location would also require extensive tree clearing. Moreover, the potential for an inadvertent release of drilling mud (frac-out) to occur during an HDD is greatest when the drill alignment is close to the surface (i.e., near the entrance and exit points). Therefore, locating the staging area and entrance point in such close proximity to Evans Creek and the Tributary to Evans Creek would increase the potential for a frac-out to occur within the wetlands.

On the north side of the Evans Creek wetland complex the workspace would be constrained by the Redmond District Office and State Highway 202. The forested area between Evans Creek and the Redmond District Office is too steep to locate a staging area for the drill rig and entry point and may not be set back a sufficient distance from the wetland to achieve the necessary drill alignment. There would also be an increased potential for a frac-out to occur in Evans Creek due to the proximity of the entry point to the wetland. It could be possible to locate the staging area for the drill rig and entry point in the forested area north of State Highway 202. However, this would require the exit point to be located on the steep forested hill south of the Tributary to Evans Creek. Extensive tree clearing would be required and the terrain would be too steep to fabricate the pipe string and support the equipment needed to handle the pipe string during the pullback. Furthermore, there would be no room on the south side of the exit point to fabricate the pipe string because of the presence of the Deer Park Subdivision. To avoid the subdivision, the HDD would need to be more than 10,000 feet long. Based on current technology, the longest achievable HDD length for a 36-inch-diameter pipeline is 6,500 feet. As discussed in section 3.5, an option to break up the crossing of the Deer Park Subdivision into multiple HDDs could not be identified. For these reasons, an HDD crossing of the Evans Creek wetland complex is not considered feasible or practical.

Northwest would permanently fill 0.6 acre of palustrine emergent wetland to expand the Chehalis Compressor Station and less than 0.1 acre of palustrine emergent wetland to install the MLV at MP 1440.1 on one of the Evergreen Expansion Project loops. Northwest would be required to provide compensatory mitigation to offset impacts on wetlands, including those that are permanently filled (see section 4.4.4).

Northwest has incorporated three HDDs into the project design: the North Fork Nooksack River (includes Jim Creek and a tributary crossing); North Fork Stillaguamish River; and South Fork Stillaguamish River. The staging areas for the three proposed HDDs would be set back from these waterbodies and their associated wetlands. Therefore, if these drills were successful, they would effectively avoid impacts on these riverine systems and the majority of their associated adjacent wetlands. If the HDDs were not successful, Northwest proposes to construct the crossings using the wet open-cut method (see sections 2.3.2 and 4.3.2.3). Use of the open-cut crossing method would increase wetland impacts associated with the loops. A total of 6.1 acres at the North Fork Nooksack River, 5.3 acres at the North Fork Stillaguamish River, and 1.9 acres at the South Fork Stillaguamish River would be affected by an open-cut crossing of these rivers (see table J-2 in Appendix J).

As discussed in section 4.3.2.3, Northwest proposes to cross Pilchuck Creek and the Nisqually River using the wet open-cut method. However, if this method is not permitted, Northwest proposes to install the crossings using the aerial span method. Based on a review of the site-specific crossing plans for Pilchuck Creek and the Nisqually River, the acreage of wetlands that would be affected by an aerial span crossing of these two waterbodies would be similar to the impact of the proposed wet open-cut method.

A scoping comment was received from a landowner regarding a possible wetland that may be the result of the plugged drain tiles on the property in the time since the 26-inch-diameter pipeline was installed. The landowner is concerned that a portion of his pasture has become wetland since the 1950s when the 26-inch-diameter pipeline was installed across the property because existing subsurface drain tiles have silted in. The landowner has suggested that Northwest install a series of pipes across the pipeline easement through the property to facilitate drainage on the site and has also requested that drainage pipes be installed in some existing ditches, or be connected to existing ditches. The landowner would also like to have the drainage tiles replaced. The WDOE has expressed concern about draining the wetland by installing this series of culverts and has stated that the repair of damaged drain tiles located within wetlands be limited to the replacement of drain tiles of the original size and depth. No expansion of underdrain systems in wetlands, including drain tiles, can be performed without specific permit approval from the appropriate regulatory agencies. In addition, ditches may be regulated by the COE as wetlands and may be regulated by the WDFW as streams. To determine exact jurisdiction, the site would have to be evaluated to see if the area is considered a farmed wetland or PC cropland.

The FERC does not get involved in easement negotiations, which are between the applicant (Northwest) and the landowner, and Northwest may or may not choose to assist with the landowner’s suggestions as part of easement negotiations. However, the COE, the WDOE, and other agencies likely would regulate the wetlands and other water features in question. Therefore, regardless of whether Northwest chooses to assist with the landowner’s requests, or if the landowner performs the requested activities himself, permits would have to be obtained from the COE, the WDOE, the WDFW, and other local regulatory agencies. In either case, the initial action would be for the landowner or Northwest to contact the COE for a jurisdictional determination regarding the wetlands on the pipeline easement and for the landowner to contact the COE for a jurisdictional determination regarding the rest of the property outside of the pipeline easement.

4.4.4 Compensatory Mitigation

The COE has a policy of "no net loss" of wetlands in the United States. This means that every wetland impact must be offset by the creation, restoration, enhancement, or preservation of at least an equal amount of wetlands, which is referred to as compensatory mitigation. Compensatory mitigation is considered once the regulatory agencies have evidence that the following steps have been carried out: 1) avoidance; 2) minimization; 3) rectification; and 4) reduction. Residual wetland impacts that are not or cannot be mitigated within the project area are accounted for using compensatory mitigation to ensure that there is a full replacement of both wetland area and functions. The COE has stated that it typically requires a 3:1 compensatory mitigation ratio for forested wetlands affected due to temporal losses and if the proposed mitigation is for restoration or creation purposes. If proposed mitigation is solely for the purposes of enhancement or preservation, then ratios would fall within the range of 10:1 to 16:1 for enhancement and 10:1 to 20:1 for preservation depending on the wetland class.

Compensatory mitigation ratios recommended by the WDOE would vary depending on a variety of factors. In Washington, wetlands are rated according to the Washington State Wetland Rating System, which groups wetlands into four categories based on wetland functions, sensitivity to disturbance, rarity, and/or the ability to replace the wetland. Compensatory mitigation ratios can range from 1.5:1 up to 24:1, depending on the wetland category, whether the impacts are temporary or permanent, and the types and combinations of mitigation proposed (i.e., restoration (rehabilitation or re-establishment), creation, enhancement, or preservation). Mitigation ratios are smaller when the compensatory wetland is created or re-established, and the ratios are largest for compensatory mitigation by wetland enhancement or preservation. While the COE and the WDOE usually agree on the kinds and amounts of compensatory mitigation required for a project, the local agencies frequently have additional requirements.

Northwest contacted various agencies, organizations, conservation groups, and trusts in the various basins (i.e., WRIAs) crossed by the project to identify potential mitigation opportunities. These specific agencies and organizations are listed in section 4.3.2.3. Northwest has collaborated with several of these groups to satisfy mitigation requirements for previous projects. Various mitigation banks are in the process of being developed in WRIAs 1, 7, and 8, and may have available credits within the time frame needed for this project. The use of a federal- and state-approved mitigation bank is dependent on a variety of factors.

Table 4.4.4-1 lists Northwest's estimated compensatory mitigation requirements for the loops for either enhancement/restoration projects or preservation projects by loop and county and identifies the WRIA in which the projects are proposed. As shown in table 4.4.4-1, Northwest proposes 33.7 acres of mitigation for enhancement/restoration projects or 202.7 acres of mitigation for preservation projects to compensate for the wetland impacts associated with the loops.

For the permanent fill associated with the aboveground facilities, Northwest proposes two wetland enhancement projects. For the impacts associated with the expansion of the Chehalis Compressor Station, Northwest proposes to enhance 2.6 acres of existing wetlands at the site. The enhancement project for this site was previously approved by Lewis County and the COE as mitigation for a Northwest project that was never constructed and, therefore, the plan was not implemented. For the impacts associated with the MLV to be installed at MP 1440.1 on one of the Evergreen Expansion Project loops, Northwest proposes to expand an existing enhancement project on the Skagit County Northern States property that Northwest completed as mitigation for the Evergreen Expansion Project. Northwest proposes to expand the existing project by about 0.3 acre. Skagit County has indicated that it would support such a project.

TABLE 4.4.4-1

Estimated Compensatory Mitigation Requirements for Enhancement/Restoration Projects and Preservation Projects for the Capacity Replacement Project [a]

WRIA	Sub Basin - Wau	Acres of Wetland Compensation Required for Enhancement/Restoration Projects [b]	Acres of Wetland Compensation Required for Preservation Projects [c]
Sumas Loop – Whatcom County			
WRIA 1 - Nooksack	Wau-12 Sumas River (Wetlands S-6 thru S-47) [d]	1.9	14.1
	Wau-77 Acme (Wetlands S-48 thru S-92)	8.2	48.5
Subtotal		10.1	62.6
Mount Vernon Loop - Snohomish County			
WRIA 5 - Stillaguamish	Wau-230 Lower Pilchuck Creek (Wetlands MV-1 to MV-9)	0.7	6.8
	Wau-272 Jordan (Wetlands MV-9 to MV-32A)	8.1	41.1
WRIA 7 - Snohomish	Wau-295 Pilchuck Lower (Wetlands MV-32.1 to MV-71)	3.7	21.9
Subtotal		12.5	69.8
Snohomish Loop - Snohomish and King Counties			
WRIA 8 - Cedar-Sammamish (Snohomish County)	Wau-368 North Lake Washington (Bear Creek Basin) (Wetlands SN-1 thru SN-6)	0.9	6.5
WRIA 8 - Cedar-Sammamish (King County)	Wau-368 North Lake Washington (Bear Creek Basin) (Wetlands SN-6 thru SN-43)	8.4	51.5
Subtotal		9.4	58.0
Fort Lewis Loop - Pierce and Thurston Counties			
WRIA 11 - Nisqually (Pierce County)	Wau-550 Muck Creek (Wetlands FL-12 thru FL-35A)	1.4	9.5
WRIA 11 - Nisqually (Thurston County)	Wau-571 Yelm (Wetlands FL-35B thru FL-53)	0.3	2.8
Subtotal		1.8	12.3
Total		33.7	202.7

[a] Acreage does not include compensatory mitigation proposed for wetland impacts at aboveground and abandoned facilities.
[b] Mitigation ratios vary and are based on WDOE recommendations, which depend on the wetland category and if the wetland impact is a permanent vegetation type conversion or a temporal impact that would be replanted.
[c] The compensation requirement is based on a mitigation ratio of 10:1 for all wetland impacts associated with forested or scrub-shrub wetlands. These wetlands would be restored except for the maintained, herbaceous corridor centered over the pipelines to facilitate corrosion and leak surveys.
[d] Impacts on wetlands S-1 to S-4A, B would only affect palustrine emergent/riverine wetlands and are, therefore, not included in this table.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

Northwest's proposed acreage estimates for compensatory mitigation have not yet been approved by the COE, the WDOE, and the local authorities nor have the specific locations of all of the mitigation projects been determined or approved. Additional details of Northwest's conceptual compensatory mitigation plan will be included in the section 404/section 401 public notice that the COE and the WDOE will jointly issue during the comment period for this draft EIS.[7]

Because Northwest's conceptual compensatory mitigation plan is still under development, **the FERC staff recommends that:**

- **Northwest continue to consult with the COE, the WDOE, and other applicable agencies on wetland mitigation requirements to finalize a conceptual compensatory wetland mitigation plan. The plan should include details regarding the amount, location, and types of mitigation proposed; specific performance standards to measure the success of the mitigation; and remedial measures, as necessary, to ensure that compensatory mitigation is successful. Northwest should file the conceptual compensatory wetland mitigation plan <u>before the end of the draft EIS comment period</u> for review and analysis in the final EIS.**

[7] The public notice will be available for public inspection at the COE's office in Seattle, Washington (call (206) 764-6960 for instructions) and at the WDOE's regional offices. If you reside in Whatcom, Skagit, Snohomish, or King Counties, you can access this notice at the WDOE's Northwest Regional Office in Bellevue by calling the Public Disclosure Coordinator at (425) 649-7190 or (425) 649-7239. If you reside in Pierce, Thurston, Lewis, Cowlitz, or Clark Counties, you can access this notice at the WDOE's Southwest Regional Office in Lacey by calling the Public Disclosure Coordinator at (360) 407-6365. The public notice will also be available on the WDOE's Internet website at http://www.ecy.wa.gov/programs/sea/nw_capacity_replacement.

4.5 VEGETATION

4.5.1 Existing Vegetation Resources

The Capacity Replacement Project would cross the Pacific Lowland Mixed Forest ecological province, which occupies a north-south depression between the Coastal Ranges and the Cascade Mountains (Bailey, 1995). The dominant vegetation type in this province is coniferous forest comprising western red cedar, western hemlock, and Douglas-fir. Additionally, deciduous trees such as big-leaf maple, Oregon ash, and black cottonwood may be interspersed. Prairie vegetation is also present within this province supporting open stands of Oregon white oak and Pacific madrone. Many of the native vegetation communities within this province have been altered by the expansion of urban, suburban, and agricultural areas. Within this ecological province, distinct vegetation cover types have been identified that occur within the project area as discussed below. Wetland vegetation communities that would be affected by the project are discussed in section 4.4.

Pipeline Facilities

The loops would cross eight distinct upland vegetation cover types. Table 4.5.1-1 lists these cover types; provides general descriptions, including common vegetative species typical of each community; and identifies the loops along which each cover type occurs. As shown in table 4.5.1.-1, seven of the cover types occur on all four loops. The eighth cover type, oak woodland, occurs only on the Fort Lewis Loop.

The primary vegetation cover type that would be crossed by the loops is shrubland. This community comprises about 35 percent of the vegetation cover types crossed by the loops. The next two most prevalent vegetation cover types are agricultural and landscape, each comprising 24 percent of the vegetation cover types crossed by the loops. The remaining vegetation cover types crossed by the loops are, in descending order of prevalence, mixed forest (8 percent), evergreen forest (4 percent), grassland/herbaceous (4 percent), deciduous forest (1 percent), and oak woodland (less than 1 percent).

Aboveground Facilities

Northwest would conduct modifications or expansions at five existing compressor station sites. The construction activities associated with the modifications at four of the compressor stations would occur within the fenceline of the facilities and would not affect vegetation. The proposed expansion of the Chehalis Compressor Station would temporarily affect vegetation by the use of extra workspace outside of the existing facility, and would permanently affect vegetation by the expansion of the facility footprint and for a gravel road to an existing water supply well. The vegetation that would be affected at the Chehalis Compressor Station comprises the grassland/herbaceous cover type. The expansion of the facility footprint would also affect wetland vegetation (see section 4.4.3).

The majority of the pig launchers/receivers and MLVs associated with the proposed loops would be collocated with other existing aboveground facilities. These facilities would require only a minor expansion in the footprint of the existing facility and would primarily affect the grassland/herbaceous cover type. Some shrubland cover type would also be affected. However, at three locations, two on the Sumas Loop at MPs 1467.9 (MLV) and 1461.8 (pig receiver and two MLVs), and one on the Mount Vernon Loop at MP 1408.8 (pig receiver and two MLVs), aboveground facilities would not be collocated with existing facilities and would permanently affect the shrubland and grassland/herbaceous cover types.

TABLE 4.5.1-1 **Vegetation Cover Types Occurring Along the Loops Associated with the Capacity Replacement Project**			
Vegetation Community	General Description	Common Species	Location of Occurrence (Loop)
Shrubland	Generally dominated by non-native species (primarily Scots broom). Shrub and brushy areas include transportation and utility corridors, clear-cut forests that have not been replanted, and disturbed areas adjacent to rural residential sites.	Scots broom, salal, blackberry, salmonberry, beaked hazelnut, wild rose, snowberry, alder saplings, willow	All
Landscape	Dominated by typical landscape vegetation including turf grass, ornamental shrubs, and trees.	Various landscape tree, shrub, and groundcover species that are generally non-native	All
Agricultural	Comprises cultivated species the majority of which are annual crops. Some perennial crops associated with vineyards, orchards, tree plantations, and plant nurseries would be affected.	Strawberries, rhubarb, melons, basil, parsley, dill, thyme, artichokes, beans, broccoli, Brussels spouts, cabbage, corn, lettuce, peppers, pumpkins, squash, tomatoes, turnips, zucchini, blueberry, raspberry, marionberry, grapes, tree and ornamental shrub nurseries, cottonwood plantations	All
Grassland/Herbaceous	Generally dominated by non-native species; however, this cover type also includes remnant native prairie species identified on Fort Lewis.	Colonial bentgrass, Kentucky bluegrass, annual bluegrass, reed canarygrass, Himalayan blackberry, evergreen blackberry, hairy cat's-ear, oxeye daisy, common St. John's-wort, English plantain, a variety of upland pasture grasses Prairie species: Roemer's fescue, common harebell, goldenrod, common bearberry, showy fleabane, Oregon sunshine	All
Evergreen Forest	Dominated by evergreen coniferous species with pockets of or scattered deciduous trees.	Douglas-fir, western hemlock, red alder, big-leaf maple	All
Mixed Forest	Consists of a mixture of evergreen and deciduous species and may include western red cedar.	Douglas-fir, western hemlock, red alder, big-leaf maple, vine maple, Oregon ash, beaked hazelnut, western red cedar	All
Deciduous Forest	Dominated by deciduous tree species.	Red alder, big-leaf maple, vine maple, beaked hazelnut	All
Oak Woodland	Deciduous woodlands dominated by Oregon white oak commonly found in small pockets in the southern drier portions of the loop, mostly within Fort Lewis.	Oregon white oak (Garry oak) typically with grassland/herbaceous understory species	Fort Lewis

The six MLVs that would be installed along the Evergreen Expansion Project loops would be collocated with existing aboveground facilities. The grassland/herbaceous cover type comprising grasses seeded as part of previous revegetation efforts would be the primary vegetation affected by the installation of these facilities. However, the installation of the MLV at MP 1440.1 would affect emergent wetland vegetation (see section 4.4.3).

Abandoned Facilities

The grassland/herbaceous cover type comprising grasses seeded as part of previous revegetation efforts would be the primary vegetation affected by the work conducted at the abandoned facilities.

Pipe Storage and Contractor Yards

Northwest has identified 13 pipe storage and contractor yards that would be used to facilitate construction activities. Most of these sites have been previously disturbed and no native vegetation would be affected by their use. Of the cover types that would be affected, 67.2 percent would be landscape, 19.4 percent would be shrubland, and 13.4 percent would be agricultural.

4.5.2 General Impact and Mitigation

Pipeline Facilities

The primary impact of the pipeline facilities on vegetation would be the cutting, clearing, and/or removal of existing vegetation within the construction work area. The degree of impact would depend on the type and amount of vegetation affected, the rate at which the vegetation would regenerate after construction, and the frequency of vegetation maintenance conducted during operation. Existing vegetation would be disturbed everywhere along the construction right-of-way. In general, the swath of vegetation that would be disturbed during construction would be 95 feet wide for the length of the Sumas, Mount Vernon, and Fort Lewis Loops and 60 to 75 feet wide for the Snohomish Loop. By working over its existing pipelines, Northwest would reduce the area of new disturbance and, therefore, would reduce impacts on vegetation. About 68 percent of the vegetation disturbance associated with the loops would be within Northwest's existing, previously disturbed right-of-way. The remaining 32 percent would create additional disturbance outside Northwest's existing right-of-way.

Secondary effects associated with disturbances to vegetation could include increased soil erosion (see section 4.2), increased potential for the introduction and establishment of invasive weedy species (see section 4.5.4), and a local reduction in available wildlife habitat (see section 4.6.1).

Northwest's proposed construction right-of-way, temporary extra workspaces, and access roads would disturb a total of about 878.3 acres of vegetation. Table 4.5.2-1 lists the amount of each vegetation cover type that would be affected by construction and operation of the loops. The most common vegetation cover types occurring along the loops, shrubland (307.4 acres), agricultural (209.5 acres), and landscape (207.2 acres) account for over 80 percent of the vegetation that would be cleared or affected by construction. The next most common cover types that would be disturbed are mixed forest (71.2 acres), evergreen forest (36.7 acres), and grassland/herbaceous (35.4 acres). Disturbance to deciduous forest and oak woodland cover types would total 10.7 acres and 0.4 acre, respectively.

TABLE 4.5.2-1

Acres of Vegetation Cover Types Affected by the Loops Associated with the Capacity Replacement Project [a]

Facility	Shrubland		Agricultural		Landscape		Mixed Forest		Evergreen Forest		Grassland/ Herbaceous		Deciduous Forest		Oak Woodland		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
Sumas Loop																		
Existing Pipeline Right-of-Way	55.5	55.5	73.3	73.3	20.3	20.3	3.9	3.9	0.3	0.3	0.8	0.8	1.7	1.7	0.0	0.0	155.7	155.7
New Permanent Right-of-Way	0.4	0.4	0.3	0.3	0.6	0.6	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	1.4
Construction Right-of-Way	7.7	0.0	18.8	0.0	5.1	0.0	8.1	0.0	1.4	0.0	0.0	0.0	0.5	0.0	0.0	0.0	41.7	0.0
Temporary Extra Workspace	8.8	0.0	25.4	0.0	4.3	0.0	6.8	0.0	0.7	0.0	0.0	0.0	0.8	0.0	0.0	0.0	46.7	0.0
Access Roads	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0
Sumas Loop Subtotal	72.4	55.9	119.2	73.6	30.1	20.8	18.8	3.9	2.5	0.3	0.8	0.8	3.0	1.7	0.0	0.0	246.8	157.0
Mount Vernon Loop																		
Existing Pipeline Right-of-Way	102.8	102.8	16.5	16.5	35.5	35.5	6.7	6.7	4.4	4.4	4.9	4.9	1.5	1.5	0.0	0.0	172.3	172.3
New Permanent Right-of-Way	2.1	2.1	2.4	2.4	1.5	1.5	0.1	0.1	0.4	0.4	0.0	0.0	0.3	0.3	0.0	0.0	6.8	6.8
Construction Right-of-Way	13.2	0.0	1.8	0.0	7.8	0.0	11.0	0.0	7.4	0.0	0.9	0.0	1.0	0.0	0.0	0.0	43.1	0.0
Temporary Extra Workspace	3.4	0.0	9.7	0.0	8.4	0.0	4.9	0.0	3.7	0.0	1.6	0.0	1.0	0.0	0.0	0.0	32.6	0.0
Access Roads	0.1	0.0	0.8	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	1.2	0.1
Mount Vernon Loop Subtotal	121.6	104.9	31.2	18.9	53.4	37.1	22.7	6.8	16.0	4.8	7.4	4.9	3.8	1.9	0.0	0.0	256.0	179.1
Snohomish Loop																		
Existing Pipeline Right-of-Way	32.3	32.3	0.9	0.9	44.2	44.2	5.2	5.2	1.1	1.1	0.8	0.8	0.6	0.6	0.0	0.0	85.1	85.1
New Permanent Right-of-Way	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Construction Right-of-Way	4.2	0.0	0.4	0.0	9.0	0.0	6.9	0.0	2.6	0.0	0.3	0.0	0.5	0.0	0.0	0.0	23.7	0.0
Temporary Extra Workspace	1.0	0.0	0.0	0.0	6.8	0.0	2.0	0.0	1.6	0.0	0.0	0.0	0.2	0.0	0.0	0.0	11.6	0.0
Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snohomish Loop Subtotal	37.5	32.3	1.3	0.9	59.9	44.2	14.1	5.2	5.3	1.1	1.1	0.8	1.2	0.6	0.0	0.0	120.4	85.1

TABLE 4.5.2-1 (cont'd.)

Acres of Vegetation Cover Types Affected by the Loops Associated with the Capacity Replacement Project [a]

Facility	Shrubland		Agricultural		Landscape		Mixed Forest		Evergreen Forest		Grassland/ Herbaceous		Deciduous Forest		Oak Woodland		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
Fort Lewis Loop																		
Existing Pipeline Right-of-Way	62.2	62.2	39.8	39.8	47.3	47.3	4.6	4.6	5.9	5.9	20.8	20.8	1.2	1.2	0.2	0.2	181.8	181.8
New Permanent Right-of-Way	2.0	2.0	0.3	0.3	0.2	0.2	0.9	0.9	0.9	0.9	0.5	0.5	0.1	0.1	0.0	0.0	4.8	4.8
Construction Right-of-Way	8.4	0.0	10.5	0.0	11.2	0.0	5.9	0.0	5.5	0.0	4.0	0.0	1.1	0.0	0.2	0.0	46.8	0.0
Temporary Extra Workspace	3.3	0.0	7.2	0.0	5.0	0.0	4.3	0.0	0.6	0.0	0.8	0.0	0.3	0.0	0.0	0.0	21.4	0.0
Access Roads	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Fort Lewis Loop Subtotal	75.9	64.1	57.8	40.1	63.8	47.6	15.7	5.4	12.9	6.8	26.1	21.3	2.7	1.3	0.4	0.2	255.0	186.8
Pipeline Total																		
Existing Pipeline Right-of-Way	252.9	252.9	130.5	130.5	147.2	147.2	20.3	20.3	11.7	11.7	27.2	27.2	5.0	5.0	0.2	0.2	594.8	594.8
New Permanent Right-of-Way	4.5	4.5	3.0	3.0	2.2	2.2	1.0	1.0	1.3	1.3	0.5	0.5	0.4	0.4	0.0	0.0	13.0	13.0
Construction Right-of-Way	33.5	0.0	31.5	0.0	33.0	0.0	31.9	0.0	16.9	0.0	5.3	0.0	3.0	0.0	0.2	0.0	155.3	0.0
Temporary Extra Workspace	16.5	0.0	42.3	0.0	24.4	0.0	18.0	0.0	6.6	0.0	2.4	0.0	2.3	0.0	0.0	0.0	112.4	0.0
Access Roads	0.1	0.0	2.2	0.0	0.4	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.1	<0.1	0.0	0.0	2.9	0.2
Pipeline Total	307.4	257.3	209.5	133.5	207.2	149.6	71.2	21.3	36.7	13.1	35.4	27.7	10.7	5.4	0.4	0.2	878.3	608.0
	(35 %)	(42%)	(24%)	(22%)	(24%)	(25%)	(8%)	(4%)	(4%)	(2%)	(4%)	(5%)	(1%)	(1%)	(<1%)	(<1%)	(100%)	(100%)

[a] Footprints for each facility were overlaid onto a digitized map of the vegetation cover types and the acres of the facilities within each vegetation cover type were calculated using a GIS system. Total acreage is equal to the sum of the acres of upland vegetation types affected. Total acres do not include wetlands, open water, and non-vegetated areas.

Const. = Construction.

Oper. = Operation.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

After cleanup and reseeding of the right-of-way, the agricultural, grassland/herbaceous, and landscape cover types would typically regenerate quickly and impacts on these vegetation cover types would be short term. Cultivated areas are regularly disturbed, generally receive ample water through irrigation if necessary, and would quickly reestablish on the right-of-way following replanting by the landowners; however, a small portion of the agricultural cover type (about 5 percent) also includes perennial-type crops associated with orchards, vineyards, tree plantations, and plant nurseries. Impacts on these perennial-type crops would be longer term because of the time needed to establish the crops and in some cases (i.e., orchards and tree plantations) the impacts would be permanent if the crop is restricted from being grown over the permanent easement. Impacts on the native grassland/herbaceous cover types including the remnant stands of prairie located on the Fort Lewis Loop, would likely recover quickly considering the ample annual rainfall and long growing season that occurs within the project area. Impacts on this cover type during operation of the loops would be minimal because it would be allowed to recover following construction, and right-of-way maintenance activities would not significantly alter this cover type. The landscape cover type would be replanted within the temporary construction right-of-way immediately after construction as part of site-specific plans and agreements with landowners with the exception of large-scale trees and shrubs, which due to availability may not be able to be replaced with ones of comparable sizes. Additional information about impacts on and potential mitigation measures for residential areas, including landscaping, is presented in section 4.8.3.

Longer-term impacts would occur on the shrubland cover type because these areas would be reseeded only with herbaceous species and the shrub species that would recolonize the right-of-way from adjacent areas would require several years to reestablish their woody canopy. Permanent impacts would occur on the shrubland cover type that is currently present within the permanent easement because the species would not regenerate the woody canopy present before construction due to periodic right-of-way maintenance activities. Northwest's ECR Plan allows for maintenance activities, including annual vegetation clearing over a 10-foot-wide area centered over the pipeline and vegetation clearing over its 60- to 75-foot-wide permanent easement (in non-riparian areas) every 3 years.

Similar to the shrubland cover type, impacts on the forest cover types, (i.e., mixed forest, evergreen forest, deciduous forest, and oak woodland) would be considered long term because of the time required to restore the woody vegetation to its preconstruction condition. Impacts associated with construction and operation would be greatest on these cover types due to the change in structure and environment caused by the removal of the large, mature tree canopy over the width of the construction right-of-way. Permanent impacts would be greatest over the maintained portion of the right-of-way, totaling about 40 acres for these forested cover types. A 10-foot-wide area centered over the pipeline would be maintained treeless on an annual basis, which would result in the conversion of the forest cover types in this area to a grassland/herbaceous cover type. Additionally the clearing of Northwest's 60- to 75-foot-wide permanent easement as frequently as every 3 years would prevent forest overstory vegetation within that area from attaining a mature size and thus would permanently alter the nature of the cover type. The clearing of trees from the construction right-of-way could also affect the remaining trees along the edge of the right-of-way. Trees located on the edge of the right-of-way may be subject to mechanical damage to trunks and branches and root impacts from soil disturbance and compaction, all of which may result in the decreased health and viability of the remaining edge trees. Edge trees that were located within a dense stand of trees before construction may lack stability following removal of adjacent supporting trees, which may result in increased tree failures.

The impacts on vegetation described above are based on the successful completion of the three proposed HDD crossings and the use of the wet open-cut crossing method at Pilchuck Creek and the Nisqually River. If the HDDs were not successful, Northwest proposes to construct the crossings using the wet open-cut method (see sections 2.3.2 and 4.3.2.3). Use of the wet open-cut crossing method would increase impacts on upland vegetation affected by the loops. A total of 11.8 acres at the North Fork

Nooksack River, 6.3 acres at the North Fork Stillaguamish River, and 16.2 acres at the South Fork Stillaguamish River would be affected by an open-cut crossing of these rivers. Agricultural vegetation would account for 40 percent of the vegetation affected if these three river crossings would be open cut. Shrubland would account for 23 percent and the deciduous forest cover type would account for 20 percent of the vegetation affected. The landscape and mixed forest cover types would account for 9 and 8 percent, respectively, and the evergreen forest would account for less than 1 percent of the vegetation affected. A total of 26.7 acres of riparian vegetation would be affected by the open-cut crossings (see section 4.3.2.3). Based on a review of the site-specific crossing plans for Pilchuck Creek and the Nisqually River, if Northwest were to install those crossings using the alternative aerial span method, the impact on vegetation would be similar to the impact of the proposed wet open-cut method.

To reduce impacts on vegetation within the construction and permanent rights-of-way and improve revegetation potential, Northwest would implement the January 17, 2003 version of the FERC staff's Plan (see Appendix E). In addition, Northwest would implement the measures for upland construction that are included in its ECR Plan (see Appendix G). Northwest's ECR Plan incorporates many of the mitigation measures outlined in the FERC staff's Plan as well as agency-recommended revegetation and erosion control procedures. Specifically, Northwest would implement the following measures:

- Segregate topsoil over the trenchline. Additionally, Northwest would mow the construction right-of-way and leave the cut vegetation in place, to provide a visual barrier between trench spoil and the existing topsoil layer, which would aid in preventing soil mixing during cleanup operations. These treatments would protect topsoil resources, which would aid in revegetation of the right-of-way by providing a viable seed bed and protecting the existing seed bank.

- Provide temporary erosion control measures, such as mulch and temporary slope breakers, during construction and implement permanent erosion control measures (e.g., permanent slope breakers, trench breakers, and revegetation of the right-of-way) following construction. Erosion control measures would reduce the loss of critical topsoil, which would improve revegetation potential.

- Recontour disturbed areas as needed. The contours would be reshaped after backfilling of the trench and replacement of the topsoil to restore preconstruction contours and natural drainage patterns. This treatment would reduce erosion and the loss of topsoil, which would improve revegetation potential.

- Test for soil compaction following construction in agricultural and residential areas and where necessary compaction would be relieved by using a harrow plow or other deep tillage equipment. This treatment would aid revegetation by preparing a viable seedbed.

- Monitor the revegetation of the right-of-way the year following construction and again during the second growing season. In non-agricultural lands, revegetation would be considered successful if upon visual survey, the density and cover are similar to adjacent undisturbed lands. In agricultural areas, crop monitoring would be conducted to determine if additional restoration is required. Additional revegetation efforts would be conducted until revegetation is deemed successful.

Following construction, Northwest would fertilize all upland areas using the broadcast seeding method or, where hydroseeding would be conducted, the fertilizer would be incorporated into the hydroseeding slurry. All disturbed areas would be seeded within 6 working days after final grading is complete. Seed would be applied using the drill seeding, hydroseeding, or broadcast seeding methods as required by the FERC staff's Plan. Northwest has consulted with the NRCS and the WDNR and has included their recommendations for fertilizer, seed species, and application rates in its ECR Plan. Table 4.5.2-2 lists the seed species, fertilizer, and application rates prescribed for revegetation of the right-of-way. In addition to the species listed in table 4.5.2-2, Northwest would replant forested areas in accordance with Washington's Forest Practice Rules Chapter 222-WAC and in consultation with individual landowners. In general, Northwest would replant forested areas with tree seedlings placed at 12-foot spacings (302 seedlings per acre). Douglas-fir would be the primary species planted because it is the dominant species that would be cleared but western hemlock and western red cedar may also be included where appropriate. Forest plantings would be considered successful if a minimum of 190 seedlings per acre survive 3 years after planting. Northwest would utilize standard silvicultural reforestation criteria for its maintenance, monitoring, and reporting practices and would comply with the requirements issued by the WDNR through its Forest Practices Act review.

As discussed in section 4.2.2, Northwest requested two variances to the FERC staff's Plan for incorporation into its ECR Plan that would affect vegetation. Northwest proposes to conduct trenchline-only topsoil segregation, which is a variance from the FERC staff's Plan (section IV.B.1), which specifies that topsoil segregation should be conducted either over the trench and spoil storage areas, or over the entire construction right-of-way. A stipulation was added to this variance request by the WDOE regarding suitable barriers to be used in wetlands to accomplish topsoil segregation. In addition, Northwest proposes to spread up to 3 tons of wood chips per acre during restoration activities. This is also a variance from the FERC staff's Plan (section IV.F.1.3.e), which specifies that no more than 1 ton of wood chips per acre should be used. The WDOE recommends allowing Northwest to spread up to 3 tons of wood chips per acre with several stipulations. The FERC staff believes Northwest's proposed measures would adequately protect topsoil and, if the WDOE's stipulations are adhered to, would not hinder revegetation of the right-of-way. In section 4.2.2, the FERC staff has recommended that Northwest file a revised ECR Plan that incorporates the WDOE's stipulations regarding barriers for topsoil segregation in wetlands and mulch and the stipulation that the variances are not acceptable if the landowner objects.

A scoping comment was received from a landowner expressing concern about his certified organic farm, requesting that only certified organic seed be applied and that no chemical fertilizer be applied. The landowner could negotiate with Northwest during the easement process to have specific revegetation treatments conducted on his property that would meet his requirements. Several landowners expressed concern about the removal of large trees (including old growth forest) and the size and type of replacement species. Where tree loss within the construction right-of-way cannot be avoided, specific revegetation treatments and/or compensation for the loss of vegetation could be negotiated with Northwest during the easement process. Additional information about the easement process and impacts on residential areas associated with the removal of trees is presented in sections 4.8.2 and 4.8.3, respectively. Additional information on old growth forest affected by the project is included in section 4.5.3.

A representative from Fort Lewis requested information regarding the removal of timber on the military reservation. Northwest would cut and dispose of timber on Fort Lewis according to specifications as provided by the Fort Lewis Forest Administrator.

Aboveground Facilities

The expansion of the Chehalis Compressor Station would affect a total of 7.7 acres of vegetation. The majority of the vegetation (5.1 acres) consists of the grassland/herbaceous cover type. About 2.6 acres of wetland vegetation would also be affected by the expansion (see section 4.4.3). Of the 7.7 acres, about 0.9 acre of the grassland/herbaceous cover type and 0.6 acre of wetland vegetation would be permanently affected by operation of the expanded facility and a gravel road to an existing water supply well.

The pig receivers and MLVs not collocated with other aboveground facilities (MPs 1467.9, 1461.8, and 1408.8) would be constructed within Northwest's existing right-of-way but would permanently convert the vegetation within the right-of-way because the sites would be graveled and fenced. The MLV at MP 1467.9 and the pig receiver and MLVs at MP 1461.8 would permanently convert about 0.2 and 0.3 acre, respectively, of the shrubland cover type to an industrial use. The pig receiver and MLVs at MP 1408.8 would permanently convert about 0.2 acre of the grassland/herbaceous cover type to an industrial use.

The pig launcher and MLV at the beginning of the Sumas Loop (MP 1484.5) would be located within the existing Sumas Compressor Station and would not affect any additional vegetation. The other two pig launchers and two of the pig receivers would be collocated with other aboveground facilities within Northwest's existing right-of-way but would require an expansion of the existing facilities, and the permanent conversion of vegetation within the pipeline right-of-way. The pig launcher and MLV at MP 1393.9 would require the expansion of an existing pig launcher/receiver site and would permanently convert less than 0.1 acre of grassland/herbaceous cover type. The pig receiver and MLV at MP 1382.0 would require the expansion of an existing MLV site and would permanently convert about 0.3 acre of grassland/herbaceous cover type. The pig launcher at MP 1338.1 would require the expansion of an existing meter station and would permanently convert about 0.2 acre of grassland/herbaceous cover type. The pig receiver and MLVs located at MP 1315.6 would require the expansion of an existing pig launcher/receiver site and would permanently convert less than 0.1 acre of shrubland cover type.

The seven remaining MLVs (MPs 1472.3, 1431.3, 1427.6, 1411.3, 1387.5, 1335.1, and 1324.7) would be collocated with existing facilities within Northwest's existing permanent right-of-way but would require an expansion of the facilities. This expansion would permanently convert a total of about 1.1 acres of grassland/herbaceous cover type within the permanent right-of-way.

The installation of six MLVs along the existing Evergreen Expansion Project loops would affect a total of 1.7 acres of land consisting primarily of the grassland/herbaceous cover type. However, all six MLVs would be collocated with existing aboveground facilities and the construction footprints would overlap these non-vegetated sites; therefore, impacts on vegetation would only occur on a small portion of the 1.7 acres affected. Installation of these facilities would not permanently affect any additional vegetation with the exception of the MLV at MP 1440.1, which would permanently affect less than 0.1 acre of emergent wetland vegetation.

Two permanent access roads would be constructed to access aboveground facilities. One access road would be constructed on the Mount Vernon Loop to access the site of the pig receiver and two MLVs at MP 1408.8 and would permanently affect about 0.1 acre of the deciduous forest cover type. A second permanent access road would be constructed on the Fort Lewis Loop to access the site of the pig receiver and two MLVs at MP 1315.6 and would permanently affect about 0.2 acre of the landscape cover type.

TABLE 4.5.2-2

Revegetation Seed Mixtures for the Capacity Replacement Project

Mixture/Type/Common Name	Botanical Name	Rate (lbs./acre) [a]
Seed Mixture 1 – Upland Sites for all Loops		
Perennial Grasses		
Bentgrass	*Agrostis spp.*	5
Fine or creeping red fescue	*Festuca rubra*	10
Tall fescue	*Festuca arundinacea*	10
Orchardgrass	*Dactylis glomerata*	7
Annual or Italian ryegrass	*Lolium multiflorum*	10
Timothy	*Phleum pratense*	2
Legumes		
Red clover	*Trifolium pratense*	4
White clover	*Trifolium repens*	4
Birdsfoot trefoil	*Lotus corniculatus*	2
Annual Cereal Grains and Legumes		
Oats	*Avena sativa*	20
Seed Mixture 2 – Upland Pasture and Hayland Sites for all Loops		
Perennial Grasses		
Tall fescue	*Festuca arundinacea*	8
Orchardgrass	*Dactylis glomerate*	25
Perennial or English ryegrass	*Lolium perenne*	10
Legumes		
Red clover	*Trifolium pratense*	3
White clover	*Trifolium repens*	5
Seed Mixture 3 – Wet Pasture and Hayland Sites for all Loops		
Perennial Grasses		
Tall fescue	*Festuca arundinacea*	30
Perennial or English ryegrass	*Lolium perenne*	20
Legumes		
Alsike clover	*Trifolium hybridum*	4
White clover	*Trifolium repens*	4
Birdsfoot trefoil	*Lotus corniculatus*	2
Seed Mixture 3a - Disturbed Emergent Wetland Sites for all Loops		
Grasses		
Annual ryegrass	*Lolium multiflorum*	20
Creeping bentgrass	*Agrostis stolonifera*	0.4
Garrison creeping foxtail	*Alopercurus arundianceus*	3
Meadow foxtail	*Alopercurus pratensis*	2
Red fescue	*Festuca rubra*	2
Tufted hairgrass	*Deschampsia caespitosa*	0.5
American sloughgrass [b]	*Beckmannia syzigachne*	2
Western mannagrass	*Glyceria occidentalis*	3
Seed Mixture 4 – Native Wetland Sites for all Loops [c]		
Grasses		
Annual ryegrass	*Lolium multiflorum*	20
Quick Guard [d]	*Triticale* 'Quick Guard'	40
Fine or creeping red fescue	*Festuca rubra*	5
Tufted hairgrass	*Deschampsia caespitosa*	2

TABLE 4.5.2-2 (cont'd)

Revegetation Seed Mixtures for the Capacity Replacement Project

Mixture/Type/Common Name	Botanical Name	Rate (lbs./acre) [a]
Reed mannagrass [b]	*Glyceria grandis*	2
Meadow barley [b]	*Hordeum brachyantherum*	5
Water foxtail [b]	*Aleopecurus geniculatus*	2
Rice cut-grass [b]	*Leersia oryzoides*	2
Springbank clover [b]	*Trifolium wormskjoldii*	2
Seed Mixture 5 - WDNR Erosion Control Mix for all Upland Right-of-Way Areas on the Mount Vernon Loop [e]		
Creeping red fescue	*Festuca rubra*	10
Perennial ryegrass 'Alf'	*Lolium perenne*	10
Colonial bentgrass 'Highland'	*Agrostis spp.*	5
White Dutch clover	*Trifolium pratense*	4
Fertilizer (16-16-16) [f]		200

[a] The seeding rate is based on broadcast seeding. The rate would be similar if hydroseeding is conducted unless adjustments are recommended by the hydroseeding company based on the type of equipment utilized. If drill seeding is conducted, the rate would be reduced by half.

[b] These species may be included in the seed mixture depending upon commercial availability.

[c] Blue wildrye would be added to the mixture on Fort Lewis in wetlands FL-23 and FL-24 at Muck Creek and South Fork Muck Creek at MPs 1332.4 and 1332.1.

[d] Quick Guard is a sterile (i.e., non-reseeding) hybrid of wheat and rye.

[e] Where seeding is conducted via hydroseeding, the WDNR recommends the following slurry mixture ratios: 50 gallons water; 20 pounds of wood fiber mulch; 4 pounds of fertilizer (16-16-16-3 = nitrogen: potassium: phosphorus: sulfur); and 1 pound of seed mix.

[f] This fertilizer would not be applied in those areas where wood chips would be composted on the right-of-way. A site-specific fertilization rate, based on soil testing would be applied in those areas. Where fertilizer is applied by broadcast methods, the fertilizer would be incorporated into the top 2 inches of soil. Where fertilizer is applied by hydroseeding, the fertilizer would be applied with the hydroseeding slurry. Fertilizer would not be applied in wetlands.

Abandoned Facilities

Approximately 14.4 acres within Northwest's existing easement would be temporarily affected by work associated with the abandoned facilities. Of the 14.4 acres, about 0.2 acre of emergent wetland vegetation and less than 0.1 acre of riverine wetland vegetation would be temporarily affected by the abandonment activities (see section 4.4.1). Impacts associated with the majority of the abandonment activities would occur within the grassland/herbaceous cover type; however, more than half of these sites coincide with existing aboveground facilities where no vegetation is present. Therefore, impacts on vegetation would only occur on a portion of the 14.4 acres affected. No permanent impacts on vegetation would occur as a result of these activities.

Pipe Storage and Contractor Yards

The temporary use of 13 pipe storage and contractor yards would affect 128.4 acres of the landscape vegetation cover type, 36.7 acres of the shrubland cover type, and 25.5 acres of the agricultural cover type. No permanent impacts on vegetation would result from the use of these sites.

4.5.3 Vegetation Communities of Special Concern or Value

The WDFW has identified and mapped 14 Priority Habitats, 3 of which, the Oregon white oak, the prairie steppe, and the riparian priority habitats, would be crossed by the Capacity Replacement Project. Priority Habitats, as defined by the WDFW, exhibit one or more of the following attributes:

- comparatively high fish and wildlife density;
- comparatively high fish and wildlife species diversity;
- important fish and wildlife breeding habitat;
- important fish and wildlife seasonal ranges;
- important fish and wildlife movement corridors;
- limited availability;
- high vulnerability to habitat alteration; and/or
- unique or dependent species.

Additionally, Thurston County has included native prairie and oak woodlands in its Critical Areas Ordinance.

The Capacity Replacement Project would affect about 0.4 acre of Oregon white oak woodland habitat during construction of the Fort Lewis Loop, of which about 0.2 acre would be permanently affected. Northwest would survey oak trees within the right-of-way on Fort Lewis before construction. The oak trees that could be preserved would be flagged for avoidance. Oak trees that would be removed due to construction would be replaced at a 1:1 ratio with oak trees either in 5-gallon containers or of 1-inch caliper planting stock. The trees would be planted within the temporary construction right-of-way in areas that would not be affected by right-of-way maintenance activities. Any trees that do not survive would be replanted. Northwest would contract with the Nature Conservancy to perform the oak tree replacement as well as monitoring and replanting if necessary. Northwest would mitigate the removal of trees on private property as requested in landowner agreements. Additional information on the removal of trees in residential areas is presented in section 4.8.3.

About 6.8 acres of native prairie vegetation (referred to as the Thirteenth Division Prairie) would be affected on Fort Lewis. To reduce impacts on these areas, Northwest consulted with Fort Lewis and the Nature Conservancy and developed a site-specific revegetation plan for the native prairie crossed on the military reservation. The plan divides the prairie cover type into three categories including high quality prairie, lower quality prairie, and floodplain prairie. The plan also prescribes specific treatments for each category, including planting both seeds and plugs of native grass and forb species. Northwest would conduct topsoil segregation over the trenchline in prairie areas between MPs 1331.8 and 1332.7 to preserve the native seedbank. Two special status species, white-top aster (a federal species of concern and a state sensitive species) and small flowered trillium (a state sensitive species), were identified within the native prairie areas during preconstruction surveys. Because white-top asters would be disturbed by construction activities, Northwest would reduce impacts on this species by either salvaging individual plants or collecting seed from the plants to be used during revegetation of the high quality prairie vegetation. All of the small flowered trillium plants would be located outside the right-of-way and would be avoided by construction. Northwest would contract with the Nature Conservancy-South Puget Sound Prairie Restoration Project to implement the revegetation plan as well as monitor restoration efforts and develop any necessary remedial actions.

Riparian vegetation would be affected on each loop associated with the project. The riparian vegetation that would be affected consists of both upland and wetland species of riparian shrub and forest vegetation as well as emergent wetland vegetation. Similar to the forest cover types, impacts on riparian shrub and forest vegetation would be considered long term because of the time required to restore riparian vegetation to its preconstruction condition. Impacts on riparian emergent wetland vegetation would be temporary (see section 4.4.2). About 72.9 acres of riparian vegetation would be temporarily affected during construction, including 30.2 acres of riparian shrub vegetation, 27.0 acres of emergent wetland vegetation, and 15.7 acres of riparian forest vegetation. Impacts associated with construction and operation would be greatest on riparian forest due to the change in structure and environment caused by the removal of the large, mature tree canopy over the width of the right-of-way. Permanent impacts on riparian vegetation would be greatest over the maintained portion of the right-of-way, totaling about 49.3 acres (23.0 acres of riparian shrub vegetation, 21.2 acres of emergent wetland vegetation, and 5.1 acres of riparian forest vegetation) for the project. A 10-foot-wide area centered over the pipeline would be maintained treeless on an annual basis, which would result in the conversion of the riparian forest community in this area to an herbaceous community. Annual maintenance in areas of riparian shrub vegetation would have a similar effect. Annual maintenance in emergent wetlands is generally not required because these areas would naturally exist in an open and herbaceous state.

Northwest would reduce impacts on riparian vegetation by utilizing the HDD method at three waterbody crossings. To further reduce impacts on riparian vegetation within the construction and permanent rights-of-way, Northwest would implement the measures included in the FERC staff's Procedures (see section 4.3.2, section 4.4, and Appendix F) and its ECR Plan (see Appendix G). In addition, Northwest would plant native riparian tree and shrub vegetation at all fish bearing streams and at other streams where riparian vegetation was present before construction. Plantings would be conducted up to 50 feet from the streambank using the species listed in table 4.5.3-1. In certain areas, the current land use (e.g., agriculture) would limit the planting area to less than 50 feet. In these situations, Northwest would plant the available area. Northwest would limit its annual maintenance activities in these areas to a 10-foot–wide area centered over the pipeline. Any trees greater than 15 feet in height and within 15 feet of the pipeline would be removed every 3 years. This mitigation would exceed the mitigation measures required by the FERC staff's Procedures, which require riparian revegetation and maintenance restrictions within 25 feet of a waterbody. Northwest adopted the 50-foot width using the WDNR's definition of a "riparian management zone, core zone" for western Washington included in the WDNR's Forest Practice Rules (Chapter WAC 222-16-010). In addition, the COE has indicated that it would require compensatory mitigation for impacts on riparian vegetation regardless of whether the vegetation affected is upland or wetland.

TABLE 4.5.3-1 **Riparian Revegetation Plantings**		
Species	Type/Size of Plant Material	Spacing (feet on center)
Shrubs		
Wet Ground		
Red-osier dogwood	36 inch cuttings	2
Pacific willow	36 inch cuttings	2
Sitka willow	36 inch cuttings	2
Moist Ground		
Indian plum	1 gallon containers	6
Pacific ninebark	1 gallon containers	8
Red elderberry	1 gallon containers	8
Vine maple [a]	1 gallon containers	6
Salmonberry	1 gallon containers	4
Clustered wild rose	1 gallon containers	6
Scouler willow	1 gallon containers	8
Dry Ground		
Snowberry	1 gallon containers	4
Service-berry	1 gallon containers	8
Ocean spray	1 gallon containers	8
Hazelnut	1 gallon containers	8
Trees		
Wet Ground		
Oregon ash	1 gallon containers	10
Sitka spruce	2 gallon containers	15
Western red cedar	2 gallon containers	12
Black cottonwood [a]	1 gallon containers	10
Quaking aspen	1 gallon containers	10
Moist Ground		
Cascara	1 gallon containers	10
Western red cedar	2 gallon containers	12
Western hemlock	1 gallon containers	12
Black cottonwood [a]	1 gallon containers	10
Dry Ground		
Douglas-fir	1 gallon containers	12
Big-leaf maple [a]	2 gallon containers	15

[a] These fast-growing native species may be used at selected stream crossings where rapid tree canopy development is desired to provide shading over waterbodies supporting fisheries. Red alder and river birch may also be utilized at these locations.

The WDFW also identifies old growth forest as a Priority Habitat. Northwest utilized the WDFW's Priority Habitats and Species Database with its GIS data to determine which stands of old growth forest identified by the WDFW would be affected by the project. Northwest then examined color aerial photographs of these areas taken during February 2004 to determine the current status of the stands. Many of the parcels defined by the WDFW as old growth forest had been altered by timber harvest and/or rural developments. Northwest also evaluated timber that would be harvested during construction of the Capacity Replacement Project. Based on these evaluations, Northwest states that none of the forested stands or individual trees that would be affected by the project are categorized as old growth.

A scoping comment was received from a landowner concerned that trees on her property died following the installation of a fiber optics cable using the HDD method. The use of the HDD method to install the loops at the three waterbody crossings would require that the drill extend to depths beyond the typical rootzone of a tree in order to achieve the necessary bend in the pipe. Therefore, an HDD is unlikely to affect trees located along the drill path.

4.5.4 Noxious Weeds and Other Invasive Plants

Noxious weeds and other invasive plants are non-native, undesirable native, or introduced species that are able to exclude and out compete desirable native species, and thereby decrease overall species diversity. Noxious weeds often invade and persist in areas after disturbance (e.g., after construction of a pipeline) and can hinder restoration. Other aggressive plant species, both native and introduced, may also out compete desirable native and other beneficial species. Noxious weeds are addressed by Executive Order 13112 (February 1999). Executive Order 13112 directs federal agencies to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species cause. The order further specifies that a federal agency shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless it has determined that the benefits of such actions outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions.

Washington has noxious weed laws that require counties and/or local weed districts to develop and oversee local weed management programs to control the spread of noxious weeds according to state laws. The Washington State Noxious Weed Control Board determines which plants are placed on the Washington State Noxious Weed List. Noxious weeds in Washington are placed into one of three categories. Class A weeds are non-native species with a limited distribution in the state and require eradication by state law. Class B weeds are species established in some regions of Washington, but are of limited distribution or not present in other regions of the state and treatment requirements vary between the different regions. Class C weeds are species already widely established in Washington or are of special interest to the state's agricultural industry. Control of Class C weeds may be required if desired by the county.

Northwest has consulted with the NRCS, the WDNR, and local counties regarding noxious weeds and Northwest’s proposed treatments and states that it has included their recommendations in its ECR Plan. Northwest would implement the measures in its ECR Plan to prevent the spread of noxious weeds during construction and control noxious weeds that develop after construction. Specifically, Northwest proposes the following measures:

- Equipment used on the project would be required to be cleaned before entering each county. Prior to transport to the construction right-of-way, all equipment would be inspected to verify that it is clean of potential weed seed sources and propagules (i.e., soil, vegetation, seeds, roots, and rhizomes).

- Before construction, the right-of-way would be surveyed for the presence of Class A weeds listed on the counties’ noxious weed lists.

- In areas where noxious weeds are identified, cleared vegetation and segregated topsoil would be stored adjacent to, and restored to, the areas from which they were removed.

- Equipment used to clear the right-of-way in areas where noxious weeds are identified would be cleaned either manually or by the use of compressed air.

- Materials used for erosion control (i.e., straw) would be certified to be weed free.

- Where weed control is necessary, Northwest would employ mechanical (e.g., mowing, discing) or chemical methods to prevent the spread of noxious weeds.

- Following construction, areas where noxious weeds were identified would be mapped and would be specifically monitored for the development of noxious weeds. Northwest would control noxious weed infestations that develop after construction using mechanical (e.g., mowing, discing) or chemical methods. Chemical applications would be made in accordance with the label restrictions and all applicable laws and restrictions.

The FERC staff believes the measures proposed above may not adequately prevent the spread of noxious weeds. Northwest proposes to only survey for Class A weeds; however, the state requires the control of certain Class B weeds in each of the counties crossed by the loops. Additionally, each county may designate certain Class B or C weeds as requiring control. By surveying for only Class A weeds, there is the potential that Class B or C weeds that require control would be spread during construction and left untreated during operation of the loops. In addition, Northwest's proposal to stockpile cleared vegetation and segregated topsoil in areas where noxious weeds are identified and to only clean clearing equipment following clearing work in these areas may not adequately prevent the spread of noxious weeds during construction. Because topsoil would be segregated only over the trenchline, there is the potential for other equipment traveling or working on the right-of-way to come into contact with noxious weed propagules before the trench spoil is placed over the working side (see table 4.2.2-1) and during restoration activities. This equipment would not be cleaned before leaving an area of noxious weed infestation and has the potential to spread noxious weed propagules along the right-of-way. Although Northwest has consulted with the county noxious weed control boards, it is not clear from the documentation provided by Northwest whether each of the county boards has agreed that Northwest's proposed noxious weed control measures would be adequate. Therefore, **the FERC staff recommends that**:

- **Northwest consult with noxious weed control boards in each of the counties crossed by the loops to develop a *Noxious Weed Control Plan* that includes a list of the noxious weed species that would be surveyed for and treated during construction and operation. The *Noxious Weed Control Plan* should also include measures, developed in consultation with the noxious weed control boards, to prevent the spread of weed propagules during construction and to control weed infestations that develop after construction. This plan should be incorporated into the ECR Plan. Documentation of the noxious weed control boards' approval of the *Noxious Weed Control Plan* and an updated ECR Plan should be filed with the Secretary <u>before construction</u>.**

4.6 WILDLIFE AND AQUATIC RESOURCES

4.6.1 Wildlife

4.6.1.1 Existing Wildlife Resources

Pipeline Facilities

As described in section 4.5, the proposed loops would cross eight distinct upland vegetation cover types. Each of these cover types (i.e., vegetation communities) provides nesting, cover, and foraging habitat for a variety of wildlife. Other resources including open water, wetland, and riparian habitats also provide these same functions for wildlife species. Impacts on these resources are described and quantified in sections 4.3.2, 4.4, and 4.5.3, respectively). Table 4.6.1-1 identifies some of the wildlife species that are common to these habitats. The most prevalent habitats are shrubland, agricultural land, and landscaped areas accounting for about 73 percent of the wildlife habitat that would be affected. Forest habitat (i.e., evergreen, deciduous, and mixed forests), which provides the greatest vertical structure and supports diverse faunal assemblages, accounts for about 12 percent of the habitat affected, followed by wetland habitat at 11 percent. A portion of the forest and wetland habitats would also be considered riparian habitat. Similar to the other forest habitats, riparian forest provides significant vertical structure, and generally supports the most diverse faunal assemblages of the affected habitats. The least prominent habitats that would be affected are, in descending order of prevalence, grassland/herbaceous (4 percent), open water (less than 1 percent), and oak woodland (less than 0.1 percent).

Aboveground Facilities

At four of the five compressor stations where modifications would be conducted, no wildlife habitat would be affected because all of the work would occur within the fenced boundaries of the existing sites. Work associated with the expansion of the Chehalis Compressor Station would affect grassland/herbaceous and wetland habitats.

The majority of the pig launchers/receivers and MLVs associated with the proposed loops would be collocated with other existing aboveground facilities within the maintained right-of-way. These facilities would require only a minor expansion in the footprint of the existing facilities into primarily grassland/herbaceous habitat but also into shrubland habitat. At three locations, two on the Sumas Loop at MPs 1467.9 (MLV) and 1461.8 (pig receiver and two MLVs), and one on the Mount Vernon Loop at MP 1408.8 (pig receiver and two MLVs), aboveground facilities would not be collocated with existing facilities and would permanently affect grassland/herbaceous and shrubland habitats.

The six MLVs that would be installed along the Evergreen Expansion Project loops would be collocated with existing aboveground facilities. Grassland/herbaceous habitat would be the primary habitat affected by the installation of these facilities. However, the MLV at MP 1440.1 would require a minor expansion of the existing facility into wetland habitat.

Two permanent access roads would be constructed to access aboveground facilities. One access road would be constructed on the Mount Vernon Loop to access the site of the pig receiver and two MLVs at MP 1408.8 and would affect forest habitat. A second permanent access road would be constructed on the Fort Lewis Loop to access the site of the pig receiver and two MLVs at MP 1315.6 and would affect landscape habitat.

TABLE 4.6.1-1

Wildlife Species Typically Found Within the Vegetation Communities Along the Capacity Replacement Project

Vegetation Communities	Typical Wildlife Found within the Vegetation Communities
Shrubland	A**mphibians**: northwestern salamander, long-toed salamander, Pacific giant salamander, ensatina, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog. **Reptiles:** painted turtle, western pond turtle, northern alligator lizard, rubber boa, western terrestrial garter snake, northwestern garter snake, common garter snake. **Mammals**: vagrant shrew, big brown bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, porcupine, long-tailed vole, creeping vole, Townsend's vole, bushy-tailed woodrat, forest deer mouse, deer mouse, coyote, bobcat, striped skunk, long-tailed weasel, mink, raccoon, spotted skunk, black bear, red fox, elk, black-tailed deer. **Birds:** American kestrel, northern harrier, peregrine falcon, short-eared owl, red-tailed hawk, western meadowlark.
Agricultural	**Amphibians:** northwestern salamander, long-toed salamander, ensatina, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog, Oregon spotted frog. **Reptiles:** painted turtle, western pond turtle, slider, rubber boa, western terrestrial garter snake, northwestern garter snake, common garter snake. **Mammals**: Virginia opossum, shrew-mole, coast mole, Townsend's mole, Trowbridge's shrew, vagrant shrew, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, snowshoe hare, eastern cottontail, beaver, porcupine, long-tailed vole, creeping vole, Townsend's vole, house mouse, nutria, bushy-tailed woodrat, muskrat, forest deer mouse, deer mouse, Norway rat, black rat, eastern gray squirrel, fox squirrel, Townsend's chipmunk, Pacific jumping mouse, coyote, mountain lion, bobcat, striped skunk, ermine, long-tailed weasel, mink, raccoon, spotted skunk, black bear, red fox, elk, black-tailed deer. **Birds:** American bittern, American kestrel, Bewick's wren, black swift, common yellowthroat, northern harrier, peregrine falcon, rufous hummingbird, short-eared owl, song sparrow, spotted towhee, barn swallow, Brewer's blackbird, brown-headed cowbird, common snipe, house finch, house sparrow, killdeer, lazuli bunting, mourning dove, red-tailed hawk, ring-necked pheasant, rock dove, Savannah sparrow, western meadowlark.
Landscape	**Amphibians:** northwestern salamander, long-toed salamander, Pacific giant salamander, ensatina, western redback salamander, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog. **Reptiles:** painted turtle, western pond turtle, slider, northern alligator lizard, rubber boa, western terrestrial garter snake, common garter snake. **Mammals:** Virginia opossum, shrew-mole, coast mole, Townsend's mole, Trowbridge's shrew, vagrant shrew, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, snowshoe hare, eastern cottontail, porcupine, northern flying squirrel, creeping vole, house mouse, nutria, bushy-tailed woodrat, forest deer mouse, deer mouse, Norway rat, black rat, eastern gray squirrel, western gray squirrel, fox squirrel, Townsend's chipmunk, coyote, mountain lion, river otter, bobcat, marten, fisher, striped skunk, long-tailed weasel, mink, raccoon, spotted skunk, black bear, red fox, elk, black-tailed deer. **Birds:** American kestrel, Bewick's wren, black swift, black-capped chickadee, peregrine falcon, rufous hummingbird, song sparrow, spotted towhee, American crow, glaucous-winged gull, house finch, house sparrow, rock dove.
Forests	**Amphibians:** northwestern salamander, long-toed salamander, Pacific giant salamander, ensatina, western redback salamander, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog, Oregon spotted frog. **Reptiles:** western pond turtle, northern alligator lizard, rubber boa, northwestern garter snake, common garter snake. **Mammals**: Virginia opossum, shrew-mole, coast mole, Townsend's mole, masked shrew, montane shrew, Trowbridge's shrew, vagrant shrew, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, snowshoe hare, mountain beaver, beaver, Gapper's red-backed vole, porcupine, northern flying squirrel, long-tailed vole, creeping vole, Townsend's vole, bushy-tailed woodrat, forest deer mouse, deer mouse, western gray squirrel, Townsend's chipmunk, Pacific jumping mouse, coyote, mountain lion, bobcat, striped skunk, ermine, long-tailed weasel, mink, raccoon, spotted skunk, black bear, red fox, elk, black-tailed deer. **Birds:** American kestrel, Bewick's wren, black swift, black-capped chickadee, black-throated gray warbler, common yellowthroat, olive-sided flycatcher, peregrine falcon, red crossbill, rufous hummingbird, song sparrow, spotted towhee, band-tailed pigeon, barred owl, blue grouse, common merganser, golden-crowned kinglet, hermit warbler, hooded merganser, northern pygmy owl, Pacific-slope/cordilleran flycatcher, ruffed grouse, varied thrush, warbling vireo, western bluebird, western tanager, Wilson's warbler, winter wren.

TABLE 4.6.1-1 (cont'd)

Wildlife Species Typically Found Within the Vegetation Communities Along the Capacity Replacement Project

Vegetation Communities	Typical Wildlife Found within the Vegetation Communities
Wetland	**Amphibians:** northwestern salamander, long-toed salamander, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog, Oregon spotted frog. **Reptiles:** painted turtle, western pond turtle, slider, western terrestrial garter snake, common garter snake. **Mammals**: shrew-mole, vagrant shrew, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, beaver, Gapper's red-backed vole, porcupine, northern flying squirrel, long-tailed vole, Townsend's vole, nutria, muskrat, forest deer mouse, deer mouse, Pacific jumping mouse, coyote, mountain lion, river otter, bobcat, striped skunk, long-tailed weasel, mink, raccoon, black bear, elk, black-tailed deer. **Birds:** American kestrel, Bewick's wren, black swift, black-capped chickadee, Caspian tern, common yellowthroat, marsh wren, northern harrier, peregrine falcon, rufous hummingbird, short-eared owl, song sparrow, American coot, Canada goose, cinnamon teal, cliff swallow, common snipe, mallard, northern pintail, northern shoveler, pied-billed grebe, purple finch, red-winged blackbird, sora, Virginia rail.
Riparian	**Amphibians:** northwestern salamander, long-toed salamander, Pacific giant salamander, ensatina, western redback salamander, roughskin newt, tailed frog, Pacific tree frog, red-legged frog, bullfrog, Oregon spotted frog. **Reptiles:** painted turtle, western pond turtle, slider, northern alligator lizard, rubber boa, western terrestrial garter snake, northwestern garter snake, common garter snake. **Mammals**: Virginia opossum, shrew-mole, coast mole, Townsend's mole, masked shrew, montane shrew, Trowbridge's shrew, vagrant shrew, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, snowshoe hare, eastern cottontail, mountain beaver, beaver, porcupine, northern flying squirrel, long-tailed vole, creeping vole, Townsend's vole, nutria, bushy-tailed woodrat, muskrat, forest deer mouse, deer mouse, Townsend's chipmunk, Pacific jumping mouse, coyote, mountain lion, river otter, bobcat, marten, fisher, striped skunk, ermine, long-tailed weasel, mink, raccoon, spotted skunk, black bear, red fox, elk, black-tailed deer. **Birds:** American kestrel, Bewick's wren, black swift, black-capped chickadee, black-throated gray warbler, common yellowthroat, olive-sided flycatcher, peregrine falcon, rufous hummingbird, song sparrow, spotted towhee, yellow warbler, American dipper, band-tailed pigeon, barn swallow, belted kingfisher, Bullock's oriole, common merganser, great blue heron, green heron, hooded merganser, mallard, mourning dove, northern rough-winged swallow, red-eyed vireo, ruffed grouse, spotted sandpiper, tree swallow, arbling vireo, willow/alder flycatcher, Wilson's warbler, wood duck, yellow-breasted chat.
Grassland/Herbaceous	**Amphibians:** northwestern salamander, long-toed salamander, Pacific giant salamander, ensatina, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog, western pond turtle. **Reptiles:** northern alligator lizard, rubber boa, western terrestrial garter snake, northwestern garter snake, common garter snake. **Mammals**: Virginia opossum, coast mole, Townsend's mole, montane shrew, vagrant shrew, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, long-tailed vole, creeping vole, Townsend's vole, forest deer mouse, deer mouse, coyote, bobcat, striped skunk, long-tailed weasel, mink, raccoon, spotted skunk, black bear, red fox, elk, black-tailed deer. **Birds:** American kestrel, northern harrier, peregrine falcon, rufous hummingbird, short-eared owl, song sparrow, ring-necked pheasant, Savannah sparrow, western meadowlark.
Open Water	**Amphibians:** northwestern salamander, long-toed salamander, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog, Oregon spotted frog. **Reptiles:** painted turtle, western pond turtle, slider. **Mammals**: big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Townsend's big-eared bat, beaver, nutria, muskrat, river otter, mink, raccoon, black bear. **Birds:** American kestrel, black swift, Caspian tern, peregrine falcon, American dipper, belted kingfisher, California gull, common goldeneye, northern rough-winged swallow, ring-billed gull.
Oak Woodland	**Amphibians:** northwestern salamander, long-toed salamander, Pacific giant salamander, ensatina, western redback salamander, roughskin newt, western toad, Pacific tree frog, red-legged frog, bullfrog, Oregon spotted frog. **Reptiles:** painted turtle, western pond turtle, northern alligator lizard, rubber boa, western terrestrial garter snake, northwestern garter snake, common garter snake. **Mammals**: Virginia opossum, shrew-mole, coast mole, Townsend's mole, montane shrew, Trowbridge's shrew, vagrant shrew, big brown bat, silver-haired bat, hoary bat, California myotis, long-eared myotis, little brown myotis, long-legged myotis, Yuma myotis, Gapper's red-backed vole, porcupine, northern flying squirrel, long-tailed vole, creeping vole, Townsend's vole, bushy-tailed woodrat, forest deer mouse, deer mouse, bobcat, eastern grey squirrel, western gray squirrel, fox squirrel, Townsend's chipmunk, Pacific jumping mouse, coyote, striped skunk, ermine, long-tailed weasel, mink, raccoon, spotted skunk, black bear, red fox, elk, black-tailed deer. **Birds:** American kestrel, Bewick's wren, black-capped chickadee, black-throated gray warbler, common yellowthroat, peregrine falcon, rufous hummingbird, song sparrow, spotted towhee, band-tailed pigeon, Bullock's oriole, Cassin's vireo, Hutton's vireo, purple finch, western bluebird, western tanager.

Abandoned Facilities

Wildlife habitat at the locations where work would be conducted on the abandoned facilities consists largely of the grassland/herbaceous cover type that was established as part of revegetation efforts following the construction of Northwest's existing pipelines. This habitat is subject to periodic right-of-way maintenance activities.

Pipe Storage and Contractor Yards

The majority of the pipe storage and contractor yards have been previously disturbed and would provide minimal habitat for most species identified in the project area. The cover types that would be affected by the yards that have not been previously disturbed or are currently used for non-industrial activities include landscaped areas, shrubland, and agricultural land.

4.6.1.2 General Impact and Mitigation

Pipeline Facilities

The impact of the project on wildlife species and their habitats would vary depending on the requirements of each species and the existing habitat present along the loops. Direct impacts of construction on wildlife would include the displacement of wildlife on the right-of-way and direct mortality of some individuals. Wildlife, such as birds and larger mammals, would leave the vicinity of the right-of-way as construction activities approach. Depending on the season, construction could also disrupt bird courting or nesting and breeding of other wildlife on and adjacent to the right-of-way. Many of these animals may relocate into similar habitats nearby; however, the lack of adequate territorial space could force some animals into suboptimal habitats. This could increase inter- and intra-specific competition and lower reproductive success and survival. The influx and increased density of animals in some undisturbed areas caused by these dislocations could also reduce the reproductive success of animals that are not displaced by construction. Additionally, some smaller, less mobile wildlife, such as small mammals and burrowing species (e.g., opossums, mice, voles, weasels, and beaver), amphibians, and reptiles, could be crushed by construction equipment or trapped in trenches. Bird nests located within the construction work area could be destroyed by clearing activities. The loss of these species could result in a decrease in the food stock available for predators of these species. These effects, however, would cease after construction, and wildlife would return to the newly disturbed areas and adjacent, undisturbed habitats after right-of-way restoration is completed. Additionally, the majority of impacts on wildlife habitat (about 68 percent) would occur over Northwest's previously disturbed and periodically maintained existing pipeline right-of-way. Therefore, the proposed project would not be expected to substantially alter the local wildlife populations.

The cutting, clearing, and/or removal of existing vegetation would also affect wildlife by reducing the amount of available habitat. The degree of impact would depend on the type of habitat affected and the rate at which vegetation regenerates after construction. The impact on agricultural and landscape habitats (209.5 acres and 207.2 acres, respectively) would be relatively minor because these areas receive regular disturbance (e.g., crop planting, harvesting, recreational, and landscape maintenance activities) and would be replanted either immediately following, or during the next growing season following installation of the loops. Similar to agricultural habitats, impacts on grassland/herbaceous habitat (35.4 acres) would be minor because these areas would recover quickly following construction.

About 118.6 acres of forested habitat and 0.4 acre of oak woodland habitat would be affected. The effect on forested areas would be much greater because forest lands would take the longest amount of time to regenerate and would be prevented from reestablishing over the permanent right-of-way due to periodic vegetation maintenance during operation of the loops. The impact on shrub habitats (307.4 acres) would be less than on forest lands but regeneration of these areas could take up to 3 years. Although the structural component of shrub-dominated habitats would recover slowly, successful restoration of non-woody vegetation may improve the value of forage for some wildlife within a relatively short time. In general, these effects are not expected to have an impact on wildlife populations because the amounts of the habitats that would be affected are relatively minor and are adjacent to an existing maintained utility corridor. Furthermore, Northwest's implementation of its ECR Plan, which includes measures to reseed disturbed areas with seed mixes prescribed by the local NRCS offices and the WDNR, and its proposal to replant forest areas with tree seedlings would improve the potential for successful revegetation of the right-of-way after construction (see section 4.5.2 and Appendix G).

The loops would cross numerous areas of wetland and open water systems affecting 107.3 and 3.6 acres, respectively. A total of about 72.9 acres of riparian habitat would be affected by the project. These areas are important habitats for a number of resident wildlife species. Disturbance to these habitats would be minimized through implementation of the FERC staff's Procedures and Northwest's ECR Plan (see Appendices F and G, respectively). To minimize construction impacts on wetlands, the construction right-of-way would be reduced from the typical 95 feet to 75 feet in most wetlands. Northwest would minimize potential impacts on numerous wildlife species that may use the permanent right-of-way in riparian areas by planting native riparian tree and shrub vegetation up to 50 feet from the streambank and limit its annual maintenance activities in these areas to a 10-foot-wide area centered over the pipeline (see section 4.5.3). Additionally, the COE would require compensatory mitigation for impacts on both wetland and riparian habitats. Disturbances to open water habitats would generally not have lasting effects following the completion of a waterbody crossing, which in most cases would be completed within 24 to 48 hours depending on the size of the crossing. Additionally, Northwest plans to cross three waterbodies using the HDD method, which would minimize impacts on open water, riparian, and wetland habitats at these crossing locations (see section 4.3.2.3).

Following construction and restoration, Northwest would monitor the revegetation of the right-of-way in upland areas the year following construction and again during the second growing season to ensure adequate revegetation. Additional revegetation efforts would be conducted until revegetation is deemed successful. In wetland areas, Northwest would monitor revegetation for 3 years in accordance with the FERC staff's Procedures and would extend the monitoring period in scrub-shrub and forested wetlands to 10 years as required by the WDOE. Additionally, Northwest would develop a noxious weed control plan to prevent the introduction and proliferation of noxious weeds during and after construction (see section 4.5.4).

Aboveground Facilities

Expansion of the Chehalis Compressor Station would affect 7.7 acres of wildlife habitat, a majority of which (5.1 acres) would be grassland/herbaceous with the remaining amount (2.6 acres) consisting of wetland habitat. About 0.9 acre of grassland/herbaceous habitat would be permanently affected and about 0.6 acre of wetland habitat would be permanently filled as a result of the compressor station expansion (see section 4.4.3). This loss of habitat would not have a significant effect on wildlife in the area because of the abundance of this habitat type in the vicinity of the project, the limited use of the area by wildlife due to the adjacent existing facilities, and the presence of graveled access roads that surround this wetland. Additionally, this wetland has been mowed annually, which further limits its value as wildlife habitat. A minor increase in the noise level would result from the upgrade of the facilities at this site (see section 4.11.2). Wildlife species inhabiting the nearby areas would not be expected to be significantly affected because these species have adapted to the existing noise levels at the site and the increase would not be a dramatic change to the habitat. Modifications at the four remaining compressor stations would not permanently affect wildlife habitat. The work would occur within the existing compressor station facilities and no perceptible increase in noise levels would be expected at these sites.

On the Sumas Loop, the construction of the MLV at MP 1467.9 and the pig receiver and MLVs at MP 1461.8 would permanently convert about 0.2 and 0.3 acre, respectively, of shrubland habitat. Construction of the pig receiver and two MLVs at MP 1408.8 on the Mount Vernon Loop would affect 0.2 acre of grassland/herbaceous habitat. Because these facilities would be graveled and fenced they would result in the permanent loss of habitats in these areas. The loss of these habitats would not have a significant effect on wildlife due to the relatively small and common nature of the habitats and the ample amount of similar habitats in the surrounding areas. The pig remaining launchers/receivers and MLVs would be collocated with existing facilities within Northwest's existing permanent easement; however, they would require minor expansions of the graveled footprints at each site and would affect a total of about 1.7 acres of grassland/herbaceous habitat and less than 0.1 acre of shrubland habitat.

The two permanent access roads that would be constructed to access aboveground facilities would permanently affect about 0.2 acre of landscape habitat (MP 1315.6) and about 0.1 acre of forest habitat (MP 1408.8). Landscape habitat is common to the project area and wildlife species within this habitat type have adapted to regular disturbances. While wildlife species within forest habitat are less adapted to disturbance, the road would be infrequently used after construction and throughout the life of the project. Because of the minimal area affected and the infrequent use of the road, no significant impacts on wildlife are anticipated.

The installation of six MLVs along the existing Evergreen Expansion Project loops would affect a total of 1.7 acres of land. These facilities would be collocated with existing aboveground facilities and only a portion of the construction areas would affect habitat. These impacts, primarily on grassland/herbaceous habitat, would be temporary in nature and would not permanently affect any additional habitat. However, the MLV at MP 1440.1 would require the permanent conversion of less than 0.1 acre of previously disturbed emergent wetland habitat. The loss associated with this wetland would be mitigated by the implementation of Northwest's compensatory wetland mitigation plan (see section 4.4.4).

Abandoned Facilities

Construction activities associated with the abandoned facilities would occur within Northwest's existing maintained permanent easement and would affect 14.4 acres of primarily grassland/herbaceous habitat. Impacts on wildlife associated with these activities would not be considered significant because they would be temporary and would occur in areas that are periodically mowed as part of Northwest's right-of-way maintenance activities. However, of the 14.4 acres, about 0.2 acre of emergent wetland habitat and less than 0.1 acre of riverine wetland habitat would be temporarily affected. No permanent impacts on wildlife would occur as a result of these activities.

Pipe Storage and Contractor Yards

The temporary use of 13 pipe storage and contractor yards would affect 128.4 acres of landscape habitat, 36.7 acres of shrubland habitat, and 25.5 acres of agricultural habitat. No permanent impacts on wildlife would result from the use of these sites.

4.6.1.3 Migratory Birds

A variety of migratory bird species, including both songbirds and raptors, utilize the vegetation communities identified along the loops. Migratory birds are species that nest in the United States and Canada during the summer, and then migrate south to the tropical regions of Mexico, Central and South

America, and the Caribbean for the non-breeding season. Of the 85 migratory bird species likely to occur within the project area, 18 species are considered by the FWS to be birds of conservation concern including: American bittern, American kestrel, Bewick's wren, black swift, black-capped chickadee, black-throated gray warbler, Caspian tern, common yellowthroat, marsh wren, northern harrier, olive-sided flycatcher, peregrine falcon, red crossbill, Rufous hummingbird, short-eared owl, song sparrow, spotted towhee, and the yellow warbler. General impacts on migratory birds are discussed below; specific impacts on many of these species are discussed in section 4.7.

Executive Order 13186 (January 2001) directs federal agencies to consider the effects of agency actions and plans on migratory birds, with emphasis on species of concern. Northwest's current schedule to begin clearing of the right-of-way in March would coincide with the nesting season for a majority of the migratory birds in the project area during most years, which could result in the mortality of eggs and young birds that have not yet fledged. The project would also result in a temporary loss of habitat available to migratory birds. However, this effect would be mitigated by Northwest's proposal to restore disturbed areas following construction and make them available for use by migratory birds during the next nesting season following construction.

4.6.1.4 Sensitive or Managed Wildlife Habitats and Species

The WDFW has identified and mapped 14 Priority Habitats. In addition to the three priority vegetation habitats identified in section 4.5.3 (i.e., Oregon white oak, prairie steppe, and riparian), the Capacity Replacement Project would also affect freshwater wetlands and in-stream habitats as well as urban natural open spaces and snags and logs.

Urban natural open space priority habitats are defined as such if the open space is an isolated remnant of natural habitat that is larger than 10 acres and is surrounded by urban development; the open space functions as a corridor connecting other priority habitats, especially those that would otherwise be isolated; or the open space is an area where a priority species occurs within or adjacent to the area and/or uses the area for breeding or regular feeding. Two urban natural open spaces designated as Priority Habitats would be crossed by the loops. The Snohomish Loop would cross an urban natural open space near MP 1383.3 that serves as a wildlife corridor between wetlands that are associated with Evans Creek and an area designated as bald eagle breeding habitat located about 2 miles west of the loop. Construction would temporarily affect approximately 1.3 acres of this priority habitat; however, Northwest's existing permanent easement would not be expanded in this area. The Fort Lewis Loop would cross an urban natural open space on the banks of the Nisqually River near MP 1324.3 that serves as a wildlife corridor between an area frequented by bald eagles and priority riparian habitat associated with the river. Construction would temporarily affect a total of 3.9 acres of this Priority Habitat of which about 0.6 acre would be added to Northwest's existing permanent easement. Although construction through these two wildlife corridors would temporarily affect their use by wildlife species, because Northwest's existing pipelines already bisect these two wildlife corridors, the construction of the loops is not expected to permanently alter the functions that these corridors currently provide.

Snags and dead trees are defined as Priority Habitat if they are greater than 20 inches in diameter measured at breast height and greater than 6.5 feet tall. Logs are considered Priority Habitat if they are greater than 12 inches in diameter at the largest end and greater than 20 feet long. Snags and logs are important habitat elements because numerous species are dependent on cavities present in these features. These features are likely to occur within the project area and would be affected during clearing operations. Trees felled as part of clearing operations in upland areas would be scattered or piled on the right-of-way during restoration activities to enhance wildlife habitat. Before construction, EIs would determine if any wetland snags would need to be removed during construction and would also determine if any snags on the edge of the right-of-way could be avoided by construction activities. If snags could be avoided, they would be flagged by the EI. In wetlands where snags would need to be removed, the EI would record the location. During restoration one or two logs for each snag removed would be replaced in the same wetland. Snag replacement would be conducted at the EI's discretion based on site-specific conditions (e.g., wetland size and function, landowner approval, availability of replacement material, and land use).

In addition to the Priority Habitats, the WDFW publishes a Priority Species List. This list includes animal and plant species that are considered to be priorities for conservation and management because they require protective measures to ensure their survival due to their population status; sensitivity to habitat alteration; and/or recreational, commercial, or tribal importance. Priority species include state endangered, threatened, sensitive, and candidate species; animal aggregations considered vulnerable; and those species of recreational, commercial, or tribal importance that are vulnerable (WDFW, 2004a and 2004b). Using the WDFW Priority Habitat and Species database, Northwest identified nine priority species known to occur near the project area that are listed either as a species to monitor or as a candidate species for the state threatened and endangered list. These species include: great blue heron, great gray owl, riffle sculpin, osprey, salish sucker, tailed frog, Vaux's swift, western bluebird, and wolverine. Northwest would minimize impacts on these priority species by implementing the mitigation measures described in section 4.6.1.2. Other priority species that are afforded a more protective state or federal status have also been identified within the project area and are addressed in section 4.7.

Of the wildlife species listed in table 4.6.1-1, many are considered to be game animals and are hunted or trapped for recreation and/or subsistence purposes. These include: amphibians (bullfrog); small mammals (snowshoe hare, eastern cottontail, raccoon, bobcat beaver, mountain beaver, muskrat, river otter, mink, weasels, and marten); large mammals (elk, black-tailed deer, black bear, and mountain lion); and birds (ducks, geese, blue grouse, ruffed grouse, ring-necked pheasant, band-tailed pigeon, and mourning dove). The impacts on these species and proposed mitigation measures would be the same as those described in section 4.6.1.2; however, the long-term impacts associated with the project could be beneficial for many of these species. Assuming that revegetation of the right-of-way is successful, many of these species would benefit from the additional forage material within the right-of-way or from the presence of prey species that would utilize the forage material.

4.6.2 Aquatic Resources

4.6.2.1 Existing Aquatic Resources

Pipeline Facilities

The loops associated with the Capacity Replacement Project would cross 146 waterbodies, including perennial and intermittent streams and ditches. Available data indicate that 45 of these waterbodies are known or presumed to be inhabited by fish. The WDNR has classified an additional 14 waterbodies as fish-bearing, but for which species' occurrence has not been documented by the WDFW, Northwest Indian Fisheries Commission (NWIFC), or other sources (WDFW and NWIFC, 2004). Table K-1 in Appendix K provides a detailed listing of each waterbody crossing including the fishery classification. Appendix O provides information on fish utilization for each waterbody crossing.

As discussed in section 4.3.2.1, a total of seven WRIAs would be crossed by the proposed loops but waterbodies would be crossed in only five of these WRIAs. Table 4.6.2-1 lists characteristic fish of commercial, recreational, and tribal importance found in the WRIAs crossed by the loops. In addition to the species listed in table 4.6.2-1, a variety of other fish may also occur in the WRIAs crossed by the loops. These species include shorthead and torrent sculpin, largescale sucker, Pacific and river lamprey, peamouth, threespine stickleback, and eulachon. Because these fish have little or no recreational or commercial value, relatively little information is available regarding their occurrence in waterbodies crossed by the project.

TABLE 4.6.2-1

Fish Species of Commercial, Recreational, and Tribal Importance in WRIAs Crossed by the Capacity Replacement Project

Facility	WRIA Number/Basin Name (Corresponding HUC)	Fish Species
Sumas Loop	WRIA 1 / Nooksack Basin (17110001 / Fraser and 17110004 / Nooksack)	Chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead (rainbow trout), cutthroat trout, bull trout, lake trout, whitefish
Mount Vernon Loop	WRIA 5 / Stillaguamish Basin (17110008 / Stillaguamish) WRIA 7 / Snohomish Basin (17110011 / Snohomish)	Chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead (rainbow trout), cutthroat trout, bull trout, whitefish
Snohomish Loop	WRIA 8 / Cedar-Samammish Basin (17110012 / Lake Washington)	Chinook salmon, coho salmon, sockeye salmon, steelhead (rainbow trout), cutthroat trout, bull trout
Fort Lewis Loop	WRIA 12 / Chamber-Clover Basin[a] (17110013 / Duwamish) WRIA 11 / Nisqually Basin (17110013 / Duwamish) WRIA 13 / Deschutes Basin [a] (17110015 / Nisqually)	Chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead (rainbow trout), cutthroat trout, bull trout, whitefish

[a] Small portions of this WRIA would be crossed by the Fort Lewis Loop, but no waterbodies would be crossed within the WRIA.

Coldwater fisheries are the primary fisheries in the project area. Although warmwater and cool water fisheries are present in western Washington, they have been established through the introduction of non-native species. Species such as largemouth bass, smallmouth bass, bluegill, pumpkinseed, yellow perch, black crappie, channel catfish, northern pike, and brown bullhead have been introduced to many lakes in the state. There are no readily available records of these species occurring in lakes and rivers whose tributaries would be crossed by the Capacity Replacement Project. Most warmwater and cool water fisheries managed by the WDFW occur in lakes, and are not an important component of the fisheries potentially affected by the Capacity Replacement Project. While some of these species may find their way into some of the affected tributaries on occasion, no managed or important warmwater or cool water fisheries would be affected by the project.

There are two major categories of coldwater fisheries in the project area: coldwater resident and coldwater anadromous. Appendix O provides the known, presumed, or potential occurrences of WDFW priority coldwater resident and anadromous fish species in the waterbodies that would be crossed by the project. In addition to fish species, freshwater mussels have been documented in Washington. Six species of unionid clams have been identified in Washington but little information is known about their distribution (Aitken, 2003). The western pearlshell mussel has been documented in the upper Bear Creek drainage in King County and in Cedar Creek, a tributary to the Lewis River in Clark County, but occurrence of this species or others in the project vicinity is unknown (Wait, 2003 and 2004; Stone, 2003).

<u>Coldwater Resident Fisheries</u> – Resident fish species spend their entire lives in freshwater. Various waterbodies crossed by the Capacity Replacement Project provide yearlong habitat for several resident fish species. Resident cutthroat trout, rainbow trout, and mountain whitefish are the most common resident game species. Non-game fish species, some of which migrate between freshwater and marine habitats (e.g., threespine stickleback and shiner perch), and others that are freshwater residents

(e.g., northern squawfish, sculpins, largescale sucker, and western brook lamprey) also occur in waterbodies in the project area.

Coldwater Anadromous Fisheries – Anadromous is a term describing fish that return from the ocean to the rivers where they were born in order to spawn. Adult anadromous fish spend a portion of their adult life in the ocean; the amount of time varies among the species. Sexually mature adults migrate or "run" from the ocean and estuaries upstream to freshwater streams to spawn in shallow gravel stretches. The fertilized eggs drop into the intergravel spaces. Hatched fry remain in these spaces for a time and then emerge to remain in the rearing areas of quiet waters, usually pools or backwaters. After a period of time, which varies with the species, juveniles migrate downstream to estuaries where they undergo smolting (physiological maturation to adjust from fresh to salt water) before entering marine waters as adults. Salmon species die after spawning but some steelhead and anadromous coastal cutthroat survive to return to the ocean, and can spawn again. Steelhead typically remain in freshwater streams after emergence for 2 to 3 years before migrating to the ocean, with adults returning to spawn in their fourth or fifth year (Behnke, 1992). Sea-run cutthroat usually remain in fresh water for 2 to 4 years before smolting and migrating to salt water, usually staying in the estuaries or near shore (Behnke, 1992).

Coldwater anadromous fisheries in the project area comprise eight species: chinook salmon, coho salmon, chum salmon, pink salmon, sockeye salmon, bull trout/Dolly Varden (native char), steelhead, and coastal cutthroat trout. Chinook salmon and bull trout are listed as threatened species under the ESA and are discussed in greater detail in section 4.7.1. Table 4.6.2-2 summarizes the major runs of these species within the WRIAs crossed by the project and their general timing of life phases. River lamprey and Pacific lamprey may also be found in the project area.

Anadromous fisheries are very important commercially, recreationally, and to the Native American tribes in the project area. Commercial fishing for salmonids in the project area is intensively managed and regulated. Most wild stocks (does not include hatchery production) are managed for natural spawning to achieve escapement goals (WDFW et al., 1993). Escapement is a term that refers to the number of sexually mature fish returning to spawn, having "escaped" mortality, including commercial and recreational fishing. Long-term escapement estimates are available for several anadromous fisheries in the project area and trend analyses are provided in the Biological and EFH Assessment that was submitted to the FWS and NOAA Fisheries under separate cover (see section 4.7). In addition, the WDFW has evaluated the status of anadromous fisheries production in the project area. These two parameters, adult survival and productivity, are key to salmonid population sustainability.

Continued diminishing returns of anadromous fish species since the late 1800s have resulted in conflict regarding annual harvests and tribal fishing rights, including ongoing, continuously evolving, regulations and court cases. Annual average commercial harvests of all anadromous salmonids by tribes in Puget Sound is generally less than half the total commercial catch (NOAA Fisheries, 2004). In addition to commercial interests, tribal salmonid harvests are utilized in numerous cultural contexts whether for personal and/or family consumption, interpersonal and community sharing and meals, or tribal ceremonies (NOAA Fisheries, 2004). Tribes' fishing rights at usual and accustomed fishing grounds and stations have been defined over time, often through litigation, to the point where different tribes now fish within allocated management areas. All freshwater and marine fisheries within the Puget Sound area are fished by one tribe or another (NOAA Fisheries, 2004). Tribal usual and accustomed uses are further discussed in section 4.10.3.

TABLE 4.6.2-2

Approximate Timing of Life Phases For Anadromous Salmonids within Water Resource Inventory Areas (WRIAs) Crossed by the Capacity Replacement Project

WRIA/Species	Upstream Migration [a]	Run [b]	Spawning [b]	Intergravel Development [a]	Juvenile Rearing [a]	Juvenile Out-Migration [a]
WRIA 1 / Nooksack Basin						
Chinook	Mar 20-Sep 30	North Fork/Middle Fork Nooksack	Jul 20-Sep 30	Aug 5-Feb 15	Jan 1-Dec 31	Mar 10-Jul 15
		South Fork Nooksack	Aug 20-Sep 30			
Chum	Oct 10-Dec 31	Sumas/Chilliwack (Fall)	Oct 20-Jan 10	Oct 15-Apr 15	Mar 1-May 15	Mar 1-May 15
		North Fork Nooksack (Fall)	Nov 20-Jan 10			
		Mainstem/South Fork Nooksack (Fall)	Nov 1-Dec 31			
Coho	Jul 5-Nov 15	Sumas/Chilliwack	Oct 20-Dec 31	Sep 10-Feb 15	Jan 15-Jun 10	Apr 15-Aug 15
		Nooksack	Oct 15-Jan 15			
Pink	Jul 10-Aug 20	North Fork/Middle Fork Nooksack (Odd-Year)	Aug 20-Sep 30	Aug 20-Apr 15	Feb 1-May 10	Feb 15-May 10
		South Fork Nooksack (Odd-Year)	Aug 20-Sep 30			
Sockeye [c]	Jul 10-Sep 10	Nooksack	Sep 10-Oct 15	Sep 10-Feb 15	Jan 1-Dec 31	Apr 15-Jul 15
Steelhead	No data	Mainstem/North Fork Nooksack (Winter)	Mar 10-Jul 10	No data	No data	No data
		South Fork Nooksack (Winter)	Feb 15-Jun 15			
		Middle Fork Nooksack (Winter)	Mar 10-Jun 15			
		South Fork Nooksack (Summer)	Feb 1-Apr 31			
Coastal cutthroat [d]	Aug 1-Oct 31	Sumas	Jan 1-Apr 30	No data	No data	No data
		Nooksack	Jan 1-Apr 30			
Bull trout [f]	June	Lower Nooksack Bull Trout/Dolly Varden	Sep 1-Nov 15	No data	No data	No data
WRIA 5 / Stillaguamish Basin						
Chinook	Apr 15-Oct 15	North Fork Stillaguamish	Aug 15-Oct 31	Aug 15-Feb 15	Jan 1-Dec 31	Mar 15-Jul 30
		South Fork Stillaguamish	Sep 1-Oct 31			
Chum	Oct 15-Jan 10	North Fork Stillaguamish (Fall)	Nov 15-Dec 31	Nov 15-Apr 15	Mar 1-May 31	Mar 1-May 31
		South Fork Stillaguamish (Fall)	Oct 20-Dec 10			
Coho [e]	Jul 15-Dec 20	Stillaguamish - WRIA 5	Nov 1-Feb 1	Oct 1-Apr 15	Jan 1-Dec 31	Mar 15-Jun 30
Pink	Jul 15-Oct 15	North Fork Stillaguamish (Odd-Year)	Sep 10-Oct 31	Sep 1-Apr 15	Mar 1-May 31	Mar 1-May 31
		South Fork Stillaguamish (Odd-Year)	Sep 20-Oct 31			
Steelhead	No data	Stillaguamish (Winter)	Mar 15-Jun 15	No data	No data	No data
		Stillaguamish (Summer)	Jan 15-Apr 20			
Coastal cutthroat [c]	Jul 1-Oct 31	Stillaguamish - WRIA 5	Feb 10-May 31	No data	No data	No data
Bull trout	No data	Stillaguamish Bull Trout/Dolly Varden	No data	No data	No data	No data
WRIA 7 / Snohomish Basin						
Chinook	May 15-Oct 20	Skykomish	Sep 1-Oct 31	Aug 10-Feb 15	Jan 1-Dec 31	Apr 15-Jul 15
		Snoqualmie	Sep 15-Oct 31			

TABLE 4.6.2-2 (cont'd)

Approximate Timing of Life Phases For Anadromous Salmonids within Water Resource Inventory Areas (WRIAs) Crossed by the Capacity Replacement Project

WRIA/Species	Upstream Migration [a]	Run [b]	Spawning [b]	Intergravel Development [a]	Juvenile Rearing [a]	Juvenile Out-Migration [a]
Chum	Oct 15-Jan 10	Skykomish (Fall)	Nov 15-Dec 31	Nov 15-Apr 30	Mar 15-Jun 15	Mar 15-Jun 15
		Snoqualmie (Fall)	Nov 15-Dec 15			
Coho	Jul 15-Dec 20	Snohomish	Oct 20-Jan 31	Oct 20-Apr 30	Jan 1-Dec 31	Apr 15-Jul 15
		Snoqualmie	Nov 10-Jan 20			
		Skykomish	Oct 20-Jan 15			
Pink	Jul 15-Oct 15	Snohomish (Odd-Year)	Sep 20-Oct 31	Sep 15-Apr 30	Feb 15-May 31	Feb 15-May 31
		Snohomish (Even-Year)	Sep 1-Sep 30			
Steelhead	No data	Snohomish/Skykomish (Winter)	Mar 10-Jun 15	No data	No data	No data
		Pilchuck (Winter)	Mar 10-Jun 10			
		Snoqualmie (Winter)	Mar 10-Jun 10			
Coastal cutthroat [c]	Jul 1-Oct 31	Snohomish WRIA 7	Feb 1-May 31	No data	No data	No data
Bull trout	May 20-Jul 10	Skykomish Bull Trout/Dolly Varden	Oct 15-Nov 10	No data	No data	No data
WRIA 8 / Cedar-Samammish Basin						
Chinook	Jun 1-Nov 30	North Lake Washington Tributaries	Sep 15-Oct 31	Sep 10-Mar 31	Dec 15-Jul 15	Mar 1-Jul 15
Coho	Aug 10-Feb 10	Lake Washington/Sammamish Tributaries	Oct 20-Dec 15	Oct 15-May 15	Jan 1-Dec 31	Mar 1-Jul 15
Sockeye	Apr 15-Dec 15	Lake Washington/Sammamish Tributaries	Sep 1-Dec 31	Aug 1-Apr 30	Jan 1-Dec 31	Mar 1-Jul 10
Steelhead	No data	Lake Washington (Winter)	Dec 15-Jun 10	No data	No data	No data
Bull trout	No data	Lake Washington Bull Trout	No data	No data	No data	No data
WRIA 11 / Nisqually Basin						
Chinook	Jul 10-Dec 31	Nisqually	Sep 20-Oct 31	Sep 15-Apr 30	Jan 1-Dec 31	Feb 15-Jun 15
Coho	Aug 15-Oct 15	Nisqually WRIA 11	Nov 15-Jan 15	Sep 15-Apr 15	Feb 15-May 31	Feb 15-May 31
Pink	Sep 15-Feb 15	Nisqually (Odd-Year)	Sep 1-Oct 31	Nov 15-May 31	Feb 20-Jul 15	Feb 20-Jul 15
Steelhead	No data	Nisqually (Winter)	Mar 10-Jun 15	No data	No data	No data
Coastal cutthroat [c]	Jul 1-Oct 31	Nisqually WRIA 11	Jan 1-Apr 30	No data	No data	No data
Bull trout	No data	Nisqually Bull Trout/Dolly Varden	No data	No data	No data	No data

[a] Approximate dates for upstream migration, intergravel development, juvenile rearing, and juvenile out-migration for the entire WRIA are from Williams et al., 1975.
[b] Runs and approximate spawning dates are from WDFW and NWIFC, 2004.
[c] If spawning dates for species and WRIA were unavailable from WDFW and NWIFC, 2004, approximate spawning dates are from Williams et al., 1975.
[d] Approximate dates for coastal cutthroat trout anadromous river entry (not upstream migration) and spawning are from WDFW, 2000.
[e] If spawning dates for species and WRIA were unavailable from WDFW and NWIFC, 2004, approximate spawning dates are from Washington Department of Fisheries et al., 1993.
[f] Approximate dates for bull trout/Dolly Varden anadromous river entry (not upstream migration) and spawning are from WDFW, 1998.

Abandoned Facilities

At MP 1232.5, the Portland Lateral Take-off would affect an intermittent ditch that drains to a tributary of the East Fork Lewis River. This ditch is not a channelized native stream, but rather appears to be a drainage ditch, excavated to drain an off-site wetland feature. The ditch sustains good winter flows, but is probably seasonal due to the lack of any elevated ground within the potential watershed. The ditch is classified as a WDNR Type 3 waterbody; however, no fish species have been documented in the ditch by the WDFW, the NWIFC, or other sources.

Pipe Storage Yards and Contractor Yards

Project activities at the proposed pipe storage and contractor yards are not expected to affect aquatic resources. However, an unnamed, tree-lined creek is located within the proposed Nooksack Yard (Sumas Loop, Whatcom County). Northwest would not clear any of the trees or conduct construction activities near the creek, and the yard would be accessible from existing roads.

4.6.2.2 Essential Fish Habitat

The MSA (Public Law 94-265 as amended through October 11, 1996) was established, along with other goals, to promote the protection of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH is defined in the MSA as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.

Section 302 of the MSA establishes eight regional fishery management councils. Among other responsibilities, these councils develop management plans for each fishery that requires conservation and management. Section 303(a)(7) of the MSA requires that these fishery management plans describe and identify EFH. The proposed project would be constructed and operated within the region of the Pacific Fishery Management Council (PFMC). The PFMC amended the *Pacific Coast Salmon Plan* to identify and describe EFH and recommended conservation measures for chinook salmon, coho salmon, Puget Sound pink salmon, and Puget Sound sockeye salmon (PFMC, 1999).

All fish-bearing streams (WDNR Water Types 1, 2, and 3) that would be crossed by the proposed loops are assumed to provide EFH for one or more of the eight salmonids discussed in section 4.6.2.1. Table 4.6.2-3 provides a summary of the EFH identified for the species that occur in the HUCs affected by the project. In freshwater, EFH for the salmon species identified in table 4.6.2-3 includes habitats for spawning and incubation, juvenile rearing, juvenile migration corridors, and adult migration corridors (and adult holding habitat for chinook salmon) (PFMC, 1999). Appendix O indicates the presence of EFH for all waterbodies that would be crossed by the project.

TABLE 4.6.2-3

Pacific Salmon Freshwater EFH within Hydrologic Units Coinciding with the Capacity Replacement Project

Facility/Potential Occurrence	Name and Hydrologic Unit Code (HUC)	EFH Identified for Species in Hydrologic Units
Pipeline Facilities		
Sumas Loop	Fraser River HUC 17110001	Coho salmon
	Nooksack River HUC 17110004	Chinook, coho, pink salmon
Mount Vernon Loop	Stillaguamish River HUC 17110008	Chinook, coho, pink salmon
	Snohomish River HUC 17110011	Chinook, coho, pink salmon
Snohomish Loop	Lake Washington HUC 17110012	Chinook, coho, sockeye salmon[a]
Fort Lewis Loop	Nisqually River HUC 17110015	Chinook, coho, pink salmon
Abandoned Facilities		
Portland Lateral Take-off	Lewis River HUC 17080002	Chinook, coho salmon

[a] Puget Sound sockeye salmon occur in other HUCs in the project area, but EFH has only been designated for the species in the Lake Washington HUC.

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with NOAA Fisheries. Although absolute criteria have not been established for conducting EFH consultations, NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes, such as NEPA, the Fish and Wildlife Coordination Act, the ESA, and the Federal Power Act in order to reduce duplication and improve efficiency (Title 50 CFR Part 600.920(e)). Generally, the EFH consultation process includes the following steps:

1) Notification - The action agency should clearly state the process being used for EFH consultations (e.g., incorporating EFH consultation into an EIS, section 10 permit, etc.).

2) EFH Assessment - The action agency should prepare an EFH Assessment that includes both identification of affected EFH and an assessment of impacts. Specifically, the EFH should include:

   - a description of the proposed action;
   - an analysis of the effects (including cumulative effects) of the proposed action on EFH, the managed fish species, and major prey species;
   - the federal agency’s views regarding the effects of the action on EFH; and
   - proposed mitigation, if applicable.

3) EFH Conservation Recommendations - After reviewing the EFH Assessment, NOAA Fisheries should provide recommendations to the action agency regarding measures that can be taken by that agency to conserve EFH.

4) Agency Response - Within 30 days of receiving the recommendations, the action agency must respond to NOAA Fisheries. The response must include a description of measures proposed by the agency to avoid, mitigate, or offset the impact of the activity on EFH.

For the Capacity Replacement Project, the required EFH Assessment has been incorporated into the Biological Assessment for the project. The Biological and EFH Assessment was submitted to NOAA Fisheries under separate cover (see section 4.7).

4.6.2.3 General Impact and Mitigation

Of the 146 waterbodies that would be crossed by the loops, 45 are known or presumed to be inhabited by fish and an additional 14 are classified as fish-bearing but for which species' occurrence has not been documented by the WDFW, NWIFC, or other sources. The waterbody that would be crossed by the Portland Lateral Take-off does not have a fishery classification. Northwest proposes to cross these 59 waterbodies using the flume method (46), HDD method (5), dam and pump method (2), aerial span method (2), wet open-cut method (2), and push-pull method (2) as described in sections 2.3.2 and 4.3.2.

In-stream construction across these waterbodies would directly affect aquatic resources. In addition, construction of the loops across waterbodies would remove vegetation and habitat and increase the sedimentation and turbidity of the water, the potential for streambank erosion, and the potential for fuel or chemical spills. Construction-related impacts on aquatic resources could also result from an inadvertent release of drilling mud during HDDs, in-stream blasting, hydrostatic testing, and water withdrawals for dust control. Northwest has indicated that no in-stream blasting would be required and dust control water would be withdrawn from municipal sources. A discussion of the remaining impacts on aquatic resources is provided below. The degree of impact would depend on the proposed crossing method, the existing conditions at each crossing location, the mitigation measures employed, and the timing of construction.

In general, Northwest would attempt to reduce or eliminate potential impacts on most aquatic resources first through impact avoidance, then minimization, and then habitat restoration and enhancement. Northwest would be required to comply with a number of regulatory requirements and programs designed specifically to protect aquatic resources, including adherence to the FERC staff's Plan and Procedures and its project-specific ECR Plan. In addition, conditions of approval incorporated into the following permits and/or authorizations would help to minimize project-related impacts on aquatic resources:

- WDFW Hydraulic Project Approval permits;
- COE sections 10 and 404 permits;
- WDOE section 401 Water Quality Certification;
- mitigation measures required by the FWS and NOAA Fisheries through consultation pursuant to the ESA and the MSA; and
- local shoreline development permits and critical areas ordinances.

In-stream Construction – In-stream construction, whether by dry waterbody crossing methods (i.e., diverted dry open-cut, flume, dam and pump) or the wet open-cut method, could interfere with essential life processes. It could also delay or prevent migrating fish from reaching upstream spawning areas or can delay downstream movement of juveniles. Equipment moving through a stream and the trenching of a waterbody could physically damage fish, fish eggs, and other aquatic organisms, including fish prey and forage species. In-stream structures for support of equipment bridges over streams may similarly impact fish and other aquatic organisms. The HDD and aerial span methods avoid in-stream construction and generally minimize impacts on aquatic resources.

The majority of the waterbodies identified as known, presumed, or classified as being fish-bearing would be crossed using the flume or dam and pump method if water is flowing in the waterbody at the time of construction. The in-stream activities associated with placing the flume pipe and constructing the sandbag dams would be expected to displace most fish either upstream or downstream from the dams. Flumes and dams would be completely installed and functioning before any in-stream disturbance. All flumed and dam and pump crossings would be completed as a single effort to minimize the time of in-stream disturbance.

Once streamflow is diverted through the flume pipe, but before pipeline trenching begins, fish trapped in any water remaining in the work area between the dams would be removed and released downstream. Northwest would contract with either the WDFW or a qualified consultant to capture the fish. If a consultant were used, Northwest would be notified of the salvage efforts approximately 2 days before field work begins, so that WDFW biologists could be onsite to review or assist in the capture and transport of the fish. Seines and dip nets would be used to collect fish; electroshocking equipment would be available for use in deep pools where seines or nets could fail to capture all of the fish. Captured fish would be transported to the lower dam and released downstream from the flume or downstream dam. Because the flume would maintain streamflow, fish may move upstream through the flume. With the dam and pump method, the fish would not be able to move upstream or downstream through the work area until the dams have been removed. Flumes and dams would be removed as soon as possible following backfilling of the trench.

For those fish-bearing waterbodies crossed by the wet open-cut method (i.e., Pilchuck Creek and the Nisqually River) and the push-pull method (i.e., Olson Lake and Evans Creek), Northwest would minimize impacts on aquatic resources by implementing the mitigation procedures described in the FERC staff's Plan and Procedures (see Appendices E and F, respectively) and its project-specific ECR Plan (see Appendix G). Northwest would also implement additional specific procedures, BMPs, and protective and restoration measures where required by site-specific conditions or permitting agencies. Additional information on measures Northwest would implement to reduce impacts on aquatic resources associated with these waterbodies is presented in section 4.6.2.4.

Inadvertent Release of Drilling Mud – Although the HDD method avoids in-stream impacts because it eliminates the need for in-stream excavation, it does not completely eliminate the possibility of impacts on aquatic resources due to the possibility of an inadvertent release of drilling mud or fluid (also referred to as a frac-out) into the waterbody. Drilling mud primarily consists of water mixed with bentonite, which is a naturally occurring clay material. The only other possible additives would be non-toxic solid materials (e.g., sawdust, nut shells, bentonite pellets, or other commercially available non-toxic products) that could be needed to plug an inadvertent release.

Bentonite, by itself, is essentially non-toxic (Breteler et al., 1985; Hartman and Martin, 1984; Sprague and Logan, 1979) and chemical toxicity of drilling muds would not exist without toxic additives. However, bentonite, as with any fine particulate material, can interfere with oxygen exchange by the gills of aquatic organisms (EPA, 1986). The degree of interference generally increases with water temperature (Horkel and Pearson, 1976). Impacts would be localized and would normally be limited to individual fish in the immediate vicinity of the frac-out. The majority of highly mobile aquatic organisms, such as fish, would be able to avoid or move away from the affected area. Other less mobile or immobile organisms, such as mussels and other macroinvertebrates, would incur direct mortality.

As discussed in section 4.3.2.3, the probability of an inadvertent release is greatest when the drill bit is working near the surface (i.e., near the entry and exit points). Northwest has designed the three proposed HDDs so that areas at greatest risk to a potential inadvertent release are in upland areas away from the water's edge. Locating the HDD entry and exit points a good distance away from the banks of the waterbody would minimize the potential for an inadvertent release into a waterbody. Northwest's HDD Plan (see Appendix I) describes how the drilling operations would be conducted and monitored to minimize the potential for inadvertent drilling mud releases. The plan also includes procedures for cleanup of drilling mud releases and for sealing the hole if a drill cannot be completed.

Sedimentation and Turbidity – Sedimentation can adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, and spawning habitat. Suspended particles and sediment can result in turbidity in sufficient quantities to affect oxygen exchange over the gills in aquatic species, resulting in weakened individuals or mortality. Additionally, sediment stirred into the water column can be redeposited on downstream substrates, which could bury aquatic macroinvertebrates (an important food source for salmonids). The highest levels of sediment would be generated by use of the wet open-cut method. Information on the fate of sediments suspended by the wet open-cut method, including the downstream extent of potential impacts, is included in section 4.3.2.2. Although the wet open-cut method has a higher potential for sedimentation and turbidity than other crossing methods, it is also the quickest crossing method. In-stream activities associated with the wet open-cut method can usually be completed in 12 to 24 hours. Because the effects of increased sedimentation and turbidity are generally limited only to the period of in-stream work, the duration of these effects would be relatively short.

Northwest would minimize impacts on surface waters and aquatic resources by implementing the mitigation procedures described in the FERC staff's Plan and Procedures (see Appendices E and F, respectively) and its project-specific ECR Plan (see section 4.3.2.2). Permits would be obtained from appropriate agencies before construction. Each crossing would be completed in accordance with the FERC staff's Procedures, Northwest's ECR Plan, and applicable permit conditions to reduce soil erosion into waterbodies. Northwest would store trench spoil above and set back from the streambank. Northwest would also install sediment barriers, such as silt fence and straw/hay bales, to prevent or significantly reduce runoff into a stream. Construction would be completed as quickly as possible to shorten the duration of sedimentation and turbidity. Northwest would stabilize the construction site, including the streambanks, immediately following installation of the loops. If circumstances require a construction delay, adequate site stabilization measures would be employed in accordance with the FERC staff's Procedures, Northwest's ECR Plan, and permit conditions.

Vegetation and Habitat Removal – Aquatic resources could be affected through the removal of vegetation and habitat at the waterbody crossing sites. Short-term, physical habitat disruption would occur during trenching activities. Long-term degradation of habitats could occur if the stream contours are modified in the area of the crossing; the flow patterns are changed; and if erosion of the bed, banks, or adjacent upland areas introduces sediment into the waterbody. Loss of riparian vegetation along the banks would reduce shade, potentially increasing water temperatures, and remove an important source of terrestrial food for aquatic organisms.

The effects of water temperature on salmonid life stages have been extensively reviewed by McCullough (1999). Maximum water temperatures ranging from 71.6 degrees Fahrenheit (^{o}F) to 75.2^{o}F limit distribution of many salmonid species. For spring chinook salmon, for example, the optimum temperature for growth is 60.1^{o}F and higher temperatures during summer could reduce growth and lead to increased mortality rates (McCullough, 1999). Vegetative cover that provides shade, especially during summer, is one factor that regulates water temperature (WDNR, 1997). Construction across waterbodies would necessitate removal of trees and riparian shrubs at the crossing locations. Impacts on riparian vegetation and Northwest's proposed mitigation measures, including its plan to plant native riparian tree and shrub vegetation at all fish-bearing streams, are described in section 4.5.3.

In addition, Northwest would mitigate for impacts on waterbodies that would be crossed using the wet open-cut method by installing LWD at appropriate areas in the waterbody within the construction right-of-way (restoration). The use of LWD as a mitigation measure for impacts associated with in-stream construction has been documented as an effective means of creating in-stream habitat heterogeneity, reducing streambank erosion, reducing sediment mobilization (Bethel and Neal, 2003), and enhancing local fish abundance (Scarborough and Robertson, 2002). Because short-term loss of riparian vegetation within construction work areas may affect water temperatures by removing shade sources, placement of LWD on the streambanks and in the streams can provide shade and increase bank stability while vegetation is maturing following construction. Additionally, placement of LWD in streams or on streambanks can supply habitat for forage species and enhance the salmonid rearing potential of an area.

Northwest proposes to remove suitable coniferous trees from the construction right-of-way with stems and root wads intact, when possible, and use the removed trees for LWD placement in the adjacent streams. LWD would be installed in various positions depending on stream channel width and configuration, and depending on the amount of bank excavation required during installation of the loops. Potential alignments of the LWD in the streams include laying the LWD piece on the streambank with the root wad partially within the channel, keying the stem into the stream channel or adjacent to the channel, and spanning both streambanks with a single LWD piece. Except for spanned streams, LWD would be installed before removing flume pipes, final trench backfill, and removal of temporary construction bridges. In most cases, a single trackhoe would be the only piece of equipment required for placement of LWD and work would be completed solely from the streambanks. Actual installation would be directed by the WDFW in the Hydraulic Project Approval permits issued for the project.

Northwest further proposes to salvage pieces of LWD during clearing of the construction right-of-way and donate them to the WDFW and/or other conservation organizations for off-site habitat creation (enhancement). Alternatively, Northwest would participate in an appropriate off-site mitigation project or bank in support of salmon recovery in the WRIA (see section 4.3.2.3).

<u>Streambank Erosion</u> – The clearing and grading of vegetation during construction could increase erosion along streambanks and turbidity levels in the waterbodies. Alteration of the natural drainage ways or compaction of soils by heavy equipment near streambanks during construction may accelerate erosion of the banks, runoff, and the transportation of sediments into waterbodies. The degree of impact on aquatic organisms due to erosion would depend on sediment loads, stream velocity, turbulence, streambank composition, and sediment particle size. To minimize these impacts, Northwest would use temporary equipment bridges, mats, and pads to support equipment that must cross the waterbody or work in saturated soils adjacent to the waterbody. In accordance with the FERC staff's Procedures and where topography allows, Northwest would attempt to preserve a minimum of 10 feet of vegetation along the waterbody banks during clearing and grading and locate temporary extra workspaces back from the edge of perennial and intermittent waterbodies where feasible to minimize the disturbance of riparian vegetation. Northwest would also install sediment barriers, such as silt fence and straw/hay bales, across the right-of-way at the edge of waterbodies throughout construction except for short periods when the removal of these sediment barriers is necessary to dig the trench, install the loop, and restore the right-of-way.

<u>Fuel and Chemical Spills</u> **-** For any large construction project, there is the potential for spills of fuel or other hazardous liquids from storage containers, equipment working in or near streams, and fuel transfers. Any spill of fuel or other hazardous liquid that reaches a waterbody would be detrimental to water quality. The chemicals released during spills could have acute, direct effects on fish, or could have

indirect effects such as altered behavior, changes in physiological processes, or changes in food sources. Fish could also be killed if a large volume of hazardous liquid is spilled into a waterbody. Ingestion of large numbers of contaminated fish could affect primary and secondary fish predators in the food chain.

To minimize the potential for spills, Northwest prepared an SPCC Plan (see section 4.3.1.2 and Appendix H). Northwest's implementation of this SPCC Plan would minimize the potential for and the impact of any spill near surface waters. Specific measures in this plan include prohibiting liquid transfer, vehicle and equipment washing, and refueling within 100 feet of waterbodies and specific steps to be followed to control, contain, and clean up any spill that occurs. Northwest's implementation of this SPCC Plan would minimize the potential for and the impact of any spill near a surface water.

If a pipeline rupture were to occur beneath a waterbody crossing after pipeline operation has begun, natural gas would percolate through the soil and sediments underlying the stream, rise through the water column of the stream, and rapidly dissipate into the atmosphere. The potential outcome would depend on the volume of natural gas released and whether an ignition source is available. A pipeline break could result in soil, sediment, and debris being thrown from the area of the break, destruction of streambank vegetation, and, in the case of ignition, explosion or fire potentially resulting in destruction of nearby fisheries. For a less severe release, natural gas would displace oxygen within the interstitial water of the sediments, resulting in temporary hypoxia within the sediments. As natural gas ascended through the water column, it would displace oxygen, possibly producing hypoxic conditions in the immediate vicinity of the release and for some distance downstream. Fish in the vicinity of a natural gas release could also be impacted by temporary hypoxia. Considering the narrow width of the majority of the waterbodies that would be crossed and their relatively shallow depth, most of the natural gas would be rapidly released to the atmosphere and any change in water chemistry or quality would be minor. Because fish are mobile, they would have the ability to avoid or leave the areas with unfavorable environmental conditions resulting from such a release.

<u>Hydrostatic Testing</u> – Potential impacts associated with hydrostatic testing include: entrainment of fish, reduced downstream flows, and impaired downstream uses associated with hydrostatic test water withdrawals, and erosion, scouring, and a release of chemical additives associated with hydrostatic test water discharges. Northwest would obtain most of its hydrostatic test water from municipal sources; however, up to 6,060,000 gallons of water would be withdrawn from the Centralia Canal for the Fort Lewis Loop (see sections 4.3.1.4 and 4.3.2.7). The Centralia Canal is a WDNR Type 3 coldwater fishery.

Northwest would minimize the potential effects of hydrostatic testing on the Centralia Canal by adhering to the measures in its ECR Plan (see Appendix G). These measures include screening intake hoses to prevent the entrainment of fish and other aquatic organisms and regulating the rate of withdrawal of hydrostatic test water to avoid adverse impact on aquatic resources or downstream flows. Northwest would be testing only new pipe and no chemicals would be added to the water during hydrostatic testing. Northwest would acquire the necessary permits from state agencies before withdrawing hydrostatic test water, including specific approvals from applicable resource agencies. As discussed in section 4.3.1.4, Northwest would discharge all hydrostatic test water to upland locations in a manner that would avoid runoff or erosion into surface waters, and would not discharge test water directly into surface waters.

<u>Timing of Construction</u> – The degree of impact associated with in-stream activities can be affected by the season of construction. Construction during periods of sensitive fish activity (i.e., spawning and migration) can have a greater impact on fish than construction during other periods. In general, construction of the loops, which is proposed for March through October of 2006, would coincide with upstream adult migration for most species in most of the basins crossed.

Northwest would cross fish-bearing waterbodies in accordance with the FERC staff's Procedures and/or any more restrictive timing windows specified by state agencies. The WDFW has provided tentative allowable in-water work windows for each HUC crossed by the project, which indicate when in-stream construction would be allowed. The tentative allowable in-water work windows are presented in Appendix K. The tentative timing restrictions would be subject to change by the WDFW during preparation of the Hydraulic Project Approval permits. Any modifications to the allowable construction windows would be dictated by stream and fish migration conditions in the year of construction. The timing restrictions would prevent construction during periods of heavier fish use and would typically allow construction only in periods of lower flow rates.

4.6.2.4 Site-Specific Impact and Mitigation

Seven of the waterbodies that would be crossed by the loops are major waterbodies (i.e., greater than 100 feet wide) and/or are considered sensitive because they provide coldwater habitat and EFH and also support special status species. These are the North Fork Nooksack River, Pilchuck Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, Olson Lake, Evans Creek, and the Nisqually River. Two federally listed aquatic species (chinook salmon and bull trout) were identified as potentially being affected by the proposed project as a result of construction across these waterbodies (see section 4.7).

Northwest proposes to cross the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers using the HDD method. The rivers support anadromous species such as chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead, bull trout, and cutthroat. The use of the HDD method would effectively avoid in-stream construction and minimize impacts on aquatic releases. The primary impact that could occur as a result of an HDD is an inadvertent release of drilling mud as described in section 4.6.2.3. Should any of the HDDs prove unsuccessful, Northwest proposes to construct the crossings using the wet open-cut method (see sections 2.3.2 and 4.3.2.3). Use of the wet open-cut crossing method would increase impacts on aquatic resources. Although many of the major waterbodies that would be crossed by the project likely contain salmonid redds (or nests), specific data are only available for steelhead redds in the North Fork Nooksack River. Data provided by the WDFW Salmon and Steelhead Habitat Inventory and Assessment Program (SalmonScape; 2004) show highly variable redd abundance in the waterbody between 1984 and 1996, the period for which data are available. The number of steelhead redds ranged from a high of 43 per mile to a low of 8 per mile in 1991, and were reported at about 20 per mile in 1996. A slight downward trend to redd abundance appears evident within the North Fork Nooksack River, but the high variability among sampling years makes predicting the number of redds present at the crossing location during any given year difficult. This variability was also evident at other waterbodies along the proposed loops. To avoid or minimize impacts associated with the wet open-cut method, Northwest would cross the waterbodies within allowable in-stream construction windows specified by the WDFW. Adherence to WDFW-specified timing restrictions is expected to facilitate avoidance of spawning periods and direct impacts on salmonid redds. Additional information on mitigation measures that Northwest would implement to minimize impacts associated with a wet open-cut crossing of these waterbodies is presented in section 4.3.2.3.

Northwest proposes to cross Pilchuck Creek and the Nisqually River using the wet open-cut method. Pilchuck Creek and the Nisqually River support anadromous species such as chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead, and cutthroat. Pilchuck Creek also supports bull trout. To minimize impacts on aquatic resources associated with the wet open-cut crossing method, Northwest would cross the waterbodies within allowable in-stream construction windows specified by the WDFW. Additional information on mitigation measures that Northwest would implement to minimize impacts associated with a wet open-cut crossing is presented in section 4.3.2.3. If Northwest is not permitted to use the wet open-cut crossing method at Pilchuck Creek or the Nisqually

River, the aerial span method would be used (see sections 2.3.2 and 4.3.2.3). Because the support structures would be installed on the waterbody banks and the main cable would be carried across the waterbody by boat, no in-stream disturbance would occur; however, riparian vegetation would still need to be removed. As a result, impacts on aquatic resources associated with in-stream construction would be avoided if this alternative crossing method were implemented at these two waterbody crossings but impacts associated with the loss of riparian vegetation would remain the same.

Northwest proposes to cross Olson Lake and Evans Creek using the pull-pull method. The push-pull method is described in section 2.3.2. Olson Lake supports chinook salmon and coho salmon, while Evans Creek supports chinook salmon, coho salmon, and cutthroat. To minimize impacts on aquatic resources associated with the push-pull crossing method, Northwest would cross the waterbodies within allowable in-stream construction windows specified by the WDFW. Additional discussion of the Olson Lake and Evans Creek crossings is included in section 4.4.3.

4.7 SPECIAL STATUS SPECIES

Federal agencies are required by section 7 of the ESA (Title 19 USC Part 1536(c)), as amended (1978, 1979, and 1982), to ensure that any actions authorized, funded, or carried out by the agency do not jeopardize the continued existence of a federally listed endangered or threatened species, or result in the destruction or adverse modification of the designated critical habitat of a federally listed species. The action agency (i.e., the FERC) is required to consult with the FWS and/or NOAA Fisheries to determine whether federally listed endangered or threatened species or designated critical habitat are found in the vicinity of the proposed project, and to determine the proposed action's potential effects on those species or critical habitats. For actions involving major construction activities with the potential to affect listed species or designated critical habitat, the federal agency must prepare a Biological Assessment for those species that may be affected. The action agency must submit its Biological Assessment to the FWS and/or NOAA Fisheries and, if it is determined that the action may adversely affect a listed species, the federal agency must submit a request for formal consultation to comply with section 7 of the ESA. In response, the FWS and/or NOAA Fisheries would issue a Biological Opinion as to whether or not the federal action would likely jeopardize the continued existence of a listed species, or result in the destruction or adverse modification of designated critical habitat.

In compliance with section 7 of the ESA, the FERC staff submitted to the FWS and NOAA Fisheries under separate cover a Biological and EFH Assessment for the Capacity Replacement Project with a request to initiate formal consultation. The Biological and EFH Assessment details environmental baselines for EFH, federally listed species, and critical habitat; direct, indirect, interdependent and interrelated, and cumulative effects; proposed conservation measures; and determinations of effect. Information included in the Biological and EFH Assessment is summarized in this EIS.

For purposes of this environmental analysis, special status species of plants and animals include species that are listed or candidates for listing by the federal government as endangered or threatened. Based on information provided by the FWS, there are no species in the project area that are currently proposed for listing by the FWS. In addition to federally listed and candidate species, Washington maintains a list of endangered, threatened, and sensitive wildlife species, many of which are also federally listed. Other special status species include those that are not afforded legal protection under the ESA or Washington state laws, but are listed by the FWS as species of concern, and/or by the WDFW as sensitive or candidate wildlife species. Species protected under the Migratory Bird Treaty Act are discussed in section 4.6.1.3. There are currently no state laws protecting rare plants in Washington. The Washington Natural Heritage Program (WNHP) rare plant list is advisory only (WNHP, 2004). A discussion of proposed mitigation for state sensitive plants that occur in the project area is provided in section 4.5.3.

With assistance from Northwest, the FERC staff informally consulted with the FWS, NOAA Fisheries, and the WDFW to assess impacts on special status species. The FWS identified 10 federally listed threatened and endangered species, 7 candidate species, and 31 species of concern that could occur in the counties crossed by the Capacity Replacement Project (FWS, 2004a). Designated critical habitat for two of the listed species (marbled murrelet and northern spotted owl) is also present in the project area. In addition, the FWS recently proposed critical habitat for the Coastal-Puget Sound Distinct Population Segment of bull trout that includes some of the major watersheds crossed by the project (FWS, 2004b). To preclude the need for further consultation in the event the Capacity Replacement Project is authorized and the proposed designation is finalized before construction, potential impacts on proposed critical habitat for bull trout are discussed in the Biological and EFH Assessment and in this EIS.

Consultation with NOAA Fisheries identified one additional federally listed species that could occur in the counties crossed by the project. The chinook salmon in the Puget Sound ESU is listed as threatened and is the only federally listed species under NOAA Fisheries' purview. Critical habitat for this ESU was designated in a final rule in 2000 (NOAA Fisheries, 2000). NOAA Fisheries subsequently withdrew the critical habitat designation after it was challenged in District Court (Washington, DC), and the court vacated the designation in 2002. However, in 2003, NOAA Fisheries published an advance notice that critical habitat was to be proposed for various ESUs, including the chinook salmon Puget Sound ESU (NOAA Fisheries, 2003). The proposed rule has not yet been published in the Federal Register. Nevertheless, potential impacts on the former chinook salmon critical habitat are discussed in the Biological and EFH Assessment and in this EIS in the event the proposed project is authorized and the designation is finalized before construction.

Consultation with the WDFW identified 16 state-listed threatened and endangered species, 18 candidate species, 8 sensitive species, and 1 monitor species that could occur in the counties crossed by the project (WDFW, 2003; 2004a; 2004b). All of these species also have federal status. Table 4.7-1 lists the federally and state-listed special status species that may occur in the Capacity Replacement Project area. These species are discussed below.

In general, the impacts of the project on special status species would be the same as described for vegetation, wildlife, and aquatic resources. However, the magnitude and duration of these impacts could be greater for special status species because their distribution and relative abundance usually are more limited than other species discussed in sections 4.5 and 4.6. Construction could remove special status plants living within the construction right-of-way and could disturb, displace, or harm special status animals on and adjacent to construction work areas. Construction could also affect special status plants and wildlife by temporarily altering the habitat along the pipeline right-of-way and permanently altering the habitat at the Chehalis Compressor Station site. These impacts would be mitigated somewhat by the fact that 99 percent of the proposed pipeline right-of-way would be within or immediately adjacent to Northwest's existing permanent right-of-way, and disturbance associated with the proposed modifications at four of the five compressor stations would occur within the existing buildings or on previously disturbed, graded, or graveled areas within the existing fencelines. As such, vegetation clearing would not create substantial fragmentation of special status species habitat. As discussed in section 2.5, Northwest would employ EIs who would be responsible for overseeing the implementation of environmental protection measures and the FERC staff would conduct periodic inspections of the project for compliance with the Commission's environmental conditions.

Species-specific impacts and conservation/mitigation measures are discussed in detail below.

4.7.1 Federally Listed Threatened and Endangered Species

Informal consultation with the FWS and NOAA Fisheries identified 11 federally listed threatened and endangered species as potentially occurring in the project area (see table 4.7-1). As shown in table 4.7-1, designated, proposed, and former critical habitat for four of these species is also present in the project area. These 11 species and their designated, proposed, and former critical habitat are discussed below.

TABLE 4.7-1

Special Status Species Potentially Occurring in the Vicinity of the Capacity Replacement Project

Species	Federal Status [a]	Washington State Status [b]	Loop in County Where Species May Occur
Birds			
Bald eagle *Haliaeetus leucocephalus*	T	T	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Marbled murrelet *Brachyramphus marmoratus*	T, CH	T	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Northern goshawk *Accipiter gentiles*	SC	C	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Northern spotted owl *Strix occidentalis*	T, CH	E	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Olive-sided flycatcher *Contopus cooperi*	SC	C	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Oregon vesper sparrow *Pooectetes gramineus affinis*	SC	C	Fort Lewis Loop
Peregrine falcon *Falco peregrinus*	SC	S	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Slender-billed white-breasted nuthatch *Sitta carolinensis aculeate*	SC	C	Fort Lewis Loop
Streaked horned lark *Eremophila alpestris strigata*	C	C	Fort Lewis Loop
Western yellow-billed cuckoo *Coccyzus americanus*	C	C	Mount Vernon Loop Snohomish Loop
Mammals			
California wolverine *Gulo gulo luteus*	SC	C	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Canada lynx *Lynx Canadensis*	T	T	Sumas Loop Mount Vernon Loop Snohomish Loop
Gray wolf *Canis lupus*	T [c]	E	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Grizzly bear *Ursus arctos horriblis*	T	E	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Long-eared myotis *Myotis evotis*	SC		Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Long-legged myotis *Myotis volans*	SC		Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop

TABLE 4.7-1 (cont'd)

Special Status Species Potentially Occurring in the Vicinity of the Capacity Replacement Project

Species	Federal Status [a]	Washington State Status [b]	Loop in County Where Species May Occur
Mazama pocket gopher *Thomomys mazama*	C	C	Fort Lewis Loop
Northern sea otter *Enhydra lutris kenyoni*	SC	E	Fort Lewis Loop
Pacific fisher *Martes pennanti*	C	E	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Pacific Townsend's big-eared bat *Corynorhinus townsendii townsendii*	SC	C	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Western gray squirrel *Sciurus griseus griseus*	SC	T	Fort Lewis Loop
Amphibians			
Cascades frog *Rana cascadae*	SC		Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Larch Mountain salamander *Plethodon larselli*	SC	S	Snohomish Loop
Oregon spotted frog *Rana pretiosa*	C	E	Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Tailed frog *Ascaphus truei*	SC	M	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Van Dyke's salamander *Plethodon vandykei*	SC	C	Fort Lewis Loop
Western toad *Bufo boreas*	SC	C	Sumas Loop Mount Vernon Loop Snohomish Loop
Reptiles			
Northwestern pond turtle *Clemmys marmorata marmorata*	SC	E	Snohomish Loop Fort Lewis Loop
Invertebrates			
Bellers ground beetle *Agonum belleri*	SC	C	Mount Vernon Loop Snohomish Loop
Fender's soliperlan stonefly *Soliperla fenderi*	SC		Fort Lewis Loop
Hatch's click beetle *Eanus hatchi*	SC	C	Snohomish Loop
Mardon skipper *Polites mardon*	C	E	Fort Lewis Loop
Valley silverspot butterfly *Speyeria zerene bremeri*	SC	C	Snohomish Loop Fort Lewis Loop
Whulge (Edith's) checkerspot *Euphydryas editha taylori*	C	C	Fort Lewis Loop
Fish			
Bull trout *Salvelinus confluentus*	T, P-CH	C	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop

TABLE 4.7-1 (cont'd)

Special Status Species Potentially Occurring in the Vicinity of the Capacity Replacement Project

Species	Federal Status [a]	Washington State Status [b]	Loop in County Where Species May Occur
Chinook salmon *Oncorhynchus tshawytscha*	T, F-CH	C	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Coastal cutthroat trout *Oncorhynchus clarki clarki*	SC		Fort Lewis Loop
River lamprey *Lampetra ayresi*	SC	C	Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Pacific lamprey *Lampetra tridentate*	SC		Sumas Loop Mount Vernon Loop Snohomish Loop Fort Lewis Loop
Plants			
Clustered lady's slipper *Cypripedium fasiculatum*	SC	S	Fort Lewis Loop
Golden paintbrush *Castilleja levisecta*	T	E	Snohomish Loop Fort Lewis Loop
Marsh sandwort *Arenaria paludicola*	E	E	Snohomish Loop Fort Lewis Loop
Obscure paintbrush *Castilleja cryptantha*	SC	S	Fort Lewis Loop
Stalked moonwort *Botrychium pedunculosum*	SC	S	Sumas Loop Snohomish Loop
Tall bugbane *Cimicifuga elata*	SC	S	Sumas Loop Snohomish Loop Fort Lewis Loop
Torrey's peavine *Lathyrus torreyi*	SC	T	Fort Lewis Loop
Triangular-lobed moonwort *Botrychium ascendens*	SC	S	Sumas Loop Fort Lewis Loop
Water howellia *Howellia aquatilis*	T	E	Fort Lewis Loop
White-top aster *Aster curtus*	SC	S	Snohomish Loop Fort Lewis Loop

[a] Federal Status:
C = candidate
E = endangered
T = threatened
SC = species of concern
CH = critical habitat
P-CH = proposed critical habitat
F-CH = former critical habitat

[b] State Status:
C = candidate
E = endangered
M = monitor
S = sensitive
T = threatened

[c] The gray wolf is a federally listed endangered species; however, the Western Distinct Population Segment in Washington is listed as threatened.

Bald Eagle

The bald eagle is currently federally and state listed as threatened. Bald eagles are common in the vicinity of fresh water lakes and rivers and near salt water in western Washington (Smith et al., 1997). Bald eagles select perches such as large, stoutly limbed trees, snags, broken-topped trees, or rocks near water that provide easy access to hunting or feeding areas. Historically, populations of bald eagles were drastically reduced due in large part to low productivity as a result of bioaccumulation of pesticides. Bald eagle numbers have been increasing since the banning of organochlorine pesticides such as DDT. Because recovery of this species nationwide appears promising, the bald eagle was proposed for federal delisting in 1999. However, the bald eagle remains protected as a threatened species by the ESA until delisting is finalized. The greatest threats to nesting and wintering eagle populations in Washington are activities that permanently alter bald eagle habitat (e.g., removal of nest, roost, and perch trees and removal of buffers) and human activities that temporarily disturb eagles to the point of reproductive failure or reduced vigor (Watson and Rodrick, 2001).

Bald eagle nesting, feeding, and wintering areas are known to occur or potentially occur within or near the entire project area. In Washington, bald eagles may begin nest repairs in December but courtship and pair bonding generally occur during January and February (Stinson et al., 2001). Adults begin incubating eggs by mid to late March in western Washington, and young hatch near the end of April. Juveniles typically fledge during July but may remain in the nest vicinity through August (Isaacs et al., 1983). The periods immediately before and during egg laying and early incubation are considered the most critical, during which even temporary abandonment by adults can leave eggs or young susceptible to inclement weather, extreme temperatures, and predation (Romin and Muck, 1999).

Bald eagle nest sites have been mapped by the WDFW and Northwest conducted aerial surveys in April 2004 to verify bald eagle nest locations and determine breeding status. The surveys encompassed an area within a minimum of 0.5 mile on each side of the proposed loops and within a 0.5-mile radius of the abandoned facilities that are not located along the loops. Active bald eagle nests observed during the survey and their distances from the project area are listed in table 4.7.1-1.

As indicated in table 4.7.1-1, the survey identified seven active bald eagle nests at distances ranging from 760 to 12,325 feet from the construction work area. Two of the active nests were located within 0.5 mile of the Sumas Loop. No nests were located along the Snohomish Loop. The active nests in the vicinity of the Mount Vernon and Fort Lewis Loops and the abandoned facilities were all more than 0.5 mile from the project area. In addition to the active eagle nests, surveyors observed five inactive eagle nests, a bald eagle roost, and four locations with perched bald eagles. The surveys also identified other active and inactive raptor nests, including several red-tailed hawk/buteo nests and one inactive osprey nest.

The WDFW (2003) has also mapped bald eagle communal winter roost sites. Such sites may be found along all of the major waterbodies crossed by the project and are most likely to be occupied from November through March. The WDFW has documented several communal winter roosts along the Sumas Loop, the closest of which is within 200 feet of the right-of-way. There are no communal winter roosts documented along the Mount Vernon Loop although eagles are likely to feed along fish-bearing streams crossed by the loop, including Pilchuck Creek, Armstrong Creek, the North and South Fork Stillaguamish Rivers, and several tributaries to the South Fork of the Stillaguamish River throughout the year. Bald eagles may also feed along Catherine Creek, Little Pilchuck Creek, and several tributaries. Similarly, there are no communal winter roosts documented along the Snohomish Loop, although bald eagles may feed in fish-bearing tributaries to Bear Creek. There are no communal winter roosts documented along the Fort Lewis Loop.

TABLE 4.7.1-1

Active Bald Eagle Nests Observed in the Vicinity of the Loops and Abandoned Facilities Associated with the Capacity Replacement Project [a]

Facility/Feature	County	Nearest Waterbody	Distance from Construction Work Area (feet)	Observation
Pipeline Facilities				
Sumas Loop				
Nest	Whatcom	Nooksack River	3,400	Adult incubating
Nest	Whatcom	Sumas River	795	Adult incubating
Nest [b]	Canada	Saar Creek	760	Adult incubating
Mount Vernon Loop				
Nest	Snohomish	Stillaguamish River	3,580	Adult incubating
Snohomish Loop		- None -		
Fort Lewis Loop				
Nest	Thurston	Yelm Creek	3,260	Adult incubating
Abandoned Facilities				
Nest	Skagit	Skagit River	12,325	Adult incubating
Nest	Skagit	Skagit River	9,650	Adult incubating

a Surveys were conducted between April 5 and 7, 2004.
b This nest is across the Canadian border within 0.5 mile of the existing Sumas Compressor Station.

Bald eagles are sensitive to human disturbances during nesting periods (Fraser et al., 1985; Johnson, 1990; Grubb et al., 1992) and at other times of the year (Stalmaster and Newman, 1978; Knight and Knight, 1984; McGarigal et al., 1991). Human activities near nest sites during the breeding season can disturb eagles, leading to abandonment and reduced reproductive success. Disturbances to feeding eagles, particularly during the winter months, can cause the birds to expend more energy, which increases their susceptibility to disease and poor health (Stalmaster, 1987). Breeding bald eagles could potentially be affected by the proposed project activities if nest trees and surrounding habitat are removed, or if construction were to occur in the vicinity of an active nest or communal roost. The FWS (1986) developed the *Pacific States Bald Eagle Recovery Plan* and the State of Washington enacted the *Bald Eagle Protection Rules* (WAC 232-12-292) to establish guidelines to help increase and maintain bald eagle populations by protecting important nesting and communal roosting habitat while allowing for flexibility in accommodating site-specific conditions. Frequently, these guidelines call for protection of nest trees (and a buffer zone) and limit activities that might disturb nesting or roosting eagles during sensitive times of the year. Generally, the WDFW recommends scrutiny of construction activities that result in increased activity within 800 feet of nests (Watson and Rodrick, 2001). Activities within this zone that may disturb eagles should be conducted outside of the critical breeding period, generally considered to be from about January 1 to August 15. Nests, nest trees, and surrounding habitat (generally within 400 feet of the nest) should not be removed at any time of the year. Similarly, the WDFW recommends avoiding activities that produce noise or visual effects within 400 feet of the edges of communal roost trees or staging trees during the critical roosting period (generally considered to be from November 15 to March 15).

Northwest would conduct additional aerial surveys before construction to determine nest status and identify any new nests. No bald eagle nest trees would be removed during construction of the Capacity Replacement Project. Northwest would not conduct any work within 0.5 mile of any active or occupied bald eagle nest from January 1 through August 15 unless specifically permitted by the FWS. Northwest anticipates that construction of the project would be completed before the bald eagle wintering period. If construction is not completed before the wintering period, Northwest states that it would not conduct any work within 0.5 mile of bald eagle roost locations between October 31 and March 31 unless specific authorization is granted by the FWS.

Based on Northwest's proposed adherence to applicable timing restrictions, the Capacity Replacement Project is *not likely to adversely affect* the bald eagle.

Marbled Murrelet

The marbled murrelet is a federally and state-listed threatened seabird that is present in coastal waters from northern California to Alaska. Critical habitat has also been designated for this species. This species feeds in shallow offshore and inland salt water areas, such as Puget Sound, on a variety of small fish and invertebrates (Marshall, 1988a, 1988b, and 1989). Marbled murrelets nest in large trees with high, moss-covered branches or branches with growths of dwarf mistletoe that serve as nest platforms (Binford et al., 1975; Marshall, 1988b; Reed and Wood, 1991; Naslund, 1993). In Washington, suitable nesting habitats may be as far as 47 miles inland from salt water (Paton et al., 1990). Forests with trees older than 150 years are considered to provide structures for suitable nesting habitat (Marshall, 1989). Removal of suitable nesting habitat by harvest of old growth timber has been cited as the primary reason for the species' decline (FWS, 1991).

The FWS (2004a) indicated that marbled murrelets could occur in the vicinity of all of the proposed loops. In addition, critical habitat units for marbled murrelets are located within each county crossed by the project. The closest critical habitat unit to the project area is WA-07-b, located approximately 5.4 miles from the Sumas Loop. In addition, breeding was suggested in Whatcom County where, in 2002, marbled murrelets were observed appearing to depart from likely nest sites located approximately 2 miles from the Sumas Loop (WDFW, 2003).

The closest critical habitat units to the Mount Vernon, Snohomish, and Fort Lewis Loops are approximately 6.5 miles, 16.2 miles, and 13.2 miles, respectively, from the loops (FWS, 1996). There are no observations of marbled murrelets in the vicinity of these loops, although three confirmed breeding sites were documented in Snohomish County in the Sultan River Basin (Marshall, 1988a) near Darrington (Reed and Wood, 1991) and Verlot (Smith et al., 1997).

With the one exception noted above near the Sumas Loop, no known marbled murrelet nesting occurs in the vicinity of the project and, given the absence of suitable old growth forest nesting habitat, future nesting in the project area is not expected. The nesting sites that may be present in the vicinity of the Sumas Loop are located approximately 2 miles from the right-of-way and would not be expected to be affected by construction (FWS, 2000b). Further, no designated critical habitat would be affected by construction or operation of project facilities. Therefore, the project would have *no effect* on the marbled murrelet or its designated critical habitat.

Northern Spotted Owl

The northern spotted owl is a federally listed threatened species and a state-listed endangered species. The FWS (2004a) indicated that northern spotted owls could occur in the vicinity of all of the proposed loops and that designated critical habitat for the species is present in each county crossed by the Capacity Replacement Project.

Suitable habitats for spotted owls provide elements necessary for nesting, roosting, and foraging. Spotted owls also require habitats that can be utilized during juvenile dispersal and that provide sufficient tree and canopy cover for protection from predators as well as habitat supporting prey species (FWS, 1992a). Nesting and roosting habitats provide diverse structural components. Characteristics usually include forest canopies enclosed by 60 to 80 percent with multiple layers provided by large trees (more than 30 inches diameter at breast height) of multiple tree species. Trees with various structural deformities (cavities, broken tops, mistletoe infections) and large snags are also characteristics of northern spotted owl habitat, as well as accumulated fallen trees and debris on the forest floor (FWS, 1992a). Most nest and roost sites are within forest stands with the oldest trees locally available, often older than 200 years, but owls also utilize mature forests 100 to 200 years old. Foraging and dispersal habitats may be in younger, more open and fragmented forests than those associated with nesting and roosting (FWS, 1992a). Habitat loss due to forest clear-cutting has been the most significant factor causing declines of the spotted owl (FWS, 1992c).

The closest critical habitat unit to the Sumas Loop is WA-20 (FWS, 1992b), located approximately 9.4 miles from MP 1466.0. An historic spotted owl nest, last active in 1993, was reported approximately 1.1 miles east of the Sumas Loop in Whatcom County. The WDFW (2003) has classified the site as no longer suitable for spotted owl occupancy. The closest critical habitat unit to the Mount Vernon Loop is WA-25 (FWS, 1992b), approximately 10.7 miles from MP 1417.0. There are no observations of northern spotted owls in the vicinity of the Mount Vernon Loop (WDFW, 2003). Similarly, the closest critical habitat unit to the Snohomish Loop is WA-32 (FWS, 1992b), approximately 21.2 miles from MP 1386.0 with no observations of northern spotted owls in the vicinity of the loop (WDFW, 2003).

The Fort Lewis Loop would cross approximately 4.6 miles on Fort Lewis. The FWS (1992a) designated Fort Lewis as critical habitat for northern spotted owls, identifying the critical habitat unit as WA-43 (FWS, 1992b). Critical habitat on Fort Lewis serves to connect occupied spotted owl habitats in the Cascades and on the Olympic Peninsula even though repeated past surveys on Fort Lewis have not found evidence of occupancy by spotted owls (U.S. Department of the Army, 1994b). Surveys for spotted owls were again conducted on Fort Lewis in 2003 but none were detected (ENSR International, 2003). There are no observations of northern spotted owls in the vicinity of the Fort Lewis Loop (WDFW, 2003).

Forests on Fort Lewis are relatively young and generally lack characteristics that contribute to nesting habitats, foraging, and roosting areas for spotted owls, with the exception of some older stands that total about 4,174 acres within WA-43. Further, surveys for prey species, particularly northern flying squirrels, indicate that a suitable prey base is minimal. Generally, forests on Fort Lewis are suitable only for use by dispersing owls (U.S. Department of the Army, 1994b). The U.S. Department of the Army (1994b) has developed a *Northern Spotted Owl Habitat Management Plan* (HMP) to enhance the species' recovery. The primary goal of Fort Lewis' HMP is to manage forested habitats for desired future conditions that would provide foraging, roosting, nesting, and dispersal habitats for spotted owls (U.S. Department of the Army, 1994b).

Construction of the Fort Lewis Loop would necessitate the removal of 13.4 acres within forest areas in Fort Lewis, including about 9.9 acres of coniferous forest and 3.3 acres of mixed forest (coniferous and deciduous trees). The remaining 0.2 acre would be deciduous forest with species such as red alder and bigleaf maple that are not likely to provide habitat elements required for northern spotted owls. Following construction, affected forested vegetation lands outside of the permanently maintained portion of the right-of-way would be replanted as described in section 4.5.3 and, over the long term, replanted trees may achieve structural characteristics comparable to those of removed trees. However, given the amount of time this would take, tree removal is considered a long-term impact.

Once the loop is operational, right-of-way maintenance operations may be conducted every 3 years or less frequently. Northwest would use mowing, but no herbicides, to control vegetation on its permanent easement. No mowing would occur between April 15 and August 1. Because juvenile owls are most likely to disperse from late August through early November (U.S. Department of the Army, 1994b), mowing on Fort Lewis would be planned for early to mid August to avoid potential impacts on dispersing juveniles if they utilize Fort Lewis in the future. With these measures and the lack of documented records of the northern spotted owl in the vicinity of the project, the project is *not likely to adversely affect* this species.

Northwest would mitigate loss of critical habitat on Fort Lewis by obtaining property or easements on land adjacent to Fort Lewis with at least the same amount of area that would be affected and with trees having characteristics similar to those that would be removed during construction. Northwest would conduct an evaluation of trees within the construction right-of-way that would be removed within the critical habitat. The following characteristics would be evaluated for each tree affected:

- tree species;
- an estimate of the age class for each tree that would be removed;
- diameter at breast height for each tree and snag by diameter class, and fallen logs; and
- an estimate of the canopy closure class for the forested stand affected.

Based on this information, Northwest would propose areas for off-site compensatory mitigation for effects on designated critical habitat through consultation with the FWS and Fort Lewis. To further ensure that an appropriate compensatory mitigation plan is developed, **the FERC staff recommends that:**

- **Northwest file with the Secretary for the review and written approval of the Director of OEP a copy of the final compensatory mitigation plan for northern spotted owl critical habitat and documentation of FWS and Fort Lewis concurrence with the plan <u>before construction of the Fort Lewis Loop</u>.**

With the implementation of an approved compensatory mitigation plan, the project is *not likely to adversely modify* critical habitat for the northern spotted owl.

Canada Lynx

The Canada lynx is a federally and state-listed threatened species. Lynx in Washington inhabit high elevation forests. There is little indication that lynx were ever present in coastal forests west of the Cascade crest (Stinson, 2001). No observations of lynx have been reported in the vicinity of the project area by the WDFW. The counties that would be crossed by the Capacity Replacement Project extend east to the Cascade crest, and the FWS noted that the species could occur in those counties. However, historical and current distributions of Canada lynx and its suitable habitat in the state do not coincide with the project area. Therefore, because the species is not known or expected to occur in the project area, the Capacity Replacement Project would have *no effect* on the Canada lynx.

Gray Wolf

The gray wolf is a federally listed endangered species; however, the Western Distinct Population Segment in Washington is listed as threatened. The gray wolf is also a state-listed endangered species. Although extirpated in Washington by the 1930s, wolves returned to the North Cascades National Park/Ross Lake National Recreation Area in 1984, probably emigrating from adjacent lands in British Columbia (National Park Service, 1998a). Since 1990, gray wolves appear to be reproducing in the Northern Cascades (National Park Service, 1998a) but there are no plans to introduce additional wolves to the region (FWS, 1987). Wolves in Washington may occur in all natural vegetation types including aspen, mixed conifer, ponderosa pine, grand fir, alpine meadows, shrublands, riparian zones, marshes, bogs, and swamps as long as there is little human disturbance (WDNR, 1997).

Because all four of the proposed loops would be located within counties that extend east to the Cascades, coinciding with potential habitat for gray wolves (Cassidy et al., 1997), the FWS (2004) noted that the species could occur in those counties. In 1995, the WDFW reported a live gray wolf sighting in Whatcom County, approximately 2.4 miles southwest of the Sumas Loop. In 1992, there were two observations of gray wolves in Skagit County in the vicinity of Northwest's existing pipelines north of Sedro-Woolley (WDFW, 2003). Other than these sightings, there have been no other observations of gray wolves in the vicinity of the project. If, however, an individual was present in the general project vicinity during construction, it would be expected to avoid project activities. Therefore, the Capacity Replacement Project would have *no effect* on the gray wolf.

Grizzly Bear

The grizzly bear is a federally listed threatened and state-listed endangered species. Grizzly bears potentially occur throughout the Cascade Range from Canada to Yakima, Washington (WDNR, 1997). Grizzly bears can travel long distances and range over wide areas. They utilize a variety of habitats including wet meadows, swamps, bogs, streams, and conifer forests without human disturbance (WDNR, 1997). The North Cascades Grizzly Bear Recovery Area (FWS, 1993a) extends from elevations of 490 feet to 10,780 feet and encompasses the west and east slope of the northern Cascades (WDNR, 1997).

Grizzly bears occur in the North Cascades National Park located over 20 miles from the Sumas Loop, but they are seldom observed and the population for the entire North Cascades Ecosystem is a maximum of 30 to 50 bears (National Park Service, 1998b). There is one record of an adult grizzly bear seen in 1990 approximately 1.3 miles east of Northwest's existing pipelines in Skagit County (WDFW, 2003). The sighting was within the Skagit River/South Josephine Elk Winter Range. Because grizzly bears are opportunistic feeders and may eat carrion of winter-killed big game, this bear may have been attracted to carcasses available in this area.

Because all four loops would be located within counties that extend east to the Cascades, coinciding with potential habitat for grizzly bears (Cassidy et al., 1997), the FWS (2004a) noted that the species could occur in those counties. However, other than the 1990 sighting noted above, there have been no observations of grizzly bears in the vicinity of the project (WDFW, 2003). Similar to the gray wolf, grizzly bears occurring in the vicinity during construction would be expected to avoid project activities and, therefore, the Capacity Replacement Project would have *no effect* on the grizzly bear.

Salmonids

<u>Bull Trout</u> – The bull trout is a federally listed threatened and state candidate species. The Coastal-Puget Sound bull trout population segment encompasses all Pacific coast drainages within Washington, including Puget Sound, and is thought to contain the only anadromous forms of bull trout in the coterminous United States (FWS, 1999b). There are four life-history forms exhibited by native char or bull trout: adfluvial forms (rearing in natal streams then migrating to lakes once they mature), fluvial forms (rearing in natal streams, migrating to larger rivers when mature), resident forms (entire lives spent in natal streams), and anadromous forms (rearing in natal streams then migrating and maturing in salt water). All four life-history forms may occur in the project area. Migration of spawning adults begins as early as May in the general region and continues into September (see table 4.6.2-2); during the summer the adults can be found throughout a basin.

Bull trout require very cold water for spawning (46° F) and incubation of eggs (below 40° F). High quality habitat is typically characterized by cold temperatures; abundant cover in the form of large wood, undercut banks, and boulders; clean substrate for spawning; intergravel spaces large enough to conceal juveniles; and stable channels (FWS, 2004b).

Bull trout in the Pacific Northwest have declined for reasons similar to those affecting other salmonids, including: changes in stream morphology; changes in stream substrate; loss of LWD in stream channels; loss of estuarine rearing habitat; loss of wetlands; loss and degradation of riparian areas; degradation of water quality; changes in streamflow; impediments blocking fish passage; elimination of habitat; and direct loss (mortality) of fish (Chase, 1998). Bull trout appear to be more sensitive than other species to degraded water quality.

The FWS recently proposed critical habitat for the bull trout in Puget Sound watersheds (2004b) and some waterbodies that would be crossed by the Capacity Replacement Project. As currently proposed, bull trout critical habitat includes the stream channel and lateral extent to bankfull elevations on both channel margins in proposed stream reaches (the bankfull elevation is defined as the level at which water begins to leave the channel to the floodplain) (FWS, 2004b).

As proposed, critical habitat has been limited to waterbodies of known bull trout occupancy that are considered essential to conservation of the species (FWS, 2004b). Water temperature and quality; in-stream and bank cover; channel form and stability; spawning and rearing substrate conditions; appropriate hydrographic conditions; migration corridors; food availability; and absence of predators, interbreeding species, and competitors have been identified as key habitat components for bull trout (FWS, 2004b).

Appendix O identifies the waterbodies crossed by the project in which critical habitat for bull trout has been proposed. Critical habitat is proposed in Smith Creek from its confluence with the Nooksack River mainstem to Highway 542 (FWS, 2004b). The Sumas Loop would cross Smith Creek approximately 800 feet upstream from Highway 542 and would not affect proposed critical habitat directly. Critical habitat is also proposed in the North Fork Nooksack River, North Fork Stillaguamish River, South Fork Stillaguamish River, and Nisqually River, all of which would be crossed by the Capacity Replacement Project.

Bull trout spawning occurs in the lower Middle Fork of the Nooksack River and in the upper reaches of the north and south forks (WDFW, 1998). In the area where the Sumas Loop would cross the North Fork Nooksack River, the WDFW and the NWIFC (2004) have reported juvenile rearing by bull trout. Known timing of anadromous entry of adult bull trout in the lower Nooksack River and spawning are provided in table 4.6.2-2.

Bull trout spawn in the upper reaches of the North and South Fork Stillaguamish Rivers, in the upper reaches of the Skykomish River, and in a tributary to the Snohomish River (WDFW, 1998). Bull trout are presumed to be present in Pilchuck Creek and Armstrong Creek. In the vicinity where the Mount Vernon Loop would cross the North and South Fork Stillaguamish Rivers, Little Pilchuck Creek, and Catherine Creek, the WDFW and the NWIFC (2004) have reported juvenile rearing by bull trout. Although not included as proposed critical habitat for bull trout, Little Pilchuck Creek and Catherine Creek are tributaries to the Pilchuck River, which is included in the critical habitat proposal (FWS, 2004b). The timing of anadromous entry and spawning by adult bull trout in the Stillaguamish River system is unknown.

Lake Washington has been proposed as critical habitat but no tributaries to the lake have been proposed (FWS, 2004b). Even though the Nisqually River has been proposed as critical habitat, the presence of bull trout in the Nisqually River basin is unknown. There has been one report of a juvenile captured in the basin in the 1980s (Kerwin, 1999), but spawning streams in the Nisqually Basin are unknown (WDFW, 1998; WDFW and NWIFC, 2004).

Bull trout juvenile rearing occurs in the Nooksack River and the North and South Fork Stillaguamish Rivers. Northwest proposes to cross these three waterbodies using the HDD method, thus minimizing potential impact on bull trout unless a frac-out occurs beneath the rivers and bentonite is discharged in the water column or an HDD were unsuccessful and the alternative wet open-cut method had to be used. Juvenile rearing also occurs in Little Pilchuck Creek and Catherine Creek. Northwest would cross these waterbodies using the flume method. Bull trout are presumed to be present in Pilchuck Creek and Armstrong Creek. Northwest proposes to cross Pilchuck Creek using the wet open-cut method and cross Armstrong Creek using the flume method. Consequently, bull trout are *likely to be adversely affected* by construction.

Bull trout migration, rearing, sheltering, and/or feeding behaviors in all of these waterbodies could be affected in the short term by placement of flumes and by open-cut construction across Pilchuck Creek. Over the long term, bull trout could be adversely affected by tree removal within the riparian zones of 37 fish-bearing waterbodies (14 on the Sumas Loop, 10 on the Mount Vernon Loop, 10 on the Snohomish Loop, and 3 on the Fort Lewis Loop).

Proposed critical habitat in the North Fork Nooksack and North and South Fork Stillaguamish Rivers could be adversely affected if a frac-out occurred in those waterbodies during HDD operations. If crossing any or all of these waterbodies by HDD is not possible, the alternative wet open-cut method would produce temporary adverse modifications to the proposed critical habitat in terms of water quality and disturbance to the streambed and streambanks. In addition, turbidity generated during the flumed crossing of Smith Creek could temporarily diminish water quality in proposed critical habitat located about 800 feet downstream from where the creek would be crossed by the Sumas Loop.

Although the Nisqually River has been proposed as critical habitat, the presence of bull trout in the Nisqually River basin is unknown. Nevertheless, Northwest's proposal to cross the Nisqually River using the wet open-cut method may adversely modify proposed critical habitat for bull trout over the short term by affecting water quality, the river substrate, and streambanks. Clearing riparian vegetation within Northwest's proposed new permanent right-of-way, temporary construction right-of-way, and temporary extra workspaces required to cross waterbodies with proposed critical habitat could affect water temperatures if shade-producing vegetation is removed.

Chinook Salmon – Chinook salmon in the Puget Sound ESU are federally listed as threatened, but chinook salmon in the Fraser River system (NOAA Fisheries, 1999a), which includes the Sumas River and Saar Creek, are not. Chinook salmon are state candidate species. Three types of chinook salmon life history are generally recognized: ocean-type, 90-day type, and stream-type (Healey, 1991). The ocean-type are fall chinook salmon that move within several weeks of emergence as fry from the spawning gravel to rear in estuaries or the lower reaches of rivers. The 90-day type rears in riverine conditions for approximately 3 months before moving to the sea. Stream-type chinook salmon are spring chinook salmon that remain in fresh water for one or two winters before migrating to the ocean (Healey, 1991; Higgs et al., 1995).

Chinook salmon have been reported in all major river drainages crossed by the Capacity Replacement Project. No critical habitat has yet been proposed or designated for chinook salmon in the Fraser River basin, including the Sumas River and Saar Creek because those waterbodies are not included in the Puget Sound ESU. Appendix O identifies waterbodies crossed by the project where chinook salmon are known to or potentially occur and where former critical habitat is present. Specific information on fisheries trends, including data for chinook salmon, is included in the Biological and EFH Assessment.

All other fish-bearing waterbodies crossed by the Capacity Replacement Project are within former critical habitat for chinook salmon in the Puget Sound ESU that was designated in 2000 (NOAA Fisheries, 2000). As defined at that time, all river reaches accessible to the Puget Sound chinook salmon ESU were considered critical habitat for the species under the ESA. Historically occupied ranges that could still be occupied by any chinook salmon life stage are accessible reaches (NOAA Fisheries, 2000). As discussed above, a court order vacated the critical habitat designation in 2002 but NOAA Fisheries is prepared to repropose critical habitat. Until a proposed rule is published, characteristics of chinook salmon critical habitat cannot be anticipated. Known or presumed fish-bearing waterbodies that would be crossed by the project are anticipated to be included as proposed critical habitat, as they were formerly.

As it was defined in the 2000 final rule, critical habitat for chinook salmon included the waterbody as well as the adjacent riparian vegetation, one of several primary constituent elements that are essential to the conservation of the species (NOAA Fisheries, 2000). At that time, NOAA Fisheries defined the adjacent riparian zone as the "area adjacent to a stream that provides the following functions: shade, sediment transport, nutrient or chemical regulation, streambank stability, and input of large woody debris or organic matter." Although it is not yet known whether the reproposed critical habitat would also include riparian zones and associated vegetation as critical elements, analysis of project impacts on riparian vegetation is included in sections 4.5.3 and 4.6.2.

Chinook salmon occur in the Fraser River (Fisheries and Oceans Canada, 1999) and have been documented by the WDFW and the NWIFC (2004) in Saar and Breckenridge Creeks in the vicinity of the Sumas Loop. Because chinook salmon in the Sumas River and tributaries are not included in the Puget Sound ESU, they are not listed as threatened under the ESA.

Chinook salmon in the Puget Sound ESU spawn in the North Fork Nooksack River as far downstream as the confluence with the Middle Fork and in the South Fork for most of its length (WDFW and NWIFC, 2004). Chinook salmon are documented or presumed to be present by the WDFW and the NWIFC in Smith Creek, Macaulay Creek, and Mitchell Creek and one of its tributaries. Chinook salmon spawn in the North Fork Nooksack River in the vicinity of the Sumas Loop crossing.

Chinook salmon spawn in Pilchuck Creek and the North and South Fork Stillaguamish Rivers in the vicinity of the Mount Vernon Loop crossing. In addition, the WDFW and the NWIFC (2004) have reported that chinook salmon are potentially present in Armstrong Creek.

Although there are no records of chinook salmon in tributaries to the Snohomish River, which would be crossed by the Mount Vernon Loop, chinook salmon spawn in the Pilchuck River (WDFW and NWIFC, 2004) to which Little Pilchuck Creek and Catherine Creek are tributaries. Because those and other fish-bearing tributaries are accessible to chinook salmon, they were formerly considered critical habitat for the species. Chinook salmon also spawn in the Skykomish River, in the mainstem of the Snohomish River in the vicinity of Northwest's existing pipeline crossing, and in the Snoqualmie River and tributaries, which is the other principal fork of the Snohomish River (WDFW and NWIFC, 2004). Chinook salmon migrating to spawning areas in the Snohomish basin potentially pass through the project area.

In tributaries to Lake Washington, chinook salmon spawn in Bear Creek (spawning from mid September through October), tributaries of which would be crossed by the Snohomish Loop. No chinook salmon have been documented in any of those fish-bearing tributaries. Nevertheless, they are accessible to chinook salmon and are noted as formerly designated critical habitat.

Chinook salmon spawn in the Nisqually River mainstem (WDFW and NWIFC, 2004), in the vicinity where it would be crossed by the Fort Lewis Loop. Nisqually chinook salmon also spawn in Yelm Creek and Muck Creek, but only within the first mile of their confluence with the Nisqually River (WDFW and NWIFC, 2004). Chinook salmon have not been documented in any fish-bearing tributaries to the Nisqually River in reaches that would be crossed by the Fort Lewis Loop. Nevertheless, those tributaries were considered critical habitat for the species because they are accessible to chinook salmon. Spawning in the Nisqually basin occurs from late September through October.

Chinook salmon in the Pacific Northwest have declined for reasons similar to bull trout and other salmonids (NOAA Fisheries, 1999a). Except for tributaries to the Sumas River, all fish-bearing waterbodies crossed by the Capacity Replacement Project were formerly designated as critical habitat for chinook salmon in the Puget Sound ESU. The Sumas Loop would cross 17 waterbodies with former designation as critical habitat, 3 of which Northwest proposes to cross by HDD. Construction of the Mount Vernon Loop would require crossing 12 waterbodies that formerly were critical habitat. The North and South Fork Stillaguamish Rivers would be crossed by HDD. Twelve waterbodies crossed by the Snohomish Loop and six waterbodies crossed by the Fort Lewis Loop were former critical habitat although not all are known to support chinook salmon in the project area.

With the exception of waterbodies crossed by HDD, all other waterbodies would be crossed using the wet open-cut, flume, dam and pump, push-pull, or aerial span methods. These methods require temporary extra workspaces no closer than 50 feet from the waterbody if riparian vegetation is present unless a site-specific variance is requested by Northwest and approved by the FERC and other jurisdictional agencies. Consequently, temporary construction right-of-way and temporary extra workspaces required to cross waterbodies by those techniques would be within the riparian zone for former chinook salmon critical habitat as would riparian vegetation to be cleared in Northwest's existing right-of-way and new right-of-way needed for the loops. The general types and amounts of riparian vegetation that would be removed as part of the project are described in section 4.5.3.

Chinook salmon spawning occurs in the North Fork Nooksack River and the North and South Fork Stillaguamish Rivers. Northwest's proposal to cross these three waterbodies by HDD would avoid potential in-stream impacts on chinook salmon unless a frac-out occurs beneath the rivers and bentonite is discharged in the water column or an HDD is unsuccessful and the alternative wet open-cut method is used.

In waterbodies within the Puget Sound ESU that would be crossed by the flume method, chinook salmon have been documented, are presumed, or are potentially present in Smith Creek, Macaulay Creek and tributary, Mitchell Creek, and Armstrong Creek. Chinook salmon have been documented in Saar Creek, which would be crossed by the dam and pump method. Even with application of the in-stream construction windows presented in Appendix K, construction of the Capacity Replacement Project would coincide with upstream migration, intergravel development, juvenile rearing, and/or chinook salmon spawning where they occur in the project area. Although chinook salmon may not actually spawn in the affected fish-bearing streams, they may be present during construction and could be affected by in-stream activities.

Northwest proposes to use the wet open-cut method to cross Pilchuck Creek and the Nisqually River. Consequently, chinook salmon in those waterbodies are *likely to be adversely affected* by construction. Chinook salmon present in waterbodies crossed by the flume method could also be affected by construction.

Chinook salmon migration, rearing, sheltering, and/or feeding behaviors in all of these waterbodies could be affected in the short term by placing flumes in streams where chinook salmon are present and by open-cut construction across Pilchuck Creek and the Nisqually River. Over the long term, chinook salmon former critical habitat could be adversely modified by tree removal within the riparian zones of 37 fish-bearing waterbodies crossed by the project.

Conservation Measures for Bull Trout and Chinook Salmon – Northwest would implement the mitigation measures described in sections 4.6.2.3 and 4.6.2.4 to avoid or minimize impacts on bull trout, chinook salmon, and other fish species. As noted above, Northwest proposes to use the HDD method to cross three of the waterbodies where bull trout and chinook salmon are known to occur and where critical habitat for these species may be designated. In the event that the HDDs cannot be completed successfully, Northwest would use the wet open-cut method and would conduct the crossings within allowable in-stream construction time windows. Proposed mitigation measures for the other waterbodies include compliance with agency-specified in-stream construction time windows, extensive use of the flume method where water is flowing at the time of construction, implementation of the FERC staff's Procedures and Northwest's ECR Plan, and the installation of LWD at appropriate areas in the waterbody within the construction right-of-way. Additional details regarding the benefits of LWD and the adequacy of using LWD to mitigate for potential impacts on aquatic resources are included in section 4.6.2.3.

Northwest further proposes to salvage pieces of LWD during clearing of the construction right-of-way and donate them to the WDFW and/or other conservation organizations to provide for off-site in-stream habitat creation (enhancement). Alternatively, Northwest would participate in an appropriate off-site mitigation project or bank in support of salmon recovery in the WRIA (see section 4.3.2.3). The FERC staff has recommended in section 4.3.2.3 that Northwest consult with the FWS and NOAA Fisheries, as well as other agencies and Native American tribes, to develop a waterbody crossing mitigation plan. These measures are expected to mitigate for potential short-term impacts that may occur from wet open-cut crossings and in-stream construction, as well as provide opportunities for habitat enhancement outside of the right-of-way (see section 4.3.2.3).

Because the project would affect waterbodies where bull trout and chinook salmon may be present, the project *is likely to adversely affect* bull trout and chinook salmon.

The project would result in disturbance of stream and river substrates and migrating bull trout or Chinook salmon; however, these effects would be temporary and short term. Increased turbidity resulting from construction activities, especially wet open-cut crossings of Pilchuck Creek and the Nisqually River, could adversely affect water quality during and immediately following in-stream construction activities, and removal of trees within riparian zones of fish-bearing waterbodies could potentially affect components of proposed bull trout habitat or former chinook salmon habitat. However, with the implementation of the proposed mitigation measures and an approved waterbody crossing mitigation plan, the project *is not likely to adversely modify* proposed critical habitat for the bull trout or former critical habitat for the chinook salmon should it become designated in the future.

Golden Paintbrush

The golden paintbrush was federally listed as threatened in 1997 and is a state-listed endangered species. This plant species occurs in open grasslands and prairies in the Puget Trough of western Washington. Most known populations are found in glacially derived soils that normally occur at native prairie sites. This species prefers sunny locations. It can tolerate partial shade, but would not grow under a closed canopy. Idaho fescue or red fescue are common associated species, although golden paintbrush often occurs with weedy species because occupied habitats often have been disturbed in the past (FWS, 1997; FWS, 2000a; WDNR and Bureau of Land Management (BLM), 1997). This species has declined because native prairies and grasslands in the Puget Trough have been reduced, whether because of fire suppression and invasion by woody species or because of residential, agricultural, and commercial developments in otherwise suitable habitat (FWS, 1997; WDNR and BLM, 1997).

The FWS identified the golden paintbrush as potentially occurring in Skagit, King, Pierce, and Thurston Counties; however, there are no known records of this species in the vicinity of the project area except for one record from 1889 of golden paintbrush in the vicinity of the Fort Lewis Loop (WNHP, 2003).

Northwest conducted surveys for golden paintbrush and other rare plants in the project vicinity during June and July 2004. Northwest used available data on species' current and historical distributions obtained from the WNHP GIS database and the habitat associations for each listed plant species to delineate appropriate survey locations along the proposed loops. The surveys were conducted along a 225-foot-wide corridor that encompassed or exceeded the anticipated project footprint in the selected survey segments. Only sites that had not been disturbed by recent actions (i.e., logging, agriculture, housing developments, and other ground disturbances) were selected along portions of the loops where potential habitat remained and where there were current or historical occurrences of the species in the region. The timing of the surveys maximized the likelihood of detecting golden paintbrush, marsh sandwort, and water howellia during flowering based on the species' recommended identification window (FWS, 2000b; WDNR and BLM, 1997 and updates). No golden paintbrush were found in the project area during the 2004 botanical surveys.

The only potential habitats for this species along the Fort Lewis Loop are within the Thirteenth Division Prairie on Fort Lewis. The golden paintbrush was not among the sensitive plant species found during comprehensive surveys that Fort Lewis conducted in 1992 and 1993 (U.S. Department of the Army, 1994a; Thomas and Carey, 1996). As noted in section 4.5.3, Northwest, in consultation with Fort Lewis and the Nature Conservancy, has developed a site-specific revegetation plan for the native prairie crossed on the military reservation, which would minimize impacts on this habitat within Fort Lewis. Because no golden paintbrush populations were found in suitable habitats along the pipeline right-of-way during the 1992/1993 or 2004 surveys, the Capacity Replacement Project would have *no effect* on the golden paintbrush.

Marsh Sandwort

The marsh sandwort is a federally and state-listed endangered species. Two extant populations are known in San Luis Obispo County, California, but the species had been collected from prairies near Tacoma, Washington in 1896 and is possibly extirpated there (FWS, 1998a). Marsh sandwort is found in freshwater marshes from sea level to 1,480 feet in elevation. Soils in marshy habitats are saturated acidic bog soils, predominantly sand with a high organic content. In California, associated plants include ferns, Pacific blackberry, cattails, sedges, California wax myrtle, and Pacific reedgrass, among others (FWS, 1998a).

Although the FWS identified the marsh sandwort as potentially occurring in King and Pierce Counties, the WNHP database did not contain any records of this species in western Washington. In addition, marsh sandwort was not observed during the botanical surveys Northwest conducted in 2004. Therefore, the Capacity Replacement Project would have *no effect* on the marsh sandwort.

Water Howellia

The water howellia is a federally threatened and state-listed endangered species. In western Washington, this species is typically found in low elevation wetlands with soils rich in organic matter. The water howellia is typically associated with Oregon ash, snowberry, water parsnip, inflated sedge, pondweed, yellow pond lily, and reed canarygrass. It occurs mostly in small, vernal ponds, but also in ponds that may retain water throughout the year (WDNR and BLM, 1997). Threats to water howellia in Washington include changes in wetland hydrology, proliferation of weedy species such as reed canarygrass, invasion by noxious weeds (e.g., purple loosestrife), livestock grazing, and timber harvest activities on adjacent uplands (WDNR and BLM, 1997).

The WNHP (2003) provided 18 records for water howellia in western Washington, 16 of which were populations recently found on or adjacent to Fort Lewis in Pierce County. One of those populations is approximately 1.3 miles from the Fort Lewis Loop.

During the 2004 botanical surveys described above, surveyors noted that a high quality wetland appeared to provide favorable conditions for water howellia where the wetland extended east of the right-of-way, but no water howellia were found within the survey corridor or were visible within the adjacent wetland from the limits of the right-of-way. Because no water howellia were found in suitable habitat in the area to be affected by the project, the project would have *no effect* on this species.

4.7.2 Other Federally Designated Special Status Species

In addition to the federally listed endangered and threatened species discussed in section 4.7.1, the FWS identified other special status species that may occur in the project area including 7 federally designated candidate species and 31 species of concern. These species are discussed below.

Candidate Species

<u>Streaked Horned Lark and Western Yellow-billed Cuckoo</u> – The FWS identified two bird species that are candidates for federal listing, the streaked horned lark and western yellow-billed cuckoo. Both of these species are also candidates for state listing. Streaked horned larks inhabit open ground with short grass or scattered bushes. In western Washington, this species is found on prairies, sandbars, and grassy ocean dunes (Seattle Audubon Society, 2002), and nests on the ground in sparsely vegetated sites in shortgrass-dominated habitats. This species has been documented nesting on the Thirteenth Division Prairie within Fort Lewis, although civilian and military activities and natural predators have been observed as potentially limiting factors to the subspecies' breeding success there (Pearson, 2003). Construction of the Capacity Replacement Project would coincide with the species' breeding and nesting periods, which extend from late February through early August. Therefore, if present, streaked horned larks nesting in the vicinity of construction could be affected by the project, particularly if nests are present within the area disturbed by construction. Impacts such as displacement of adult birds and disturbance of habitat within the construction right-of-way would be temporary and short term; however, if nests with eggs or young birds are present within the construction area, they could be destroyed by construction activities. To ensure appropriate protection of the streaked horned lark, **the FERC staff recommends that:**

- **Northwest coordinate with the FWS to determine whether nest surveys for the streaked horned lark should be conducted before construction and, if nests are present, to identify appropriate conservation measures to minimize impacts on the species. Documentation of Northwest's discussions with the FWS and the outcome of those discussions should be filed with the Secretary <u>before construction</u>.**

With implementation of the FERC staff's recommendation, the project *is not likely to adversely affect* the streaked horned lark.

The western yellow-billed cuckoo is a neotropical migrant that primarily inhabits deciduous riparian woodlands (particularly those with cottonwoods and willows) during breeding season, and forest, woodland, and scrub habitats during the non-breeding season. Although the FWS identified this species as potentially occurring in Whatcom, Snohomish, and King Counties, it has probably been extirpated as a breeder and is widely thought to have disappeared from the state. Therefore, the project would have *no effect* on the western yellow-billed cuckoo.

Mazama Pocket Gopher – The FWS identified eight subspecies of the Mazama pocket gopher (Shelton, Roy Prairie, Cathlamet, Olympic, Olympia, Tenino, Yelm, and Tacoma) as federal candidate species that potentially occur in the project area. Four of the subspecies are also state candidate species. Mazama pocket gophers occur in isolated populations in scattered areas of Pierce and Thurston Counties. Habitat for this species is characterized by open vegetation with substantial herb growth and dry loose soils, ranging from lowland prairies to mountain meadows (FWS, 2004a). None of the relevant subspecies of Mazama pocket gophers have been documented within the Thirteenth Division Prairie on Fort Lewis, but two subspecies, the Roy Prairie and Yelm pocket gophers, are known to occur elsewhere on Fort Lewis (FWS, 2003). The Roy Prairie pocket gopher has been found within four of the seven remnant prairies on Fort Lewis, mainly in an area several miles west of the project area (COE, 1994a). One or both of these subspecies could be present on or in the vicinity of the Fort Lewis Loop, although recent surveys of the Thirteenth Division Prairie on Fort Lewis did not locate any of the pocket gopher subspecies (ENSR International, 2004). If present in the construction area, potential impacts on pocket gophers would be similar to those discussed for other wildlife species in section 4.6.1.2, including temporary displacement to similar habitats nearby, and possible direct mortality of individuals. As discussed in section 4.6.1.2, Northwest would restore the disturbed right-of-way in accordance with the FERC staff's Plan and Northwest's ECR Plan, and the type of habitat used by pocket gophers would recover quickly. Therefore, while the project may affect this species if present, it *is not likely to adversely affect* the Mazama pocket gopher.

Pacific Fisher – In addition to being a federal candidate species, the Pacific fisher is a state-listed endangered species. Historically, Pacific fishers were present in low densities in forested habitats throughout Washington. This species has remained at low population levels in Washington despite legal protection from harvest for over 64 years. These low levels are attributed to reduction of habitat quantity and quality by logging and human developments, past predator and pest control efforts, the species' low reproductive rate, and genetic effects related to small populations (Lewis and Stinson, 1998). Pacific fishers are also subject to mortality due to vehicles and incidental trapping (traps set for other species).

The FWS identified this species as potentially occurring in all of the counties crossed by the project. However, the most recent records in the vicinity of the proposed loops range from 1981 to 1996, and all except one were from locations several miles from the project area. The closest recorded occurrence was a Pacific fisher trapped on Fort Lewis in Pierce County in 1992 (Lewis and Stinson, 1998). The WDFW has no recorded observations of this species in the project area, and the Pacific fisher is not expected to occur in the vicinity. In addition, conservation efforts directed at other species (northern spotted owl, marbled murrelet) have probably benefited the Pacific fisher (Lewis and Stinson, 1998) and Northwest's proposed compensatory mitigation for spotted owl critical habitat discussed above may provide benefit to the Pacific fisher if this species occupies the compensatory habitat in the future. Therefore, the Pacific fisher *is not likely to be adversely affected* by the project.

Oregon Spotted Frog – In addition to being a federal candidate species, the Oregon spotted frog is a state-listed endangered species. Oregon spotted frogs in Washington are limited to three extant populations (two in Klickitat County and one in Thurston County). The principal reasons for the species' decline include loss and alterations of habitat and introduction of exotic species such as bullfrogs. The population in Thurston County inhabits wetlands, pools, and shallow waters associated with Dempsey

Creek, a tributary to Black Lake. Censuses conducted in the late 1990s indicate that the population is healthy and reproducing (McAllister and Leonard, 1997). Since 1997, an additional population was discovered on Rocky Prairie in 1998 in the vicinity of Beaver Creek. There are no current records of Oregon spotted frogs in the vicinity of the project, and the species is not expected to be present in the project area. Therefore, the project would have *no effect* on the Oregon spotted frog.

Mardon Skipper – In addition to being a federal candidate species, the Mardon skipper is a state-listed endangered species. This small butterfly is found in four widely separated areas in Washington, Oregon, and California. One of the inhabited areas in Washington is the Puget Prairies in Pierce and Thurston Counties. The species typically inhabits grasslands dominated by Idaho fescue where adults feed on flower nectar of several plant species, especially early blue violets. The Mardon skipper appears to avoid sites covered with Scots broom. The species has declined due to the reduction of native prairie and grassland habitat in the Puget Trough. Residential, agricultural, and commercial developments; use of herbicides; overgrazing by livestock; introduced weeds; and fire suppression with invasion by woody species in native grassland habitats have all contributed to the Mardon skipper's decline (Potter et al., 1999).

Butterfly surveys have been conducted within the Thirteenth Division Prairie on Fort Lewis since 1997 (Ressa, 2003). Although suitable habitat may be present in the project area, no Mardon skippers have been documented within the Thirteenth Division Prairie. The occurrence of Mardon skippers near project facilities is remote and unpredictable. Therefore, the project would have *no effect* on the Mardon skipper.

Whulge (Edith's) Checkerspot – This butterfly species is both a federal and state candidate species that is associated with glacial gravelly outwash and mounded prairies of the Puget Trough. Host plants include native seaside plantain and introduced English plantain.

The Whulge checkerspot could inhabit remnant prairies and, until recently, a population of Whulge checkerspot inhabited the Thirteenth Division Prairie on Fort Lewis. However, this species has not been observed in the area since 1998 (Ressa, 2003). In addition, English plantain, a required host plant for this species, was not found during Northwest's botanical surveys of the Fort Lewis Loop. Thus, even if this species is present in the vicinity of the project, its host plant would not be affected and, therefore, the project would have *no effect* on the Whulge checkerspot.

Species of Concern

Three of the 31 species of concern identified by the FWS as potentially occurring in the project area, the northern sea otter, western gray squirrel, and northwestern pond turtle, are state-listed threatened or endangered species and are discussed in section 4.7.3. Many of the remaining federal species of concern, which are discussed below, are also identified as state sensitive, candidate, or monitor species (see table 4.7-1).

Birds – Bird species of concern to the FWS include the northern goshawk, olive-sided flycatcher, Oregon vesper sparrow, peregrine falcon, and slender-billed white-breasted nuthatch. The peregrine falcon is also a state sensitive species; the others are state candidate species.

Peregrine falcons typically nest on high cliffs closer to the coast, and as such the project area does not provide this species' preferred nesting habitat (with the potential exception of manmade structures). There are no records of peregrine falcons in the WDFW Priority Habitats and Species Database, and only one 1991 occurrence was documented on one of the North American Breeding Bird Survey (BBS) routes that coincide with counties crossed by the project (Sauer et al., 2003). Oregon vesper sparrows may be present within the Thirteenth Division Prairie on Fort Lewis because remnant prairies provide suitable habitat for this species. Also in the vicinity of the Fort Lewis Loop, slender-billed white-breasted nuthatches may inhabit remnant oak woodlands that occur as patches surrounded by prairies with invading Douglas fir or human developments in Pierce and Thurston Counties. However, no occurrences of Oregon vesper sparrows or slender-billed white-breasted nuthatches have been documented on BBS routes in the vicinity of the project, and there are no WDFW records of their occurrence near the Fort Lewis Loop. Northern goshawks have been documented in the vicinity of Northwest's existing pipelines elsewhere in western Washington and may be present in the project area, especially around the Sumas and Fort Lewis Loops. Olive-sided flycatchers have been recorded on all BBS routes near the project area.

Based on the lack of recorded occurrences in the project area, the project is unlikely to affect the peregrine falcon, Oregon vesper sparrow, or slender-billed white-breasted nuthatch. There is potential for the project to affect the northern goshawk and olive-sided flycatcher, particularly where forest clearing is required in areas inhabited by these species. Potential impacts and proposed mitigation for forested habitat are discussed in section 4.5. Migratory birds are discussed in section 4.6.1.3.

<u>Mammals</u> – Mammal species of concern to the FWS include the California wolverine and three species of bat (the long-eared myotis bat, long-legged myotis bat, and Pacific Townsend's big-eared bat). The California wolverine and the Pacific Townsend's big-eared bat are also state candidate species.

The California wolverine is generally found in remote montane forests with adequate year-round food supplies. It dens in areas with fallen logs and deep snow. Although the FWS identified this species as potentially occurring in five of the counties crossed by the project, the WDFW Priority Habitats and Species Database provided only one documented occurrence in the project area. This occurrence was an apparent vehicle-related mortality near the Sumas Loop. Due to their large home ranges, California wolverines may be present in the project area; however, they would be expected to avoid project-related construction activity and would not be affected by the project.

The three bat species may occupy a variety of habitats. The Pacific Townsend's big-eared bat uses caves, lava tubes, and abandoned buildings. The two myotis bat species may be found in mature and immature conifers, alder/salmonberry shrubby species, arid grasslands, or rangelands. These bats roost in buildings and loose bark attached to trees, and may use these habitats as maternity colonies. All three bat species are likely to be present, at least for feeding, in appropriate habitats in the project area. While tree-clearing may reduce some of the forested habitat used by the myotis bat species and displace the species into suitable nearby habitat, most potential impacts on bats are expected to be short term and indirect.

<u>Amphibians</u> – Special concern amphibians identified by the FWS include the Cascades frog, Larch Mountain salamander, tailed frog, Van Dyke's salamander, and western toad. The Van Dyke's salamander and western toad are also state candidate species. The Larch Mountain salamander is a state sensitive species and the tailed frog is a state monitor species. Although these species may occur in the counties noted by the FWS (2004), distributions and/or habitat associated with some of them preclude their potential occurrence in the area of the Capacity Replacement Project. Tailed frogs have been documented near the Sumas Loop and both tailed frogs and western toads may be encountered in their respective habitats. To the extent that these species are present in the project area, they may be affected by construction activities in ways similar to those described for other wildlife species. Displacement to nearby suitable habitats would likely be temporary, but construction activities could cause direct mortality of some individuals. Northwest would minimize and mitigate impacts on amphibians in the project area by implementing the FERC staff's Plan and Procedures and Northwest's ECR Plan.

<u>Invertebrates</u> – Special concern invertebrates identified by the FWS include the Bellers ground beetle, Fender's soliperlan stonefly, Hatch's click beetle, and the valley silverspot butterfly. The Bellers

ground beetle, Hatch's click beetle, and valley silverspot butterfly are also state candidate species. The valley silverspot butterfly could potentially inhabit remnant prairies in the vicinity of the Fort Lewis Loop. However, no valley silverspot butterflies have been identified during surveys conducted within the Thirteenth Division Prairie on Fort Lewis since 1997 (Ressa, 2003). This species' host plant, the western blue violet, was also not found along the Fort Lewis Loop during Northwest's 2004 botanical surveys. The Bellers ground beetle could occur in sphagnum bogs with living, floating sphagnum mats and, if present, could be affected by construction activities. The Fender's soliperlan stonefly is found in seeps in Saint Andrews Creek in Mount Rainier National Park and in seeps along the Puyallup River in Christina Falls. Little information is available about the Hatch's click beetle. To the extent that any of these species would be present within areas disturbed by construction, they could be affected by project-related activities. However, Northwest's proposed construction procedures and mitigation measures would prevent or minimize adverse impacts on these species.

Fish – Special concern fish species identified by the FWS include the coastal cutthroat trout, river lamprey, and Pacific lamprey. The river lamprey is also a state candidate species. The coastal cutthroat trout is a coldwater anadromous species (see section 4.6.2). The Pacific lamprey is an anadromous fish that spawns on gravel and sandy stream substrate. Newly hatched individuals move to backwater areas with low velocity and rich organic sediments. These filter feeders remain in the mud for 4 to 6 years, emerging as adults and migrating to the ocean during high water periods. Adults have been measured up to 30 inches in length (Pacific States Marine Fisheries Commission, 2001). The river lamprey is a smaller fish but with a similar life history (Froese and Pauly, 2001). In the project area, both species have been documented in the South Fork Stillaguamish River and the Pacific lamprey has also been documented in the Nisqually River. Northwest proposes to cross the South Fork Stillaguamish River using the HDD method, which would avoid impacts on the streambed and banks and would therefore avoid impacts on fish unless a frac-out occurs or the HDD is not successful requiring the use of the wet open-cut method. The Nisqually River is proposed as a wet open-cut crossing, which would temporarily affect water quality and in-stream habitat. As discussed in sections 4.3.2 and 4.6.2, Northwest would implement several mitigation measures to avoid, minimize, or mitigate impacts on waterbodies and aquatic resources.

Plants – Special concern plant species identified by the FWS as potentially occurring in the project area include the clustered lady's slipper, obscure paintbrush, stalked moonwort, tall bugbane, Torrey's peavine, triangular-lobed moonwort, and white-top aster. All of these species are also considered sensitive in Washington with the exception of Torrey's peavine, which is state-listed as threatened. The only one of these species found during Northwest's botanical surveys of the proposed loops is the white-top aster. Mitigation measures that Northwest has proposed for this species are discussed in section 4.5.3.

4.7.3 State-listed Threatened and Endangered Species

Consultation with the WDFW identified 16 state-listed threatened and endangered species (WDFW, 2003; 2004a; 2004b). Thirteen of these species are included in the discussions above. The remaining three species, northern sea otter, western gray squirrel, and northwestern pond turtle, are discussed below.

Northern Sea Otter

The northern sea otter is a state-listed endangered species. Sea otters are found in nearshore marine waters of the North Pacific. They feed primarily on benthic invertebrates such as sea urchins, abalones, clams, and crabs (Richardson and Allen, 2000). Because Thurston County extends west to Puget Sound and would be crossed by the Capacity Replacement Project, the FWS (2004) noted that the species could occur in the county. Although sea otters may occasionally enter estuaries to Puget Sound, as occurred in 2001 when an individual sea otter was captured 5 miles upstream from the mouth of McAllister Creek (WDFW, 2001), no northern sea otters are expected to occur in the project area. Therefore, the project is not expected to affect the northern sea otter.

Western Gray Squirrel

The western gray squirrel is a state-listed threatened species. In Washington, the distribution of this species is closely tied to Oregon white oak habitat and loss of oak woodlands is one factor contributing to the species' decline. Another factor has been the invasion by the eastern gray squirrel, which is a species more tolerant of humans and more adaptable to alternative food sources than the western gray squirrel (WDFW, 1993).

Western gray squirrels have been documented in the vicinity of the Fort Lewis Loop. Northwest has surveyed Oregon white oaks along the Fort Lewis Loop and determined that approximately 0.4 acre of oak woodland vegetation would be affected by construction. The actual number of oak trees that would be affected cannot be determined until all construction areas have been surveyed and staked in the field. However, it is expected that the majority of the trees can be avoided because they are on the periphery of Northwest's existing permanent right-of-way. Northwest would avoid removing individual oak trees whenever practicable. The oak trees that could be preserved would be flagged for avoidance. Oak trees that would be removed due to construction would be replaced at a 1:1 ratio with oak trees either in 5-gallon containers or of 1-inch caliper planting stock. The trees would be planted within the temporary construction right-of-way in areas that would not be affected by right-of-way maintenance activities. To ensure that removed trees are replaced, Northwest proposes to include planting, monitoring, and replacement of oak trees within the scope of work performed by the Nature Conservancy in conjunction with its prairie restoration work on Fort Lewis (see section 4.5.3). Activities associated with construction may displace western gray squirrels from occupied habitat in or adjacent to the disturbance, but effects are expected to be temporary and thus the project is not expected to adversely affect the western gray squirrel.

Northwestern Pond Turtle

The northwestern pond turtle is a state-listed endangered species. Pond turtles spend most of their lives in aquatic habitats that include streams, ponds, lakes, and permanent and ephemeral wetlands, but they nest on land and use terrestrial sites to aestivate during hot periods and to overwinter. Basking sites such as rocks, logs, sand, mud, emergent or submerged aquatic vegetation, or other above water objects within aquatic habitats are important habitat components. Northwestern pond turtles delay reproduction until they are 10 years old or more and face low recruitment. Human alteration of wetlands and other aquatic habitats has adversely affected this species by eliminating nesting habitat and increasing depredation of adults, nests, and hatchlings (Hays et al., 1999). In addition, climate variations can affect their survival due to the temperature influence on hatching rates (Hays et al., 1999).

Recent sightings of pond turtles in 1991 and 1992 indicate that they are present in King County near Lake Washington, in Thurston County near the Nisqually National Wildlife Refuge, and in Pierce County near Fife. Captive breeding and reintroduction programs have been operating since 1991. Turtles were reintroduced at ponds near Lakewood between 1996 and 1998 (Hays et al., 1999). Nisqually Lake on Fort Lewis was evaluated as suitable habitat but there is no information about reintroductions there. No observations were reported by the WDFW in the project vicinity and northwestern pond turtles are not expected to be present. Therefore, the project is not anticipated to affect the northwestern pond turtle.

4.7.4 Cumulative, Interdependent, and Interrelated Effects

Section 7 of the ESA requires the federal action agency to provide an analysis of cumulative effects when assessing potential impacts on federally listed species. Under the ESA, cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area. Future federal actions that are unrelated to the proposed action are not considered because evaluating the potential impact of such actions would be speculative, and such actions would require a separate consultation pursuant to section 7 of the ESA.

Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. Several other existing or planned activities in the general vicinity of the Capacity Replacement Project could have a cumulative impact when considered with the proposed project.

Most native wildlife habitats in the project area have been altered over time by state and private activities that historically included logging and agriculture. More recently, construction of utility transmission lines, roads and highways, residential subdivisions, and industrial sites has removed or further altered existing vegetation as potential wildlife habitat. Significant habitat fragmentation has occurred in the project area as a result of these developments as well as extensive commercial timber harvest. These sources of cumulative impact on wildlife and plant species of concern are expected to be constant or increasing in the foreseeable future. Wildlife species are likely to be further affected by increased vehicular traffic, noise, and human presence in general within the project area. Residential developments, in particular, are proliferating throughout western Washington with associated road construction and additional utility lines. These and associated commercial and industrial developments would likely contribute cumulatively to affect listed terrestrial vertebrates, plants, and salmonids inhabiting Puget Sound drainages within the foreseeable future.

Impacts from known existing and planned projects are discussed in section 4.13. In general, the projects with the potential to affect wildlife and vegetation are those most likely to have a cumulative impact on listed species. It is not possible to speculate on potential acreage affected or the extent to which any given species would be affected by the other activities discussed in section 4.13 because the FERC has no control over actual routes, facilities, or project feasibility. However, the Capacity Replacement Project, considered together with other non-federal actions, is not likely to appreciably reduce the likelihood of survival and recovery of the species considered in this analysis for the following reasons:

- Northwest has proposed to construct within or adjacent to its existing pipeline right-of-way and within existing fencelines of compressor station facilities to the maximum extent practicable. Of the 79.5 miles of proposed pipeline, approximately 78.4 miles (99 percent) would be constructed within or adjacent to Northwest's existing right-of-way and 74.2 miles (93 percent) would be constructed within Northwest's existing right-of-way and would not require any additional permanent right-of-way for operation;

- the effects of the proposed project on listed species habitats would be minimized through revegetation and restoration efforts; and

- the implementation of Northwest's proposed species-specific conservation measures and the FERC staff's additional recommendations would reduce the project's impacts on federally listed species.

Interdependent and interrelated actions are those actions associated with the proposed action and are either part of a larger complete action or have no independent utility apart from the proposed action. The direct and indirect effects of the interrelated and interdependent actions are considered along with those of the proposed action. The proposed project may include interrelated and interdependent actions to the extent that it would likely result in future maintenance activities related to the proposed facilities. Such activities would likely be similar in nature to those described for the current project and would likely result in only short-term, insignificant effects on listed species. However, given the purpose of this particular project (see section 1.1) and the fact that the proposed loops would replace existing facilities, maintenance activities would not be expected to increase over past levels.

The main purpose of the project is to ensure the long-term integrity of Northwest's existing pipelines. There are no other projects by parties other than Northwest that are being planned that would depend on implementation of the project. Further, Northwest states that it has no definitive plans for either further expansion or modifications of the new facilities proposed as part of the Capacity Replacement Project.

4.7.5 Summary of Determinations of Effect for Federally Listed or Proposed Species

To comply with section 7 of the ESA, the FERC staff has informally consulted with the FWS and NOAA Fisheries regarding the presence of federally listed or proposed species in the project area. Based on these consultations, it has been determined that 11 federally listed species potentially occur in the general vicinity of or in the counties crossed by the project. It has also been determined that designated or potential critical habitat for four species occurs in the project area. Northwest conducted botanical surveys of the loops to identify the presence of listed plant species in the project area and aerial surveys for bald eagle nests. Additional surveys would be conducted for bald eagle nests before construction.

The FERC staff's determinations of effect are summarized in table 4.7.5-1. It has been determined that the project is likely to adversely affect the bull trout and the chinook salmon.

To ensure that potential impacts on special status species would be avoided or mitigated, as well as to comply with the ESA, **the FERC staff recommends that:**

- **Northwest not begin construction activities <u>until</u>:**

  a. **Northwest completes any outstanding species-specific surveys and the FERC receives comments from the FWS and NOAA Fisheries regarding the preconstruction survey reports;**

  b. **the FERC completes formal consultation with the FWS and NOAA Fisheries; and**

  c. **Northwest receives written notification from the Director of OEP that construction and/or implementation of conservation measures may begin.**

TABLE 4.7.5-1

Determinations of Effect for Federally Listed Species and Critical Habitat Potentially Occurring in the Vicinity of the Capacity Replacement Project

Species	Determination	Justification
Birds		
Bald eagle *Haliaeetus leucocephalus*	Not likely to adversely affect	Preconstruction surveys and implementation of proposed conservation measures would avoid or minimize potential impacts on this species.
Marbled murrelet *Brachyramphus marmoratus*	No effect on species; no effect on critical habitat	No observations of this species in the project area. No critical habitat would be affected.
Northern spotted owl *Strix occidentalis*	Not likely to adversely affect species; not likely to adversely modify critical habitat	No recent observations of this species in the project area. Implementation of proposed conservation measures and the FERC staff's recommendation would avoid or minimize potential impacts on species and its critical habitat.
Mammals		
Canada lynx *Lynx canadensis*	No effect	No observations of this species in the project area.
Gray wolf *Canis lupus*	No effect	No recent observations of this species in the project area.
Grizzly bear *Ursus arctos horriblis*	No effect	No recent observations of this species in the project area.
Fish		
Bull trout *Salvelinus confluentus*	Likely to adversely affect species; not likely to adversely modify proposed critical habitat	Species may be present in project area during construction, including a waterbody to be crossed by the wet open-cut method. Proposed conservation measures and the FERC staff's recommendation would prevent adverse modification of proposed critical habitat.
Chinook salmon *Oncorhynchus tshawytscha*	Likely to adversely affect species; not likely to adversely modify former (and potential future) critical habitat	Species may be present in project area during construction, including a waterbody to be crossed by the wet open-cut method. Proposed conservation measures and the FERC staff's recommendation would prevent adverse modification of former critical (and potential future) habitat.
Plants		
Golden paintbrush *Castilleja levisecta*	No effect	No plants were identified during surveys in 2004.
Marsh sandwort *Arenaria paludicola*	No effect	No plants were identified during surveys in 2004.
Water howellia *Howellia aquatilis*	No effect	No plants were identified during surveys in 2004.

4.8 LAND USE, RECREATION AND SPECIAL INTEREST AREAS, AND VISUAL RESOURCES

4.8.1 Land Use

Pipeline Facilities

The Capacity Replacement Project would involve the construction of 79.5 miles of new 36-inch-diameter pipeline in four loops in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties, Washington. Of the 79.5 miles of proposed pipeline, approximately 78.4 miles (99 percent) would be constructed within or adjacent to Northwest's existing right-of-way and 1.1 miles (1 percent) would be constructed on newly created right-of-way. Of the 78.4 miles, 74.2 miles (93 percent of the total route) would be constructed within Northwest's existing right-of-way and would not require any additional permanent right-of-way for operation (51.6 miles using the standard 20-foot offset to the east of the existing 30-inch-diameter pipeline and 22.6 miles using a non-standard parallel offset) (see table C-1 in Appendix C). The remaining 4.2 miles (5 percent of the total route) would be located adjacent to and/or partially overlap Northwest's existing easement but would require additional permanent right-of-way for operation.

Table 4.8.1-1 lists the land uses that would be crossed by the proposed loops. The predominant land use that would be crossed is developed land, comprising about 47.4 miles (60 percent) of the route. Agricultural land is the second most prevalent land use, comprising 15.4 miles (19 percent) of the proposed route. Other land uses that would be crossed by the loops include 10.0 miles (13 percent) of open land, 6.2 miles (8 percent) of forest land, and 0.5 mile (less than 1 percent) of open water.

TABLE 4.8.1-1

Land Uses Crossed by the Loops Associated with the Capacity Replacement Project

Facility	Developed Land [a] (miles)	Agricultural Land [b] (miles)	Open Land [c] (miles)	Forest Land [d] (miles)	Open Water [e] (miles)	Total (miles)
Sumas Loop	9.1	8.1	4.8	0.5	0.2	22.7
Mount Vernon Loop	17.3	2.3	1.5	1.2	0.2	22.5
Snohomish Loop	10.1	0.1	0.9	0.8	0.1	11.9
Fort Lewis Loop	11.0	4.9	2.8	3.7	0.1	22.4
Project Total	47.4 (60%)	15.4 (19%)	10.0 (13%)	6.2 (8%)	0.5 (<1%)	79.5 (100%)

[a] Developed land includes residential and commercial land and transportation, communications, and utility rights-of-way not currently used for other purposes (e.g., residential lawns, agriculture).

[b] Agricultural land includes cropland and pastureland, as well as orchards, groves, vineyards, and nurseries.

[c] Open land includes upland herbaceous and scrub-shrub areas, as well as non-forested wetlands.

[d] Forest land includes areas of upland deciduous, evergreen, and mixed forest, as well as forested wetlands.

[e] Open water includes stream and canal crossings.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

Land use impacts associated with the project would include the disturbance of existing land uses within the construction right-of-way during construction and retention of an expanded or new permanent right-of-way for operation of the loops. Northwest proposes to generally use a 95-foot-wide construction right-of-way, consisting of Northwest's existing 75-foot-wide maintained right-of-way and 20 feet of new temporary extra workspace. On the Snohomish Loop and in other areas where encroachment, development, or other limitations confine available workspace, Northwest would remove the 26-inch-diameter pipeline and place the 36-inch-diameter loop in the same trench using the full width of the existing right-of-way, which varies from 60 to 75 feet. In total, the 26-inch-diameter pipeline would be removed from about 14.6 miles along the proposed loops (11.9 miles along the Snohomish Loop, 1.8 miles along the Sumas Loop, 0.7 mile along the Mount Vernon Loop, and 0.2 mile along the Fort Lewis Loop). Northwest would generally use a 75-foot-wide construction right-of-way in wetland areas. In the areas where the proposed loop deviates from the existing right-of-way, Northwest would typically use a 95-foot-wide construction right-of-way. In addition to the construction right-of-way, various temporary extra workspaces and access roads would be used for construction.

Because the majority of the new loops would be installed within the existing 75-foot-wide right-of-way, no additional permanent right-of-way would be required. However, in some locations, Northwest retains only a 60-foot-wide permanent right-of-way. In these areas, Northwest states that it may request additional operational right-of-way to bring the easement up to 75 feet if space is available and the landowner is willing to expand the easement. In the areas where the proposed loop deviates from the existing right-of-way, Northwest would typically retain a 50-foot-wide new permanent right-of-way.

Construction of Northwest's proposed loops would affect a total of about 1,024.1 acres of land, including 877.0 acres for the pipeline right-of-way, 144.1 acres for temporary extra workspace, and 3.0 acres for access roads. Of the 877.0 acres affected by the pipeline right-of-way, about 687.6 acres (78 percent) would be within Northwest's existing right-of-way. Table 4.8.1-2 summarizes the acres of each land use that would be affected by construction and operation of the loops. Developed land would be the primary land use affected by construction of the loops totaling about 550.8 acres (54 percent). The remaining land uses that would be disturbed consist of 209.5 acres (20 percent) of agricultural land, 140.9 acres (14 percent) of open land, 119.3 acres (12 percent) of forest land, and 3.6 acres (less than 1 percent) of open water.

Of the 1,024.1 acres of land affected by construction of the loops, about 687.6 acres would be returned to Northwest's existing permanent right-of-way and 16.7 acres would be retained as new permanent right-of-way. The land retained as permanent right-of-way would be allowed to revert to former use; however, certain activities such as the construction of aboveground structures, including houses, house additions, garages, patios, pools, or other objects not easily removable, or the planting and cultivating of trees or orchards, would be prohibited within the permanent right-of-way. An additional 0.3 acre of land would be affected by permanent access roads along the right-of-way. The remaining 319.5 acres used for temporary construction right-of-way and temporary extra workspace would be allowed to revert to prior uses following construction with no restrictions.

The impacts on the land uses described above are based on the successful completion of the three proposed HDD crossings. If the HDDs were not successful, Northwest proposes to construct the crossings using the wet open-cut method (see sections 2.3.2 and 4.3.2.3). Use of the wet open-cut crossing method would increase the total land affected by the loops. A total of 18.2 acres of land would be affected by an open-cut crossing of the North Fork Nooksack River. Of the 18.2 acres, 6.5 acres would be forest land, 6.4 acres would be open water, 4.0 acres would be developed land, and 1.3 acres would be open land. A total of 11.6 acres of land would be affected by an open-cut crossing of the North Fork Stillaguamish River. Of the 11.6 acres, 3.9 acres would be developed land, 3.6 acres would be forest land, 2.9 acres would be open land, and 1.2 acres would be open water. A total of 18.1 acres of land would be affected by an open-cut crossing of the South Fork Stillaguamish River. Of the 18.1 acres, 13.6 acres would be agricultural land, 1.6 acres would be developed land, 1.0 acre would be forest land, 1.0 acre would be open land, and 0.9 acres would be open water.

TABLE 4.8.1-2

Acres of Land Affected by Construction and Operation of the Loops Associated with the Capacity Replacement Project

Facility	Developed Land [a]		Agricultural Land [b]		Open Land [c]		Forest Land [d]		Open Water [e]		Total	
	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
Sumas Loop												
Pipeline Right-of-Way												
Existing Permanent Easement	78.3	78.3	73.3	73.3	40.5	40.5	5.9	5.9	0.8	0.8	198.8	198.8
New Permanent Easement	0.8	0.8	0.3	0.3	1.3	1.3	0.1	0.1	0.1	0.1	2.6	2.6
Temporary Construction Right-of-Way	13.1	0.0	18.8	0.0	7.9	0.0	10.0	0.0	0.1	0.0	49.9	0.0
Pipeline Right-of-Way Subtotal	92.2	79.1	92.4	73.6	49.7	41.8	16.0	6.0	1.0	0.9	251.3	201.4
Temporary Extra Workspace	13.4	0.0	25.4	0.0	10.9	0.0	8.3	0.0	0.3	0.0	58.3	0.0
Access Roads	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0
Sumas Loop Subtotal	105.6	79.1	119.2	73.6	60.6	41.8	24.3	6.0	1.3	0.9	311.0	201.4
Mount Vernon Loop												
Pipeline Right-of-Way												
Existing Permanent Easement	142.1	142.1	16.5	16.5	20.6	20.6	12.6	12.6	0.5	0.5	192.3	192.3
New Permanent Easement	3.8	3.8	2.4	2.4	1.5	1.5	0.8	0.8	0.0	0.0	8.5	8.5
Temporary Construction Right-of-Way	21.3	0.0	1.8	0.0	3.7	0.0	19.4	0.0	0.1	0.0	46.3	0.0
Pipeline Right-of-Way Subtotal	167.2	145.9	20.7	18.9	25.8	22.1	32.8	13.4	0.6	0.5	247.1	200.8
Temporary Extra Workspace	11.9	0.0	9.7	0.0	3.5	0.0	9.6	0.0	0.2	0.0	34.9	0.0
Access Roads	0.2	0.0	0.8	0.0	0.2	0.0	0.2	0.1	0.0	0.0	1.4	0.1
Mount Vernon Loop Subtotal	179.3	145.9	31.2	18.9	29.5	22.1	42.6	13.5	0.8	0.5	283.4	200.9
Snohomish Loop												
Pipeline Right-of-Way												
Existing Permanent Easement	81.6	81.6	0.9	0.9	7.8	7.8	6.9	6.9	0.3	0.3	97.5	97.5
New Permanent Easement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temporary Construction Right-of-Way	15.6	0.0	0.4	0.0	1.2	0.0	10.0	0.0	0.1	0.0	27.3	0.0
Pipeline Right-of-Way Subtotal	97.2	81.6	1.3	0.9	9.0	7.8	16.9	6.9	0.4	0.3	124.8	97.5
Temporary Extra Workspace	19.3	0.0	0.0	0.0	0.6	0.0	3.8	0.0	0.0	0.0	23.7	0.0
Access Roads	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snohomish Loop Subtotal	116.5	81.6	1.3	0.9	9.6	7.8	20.7	6.9	0.4	0.3	148.5	97.5
Fort Lewis Loop												
Pipeline Right-of-Way												
Existing Permanent Easement	120.0	120.0	39.8	39.8	26.8	26.8	11.9	11.9	0.5	0.5	199.0	199.0
New Permanent Easement	1.9	1.9	0.3	0.3	1.3	1.3	1.9	1.9	0.2	0.2	5.6	5.6

TABLE 4.8.1-2 (cont'd)

Acres of Land Affected by Construction and Operation of the Loops Associated with the Capacity Replacement Project

	Developed Land [a]		Agricultural Land [b]		Open Land [c]		Forest Land [d]		Open Water [e]		Total	
Facility	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.	Const.	Oper.
Temporary Construction Right-of-Way	18.7	0.0	10.5	0.0	7.3	0.0	12.7	0.0	0.0	0.0	49.2	0.0
Pipeline Right-of-Way Subtotal	140.6	121.9	50.6	40.1	35.4	28.1	26.5	13.8	0.7	0.7	253.8	204.6
Temporary Extra Workspace	8.6	0.0	7.2	0.0	5.8	0.0	5.2	0.0	0.4	0.0	27.2	0.0
Access Roads	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
Fort Lewis Loop Subtotal	149.4	122.1	57.8	40.1	41.2	28.1	31.7	13.8	1.1	0.7	281.2	204.8
Project Subtotal												
Pipeline Right-of-Way												
Existing Permanent Easement	422.0	422.0	130.5	130.5	95.7	95.7	37.3	37.3	2.1	2.1	687.6	687.6
New Permanent Easement	6.5	6.5	3.0	3.0	4.1	4.1	2.8	2.8	0.3	0.3	16.7	16.7
Temporary Construction Right-of-Way	68.7	0.0	31.5	0.0	20.1	0.0	52.1	0.0	0.3	0.0	172.7	0.0
Pipeline Right-of-Way Subtotal	497.2	428.5	165.0	133.5	119.9	99.8	92.2	40.1	2.7	2.4	877.0	704.3
Temporary Extra Workspace	53.2	0.0	42.3	0.0	20.8	0.0	26.9	0.0	0.9	0.0	144.1	0.0
Access Roads	0.4	0.2	2.2	0.0	0.2	0.0	0.2	0.1	0.0	0.0	3.0	0.3
Project Total	550.8	428.7	209.5	133.5	140.9	99.8	119.3	40.2	3.6	2.4	1,024.1	704.6

[a] Developed land includes residential and commercial land and transportation, communications, and utility rights-of-way not currently used for other purposes (e.g., residential lawns, agriculture).

[b] Agricultural land includes cropland and pastureland, as well as orchards, groves, vineyards, and nurseries.

[c] Open land includes upland herbaceous and scrub-shrub areas, as well as non-forested wetlands.

[d] Forest land includes areas of upland deciduous, evergreen, and mixed forest, as well as forested wetlands.

[e] Open water includes stream and canal crossings.

Const. = Construction.

Oper. = Operation.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

Impacts on agricultural, open, forested, and developed areas associated with commercial land are discussed below. Impacts on developed areas associated with residential areas are discussed in section 4.8.3. Wetlands and surface waters are discussed in sections 4.4 and 4.3.2, respectively. Impacts on transportation uses are discussed in section 4.9.4.

Agricultural Land – The loops would cross about 15.4 miles of agricultural land. Of this total, about 8.1 miles would be crossed by the Sumas Loop, 2.3 miles would be crossed by the Mount Vernon Loop, 0.1 mile would be crossed by the Snohomish Loop, and 4.9 miles would be crossed by the Fort Lewis Loop. The primary agricultural land that would be crossed by the project is cropland or pasture with a small amount of irrigated cropland. The loops would also cross several orchards, nurseries, and vineyards (see section 4.8.4).

Short-term impacts on agricultural areas could include the loss of standing crops within the construction work area and disruption of farming operations for the growing season during the year of construction. Installation of the proposed loops would generally take row crops out of production for one growing season; pasture and hayfields could take several years to return to previous production levels. Northwest would address compensation for crop damage or loss associated with construction with each individual landowner. Northwest would minimize impacts on agricultural land by segregating and conserving topsoil in all actively cultivated and rotated cropland and improved pasture (see section 4.2.2). Northwest would also repair any damage to irrigation systems or drain tiles caused by construction activities. Repairs of damaged drain tiles in wetland areas would be limited to replacement of the original size and depth. Northwest would allow agricultural activities to resume following construction and would monitor crops for at least 2 years to determine if additional restoration is necessary.

The loops would cross numerous developed pasture lands where temporary removal of fences during construction could result in a release of livestock. To minimize impacts on these areas, Northwest would:

- contact the owners of the fences before cutting or removing the fence;
- brace and secure each fence before cutting the opening needed for construction to prevent slacking of the wire;
- place a temporary gate in the opening that would be kept closed to prevent passage of domestic livestock; and
- promptly repair fences and cattle guards to their preconstruction condition per landowner specifications.

If construction activities break or destroy a natural barrier used for livestock control, Northwest would temporarily fence the gap and then restore the area to preconstruction conditions following construction.

Open Land – The loops would cross about 10.0 miles of open land, including about 8.7 miles of non-forested wetlands. The upland parcels crossed consist primarily of ungrazed overgrown vacant pastures or lots. Impacts on these areas would include the removal of vegetation and disturbance of the soils. These impacts would be temporary and short term and would be minimized by Northwest's implementation of the January 17, 2003 version of the FERC staff's Plan (see Appendix E) and its project-specific ECR Plan (see section 4.2.2 and Appendix G). Impacts on wetland areas are discussed in section 4.4.

Forest Land – About 6.2 miles of forest land would be crossed by the loops. During construction, Northwest would disturb about 119.3 acres of forest land consisting mainly of mixed forest. Disturbance to forest land has been minimized by locating the proposed loops within Northwest's existing right-of-way wherever possible. As a result, only about 12 percent of the total land area that would be disturbed by the project is forest land. Construction of the loops in forested areas would require the removal of trees to prepare the construction workspace. Although trees cleared within temporary extra workspace areas would be allowed to regenerate to preconstruction conditions following construction, impacts on forest resources within these areas could last for several years (see section 4.5.2). Permanent impacts would be greatest over the maintained portion of the right-of-way. As discussed in section 4.5.2, a 10-foot-wide area centered over the pipeline would be maintained treeless on an annual basis. In addition, the clearing of Northwest's 60- to 75-foot-wide permanent easement as frequently as every 3 years would prevent forest overstory vegetation within that area from attaining a mature size and thus would permanently alter the nature of the affected forest land.

Commercial Land – Of the 47.4 miles of developed land crossed by the loops, about 0.7 mile consists of commercial land. About 0.3 mile would be crossed by the Sumas Loop, 0.2 mile would be crossed by the Mount Vernon Loop, and 0.2 mile would be crossed by the Fort Lewis Loop. No commercial land would be crossed by the Snohomish Loop. A total of about 10.0 acres of commercial land would be affected by the loops. Commercial land uses could be temporarily impacted during pipeline construction by increased dust from exposed soils, construction noise, and traffic congestion. Northwest would minimize impacts on commercial land uses by providing access across the construction right-of-way. Northwest does not anticipate that any detours around commercial areas would be necessary and no businesses would be permanently displaced by project activities. Operation of the loops would not affect commercial land uses because they would be located primarily within Northwest's existing right-of-way.

Aboveground Facilities

Northwest proposes to modify 5 existing compressor stations and construct 4 pig receivers (one of which would be relocated from its previous location on a loop associated with the Evergreen Expansion Project), 3 pig launchers, and 26 MLVs (5 30-inch and 15 36-inch MLVs associated with the proposed loops and 6 30-inch MLVs along the Evergreen Expansion Project loops). A total of about 9.4 acres of land would be disturbed by construction of these aboveground facilities. Of this total, 1.5 acres would be retained during operation. Table 4.8.1-3 summarizes the land requirements and land use for the aboveground facilities associated with the Capacity Replacement Project.

Construction activities at four of the five compressor stations (Sumas, Mount Vernon, Snohomish, and Washougal) would occur within the existing buildings or on previously disturbed, graded, or graveled areas within the existing fenceline of the facilities. No additional land would be required or disturbed during the modifications at these stations.

The modifications at the Chehalis Compressor Station would require the expansion of the existing footprint of the station to install the additional compression needed for the project and the construction of a gravel road to an existing water well located southwest of the station to comply with a county fire control requirement. A total of approximately 7.7 acres of land would be required during construction activities at the station. Of the 7.7 acres, 1.5 acres would be permanently added to the existing facility (1.4 acres to expand the station's fenced area and 0.1 acre for the gravel road to the water supply well).. The 6.2 acres temporarily used would be allowed to revert to prior uses following construction. The 1.5 acres of land affected by the expansion are owned by Northwest. Of this 1.5 acres, 0.9 acre is classified as developed land consisting of the grassland/herbaceous vegetation cover type and 0.6 acre is wetland.

TABLE 4.8.1-3

Aboveground Facilities Associated with the Capacity Replacement Project

Facility	Milepost	Associated Loop	County	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Compressor Stations					
Sumas Compressor Station	1484.5	NA	Whatcom	0.0	0.0
Mount Vernon Compressor Station	1440.2	NA	Skagit	0.0	0.0
Snohomish Compressor Station	1393.9	NA	Snohomish	0.0	0.0
Chehalis Compressor Station	1289.4	NA	Lewis	7.7	1.5
Washougal Compressor Station	1216.2	NA	Clark	0.0	0.0
Compressor Station Subtotal				7.7	1.5
Pig Launchers/Receivers					
Launcher	1484.5	Sumas	Whatcom	0.0 [a]	0.0 [a]
Receiver [b]	1461.8	Sumas	Whatcom	0.0 [c]	0.0 [c]
Receiver [b, d]	1408.8	Mount Vernon	Snohomish	0.0 [e]	0.0 [e]
Launcher	1393.9	Snohomish	Snohomish	0.0 [f]	0.0 [f]
Receiver	1382.0	Snohomish	King	0.0 [g]	0.0 [g]
Launcher	1338.1	Fort Lewis	Pierce	0.0 [h]	0.0 [h]
Receiver	1315.6	Fort Lewis	Thurston	0.0 [i]	0.0 [i]
Pig Launchers/Receivers Subtotal				0.0	0.0
Mainline Valves Along the Proposed Loops					
MLV (36-inch)	1484.5	Sumas	Whatcom	0.0 [a]	0.0 [a]
MLV (36-inch)	1472.3	Sumas	Whatcom	0.0 [j]	0.0 [j]
MLV (36-inch) [b]	1467.9	Sumas	Whatcom	0.0 [k]	0.0 [k]
MLVs (30-inch and 36-inch) [b]	1461.8	Sumas	Whatcom	0.0 [c]	0.0 [c]
MLVs (30-inch and 36-inch)	1431.3	Mount Vernon	Skagit	0.0 [j]	0.0 [j]
MLV (36-inch)	1427.6	Mount Vernon	Snohomish	0.0 [j]	0.0 [j]
MLV (36-inch)	1411.3	Mount Vernon	Snohomish	0.0 [j]	0.0 [j]
MLVs (30-inch and 36-inch) [b]	1408.8	Mount Vernon	Snohomish	0.0 [e]	0.0 [e]
MLV (36-inch)	1393.9	Snohomish	Snohomish	0.0 [f]	0.0 [f]
MLV (36-inch)	1387.5	Snohomish	King	0.0 [j]	0.0 j
MLV (36-inch)	1382.0	Snohomish	King	0.0 [g]	0.0 [g]
MLVs (30-inch and 36-inch)	1338.1	Fort Lewis	Pierce	0.0 [h]	0.0 [h]
MLV (36-inch)	1335.1	Fort Lewis	Pierce	0.0 [j]	0.0 [j]
MLV (36-inch)	1324.7	Fort Lewis	Pierce	0.0 [j]	0.0 [j]
MLVs (30-inch and 36-inch)	1315.6	Fort Lewis	Thurston	0.0 [i]	0.0 [i]
Mainline Valves Along the Proposed Loops Subtotal				0.0	0.0
Mainline Valves Along the Evergreen Expansion Project Loops					
MLV (30-inch)	1453.5	Evergreen Sedro-Woolley	Skagit	0.3	0.0 [l]
MLV (30-inch)	1440.1	Evergreen Mount Vernon	Skagit	0.3	0.0 [m]
MLV (30-inch)	1370.8	Evergreen Covington	King	0.3	0.0 [l]
MLV (30-inch)	1364.0	Evergreen Covington	King	0.3	0.0 [l]
MLV (30-inch)	1355.2	Evergreen Auburn	King	0.3	0.0 [l]

TABLE 4.8.1-3 (cont'd)

Aboveground Facilities Associated with the Capacity Replacement Project

Facility	Milepost	Associated Loop	County	Land Affected During Construction (acres)	Land Affected During Operation (acres)
MLV (30-inch)	1351.7	Evergreen Auburn	Pierce	0.2	0.0 [l]
Mainline Valves Along the Evergreen Expansion Project Loops Subtotal				1.7	0.0
Project Total				9.4	1.5

[a] This facility would be located within the Sumas Compressor Station and no additional land would be affected during construction and operation.

[b] Not collocated with other existing aboveground facilities.

[c] Because this facility would be located within the pipeline right-of-way, no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, the site would permanently convert about 0.3 acre of open land consisting of the shrubland vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[d] Relocated from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop.

[e] Because this facility would be located within the pipeline right-of-way, no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, the facility would permanently convert about 0.2 acre of developed land consisting of the grassland/herbaceous vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[f] This facility would be collocated with an existing aboveground facility within the pipeline right-of-way so no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, the facility would require an expansion of the existing facility and the permanent conversion of less than 0.1 acre of developed land consisting of the grassland/herbaceous vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[g] This facility would be collocated with an existing aboveground facility within the pipeline right-of-way so no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, the facility would require an expansion of the existing facility and the permanent conversion of 0.3 acre of developed land consisting of the grassland/herbaceous vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[h] This facility would be collocated with an existing aboveground facility within the pipeline right-of-way so no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, the facility would require an expansion of the existing facility and the permanent conversion of 0.2 acre of developed land consisting of the grassland/herbaceous vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[i] This facility would be collocated with an existing aboveground facility within the pipeline right-of-way so no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, the facility would require an expansion of the existing facility and the permanent conversion of less than 0.1 acre of developed land consisting of the shrubland vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[j] These facilities would be collocated with an existing aboveground facility within the pipeline right-of-way so no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, each facility would require an expansion of the existing facilities and the permanent conversion of less than 0.2 acre (1.1 acres total) of developed land consisting of the grassland/herbaceous vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[k] Because this facility would be located within the pipeline right-of-way, no additional land would be affected during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, the facility would permanently convert about 0.2 acre of developed land consisting of the shrubland vegetation cover type within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

[l] These facilities would be collocated with existing aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside of the right-of-way during operation.

[m] This facility would be collocated with an existing aboveground facility within Northwest's existing right-of-way and would not require any additional land outside of the right-of-way during operation; however, the facility would require an expansion of the existing facility and the permanent conversion of less than 0.1 acre of developed land consisting of wetland vegetation within the pipeline right-of-way to an industrial use (i.e., graveled and fenced).

NA = Not applicable.

Three pig launchers and four pig receivers would be constructed as part of the Capacity Replacement Project. The three pig launchers would be installed at the beginning of the Sumas, Snohomish, and Fort Lewis Loops. Three of the pig launchers would be installed at the end of each of these loops and one pig receiver would be relocated from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop to the end of the proposed Mount Vernon Loop. The pig launcher at the beginning of the Sumas Loop (MP 1484.5) would be located within the existing Sumas Compressor Station and would not require any additional land during construction and operation. The other two pig launchers and two of the pig receivers would be collocated with other aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, each facility would require an expansion of the existing facilities and the permanent conversion of land within the pipeline right-of-way to an industrial use (i.e., graveled and fenced) (see table 4.8.1-3).

The two pig receivers not collocated with other aboveground facilities (MPs 1461.8 and 1408.8) would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with these facilities is included in the acreage calculations for the pipeline right-of-way; however, each facility would permanently convert the land within the right-of-way because the sites would be graveled and fenced. The site at MP 1461.8 would permanently convert about 0.3 acre of open land consisting of the shrubland vegetation cover type to an industrial use. The site at MP 1408.8 would permanently convert about 0.2 acre of developed land consisting of the grassland/herbaceous vegetation cover type.

A total of 26 MLVs (5 30-inch and 15 36-inch MLVs associated with the proposed loops and 6 30-inch MLVs along the existing Evergreen Expansion Project loops) would be constructed as part of the project. All but five of the MLVs along the proposed loops would be collocated with existing aboveground facilities within Northwest's existing right-of-way. The 15 MLVs that would be collocated with existing aboveground facilities would not require any additional land during construction and operation (the acreage of disturbance is included in the acreage calculations for the pipeline right-of-way); however, each facility would require an expansion of the existing facilities and the permanent conversion of land within the pipeline right-of-way to an industrial use (see table 4.8.1-3). Four of the MLVs (two at each site) would be collocated with the proposed pig receiver sites at MPs 1461.8 and 1408.8 as described above. The one MLV not collocated with other aboveground facilities (MP 1467.9) would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with this facility is included in the acreage calculations for the pipeline right-of-way; however, the facility would permanently convert about 0.2 acre of developed land consisting of the shrubland vegetation cover type to an industrial use.

Of the six MLVs along the Evergreen Expansion Project loops, five would require about 0.3 acre each of land for construction and one would require about 0.2 acre of land for construction (1.7 acres total). All of these facilities would be collocated with existing aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside of the right-of-way during operation; however, the valve at MP 1440.1 would require an expansion of the existing facility and the permanent conversion of 0.1 acre of wetland vegetation to an industrial use (see section 4.4.1).

Northwest would construct two permanent access roads to provide operational access to the site of the pig receiver and two MLVs at the end of the Mount Vernon Loop at MP 1408.8 and the site of the pig receiver and two MLVs at the end of the Fort Lewis Loop at MP 1315.6. The access road to the site at MP 1408.8 would be about 266 feet long and would affect about 0.1 acre of forest land. The access road to the site at MP 1315.6 would be about 352 feet long and would affect about 0.2 acre of developed land consisting of the landscape vegetation cover type.

Abandoned Facilities

The abandonment activities at the 24 locations along the proposed loops would occur within the construction right-of-way associated with each loop and would not require any additional land. Construction activities at the 48 abandoned facility sites located outside of the proposed loops would require about 14.4 acres of land. The entire 14.4 acres of disturbance would occur within Northwest's existing right-of-way on developed land consisting primarily of the grassland/herbaceous vegetation cover type.

Pipe Storage and Contractor Yards

To support construction activities, Northwest proposes to use 13 pipe storage and contractor yards on a temporary basis. These yards would temporarily affect about 190.6 acres of land. The 190.6 acres would consist of about 128.4 acres of developed land, 36.7 acres of open land, and 25.5 acres of agricultural land.

4.8.2 Land Ownership and Easement Requirements

Table 4.8.2-1 summarizes land ownership along the proposed loops. Approximately 69.2 miles (87 percent) of the land affected by construction and operation of the Capacity Replacement Project would be privately owned. The remaining 10.3 miles (13 percent) would be located on public land managed by a variety of federal, state, and local agencies and also tribal lands. All of the tribal lands associated with the Capacity Replacement Project would be crossed by the Sumas Loop and are summarized in table 4.8.2-2. Recreation and special interest areas within these public lands are discussed in section 4.8.4.

TABLE 4.8.2-1

Summary of Land Ownership Along the Capacity Replacement Project

Facility	Private (miles)	Federal (miles)	Tribal Lands (miles)	Local Land (miles)	State (miles)	Total (miles)
Sumas Loop	21.4	0.0	1.2	0.1	0.0	22.7
Mount Vernon Loop	20.8	0.0	0.0	0.4	1.3	22.5
Snohomish Loop	9.8	0.0	0.0	2.1	0.0	11.9
Fort Lewis Loop	17.2	4.6	0.0	0.6	0.0	22.4
Project Total	69.2 (87%)	4.6 (6%)	1.2 (1%)	3.2 (4%)	1.3 (2%)	79.5 (100%)

TABLE 4.8.2-2

Summary of Tribal Lands Crossed by the Sumas Loop Associated with the Capacity Replacement Project

Begin MP	End MP	Length (miles)	Description
1479.3	1479.0	0.3	Bureau of Indian Affairs, Old Antone, allottee
1469.8	1469.5	0.3	Nooksack Indian Tribe
1468.8	1468.7	0.1	Bureau of Indian Affairs, Heirs of George Whaholach
1468.2	1468.0	0.2	Bureau of Indian Affairs, Heirs of Billy Willamot
1467.5	1467.2	0.3	Bureau of Indian Affairs, Heirs of Foss Weaxta
Total		1.2	

Northwest's existing easement for the 26-inch- and 30-inch-diameter pipelines gives it the right to maintain the right-of-way as necessary for pipeline operation, including the removal of larger vegetation and trees, as needed regardless of whether the area is part of a loop associated with the

Capacity Replacement Project. Because about 93 percent of the proposed loops would be located within Northwest's existing easement, Northwest would not need to acquire new easements or property to operate the proposed facilities in these areas. However, Northwest would need to acquire new easements in the areas where the loops would deviate from the existing right-of-way or where Northwest requests additional operational right-of-way to bring the easement up to 75 feet. Northwest would also need to acquire temporary easements or property to construct the proposed facilities. The easement would convey both temporary (for construction) and permanent rights-of-way to Northwest and would give Northwest the right to construct, operate, and maintain the pipeline. Northwest would negotiate a one-time payment for each easement. An easement agreement between a company and a landowner typically specifies compensation for losses resulting from construction, including losses of non-renewable and other resources, damages to property during construction, and restrictions on existing uses that would not be permitted on the permanent right-of-way after construction.

As discussed in section 4.8.1, Northwest states that it would only expand the existing permanent easement if the landowner agrees to the expansion; however, Northwest has not identified specific locations where it would request an easement expansion. **Therefore, the FERC staff recommends that:**

- **Northwest file with the Secretary the specific locations where Northwest would expand its existing permanent easement to 75 feet. For each area, the request must include documentation of landowner approval. Each area must be approved in writing by the Director of OEP <u>before construction in that area</u>.**

If an easement cannot be negotiated with a landowner and the project has been certificated by the FERC, Northwest may use the right of eminent domain granted to it under section 7(h) of the NGA and the procedures set forth under the Federal Rules of Civic Procedure (Rule 71A) to obtain the right-of-way and temporary extra workspace areas. Northwest would still be required to compensate the landowner for the right-of-way and damages incurred during construction. However, the level of compensation would be determined by a court according to state or federal law. In either case, Northwest would compensate landowners for use of the land. Eminent domain does not apply to lands under federal or tribal ownership but does apply to lands under state and local ownership.

The federal land affected by the project is associated with Fort Lewis. Northwest would need to submit an official written request to the Fort Lewis Real Estate Officer asking for an amendment to its existing easement for the activities associated with the Capacity Replacement Project. The Real Estate Officer would review the request and, after the NEPA analysis has been completed and the final EIS has been issued, would forward a recommendation to the Northwest Region Installation Management Agency for approval. The documentation would then be submitted to the COE for continued processing and coordination with the BLM for execution of the required real estate easement amendment. The existing 26-inch-diameter pipeline also crosses the Camp Bonneville Military Reservation in Clark County, Washington. Northwest would submit a separate written notification to Fort Lewis to cover the abandonment activities that would occur on this military reservation.

The modifications at the five existing compressor stations would occur on private lands owned by Northwest. All of the pig launchers and pig receivers, MLVs, and activities associated with the abandoned facilities would be located within Northwest's existing right-of-way. No additional easements would be required for these facilities. Northwest would obtain temporary easements from the landowners of the pipe storage and contractor yards for use of these facilities during construction.

4.8.3 Existing Residences and Planned Developments

4.8.3.1 Existing Residences

Northwest's existing 26-inch- and 30-inch-diameter pipelines were installed in 1956 and 1971, respectively. Since that time, significant development has occurred along portions of Northwest's system. In some cases this development has occurred immediately adjacent to or within Northwest's permanent easement. In total, Northwest's proposed construction work area (i.e., construction right-of-way and temporary extra work areas) would be located within 50 feet of 222 residences and 22 other structures, including shops, barns, garages, trailers, and commercial buildings. Of the 244 residences or other structures, 124 are located on the Snohomish Loop, 67 are located on the Fort Lewis Loop, 28 are located on the Mount Vernon Loop, and 25 are located on the Sumas Loop. Appendix P lists these residences by milepost and indicates the distance and orientation of each from the proposed construction work area. If the wet open-cut method were implemented instead of the three proposed HDD crossings, no additional residences would be affected. No residences are located within 50 feet of the compressor station sites.

In residential areas, the two most significant impacts associated with construction and operation of a pipeline are disturbance during construction and encumbrance of property for future uses caused by the easement. This includes the limitation on future permanent structures within the permanent right-of-way. The 244 residences or other structures within 50 feet of the construction work area would be most likely to experience the effects of construction and operation of the project. In general, as the distance to the construction work area increases, the impacts on residences decrease.

Temporary construction impacts on residential areas could include inconvenience caused by noise and dust generated by construction equipment, personnel, and trenching of roads or driveways; ground disturbance of lawns; removal of trees, landscaped shrubs, or other vegetative screening between residences and/or adjacent rights-of-way; potential damage to existing septic systems or wells; and removal of aboveground structures, such as fences, sheds, or trailers, from within the right-of-way.

Northwest would implement the following general measures to minimize construction-related impacts on all residences and other structures located within 50 feet of the construction right-of-way:

- notify landowners before construction;
- maintain access to residences and traffic flows during construction activities, particularly for emergency vehicles;
- fence the construction work area within 50 feet of a residence for a distance of 100 feet on either side of the residence to ensure that construction equipment and materials, including the spoil pile, remain within the construction work area. Fencing would be maintained, at a minimum, throughout the open trench phases of pipeline installation;
- reduce the construction right-of-way and use other temporary extra workspaces farther from the residences where feasible;
- preserve mature trees, vegetation screens, and landscaping to the extent possible while ensuring safe operation of construction equipment;
- use dust minimization techniques such as watering disturbed areas;
- remove all litter and debris from the construction site daily;

- comply with all local noise ordinances. For example, the King County Noise Ordinance allows construction between 7:00 AM and 7:00 PM Monday through Friday and 8:00 AM to 7:00 PM on weekends. Northwest does not currently plan to work on Sunday. However, certain activities such as hydrostatic testing may require a 24-hour work schedule. Northwest would attempt to schedule activities during normal working hours;

- limit the period of time the trench remains open before backfilling;

- compensate landowners for the removal of trees, including those on Northwest's existing permanent right-of-way;

- compensate landowners for damage to homes caused by pipeline construction; and

- implement the Landowner Complaint Resolution Procedure as described in section 2.5.

Depending on the specific circumstances, Northwest would pay to relocate residents during construction activities as negotiated with the landowner and Northwest's Land Representative.

As discussed in section 4.3.1.4, Northwest would provide written notification to landowners located along the construction right-of-way before initiating hydrostatic testing activities. If time permits, a letter would be mailed notifying the landowners that hydrostatic testing would take place during certain dates and what precautions they should take as well as a contact telephone number. If letters cannot be mailed, Northwest's Land Representatives would notify landowners using written door hanger informational pamphlets and/or a personal visit. Safety fence installed on the edges of both sides of the right-of-way in residential areas would remain in place for the duration of hydrostatic testing activities.

Immediately after backfilling the trench, Northwest would restore all lawn areas and landscaping within the construction work area. Landowners would continue to have use of the right-of-way provided it does not interfere with the easement rights granted to Northwest for construction and operation of the pipeline system. In areas where the right-of-way is currently used for a trail, Northwest would allow the right-of-way to continue to be used as a trail after construction (see section 4.8.4).

During the scoping process, several comments were received regarding impacts on residences in the Sammamish area crossed by the Snohomish Loop, in particular from residents in the Deer Park Subdivision. The developers in this neighborhood placed homes immediately adjacent to the right-of-way and the backyards extend into the easement in several locations. As a result, several homes are located within 50 feet of the construction work area (see Appendix P) and several fences would have to be temporarily removed during pipeline construction. In addition to the general mitigation measures identified above that would apply to all residences within 50 feet of the construction work area, Northwest developed a *Residential Area Work Plan for the Deer Park Subdivision*. Details of the plan and Northwest's proposed construction and mitigation measures are described below.

Before mobilizing any equipment, Northwest would stake the limits of disturbance and the centerline of the pipeline. All underground utilities would be located and flagged. Wetlands would be identified and signs would be put up to restrict fueling activities near them. Access points would also be marked with signs. Crews would mobilize to the southern end of the Deer Park neighborhood and begin working in a northerly direction.

Where necessary, fences within the construction work area would be taken down. Safety fence would be installed on the edges of both sides of the right-of-way. The safety fence would consist of 6-foot-high chain link sections that would create a continuous boundary to separate the work area from the homes. This fence would also serve as temporary fencing for any fences that would be removed for construction. The fence would be secure to keep children and pets out of the work area and all construction activities would be contained within the fencing. A security guard would be posted within the work area during non-working hours.

Northwest plans to construct in sections throughout the subdivision to minimize the construction time near any individual home. Typically, a section would be between road crossings. Clearing activities would involve equipment such as bulldozers, motor graders, loaders, and dump trucks and would last about 5 days per 1,000-foot-long section. The construction right-of-way would generally be 60 feet wide except where extra workspaces are required for truck turn arounds and road crossings. Trees, brush, and grass within the right-of-way would be removed along with any temporary structures. All brush would be hauled off the right-of-way to an approved disposal area. Northwest would save as many trees as possible within the construction work area. Northwest would flag the trees that would be removed. The right-of-way would be graded as necessary to create a level working surface to allow safe passage of equipment. The topsoil from over the trenchline would be stockpiled separately so it can be replaced during restoration activities. If there is a wetland area, timber mats would be laid down on the working side of the pipeline centerline to protect the wetland and the existing 30-inch-diameter pipeline that would be in service during construction. Erosion control measures, such as silt fence, would be installed along the edges of the construction work area as necessary to prevent erosion. Throughout construction, water trucks would drive the right-of-way applying water to control excess dust.

Because of the limited amount of workspace along the Snohomish Loop, Northwest would remove the existing 26-inch-diameter pipeline and replace it with the proposed 36-inch-diameter loop using the same trench. The trench would be excavated to expose the existing 26-inch-diameter pipeline using a backhoe. Trenching activities would last approximately 6 days per 1,000-foot-long section. The trench would be 6 to 7 feet deep and about 4 to 5 feet wide at the bottom of the trench. The spoil from the trench would be spread across the working side of the right-of-way to provide additional cover and protect the existing 30-inch-diameter pipeline. Sprinkler system lines could be cut during the excavation. These lines would be repaired as soon as practical. Utility lines cut during excavation that were not properly located by the One-Call service would be temporarily repaired the same day. Final repairs would be done before backfilling the trench.

After the 26-inch-diameter pipeline is exposed, it would be pulled out of the trench using backhoes or sidebooms and cut into 40-foot-long sections. These sections would be loaded onto trucks and hauled off the right-of-way to an approved off-site storage yard. After the 26-inch-diameter pipeline is removed, the trench would be backfilled and re-dug in some areas to accommodate the 36-inch-diameter pipeline.

If the construction right-of-way crosses a road, Northwest would maintain access so residents have ingress/egress to their homes. If the road would be open cut, one lane would remain open during construction. There may be a short period (minutes) when the entire road would be closed to pull a joint of pipe across the road. In these instances, Northwest would implement a traffic plan and would have flag persons to facilitate access. At night, Northwest would place steel plates over the trench in the road so traffic can flow across all lanes.

The new 36-inch-diameter pipeline would be transported to the right-of-way by truck. The joints of pipe would be laid along the trench in a single, continuous line on the working side of the right-of-way (typically 40 feet wide). The joints would be lined up and welded together. Some bending would be required to follow any turns or elevation changes in the right-of-way. A track-mounted hydraulic bending machine would bend the pipe before welding. Stringing, bending, and welding would take about 6 days per 1,000-foot-long section.

To ensure that the pipe meets or exceeds the design strength requirements, the welds would be visually inspected and x-rayed in accordance with API standards. Any welds with defects would be repaired or cut out and re-welded. The welded joints of the pipe would then be cleaned and epoxy coated to prevent corrosion. These activities would last about 4 days per 1,000-foot-long section.

The completed section of pipe would then be lowered into the trench using sidebooms or backhoes. Before lowering in the pipe, the trench would be inspected to make sure it is free of rocks or other debris that could damage the pipe or its coating. If there is substantial rock in the trench due to soil conditions, padding would be placed in the bottom of the trench to protect the pipe. Padding would consist of rock-free soil or foam pillows. After the pipe is lowered into the trench, the subsoil stored on the right-of-way would be pushed back into the trench and compacted to cover the pipe. The topsoil would then be replaced over the top of the trench. Backfilling and compacting would take about 4 days per 1,000-foot-long section.

Restoration would begin immediately after the topsoil is replaced. The sequence of restoration would be repairs or replacement to sprinkler systems and other utilities; removal of any damaged sod, fine grading of the topsoil, and placement of new imported sod; paving of walking paths, sidewalks, and driveways; restoration of flower beds; removal of safety devices; removal of allowable erosion control devices; and restoration of fences. All contours would be restored to the original elevations. New sod would be reserved through a local sod company to make sure there are sufficient quantities to complete the restoration. Restoration in each section would be completed within 10 days of backfilling, weather permitting. Northwest would work closely with residents to ensure that restoration is done in accordance with easement agreements and landowner stipulations.

An electronic device called a geometry pig would be run through the new pipeline. This device checks the pipeline to make sure there are no dents or anomalies within the pipe. If any anomalies are found that exceed tolerance specifications, they would be dug up and visually inspected. If necessary, the piece of pipe containing the anomaly would be replaced. The pipeline would also be hydrostatically tested. Once the pipe is filled with water, the pressure would be allowed to stabilize for several hours. The actual test would last for 8 hours. Once the test is successfully completed, the water would be drained through a filtration device and discharged into dewatering structures located in an upland area near the Snohomish Compressor Station.

Residents in the Deer Park Subdivision expressed concern about the continued use of the right-of-way as a recreational trail following construction and impacts on schools and traffic in the area. As previously discussed, Northwest would allow the right-of-way to continue to be used as a trail after construction (see section 4.8.4). Construction-related impacts on schools and traffic are discussed in sections 4.9.3 and 4.9.4, respectively. A discussion of visual impacts on the Deer Park Subdivision is included in section 4.8.6.

In addition to the *Residential Area Work Plan for the Deer Park Subdivision*, Northwest has prepared and would follow site-specific residential construction mitigation plans to minimize disruption and to maintain access to the 244 residences or other structures located within 50 feet of the construction work area for all the loops. The plans show the proposed centerline of the loop, the limits of the construction work area, each residence or associated structure located within 50 feet of the construction work area, the existing pipelines, existing fences, the general tree line in the area, and the location of safety fencing that would be installed during construction. Although the plans show the general tree line surrounding the residences within 50 feet of the construction work area, they do not specifically show the trees and other landscaping that would need to be removed during construction. The plans also do not show private water wells or septic systems. **Therefore, the FERC staff recommends that:**

- **<u>Before construction</u>, Northwest file with the Secretary for the review and written approval of the Director of OEP revised site-specific residential construction mitigation plans depicting the individual locations of large specimen trees and other landscaping that would be removed during construction activities within 50 feet of residences and all private water wells and septic systems associated with these residences.**

Northwest may also submit the site-specific residential construction mitigation plans to applicable local agencies as required by local regulations.

A comment was received from Norpoint Communities regarding potential impacts on a 184-unit retirement community located in Puyallup, Washington. Although Northwest's existing easement crosses this property, construction of the Fort Lewis Loop would not affect this portion of the easement. The north end of the proposed Fort Lewis Loop would be about 6 miles south of this retirement community.

4.8.3.2 Planned Developments

Planned developments within 0.25 mile of the loops were identified through consultations with local planning agencies and are summarized below. Section 4.13 includes an analysis of potential cumulative effects when considered in conjunction with the Capacity Replacement Project. Because the work at the existing compressor stations would occur within the existing facility or on land owned by Northwest immediately outside of the existing facility, conflicts with other planned developments in the area are not anticipated. Similarly, work associated with the other aboveground facilities and abandoned facilities at the 48 locations outside of the proposed loops would not conflict with other planned developments because the work associated with these facilities would be conducted within Northwest's existing right-of-way.

Sumas Loop

An existing stone quarry is located about 800 feet east of the proposed Sumas Loop at MP 1474.0. The quarry is planning an expansion that would bring the operations to within 600 feet of the loop. The loop in this location would be constructed within Northwest's existing right-of-way, which already precludes surface mining operations. Therefore, construction and operation of the Sumas Loop would not result in conflicts with the proposed quarry expansion.

Mount Vernon Loop

There are no known planned developments within 0.25 mile of the proposed loop in Skagit County. Several planned developments have been proposed near the Mount Vernon Loop in Snohomish County. Between MPs 1427.2 and 1427.4, a plan has been filed to subdivide a parcel into four lots. Between MPs 1420.7 and 1420.9, a cemetery is proposed by the Bikur Cholim-Machzikay Hadath Congregation. The proposal is for a conditional use permit to utilize 12 acres as a cemetery site and for construction of a chapel with seating for 120 people. In addition, a lot has been proposed for subdivision about 450 feet west of MP 1428.9 and an 11-lot rural cluster subdivision called the Emerald Springs Estate has been proposed about 570 feet west of MP 1429.1. Because these areas would not be crossed and the loop would be constructed within Northwest's existing right-of-way in these locations, no conflicts with these planned developments are anticipated.

In addition, a gravel pit operation located near MP 1424.4 has proposed an expansion across Northwest's right-of-way; however, the loop in this location is located adjacent to and within Northwest's existing right-of-way, which already precludes surface mining operations.

Snohomish Loop

There are no planned developments within 0.25 mile of the Snohomish Loop in Snohomish County. The southern end of the Snohomish Loop near MP 1382.0 would cross an area currently being developed for a residential subdivision. The loop in this area would be located within Northwest's existing right-of-way, which already precludes the construction of aboveground structures such as houses and related structures on the right-of-way. Therefore, no additional impacts on this development are anticipated.

Fort Lewis Loop

There are no known planned developments within 0.25 mile of the Fort Lewis Loop in either Pierce or Thurston Counties.

4.8.4 Recreation and Special Interest Areas

The proposed loops would not cross any national or state designated Wild and Scenic Rivers, natural landmarks, national forests, national parks, state parks, or Indian Reservations. Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties are all coastal counties in the State of Washington and fall under the CZMA (see section 1.5). The loops would also cross or be located adjacent to several recreation and/or special interest areas. In addition, activities associated with the abandonment of the existing 26-inch-diameter pipeline could affect recreational uses in two locations. Table 4.8.4-1 lists the locations, land ownership, and crossing length for each of these areas. A more detailed discussion of each area is provided below. In addition to these areas, several gravel pits and a stone quarry are located within 1,500 feet of the proposed loops. These areas are discussed in section 4.1.2. Schools crossed by or located near the loops are discussed in section 4.9.3.

One of the primary concerns when crossing recreation and special interest areas is the impact of construction on the purpose for which the area was established (e.g., the recreational activities, public access, and resources the area aims to protect). Construction would alter visual aesthetics by removing existing vegetation and disturbing soils. Construction would also generate dust and noise, which could be a nuisance to recreational users. Construction could also interfere with or diminish the quality of the recreational experience by affecting wildlife movements or disturbing trails. In the case of nurseries, vineyards, and tree orchards, construction would take the area affected out of production for one or more growing seasons. In general, impacts on recreational and special interest areas would be temporary and would be limited to the period of active construction, which typically would last only several days to several weeks in any one area. Impacts on nurseries, vineyards, and tree nurseries would last longer depending on the type of products/species grown.

Overall, Northwest would minimize construction-related impacts on these areas by:

- installing the new loops almost entirely within the existing right-of-way maintained for the 26-inch- and 30-inch-diameter pipelines;
- timing construction to avoid peak usage periods, when practical; and
- ensuring effective post-construction reclamation of the right-of-way to preconstruction conditions.

TABLE 4.8.4-1				
Recreation and Special Interest Areas Crossed by or Located Adjacent to the Capacity Replacement Project				
Facility	Milepost Location	Name of Area	Land Ownership	Crossing Length
Pipeline Facilities				
Sumas Loop	1478.6 – 1478.4	Vander Lann Vineyards	Private	1,003 feet
	1477.5 – 1477.4	Christmas Tree Nursery	Private	686 feet
	1476.3 – 1476.2	Anderson Vineyards	Private	581 feet
	1476.2 – 1476.1	Thornton Tree Nursery	Private	581 feet
	1472.2 – 1472.1	Mount Baker Vineyards	Private	634 feet
	1469.4 – 1469.3	Mount Hope Cemetery	Private	410 Feet
	1468.8	Deming Eagle Park	County	NA – 1,900 feet northwest
	1462.4	Van Zandt/Hutchinson Creek State Forest Land	State	NA – 945 feet east
Mount Vernon Loop	1431.3 – 1430.8	Washington Department of Natural Resources-managed lands	State	2,500 feet
	1425.9 – 1425.8	Hammond Nursery	Private	422 feet
	1424.4 & 1410.0	Whitehorse and Centennial Trails	County	50 feet
	1423.9	Twin Rivers County Park	County	NA – 2,000 feet southwest
	1422.0	River Meadows County Park	County	NA - 2,900 feet east
	1414.3 – 1414.1	Seven Oaks Driving Range	Private	1,214 feet
Snohomish Loop	1393.1 – 1392.8	Upper Bear Creek Conservation Area	County	1,320 feet
	1392.6	Bear Creek Waterway	State	NA – 1,200 feet west
	1388.8 – 1387.4	City of Redmond Watershed Preserve	City	7,500 feet
	1387.2 – 1386.3 1383.2 – 1382.2	Community Trails	Private	4,699 feet 5,174 feet
	1386.1 – 1386.0	Ornamental Nursery	Private	475 feet
Fort Lewis Loop	1336.9	Private Air Park	Private	200 feet
	1335.2 – 1330.6	Fort Lewis Military Reservation	Federal	4.6 miles
	1323.8	Private Air Strip	Private	100 feet
Abandoned Facilities	1447.7	Sauk Mountain Golf Course	Private	231 feet
	1356.1	Cameron Park	City	100 feet

NA = Not applicable.

No designated recreational or special interest areas would be affected if the three proposed HDD crossings were not successful and the wet open-cut method implemented or if Pilchuck Creek and the Nisqually River were spanned; however, any recreational uses of the waterbodies for fishing or boating would be temporarily affected during construction activities. Any impacts would be temporary, lasting only during the period of in-stream construction (estimated to be 3 to 5 days for an open-cut crossing). Although no in-stream disturbance would be required to construct the aerial span crossings, there would be a brief period where use of the waterbody would be precluded while the main cable needed to pull the pipe string across the waterbody to be installed on the support structures would be carried across by boat.

Nurseries, Vineyards, and Tree Nurseries

The Sumas, Mount Vernon, and Snohomish Loops would cross several nurseries, vineyards, or tree nurseries. Impacts on these areas could include the loss of standing crops within the construction work area and disruption of operations during the growing season affected by construction and longer depending on the products/species grown. Northwest would address compensation for crop damage or losses associated with construction with each individual landowner. Overall, Northwest would minimize impacts on agricultural land by segregating and conserving topsoil in all actively cultivated cropland (see section 4.2.2). Northwest would also repair damage to irrigation systems or drain tiles caused by construction activities. Repairs of damaged drain tiles in wetland areas would be limited to replacement of the original size and depth. Northwest would allow agricultural activities to resume following construction provided that they do not interfere with operation of the pipeline. Northwest would monitor crops for at least 2 years to determine if additional restoration is necessary.

The ornamental nursery crossed by the Snohomish Loop between MPs 1386.1 and 1386.0 contains temporary greenhouse structures that have been placed on Northwest's existing right-of-way. These structures do not have foundations and would be removed from the right-of-way during construction. Northwest would negotiate with the owner of the nursery to ensure that impacts on the nursery and greenhouse structures are minimized.

Mount Hope Cemetery

The Sumas Loop would cross about 410 feet of land owned by the Deming Historical Cemetery Association for the Mount Hope Cemetery near MP 1469.4. The Mount Hope Cemetery was active between 1900 and 1945 and approximately 150 individuals were buried there before its use was discontinued. Northwest adopted a non-standard parallel offset in this area (20 feet west of the existing 26-inch-diameter pipeline) to avoid the cemetery. Additional information on this site is presented in section 4.10.1.

Deming Eagle Park

Deming Eagle Park is located about 1,900 feet northwest of MP 1468.8 of the Sumas Loop. The park is located on the North Fork of the Nooksack River, which is a bald eagle migration area. The park is maintained by Whatcom County and has hiking and biking facilities. Because of its distance from the park, the Sumas Loop would not affect recreational activities at Deming Eagle Park.

Van Zandt/Hutchinson Creek State Forest Land

The Van Zandt/Hutchinson Creek area is a continuous mass of land that contains the Van Zandt Dike and Hutchinson camping area and is located about 945 feet east of MP 1462.4 of the Sumas Loop. It is managed by the WDNR and includes sandstone cliffs that reach 600 feet, a natural dike, trails, picnic areas, restrooms, and campgrounds. The property is located near the fork of the Nooksack River and is off of Highway 9 near the town of Acme. Because of its distance from the area, the Sumas Loop would not affect recreational activities within the Van Zandt/Hutchinson Creek State Forest Land.

Washington Department of Natural Resources-Managed Lands

Between MPs 1431.3 and 1430.8, the Mount Vernon Loop would cross lands managed by the WDNR. The WDNR manages these lands to generate long-term, continuing revenue from timber sales for local services, construction of primary and secondary public schools, Washington State University, University of Washington, capitol buildings, and state charitable institutions. The lands are also managed to provide recreational and educational opportunities. The Mount Vernon Loop would be constructed within Northwest's existing right-of-way through this area. Northwest would compensate the WDNR for the use of any temporary extra workspace in this area, which would provide revenue to support the various programs identified above.

Whitehorse and Centennial Trails

The Mount Vernon Loop would cross the Centennial Trail at MP 1410.0. The Centennial Trail was converted from an abandoned Northern Pacific Railroad right-of-way into a non-motorized trail. Pedestrians, bicyclists, and equestrians use the trail. The trail is designated a National Recreation Trail by the U.S. Department of the Interior and is recognized in Snohomish County as a linear park that would eventually link with trails in King and Skagit Counties. The Centennial Trail is very popular for walking, bicycling, hiking, and horseback riding. The Mount Vernon Loop would also cross the Whitehorse Trail at MP 1424.4, which is part of the Centennial Trail system but is unimproved. Construction would temporarily impact use of the trails at the location of the crossings. Northwest would consult with Snohomish County Parks and Recreation regarding construction activities and potential mitigation measures to minimize impacts on trail users. Recreational use of the trails would be allowed to resume following construction.

Twin Rivers County Park

The Twin Rivers County Park is located about 2,000 feet southwest of MP 1423.9 of the Mount Vernon Loop. The park is located at the point where the North and South Fork Stillaguamish Rivers converge. The park provides practice and competition soccer fields and little league baseball fields. Large open fields are available for walking pets or jogging. Because of its distance from the park, the Mount Vernon Loop would not affect recreational activities at Twin Rivers County Park.

River Meadows County Park

The River Meadows County Park is located about 2,900 feet east of MP 1422.0 of the Mount Vernon Loop. The park consists of 150 acres of large open meadows and forests along the banks of the Stillaguamish River. Activities available at the park include fishing, camping, and hiking. Because of its distance from the park, the Mount Vernon Loop would not affect recreational activities at River Meadows County Park.

Seven Oaks Driving Range

The Mount Vernon Loop would cross the Seven Oaks Driving Range between MPs 1414.3 and 1414.1. Based on a review of Northwest's Environmental Construction Alignment Sheets, it appears that construction activities would disturb a portion of the tee-off area and the remainder of the range. Disruption and noise during construction could temporarily restrict the activities of golfers. The degree of impact would depend on the timing of construction. Construction of the pipeline during the summer months when golfing activities are at their peak would cause more of a disruption than construction during the off-peak, winter months. Some of the construction-related impacts would be unavoidable; however, the duration of the impacts would be short term, lasting several days to several weeks until the right-of-way and driving range are restored in accordance with the requirements specified in the easement agreement between the landowner and Northwest. Operation of the pipeline would not affect long-term golfing activities because the loop would be installed within Northwest's existing easement and the right-of-way would be allowed to revert to former use.

Upper Bear Creek Conservation Area

The Snohomish Loop would cross the Upper Bear Creek Conservation Area between MPs 1393.1 and 1392.8. The WRIA 8 Salmon Recovery Project is located in this area. The recovery project consists of the acquisition of 670 acres of forested headwaters and timber rights to protect natural flow regimes and high quality habitat for the chinook salmon population. The area is sponsored by the King County

Department of Parks and Recreation. This is one of many natural areas purchased by the county for habitat restoration. Impacts on this area would be minimized by the placement of the loop within Northwest's existing right-of-way. Northwest would restore the disturbed area to preconstruction conditions and would allow the area to continue to be used for WRIA 8 Salmon Recovery Project-related purposes following construction.

Bear Creek Waterway

The Bear Creek Waterway is located about 1,200 feet west of MP 1392.6 of the Snohomish Loop and just south of the Upper Bear Creek Conservation Area. This area was also purchased by King County for habitat restoration. Because of its distance from the waterway, the Snohomish Loop is not expected to affect the Bear Creek Waterway.

City of Redmond Watershed Preserve

The Snohomish Loop would cross the City of Redmond Watershed Preserve between MPs 1388.8 and 1387.4. The MLV at MP 1387.5 would also be located within the preserve. In 1989 the voters of King County converted this land, which was originally purchased for a city water supply, into a preserve. Northwest's existing right-of-way serves as a trail, referred to as the Pipeline Regional Trail, through the length of the preserve. The preserve is maintained by the Redmond Parks and Recreation Department and includes amenities such as multi-use trails, restrooms, and parking. Construction of the pipeline facilities would result in the temporary closure of the Pipeline Regional Trail. This construction-related impact would be unavoidable; however, the duration of the impact would be short term, lasting only for the duration of construction (up to 8 months) until the right-of-way is restored in accordance with project specifications and applicable requirements. Northwest would allow the right-of-way to continue to be used as a recreational trail following construction. The proposed MLV would be installed within the existing right-of-way adjacent to an existing MLV and would not conflict with recreational uses during operation of the project. A discussion of visual impacts on the users of the Pipeline Regional Trail is included in section 4.8.6.

Community Trails

The Snohomish Loop would affect two private community trails in residential developments between MPs 1387.2 and 1386.3 and between MPs 1383.2 and 1382.2. Northwest's existing easement serves as the trail in both of these locations. Construction of the pipeline facilities would result in the closure of these trails for the duration of construction (up to 8 months). This construction-related impact would be unavoidable; however, the duration of the impact would be short term until the right-of-way is restored in accordance with project specifications and applicable requirements. Northwest would allow the right-of-way to continue to be used as a recreational trail in these areas following construction.

Private Air Park

The Fort Lewis Loop would cross about 200 feet of a private air park at MP 1336.9. The air park consists of several houses with a connecting taxiway for private airplanes. The loop would cross a portion of the taxiway. Northwest would coordinate with the owners of the air park to minimize potential impacts on this area during construction. The air park would not be affected by operation of the project because the loop would be installed within Northwest's existing right-of-way.

Fort Lewis Military Reservation

Fort Lewis would be crossed by the Fort Lewis Loop between MPs 1335.2 and 1330.6. Fort Lewis was established in 1916 and covers 86,000 acres. It consists of several close-in training areas, including 115 live fire ranges. Fort Lewis serves over 25,000 soldiers and civilian workers. In 1992 the FWS designated Fort Lewis as critical habitat for the spotted owl (see section 4.7.1). The loop would also cross an area with native prairie vegetation between MPs 1331.8 and 1332.7 (see section 4.5.3). In addition to military training exercises, seasonal pheasant hunting occurs within the boundaries of Fort Lewis. Northwest would provide a construction schedule and would consult with Fort Lewis to ensure that construction activities do not interfere with military training exercises. No impacts on seasonal pheasant hunting are anticipated because the hunting season is in early to mid December. Construction of the loop is scheduled to begin in March 2006 with an in-service date of November 1, 2006. Details on the easement requirements and acquisition process for the federal land affected by the Capacity Replacement Project are provided in section 4.8.2.

Private Air Strip

The Fort Lewis Loop would cross about 100 feet of a private air strip at MP 1323.8. Northwest would coordinate with the owners of the air strip to minimize potential impacts on this area during construction. The air strip would not be affected by operation of the project because the loop would be installed within Northwest's existing right-of-way.

Sauk Mountain Golf Course

Construction activities at the abandoned facility at MP 1447.7 would temporarily affect a small portion of the Sauk Mountain Golf Course. The golf course would not be affected by operation of the project because the activities would occur at an existing aboveground facility site within Northwest's existing right-of-way.

Cameron Park

Construction activities at the abandoned facility at MP 1356.1 would temporarily affect a walking path and would be located adjacent to a playground within Cameron Park in the City of Auburn. Access to the site is located adjacent to the playground. No trees would be disturbed during construction activities. The park would not be affected by operation of the project because the activities would occur at an existing aboveground facility site within Northwest's existing right-of-way.

4.8.5 Hazardous Waste Sites

A search of federal and state databases was conducted for documentation of National Priority List (NPL) sites, state-listed hazardous waste sites, and landfills located within 0.25 mile of the proposed loops. No NPL sites, state-listed hazardous waste sites, or landfills were identified within 0.25 mile of any of the proposed loops. However, Northwest has developed the following mitigation measures that would be implemented if unanticipated hazardous materials/waste are encountered during construction:

- All construction work in the immediate vicinity of areas where hazardous or unknown wastes are encountered would be halted.
- All construction, oversight, and observing personnel would be evacuated to a road-accessible, up-wind location until the types and levels of potential contamination can be verified.

- Northwest's Chief Inspector and Environmental Lead would be notified. Following consultation with on-site personnel, the Environmental Lead would be responsible for designating follow-up actions, including mobilizing emergency response personnel and coordinating with the EPA and state and local agencies.

- If an immediate or imminent threat to human health or the environment exists, one of Northwest's emergency response contractors identified in the SPCC Plan (see Appendix H) or the National Response Team would be notified and mobilized.

- If an immediate or imminent threat to human health or the environment does not exist, or has been abated, Northwest or qualified subcontractor personnel would collect representative samples of the waste and surrounding materials for laboratory analysis.

- The contaminated material would be removed and properly disposed, if feasible, in accordance with WAC 173-303. If the extent of contamination is too widespread for economical removal, or if disposal options are technically infeasible or cost-prohibitive, backfilling of that portion of the trench would be suspended until appropriate mitigation options are approved.

In addition, Northwest has developed an SPCC Plan to address spills or leaks of material during construction (see Appendix H). The SPCC Plan is discussed in section 4.3.1.2. Information on contaminated soils, groundwater, and sediments near the proposed facilities is provided in sections 4.2.3, 4.3.1.2, and 4.3.2.6, respectively.

The facilities associated with the Capacity Replacement Project do not involve the replacement, abandonment by removal, or abandonment in place of facilities determined to have exposure to PCB contamination in excess of 50 parts per million (ppm) in pipeline liquids.

As discussed in section 4.2.3, the WDOE has expressed concern over possible contamination at existing aboveground facility sites. Northwest provided the WDOE with a list of 78 aboveground facility sites that are associated with the Capacity Replacement Project. Northwest reviewed its records for these 78 sites and determined that 28 of the sites are known or suspected to have used mercury (see table 4.8.5-1). Ten of these 28 sites are included on the WDOE's Confirmed and Suspected Contaminated Sites List (see table 4.8.5-2). In addition to mercury, the WDOE is concerned that there is a potential for PCBs and petroleum hydrocarbons contamination as well as the potential for asbestos contamination at meter stations that currently contain or historically contained sheds constructed of corrugated asbestos board.

Northwest would conduct sampling at each of the 28 sites listed in table 4.8.5-1 to determine whether mercury, PCBs, petroleum hydrocarbons, or asbestos contamination is present. The sampling would be conducted based on a site-specific sampling plan approved by the WDOE's Toxics Cleanup Program in the context of the program's Voluntary Cleanup Program. Based on the sampling results, the need for further actions would be determined by the WDOE's Toxics Cleanup Program. All necessary remediation to attain Model Toxics Control Act cleanup levels would be completed before the commencement of ground-disturbing activities at these specific locations. Once the sites associated with the Capacity Replacement Project are adequately remediated, Northwest would address the sites listed on the WDOE's Confirmed and Suspected Contaminated Sites List that are not associated with the Capacity Replacement Project (see table 4.8.5-2).

TABLE 4.8.5-1

Aboveground Facility Sites Associated with the Capacity Replacement Project That were Reviewed for Potential Mercury Contamination

Facility	Facility Type	Milepost	WDOE Region	County	Address	Latitude (°North)	Longitude (°West)
Sumas Compressor Station [a]	CS	1484.5	NW	Whatcom	4738 Jones Road Sumas, WA	NA	NA
Bellingham No. 2 Delivery Meter Station [a]	MS	1481.6	NW	Whatcom	Minakee Road Sumas, WA	48.9512	122.2596
Lynden Delivery Meter Station [a]	MS	1478.6	NW	Whatcom	Lebrant Road Lynden, WA	48.9134	122.2772
Lawrence Delivery Meter Station	MS	1473.5	NW	Whatcom	NA	48.8469	122.2708
Bellingham Line Interconnect	Line	1472.3	NW	Whatcom	Highway 542 at Hillard Road	48.8390	122.2494
6-inch Bellingham Line	Line	1472.3	NW	Whatcom	NA	48.8390	122.2494
Deming Delivery Meter Station	MS	1469.9	NW	Whatcom	NA	48.8245	122.2061
26-inch Crossover	Crossover	1468.1	NW	Whatcom	NA	48.8034	122.1898
Acme Meter Station	MS	1461.2	NW	Whatcom	Acme, WA	48.7112	122.1975
Fruitdale Block Valve	Valve	1450.7	NW	Skagit	Fruitdale Road at Highway 9, WA	48.5646	122.2172
Sedro-Woolley Meter Station [a]	MS	1447.7	NW	Skagit	Fruitdale Road Sedro-Woolley, WA	48.5232	122.2111
Anacortes Meter Station [a]	MS	1440.6	NW	Skagit	State Route 242	48.4284	122.2133
Mount Vernon Compressor Station [a]	CS	1440.0	NW	Skagit	15498 Lange Road Mount Vernon, WA	NA	NA
Stanwood Line	Line	1429.8	NW	Snohomish	NA	NA	NA
26-inch Crossover	Crossover	1427.6	NW	Snohomish	NA	NA	NA
Latter Day Saint Delivery Tap	Tap	1424.0	NW	Snohomish	Arlington Heights Road Arlington, WA	48.2077	122.1140
Arlington Delivery Meter Station	MS	1422.6	NW	Snohomish	Burn Hill Ridge Road Arlington, WA	48.1893	122.1027
Granite Falls Delivery Meter Station	MS	1414.1	NW	Snohomish	Getchell Road, WA	48.0720	122.0606
Lake Stevens Delivery Meter Station	MS	1409.8	NW	Snohomish	Robinett at N. Machias Road, Lake Stevens, WA	48.0127	122.0520
Machias Meter Station	MS	1408.0	NW	Snohomish	12th at 135th Machias, WA	47.9852	122.0519
Snohomish Meter Station [a]	M5S	1402.5	NW	Snohomish	13931 State Route 2 Snohomish, WA	47.9073	122.0436
Grotto line Take-off	Take-off	1401.0	NW	Snohomish	NA	47.8871	122.0448
Bartelheimer Dairy Meter Station	MS	1400.2	NW	Snohomish	NA	47.8731	122.0446
North Seattle Take-off	Take-off	1397.1	NW	Snohomish	NA	47.8323	122.0525
Echo Lake Meter Station	MS	1394.0	NW	Snohomish	Echo Lake Road Maltby, WA	47.7886	122.0575
Snohomish Compressor Station [a]	CS	1393.9	NW	Snohomish	22906 Echo Lake Road Snohomish, WA	47.7877	122.0575

TABLE 4.8.5-1 (cont'd)

Aboveground Facility Sites Associated with the Capacity Replacement Project That were Reviewed for Potential Mercury Contamination

Facility	Facility Type	Milepost	WDOE Region	County	Address	Latitude (°North)	Longitude (°West)
Duvall-Cottage Lake Delivery Meter Station (Abandoned)	MS	1391.4	NW	King	NA	47.7530	122.0496
Novelty Hill Delivery Meter Station	MS	1387.2	NW	King	Novelty Hill Road Redmond, WA	47.6930	122.0466
Redmond Delivery Meter Station [a]	MS	1385.4	NW	King	22607 NE Union Hill Road, Redmond, WA	47.6670	122.0384
Redmond District Delivery Tap (Abandoned)	Tap	1383.9	NW	King	State Highway 202 Redmond, WA	47.6456	122.0340
North Bend Meter Station [a]	MS	1379.3	NW	King	24403 SE 32nd Street Issaquah, WA	47.5805	122.0141
May Valley Meter Station	MS	1372.7	NW	King	NA	47.4898	122.0232
South Seattle Take-off	Take-off	1370.1	NW	King	NA	47.4529	122.0340
Lake Francis Meter Station	MS	1368.6	NW	King	NA	47.4311	122.0380
Covington Meter Station [a]	MS	1362.8	NW	King	19241 SW 272nd Avenue, Covington, WA	47.3579	122.0848
Black Diamond Meter Station	MS	1360.2	NW	King	NA	47.3231	122.1088
Cameron Village East Auburn Tap	Tap	1356.1	NW	King	NA	47.2772	122.1531
Enumclaw Buckley Meter Station [a]	MS	1356.0	NW	King	3839 Academy Drive SE, Auburn, WA	47.2760	122.1556
North Tacoma Take-off	Take-off	1352.1	SW	Pierce	NA	47.2352	122.2087
Sumner Compressor Station [a]	CS	1351.6	SW	Pierce	3104 166th Avenue E Sumner, WA	47.2305	122.2105
Puyallup North Meter Station	MS	1347.2	SW	Pierce	NA	47.1846	122.2524
Puyallup (Rainier Terrace) Meter Station [a]	MS	1343.3	SW	Pierce	9616 128th Street E Puyallup, WA	47.1401	122.3005
South Tacoma Delivery Site [a]	MS	1339.2	SW	Pierce	6028 176th Street E Puyallup, WA	47.0960	122.3486
Boeing and Fredrickson Delivery Meter	MS	1338.9	SW	Pierce	Canyon Road E (S of 176th Street E) Puyallup, WA	47.0919	122.3547
Scott Delivery Meter Station	MS	1338.4	SW	Pierce	Canyon Road E (S of 176th Street E) Puyallup, WA	47.0858	122.3589
Frederickson and Puget Power Delivery Meter Station	MS	1338.1	SW	Pierce	NA	47.0811	122.3616
Bethel Delivery Meter Station	MS	1335.8	SW	Pierce	224th Street E	47.0534	122.3850
26-inch Crossover, Valve 16-7AX-A,B (16-inch-diameter pipeline)	Crossover	1335.1	SW	Pierce	NA	NA	NA

TABLE 4.8.5-1 (cont'd)

Aboveground Facility Sites Associated with the Capacity Replacement Project That were Reviewed for Potential Mercury Contamination

Facility	Facility Type	Milepost	WDOE Region	County	Address	Latitude (°North)	Longitude (°West)
26-inch Crossover, Valve 16-7AX (26-inch-diameter pipeline)	Crossover	NA	SW	Pierce	NA	NA	NA
16-inch Crossover	Crossover	1324.7	SW	Pierce	NA	NA	NA
Yelm Delivery Meter Station	MS	1322.9	SW	Thurston	NA	46.9139	122.5590
Olympia/Grays Harbor Lateral	Lateral	1315.6	SW	Thurston	NA	46.8538	122.6764
26-inch Crossover, Valve 16-6XS	Crossover	1309.9	SW	Thurston	NA	46.7941	122.7543
Centralia Line Take-off	Take-off	1305.3	SW	Lewis	NA	46.7459	122.8126
Chehalis Meter Station [a]	MS	1298.2	SW	Lewis	1010 Centralia Alpha Road Centralia, WA	46.6591	122.8680
Berwick Lateral Tie-in	Lateral	1297.2	SW	Lewis	Pattee Road, WA	46.6448	122.8657
Mac Millan Rest Home Tap [a]	MS	1294.5	SW	Lewis	3188 Jackson Highway Chehalis, WA	46.6074	122.8731
Chehalis Compressor Station	CS	1289.4	SW	Lewis	156 Meier Road Chehalis, WA	46.5337	122.8732
Jackson Prairie Storage Facility [a]	CS	1289.3	SW	Lewis	NA	46.5321	122.8732
Winlock Meter Station [a]	MS	1286.8	SW	Lewis	774 Frost Road Winlock, WA	46.4958	122.8712
Toledo Meter Station [a]	MS	1284.0	SW	Lewis	276 Drews Prairie Road Toledo, WA	46.4563	122.8746
Castle Rock Meter Station [a]	MS	1270.9	SW	Cowlitz	425 Powell Road Castle Rock, WA	46.2747	122.8851
Kelso-Beaver Meter Station	MS	1266.6	SW	Cowlitz	NA	46.2146	122.8811
Weyerhaeuser/ Ostrander Meter Station	MS	1265.5	SW	Cowlitz	NA	46.2008	122.8741
Kelso (Longview) Meter Station [a]	MS	1262.9	SW	Cowlitz	2502 Mount Brynion Road Kelso, WA	46.1656	122.8759
Longview South Meter Station	MS	1258.4	SW	Cowlitz	NA	46.1068	122.8460
Kalama Farm Tap [a]	MS	1251.4	SW	Cowlitz	2301 China Garden Road Kalama, WA	46.0179	122.7930
Astoria Line Take-off	Take-off	1249.3	SW	Cowlitz	NA	45.9901	122.7790
Woodland Meter Station [a]	MS	1243.7	SW	Cowlitz	1950 Lewis River Road Woodland, WA	45.9190	122.7314
Van Der Salm Bulb Farm Meter Station	MS	1240.0	SW	Clark	NA	45.8649	122.6935
26-inch Crossover, Valve 16-1X	Crossover	1239.4	SW	Clark	NA	45.8645	122.6932
Ridgefield Meter Station [a]	MS	1237.7	SW	Clark	30904 NW Spencer Road Ridgefield, WA	45.8451	122.6777

TABLE 4.8.5-1 (cont'd)

Aboveground Facility Sites Associated with the Capacity Replacement Project That were Reviewed for Potential Mercury Contamination

Facility	Facility Type	Milepost	WDOE Region	County	Address	Latitude (°North)	Longitude (°West)
Portland Lateral Take-Off	Take-off	1232.5	SW	Clark	NA	45.7942	122.6019
Battleground District Office Meter Tap	MS	1231.1	SW	Clark	8907 NE 219th Street Battle Ground, WA	45.7797	122.5834
Battleground Meter Station [a]	MS	1229.1	SW	Clark	19709 NE 122nd Avenue, Battle Ground, WA	45.7666	122.5498
North Vancouver Meter Station [a]	MS	1225.4	SW	Clark	14450 NE 172nd Ave. Bush Prairie, WA	45.7226	122.4972
Camas Delivery Meter Station [a]	MS	1217.45	SW	Clark	27712 NE 28th Street Camas, WA	45.6434	122.3873
Washougal Compressor Station	CS	1216.2	SW	Clark	1309 NE Brown Road Washougal, WA	45.6320	122.3653

[a] Known or suspected to have used mercury.

CS = Compressor station.
MS = Meter station.
Tap = Pipeline tap.
Take-off = Pipeline take-off.
Storage = Storage facility.
Line = Pipeline.
Crossover = Pipeline crossover.
NA = Not available.

TABLE 4.8.5-2

Aboveground Facility Sites Included on the WDOE's Confirmed and Suspected Contaminated Sites List for the Northwest Region

Facility Name	Facility Type	Milepost	County	Address	WDOE Ranking [a]
Bellingham No. 2 Delivery Meter Station [b]	MS	1481.6	Whatcom	Minakee Road Sumas, WA	WARM-5 (11/01)
Lynden Delivery Meter Station [b]	MS	1478.6	Whatcom	Lebrant Road Lynden, WA	WARM-5 (11/01)
Bellingham I (Ferndale) Meter Station [c]	MS	8.3	Whatcom	Britton Road and Mount Baker Highway Bellingham, WA	WARM-5 (11/02)
Sedro-Woolley Meter Station [b]	MS	1447.7	Skagit	Fruitdale Road Sedro-Woolley, WA	WARM-5 (11/02)
Mount Vernon Compressor Station [b]	CS	1440.2	Skagit	15498 Lange Road Mount Vernon, WA	WARM-5 (11/02)
Snohomish Meter Station [b]	MS	1402.5	Snohomish	13931 State Route 2 Snohomish, WA	WARM-5 (11/02)
Snohomish Compressor Station [b]	CS	1393.9	Snohomish	22906 Echo Lake Road Snohomish, WA	WARM-5 (11/02)
Oak Harbor – Stanwood Meter Station [c]	MS	11.4	Snohomish	Camino Island Bridge Stanwood, WA	NFA (07/97)
North Seattle Meter Station [c]	MS	0.6	Snohomish	12426 Elliot Road Snohomish, WA	WARM-5 (11/02)
Redmond Delivery Meter Station [b]	MS	1385.4	King	22607 NE Union Hill Road Redmond, WA	WARM-3 (11/02)
North Bend Meter Station [b]	MS	1379.3	King	24403 SE 32nd Street Issaquah, WA	WARM-3 (07/96)
Covington Meter Station [b]	MS	1362.8	King	19241 SW 272nd Avenue Covington, WA	WARM-3 (11/02)
Enumclaw Buckley Meter Station [b]	MS	1356.0	King	3839 Academy Drive SE Auburn, WA	WARM-2 (08/03)
South Seattle Meter Station [c]	MS	8.6	King	800 S 21st Street Renton, WA	WARM-3 (11/02)
Issaquah Highlands Meter Station [c]	MS	1.4	King	22339 SE 56th Street Issaquah, WA	WARM-3 (11/02)

[a] WARM = Washington Ranking Method. A rank of "1" represents the highest level of risk compared to other sites and a rank of "5" represents the lowest level of risk.
[b] Located along the right-of-way or at compressor stations associated with the Capacity Replacement Project.
[c] Not associated with the Capacity Replacement Project.

CS = Compressor station.
MS = Meter station.
Note: No facilities within the WDOE's southwest region are listed in the database. Approximately 25 additional facilities are listed in the database and fall within the eastern and central regions.

4.8.6 Visual Resources

Pipeline Facilities

Visual resources along the pipeline route are a function of geology, climate, and historical processes and include topographic relief, vegetation, water, wildlife, land use, and human uses and development. The vegetation along the loops consists largely of grasses, shrubs, and small- to large-diameter trees on mostly flat to rolling terrain. Although some stretches of forest and natural landscape are present along the proposed loops, much of the area has been developed or visual resources have been previously affected by other activities such as farming.

Northwest proposes to generally use a 95-foot-wide construction right-of-way, consisting of Northwest's existing 75-foot-wide maintained right-of-way and 20 feet of new temporary extra workspace. On the Snohomish Loop and in other areas where encroachment, development, or other limitations confine available workspace, Northwest would remove the 26-inch-diameter pipeline and place the 36-inch-diameter loop in the same trench using the full width of the existing right-of-way, which varies from 60 to 75 feet. Some areas would be widened for additional temporary extra workspaces required for construction at waterbody, road, and utility crossings as well as in areas of steep side slopes or other difficult terrain. Visual impacts associated with the construction right-of-way and temporary extra workspaces would include the removal of existing vegetation and the exposure of bare soils, as well as earthwork and grading scars associated with heavy equipment tracks, trenching, blasting (if required), rock formation alteration or removal, and machinery and tool storage. Other visual effects could result from the removal of large individual trees that have intrinsic aesthetic value; the removal or alteration of vegetation that may currently provide a visual barrier; or landform changes that introduce contrasts in visual scale, spatial characteristics, form, line, color, or texture.

Visual impacts would be greatest where the pipeline route parallels or crosses roads and the pipeline right-of-way may be seen by passing motorists, on residents where vegetation used for visual screening of existing utility rights-of-way or for ornamental value would be removed, and in forested areas. The duration of visual impacts would depend on the type of vegetation that is cleared or altered. The impact of vegetation clearing would be shortest in areas consisting of short grasses and scrub-shrub vegetation and in agricultural crop and pasture lands, where the reestablishment of vegetation following construction would be relatively fast (generally less than 5 years). The impact would be greater in forest land, which would take many years to regenerate mature trees. The greatest potential visual impact would result from the removal of large specimen trees, which would take longer than other vegetation types to regenerate and would be prevented from reestablishing on the permanent right-of-way.

About 99 percent of the proposed loops would be located within or adjacent to Northwest's existing right-of-way. Construction within or adjacent to existing rights-of-way typically reduces impacts on visual resources because it minimizes vegetation clearing for the construction work areas and permanent right-of-way and also minimizes new fragmentation of vegetation. In some areas, however, Northwest's existing right-of-way has not been completely maintained and vegetation, including trees, has been allowed to reestablish on portions of the right-of-way. This vegetation would be cleared during construction of the loops and would result in both short and long-term impacts on visual resources depending on the type of vegetation that is removed. Where feasible, Northwest would retain trees on the edge of the construction right-of-way for wildlife habitat or tree screens. Northwest would conduct grading activities in a manner that minimizes erosion and conforms to the natural terrain.

Northwest proposes to install two waterbody crossings using the aerial span installation method (see sections 2.3.2 and 4.3.2.3). An aerial pipeline span is visible and has a permanent impact on visual resources; however, in these two crossing locations, the loop would be adjacent to the existing pipelines that were also installed as aerial spans. As a result, the aerial spans associated with these two waterbody crossings would not have a significant impact on visual resources. If Northwest is not permitted to use the wet open-cut crossing method at Pilchuck Creek and the Nisqually River, the aerial span method would be used. Aerial spans of these waterbodies would have a permanent impact on visual resources because the existing pipelines at these crossing locations were installed using the open-cut method. The impact of an aerial span crossing would be particularly noticeable because both of these waterbodies are in rural, open settings.

Of the 1.1 miles (1 percent) of the proposed loops not located within or adjacent to Northwest's existing right-of-way, about 0.9 mile is a route variation associated with the HDDs of the North and South Fork Stillaguamish Rivers. As a result, no impacts on visual resources are anticipated in these areas because no ground disturbance would occur between the drill entry and exit points. However, if the HDDs were not successful, Northwest proposes to construct the crossings using the wet open-cut method (see sections 2.3.2 and 4.3.2.3). Use of the open-cut crossing method at the North Fork Stillaguamish River would increase impacts on forest land, which would have a greater impact on visual resources. Use of the open-cut crossing method at the South Fork Stillaguamish River would primarily increase impacts on agricultural land, which would have minimal impacts on visual resources.

The remaining 0.2 mile where new right-of-way would be created is generally located in non-forested areas, which minimizes the potential for impacts on visual resources. After construction, all areas disturbed during construction would be restored and returned to preconstruction conditions in compliance with federal, state, and local permits; landowner agreements; and Northwest's easement requirements.

A visual analysis was conducted at specific key observations points along the proposed loops. Key observation points were analyzed from the Pipeline Regional Trail within the City of Redmond Watershed Preserve, Novelty Hill Road, the Deer Park Subdivision, and State Highway 202. The results of the analysis are presented below. Figures containing photographs of the existing right-of-way in these areas are provided in Appendix Q.

<u>Pipeline Regional Trail</u> – As discussed in section 4.8.4, Northwest's existing right-of-way serves as a trail, referred to as the Pipeline Regional Trail, through the length of the City of Redmond Watershed Preserve between MPs 1388.8 and 1387.4 of the Snohomish Loop. The trail winds in and out of the pipeline right-of-way within the preserve (see figure Q-1 in Appendix Q). The existing permanent easement is not entirely cleared through this area and there are some coniferous trees present, especially along the west side of the right-of-way. These trees would be cleared as well as up to 20 feet of temporary construction right-of-way on each side of the existing permanent easement. Portions of the trail that parallel the existing easement would appear more open after construction because the cleared area would be widened. However, there is sufficient tree screen so that the existing visual setting would remain and no structures would become visible to users of the trail as a result of the tree clearing. The viewer would see more open areas and the portions of the trail perpendicular to the right-of-way would be located in cleared areas instead of areas containing trees. The edges of the cleared area would appear sharper and less natural. Northwest would replant the temporary construction right-of-way as required by the City of Redmond and the WDNR.

<u>Novelty Hill Road</u> – Novelty Hill Road would be crossed at MP 1387.3 of the Snohomish Loop. Northwest's existing permanent right-of-way both north and south of Novelty Hill Road contains some large coniferous trees, especially on the west side of the easement (see figure Q-2 in Appendix Q). Northwest estimates that about 45 feet of clearing would be required on the west side of the right-of-way on both the north and south sides of Novelty Hill Road for temporary construction right-of-way and extra workspace. Northwest is also proposing temporary extra workspace on the east side of the right-of-way north of Novelty Hill Road, which would result in an additional 20 feet of clearing. Although the cleared area would be wider after construction, there would still be sufficient coniferous tree screen adjacent to the cleared area so that the viewers on Novelty Hill Road would not be able to see other structures. The widening at the pipeline corridor would not be noticeable to traffic on Novelty Hill Road.

<u>Deer Park Subdivision</u> – The Snohomish Loop would cross the Deer Park Subdivision. Photographs of the existing right-of-way from key observation points within the Deer Park Subdivision are provided on figure Q-3, sheets 1 through 3, in Appendix Q. Within the Deer Park Subdivision, Northwest proposes to limit construction activities, including clearing, to its existing permanent right-of-

way (typically 60 feet in this area). In some locations, deciduous vegetation (shrubs/brush) and trees associated with landscaping as well as fences have encroached on Northwest's permanent right-of-way. This vegetation provides visual screens from the cleared right-of-way and adjacent neighbors. To the viewer, the right-of-way in these areas would appear more open without the vegetation screens, and homes would be more visible than before construction. These impacts would be more apparent where fences and landscaped yards are currently located on Northwest's permanent right-of-way. After construction, Northwest would replace fences so that they are not located over the pipe and would negotiate appropriate compensation with affected landowners.

State Highway 202 – State Highway 202 would be crossed at MP 1383.9 of the Snohomish Loop. Northwest's Redmond District Office is located on State Highway 202 on the south side of the existing right-of-way (see figure Q-4 in Appendix Q). There would be no impacts on visual resources on this side of the highway as a result of pipeline construction because the entire existing right-of-way as well as the proposed temporary construction right-of-way and extra workspaces are already cleared. On the north side of the highway, Northwest is proposing to use a temporary extra workspace adjacent to the east side of the right-of-way where trees would have to be cleared. Trees would also have to be cleared from Northwest's proposed temporary extra workspace on the west side of the pipeline right-of-way in this area. Although the pipeline corridor would be slightly wider following construction, the change would not be noticeable to traffic on State Highway 202.

Aboveground Facilities

Modifications at the Sumas, Mount Vernon, Snohomish, and Washougal Compressor Stations would not result in additional permanent impacts on visual resources. All of the modifications would occur within the fencelines of the existing facilities.

Modification activities at the Chehalis Compressor Station would require expansion of the existing footprint of the station to install the additional compression needed for the project. The station is located in a rural setting surrounded by open pastures/fields and forest land. Surrounding viewpoints include Interstate 5 and a single home located approximately 1,600 feet east of the station. Meir Road, which provides access to the station, dead ends at Interstate 5 and does not provide access to any other residences, farms, or businesses (see figure Q-5, sheets 1 though 3, in Appendix Q). The new turbine associated with the station would be located within a new building that would require an additional 1.4 acres of land to be added to the existing station footprint. Another 0.1 acre would be permanently affected by construction of a gravel road to an existing water supply well located southwest of the station. The modifications and expansion of the Chehalis Compressor Station would have a permanent impact on visual resources; however, the new building and road would be seen in the context of the existing industrial facility, thereby minimizing visual impacts. In addition to the 1.5 acres, about 6.2 acres of temporary extra workspace would be required for construction activities. After construction, the 6.2 acres of land would be returned to preconstruction conditions and would not result in any permanent visual impacts.

The pig launchers and receiver and MLVs that would be collocated with existing aboveground facilities would only slightly expand the footprint of the existing facilities and would not result in additional permanent impacts on visual resources. All aboveground piping surfaces and structures would be sandblasted and painted in accordance with Northwest's construction specifications. A reflective material may be used to reduce hazards that occur when such structures are near roads and/or to comply with OSHA requirements. Otherwise, the paint would be a non-glare, non-reflective, non-chalking color. Northwest would conduct all paint inspection and cleanup in accordance with regulatory requirements and best engineering practices. The construction of the pig receivers (MPs 1461.8 and 1408.8) and MLVs (MPs 1467.9, 1461.8, and 1408.8) that would not be collocated with existing facilities would permanently affect visual resources. To minimize impacts on visual resources associated with these facilities, **the FERC staff recommends that:**

- **Northwest paint all aboveground piping surfaces and structures associated with the non-collocated pig receivers at MPs 1461.8 and 1408.8 and the MLVs at MPs 1467.9, 1461.8, and 1408.8 to blend with the surrounding landscape.**

Abandoned Facilities

Northwest would abandon the existing 268-mile-long, 26-inch-diameter pipeline and appurtenant facilities in place with the exception of the Snohomish Loop and a few other distinct locations where the existing pipeline would be removed. Because these are existing facilities located mostly below ground, the abandoning of the 26-inch-diameter pipeline and the associated facilities would not result in additional permanent impacts on visual resources.

Pipe Storage and Contractor Yards

With the possible exception of minor grading activities and surfacing, soils at the pipe storage and contractor yards would not be disturbed. As a result, there would be no permanent impacts on visual resources associated with the use of these yards.

4.9 SOCIOECONOMICS

The Capacity Replacement Project would involve the construction and operation of about 79.5 miles of pipeline in four loops, 26 MLVs (5 30-inch and 15 36-inch MLVs associated with the proposed loops and 6 30-inch MLVs along the existing Evergreen Expansion Project loops), 4 pig receivers (one of which would be relocated from its previous location on the existing Evergreen Expansion Project), and 3 pig launchers, as well as modifications to 5 existing compressor stations. The four loops would cross Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties, Washington. In addition to these counties, modifications to the existing Chehalis and Washougal Compressor Stations would occur in Lewis and Clark Counties, respectively. The project would also involve abandoning the existing 26-inch-diameter pipeline. Abandonment activities would involve work at 24 locations along the proposed loops and at 48 independent sites located outside of the looped segments. Of the 48 sites, 40 are located within the counties identified above. Abandonment activities at the remaining eight locations would be conducted along the 26-inch-diameter pipeline in Cowlitz County (see table 2.1.3-1). This work would be completed by small, independent crews consisting of about 10 workers and would not have a measurable effect on population, employment, housing, public services, traffic conditions, and tax revenue in Cowlitz County; therefore, Cowlitz County is not included in the FERC staff's analysis of these socioeconomic factors.

Some of the potential socioeconomic effects from construction, operation, and maintenance of the project are related to the number of construction workers that would work on the project and their impact on population, public services, and temporary housing during construction. Other potential effects are related to construction, such as increased traffic or disruption of normal traffic patterns along the loops, or temporary disturbance of agricultural land, homes, and businesses. Other effects associated with the project include increased property tax revenue, increased job opportunities and income associated with local construction employment, and local expenditures by the pipeline company and non-local construction workers.

The potential impact of the project on land use and residences in the project area is discussed in section 4.8. A discussion of the project's effects on population and employment, housing, public services, transportation and traffic, and tax revenue is provided below as well as a discussion of the impact of the project on property values.

4.9.1 Population, Economy, and Employment

Table 4.9.1-1 provides a summary of selected demographic and socioeconomic statistics for the counties in the project area.

The counties affected by the Capacity Replacement Project vary widely in their population totals and densities. The most densely populated county affected by the project (King County) has a population density of 827.7 people per square mile. The least densely populated county affected by the project (Lewis County) has a population density of 28.9 people per square mile. Populations in the project area range from approximately 70,000 to 1,800,000 persons county-wide. The largest city in the project area is Seattle with a population of about 570,000 (U.S. Census Bureau, 2000).

The major occupations in the project area are management/professional and office/sales related occupations. According to the U.S. Census Bureau (2000), the main industries in the area include education, health and social services, manufacturing, and retail trade. The county-wide per capita income for counties affected by the project is lower than the state average of $31,230, with the exception of King County. The unemployment rates for counties within the project area range between 4.9 and 8.0 percent with Skagit, Snohomish, Pierce, Lewis, and Clark Counties exceeding the state average of 6.1 percent.

TABLE 4.9.1-1

Existing Socioeconomic Conditions in the Counties Affected by the Capacity Replacement Project

State/County	Population (2002 est.) [a]	Population Density (2002 est.) [b]	Per Capita Income (2000) [a]	Civilian Labor Force (2004) [c]	Unemploy-ment Rate (percent) (2004) [c]	Top Two Major Occupations (2000) [a]
Washington	6,068,996	91.2	$31,230	2,663,800	6.1	Management/Professional (35.6) Office and Sales (25.9)
Whatcom	174,362	82.2	$23,133	90,800	5.1	Management/Professional (31.5) Office and Sales (26.3)
Skagit	106,906	61.6	$26,414	53,460	6.6	Management/Professional (28.5) Office and Sales (24.8)
Snohomish	633,947	303.5	$28,394	352,900	6.9	Management/Professional (33.7) Office and Sales (26.8)
King	1,759,604	827.7	$45,536	1,036,100	5.6	Management/Professional (43.4) Office and Sales (26.4)
Pierce	732,282	436.1	$25,587	365,200	6.7	Management/Professional (30.1) Office and Sales (26.8)
Thurston	217,641	299.4	$26,460	113,600	4.9	Management/Professional (37.4) Office and Sales (27.1)
Lewis	69,710	28.9	$21,316	30,470	8.0	Management/Professional (23.9) Office and Sales (24.3)
Clark	370,236	589.5	$29,085	187,500	7.4	Management/Professional (30.9) Office and Sales (27.3)

a U.S. Census Bureau. 2000a. Census 2000a: MapStats/County Profile. http://www.fedstats.gov/qf.

b Population density is based on persons per square mile as follows: Washington (66,544 sq. mi.), Whatcom County (2,120 sq. mi.), Skagit County (1,735 sq. mi.), Snohomish County (2,089 sq. mi.), King County (2,126 sq. mi.), Pierce County (1,679 sq. mi.), Thurston County (727 sq. mi.), Lewis County (2,408 sq. mi.), and Clark County (628 sq. mi.).

c Workforce Explorer: Labor Market Info through March 2004. http://www.workforceexplorer.com.

Table 4.9.1-2 lists the size of the estimated construction workforce for the loops and modifications at the existing compressor stations. Activities associated with the abandonment of the existing 26-inch-diameter pipeline along the loops would be conducted by the construction workforce for each loop. Abandonment activities along the remainder of Northwest’s system would be conducted by small, independent crews consisting of about 10 workers. Northwest estimates that a peak workforce of about 1,535 workers would be employed during construction of the loops and modifications at the compressor stations. Northwest estimates that between 300 and 350 workers would be employed on each loop. The number of construction workers at each compressor station would vary depending on the modifications required and stage of construction.

TABLE 4.9.1-2

Estimated Construction Workforce for the Capacity Replacement Project

Facility	Milepost Range	Estimated Workforce Average/Peak	Estimated Time to Complete
Pipeline Facilities			
Sumas Loop	1484.5 – 1461.8	300/350	8 months
Mount Vernon Loop	1431.3 – 1408.8	300/350	8 months
Snohomish Loop	1393.9 – 1382.0	300/350	8 months
Fort Lewis Loop	1338.1 – 1315.6	300/350	8 months
Compressor Stations			
Sumas Compressor Station	1484.5	10/20	3 months
Mount Vernon Compressor Station	1440.2	5/15	3 months
Snohomish Compressor Station	1393.9	5/15	3 months
Chehalis Compressor Station	1289.4	40/70	7 months
Washougal Compressor Station	1216.2	5/15	3 months

The construction workforce would include both local and non-local workers. Local workers would be employed for construction when available. Additional construction personnel hired from outside the project area would include construction specialists, supervisory personnel, and inspectors who would temporarily relocate to the project area. Northwest estimates that up to 30 percent of the construction workforce would be local hires, depending on union agreements and the methods the contractor uses to hire subcontractors.

Project-area population impacts are expected to be temporary and proportionally small. A majority of the impacts would come from the temporary influx of construction personnel. The total population change would equal the total number of non-local construction workers, plus any family members accompanying them. Given the brief construction period (between 3 to 8 months), most non-local workers are not expected to be accompanied by their families. Assuming 70 percent of the total peak construction workforce for the project is non-local (1,075 workers), and 20 percent of these bring three other family members with them, the total increase in population in the project area would be 1,720 people. This temporary increase in population would be distributed throughout the 268-mile-long area between Sumas and Washougal and would not have a permanent impact on population. A brief decrease in the unemployment rate could occur as a result of construction due to the hiring of local workers for construction and the increased demands on the local economy. However, given the relatively short construction period, impacts on the economy and employment as a whole would be temporary and minimal.

Because Northwest currently operates an existing pipeline system in the project area, no additional permanent employees associated with facilities constructed or modified as part of the Capacity Replacement Project would be required. Personnel from Northwest's existing staff would be available to assume operation and maintenance of the facilities as part of their routine workload. As a result, operation of the proposed project would not affect the local population or employment.

4.9.2 Housing

Housing statistics for the counties affected by the Capacity Replacement Project are presented in table 4.9.2-1. Rental vacancy rates in counties affected by the project are higher than the state average in Pierce, Thurston, Lewis, and Clark Counties. Skagit and King Counties have the lowest rental vacancy rates of the counties affected by the project.

Temporary housing availability varies seasonally and geographically within the counties and communities near the proposed facilities. Temporary housing is available in the form of daily, weekly, and monthly rentals in motels, hotels, campgrounds, and recreational vehicle (RV) parks. The demand for temporary housing in the project area is generally greatest during the summer months when tourism is at its highest. Table 4.9.2-2 provides the number of hotels/motels and campgrounds/RV parks in the towns closest to the proposed facilities. Other available temporary housing such as Bed and Breakfast facilities, apartments, and vacation properties, as well as those in other towns/cities within commuting distance of the project area (e.g., Seattle, Washington and Portland, Oregon) are not included. Therefore, the availability of temporary housing is substantially greater than presented in table 4.9.2-2.

TABLE 4.9.2-1

Housing Characteristics in Counties Crossed by the Capacity Replacement Project

State/County	Owner Occupied (percent)	Renter Occupied (percent)	Median Value, Owner Occupied Units	Median Gross Monthly Rent	For Seasonal or Occasional Use	Owner Vacancy Rate (percent)	Rental Vacancy Rate (percent)
Washington	64.6	35.4	$168,300	$663	60,355	1.8	5.9
Whatcom	63.4	36.6	$155,700	$622	5,946	2.2	5.7
Skagit	69.7	31.3	$158,100	$668	1,971	1.9	4.7
Snohomish	67.8	32.2	$196,500	$766	2,337	1.5	5.5
King	59.8	40.2	$236,900	$758	5,234	1.2	4.2
Pierce	63.5	36.5	$149,600	$624	2,584	1.8	6.1
Thurston	66.6	33.4	$145,200	$655	981	2.1	6.0
Lewis	71.4	28.6	$117,800	$551	1,312	3.0	8.0
Clark	67.3	32.7	$156,600	$684	550	2.0	6.6

Sources: U.S. Census Bureau. 2000b. 2000 Census of Population and Housing. Summary Social, Economic and Housing Characteristics. PHC-2. http://www.census.gov/prod/cen2000/. U.S. Census Bureau. 2000c. 2000 Census of Population and Housing. Population and Housing Unit Counts. PHC-3. http://www.census.gov/prod/cen2000/.

Construction of the project could affect the availability of housing in the project area; however, no significant impacts on local housing markets are expected. Because the construction period along each loop is relatively short, and because most non-local workers are expected to come alone without their families due to the temporary nature of the relocations, most workers are likely to use temporary housing such as hotels, motels, apartments, and campgrounds within commuting distance of the project area.

Assuming that local construction workers do not require housing, a total of about 1,075 housing units for the non-local workers may be required during peak construction activities associated with the project. The workers and the demand for housing would be distributed throughout the 268-mile-long area between Sumas and Washougal. Given the vacancy rates, the number of rental housing units in the area, and the number of hotel/motel rooms and campgrounds available in the cities and towns in the vicinity of the project, construction crews should not encounter difficulty in finding temporary housing. Most construction activities are scheduled to occur during the spring and summer of 2006. While these activities would occur during the peak tourism season, temporary housing would still be available but may be more difficult to find, and/or more expensive to secure. Should accommodations not be available near the loops, construction workers would have to locate accommodations a further commuting distance from the area. Temporary camps along the construction right-of-way would not be used to accommodate construction workers.

4.9.3 Public Services

A wide range of public services and facilities are offered along the loops, with concentrations in the larger cities. Where services are not available at the local level, they are available from the county. Services provided in the immediate project area include law enforcement agencies; fire departments; hospitals and other medical facilities; schools; solid waste disposal; sewer and water; and other utilities.

Law Enforcement/Fire/Medical Services

Table 4.9.3-1 provides an overview of selected public services available in the larger cities of Bellingham, Mount Vernon, Everett, Bellevue, Seattle, Tacoma, Olympia, and Vancouver, Washington.

TABLE 4.9.2-2

Temporary Housing Availability in Cities and Towns in the Vicinity of the Capacity Replacement Project

Facility	County	City/Town	Distance to Facility (miles)	Number of Hotels/Motels [a]	Number of Campground/ RV Parks
Pipeline Facilities					
Sumas Loop [b]	Whatcom	Sumas	1.0	2	1
		Ferndale	12.5	2	2
		Bellingham	7.8	25	9
	Skagit	Sedro-Woolley	14.1	2	1
		Burlington	17.8	5	2
		Mount Vernon	19.9	10	5
Mount Vernon Loop	Skagit	Sedro-Woolley	13.3	2	1
		Burlington	11.9	5	2
		Mount Vernon	7.6	10	5
	Snohomish	Arlington	0.1	6	6
		Marysville	2.5	4	0
		Everett	5.1	25	5
		Snohomish	4.5	1	1
		Monroe	8.7	4	1
Snohomish Loop [c]	Snohomish	Everett	9.8	25	5
		Snohomish	8.5	1	1
		Monroe	4.2	4	1
	King	Woodinville	2.6	1	0
		Bothell	5.1	5	1
		Redmond	1.8	4	0
		Kirkland	5.4	7	0
		Sammamish	0.0	0	0
		Bellevue	2.5	34	2
		Issaquah	1.3	6	4
		Renton	7.9	19	0
Fort Lewis Loop	Pierce	Sumner	7.6	1	0
		Puyallup	3.8	4	4
		Edgewood	7.7	0	0
		Fife	7.2	9	0
		Tacoma	6.1	62	5
		Lakewood	6.9	3	0
	Thurston	Lacey	11.7	8	1
		Olympia	14.2	20	10
		Tumwater	14.8	5	2
Compressor Stations					
Mount Vernon Compressor Station	Skagit	Burlington	6.0	5	2
		Mount Vernon	5.2	10	5
Chehalis Compressor Station	Lewis	Centralia	11.6	10	5
		Chehalis	7.7	3	2
Washougal Compressor Station	Clark	Washougal	2.6	1	0
		Camas	2.8	3	0
		Vancouver	5.0	37	8

[a] Each motel, hotel, and campground would consist of multiple accommodations per facility.
[b] The Sumas Compressor Station is located at the north end of the proposed Sumas Loop.
[c] The Snohomish Compressor Station is located at the north end of the proposed Snohomish Loop.

Sources: Washington State Tourism, Department of Community, Trade and Economic Development. http://www.tourism.wa.gov; Yahoo! Yellow Pages. http://yp.yahoo.com.

TABLE 4.9.3-1

Existing Public Services in Cities Located Near the Facilities Associated with the Capacity Replacement Project

City	Number of City Fire Stations	County Law Enforcement Office	Largest Hospital	Number of Hospital Beds	Number of Other WSHA [a] Hospitals
Bellingham	6	Whatcom County Sheriff's Office	St. Joseph's	253	0
Mount Vernon	3	Skagit County Sheriff's Office	Skagit Valley Hospital	137	2
Everett	7	Snohomish County Sheriff's Office	Providence Everett Medical Center	362	2
Bellevue	9	King County Sheriff's Office	Overlake Hospital Medical Center	257	0
Seattle	34	King County Sheriff's Office	Swedish Medical Center	697	13
Tacoma	18	Pierce County Sheriff's Office	Tacoma General Hospital	391	6
Olympia	4	Thurston County Sheriff's Office	Providence St. Peters Hospital	314	1
Vancouver	9	Clark County Sheriff's Office	Southwest Washington Medical Center	360	0

[a] WSHA = Washington State Hospital Association.

Sources: http://www.wsha.org/about.htm; http://www.cob.org/index.htm; http://www.ci.mount-vernon.wa.us/; http://www.ci.everett.wa.us/; http://www.ci.bellevue.wa.us/; http://www.ci.olympia.wa.us/; http://www.cityoftacoma.org/10Home/default.asp; http://www.ci.vancouver.wa.us/; http//:www.co.whatcom.wa.us/sheriff/index.jsp; http://www.seattle.gov/fire/firestations/stations.htm; http://www.skagitcounty.net; http://www1.co.snohomish.wa.us/Departments/Sheriff/; http://www.metrokc.gov/sheriff/; http://www.co.pierce.wa.us; http://www.thurstonsheriff.org/; http://www.co.lewis.wa.us/Sheriff/sheriff.htm; http://www.co.clark.wa.us/sheriff/index.html.

Because the non-local workforce would be small relative to the current population, construction of the Capacity Replacement Project would result in minor, temporary, or no impact on local community facilities and services, such as police, fire, and medical services. The counties, cities, and towns in the project vicinity presently have adequate infrastructure and services to meet the needs of the non-local workers.

Other construction-related demands on local services would include increased demand for permits for vehicle load and width limits, local police assistance during construction at road crossings to facilitate traffic flow, and emergency medical services to treat injuries resulting from construction accidents. Northwest would work with the local law enforcement, fire departments, and emergency medical services to coordinate for effective emergency response. The degree of impact would vary from community to community depending on the number of non-local workers and accompanying family members that temporarily reside in each community, the duration of their stay, and the size of the community. Although these factors are too indeterminate and variable to accurately predict the magnitude of impact, the effects would be short term and therefore not expected to be significant. This is supported by Northwest's past experience constructing projects in the area. In 2003 and 2004, Northwest installed over 90 miles of pipeline and conducted numerous compressor station modifications in several western Washington counties. None of these projects experienced problems that overburdened local services.

The limited number of permanent employees associated with the proposed project would result in unnoticeable long-term impacts on these public services. In addition, because the majority of the facilities would be located in Northwest's existing right-of-way or collocated with existing aboveground facility sites, operation of the project would not introduce any new facilities that the local infrastructure could not handle.

As described in section 4.12.1, Northwest representatives would meet with the emergency services departments of the municipalities and counties along the pipeline facilities on an on-going basis in compliance with Title 49 CFR Part 192.

Schools

Several school properties would be crossed by or located adjacent to the proposed loops (see table 4.9.3-2). Temporary construction impacts on schools could include inconvenience caused by noise and dust generated by construction equipment, personnel, and trenching of roads or parking lots; disrupted access to school grounds; and ground disturbance of sports fields or other vegetated areas. Impacts would be greatest if construction activities near the schools coincided with the school year.

TABLE 4.9.3-2

Schools Crossed by or Located Adjacent to the Facilities Associated with the Capacity Replacement Project

Facility	Milepost Location	Name and Address of School	Building Distance and Direction from Construction Work Area	Last Day of School (2005) [a]
Sumas Loop	1470.2	Mount Baker Junior and Senior High Schools 4936 Deming Road Deming, WA	500 feet east	June 17
Mount Vernon Loop		- None -		
Snohomish Loop	1392.5	Timbercrest Junior High School 19115 215th Way NE Woodinville, WA	400 feet east	June 17
	1382.1	Smith Elementary School 23305 NE 14th Street Sammamish, WA	500 feet west	June 22
Fort Lewis Loop	1336.3	Bethel Junior and Senior High Schools 22201 & 22215 38th Avenue E Spanaway, WA	150 feet east (in parking lot)	June 16

[a] Last day of school for the 2004 to 2005 school year. Construction of the loops is scheduled to occur in 2006 but calendars for the 2005 to 2006 school year are not yet available. The last day of school for the 2005 to 2006 school year is assumed to be around this same time.

At MP 1470.2, the Sumas Loop would be located across the Mount Baker Highway from the Mount Baker Junior and Senior High Schools and associated football and baseball fields. At its closest point, the construction work area would be located about 500 feet east of the school buildings. Construction of the Sumas Loop is scheduled to begin in March 2006 but because the schools are located in about the middle of the proposed loop, construction activities most likely would not reach this area until near the end of the school year and should be substantially completed before the next school year begins. In addition, construction activities associated with the Sumas Loop would occur across a busy highway from the schools, thereby minimizing any potential noise- and dust-related impacts on the schools.

The buildings associated with Timbercrest Junior High School would be located about 400 feet east of the Snohomish Loop at MP 1392.5. A track and field area is located between the school buildings and the proposed construction right-of-way. Because this area is located on the northern end of the Snohomish Loop (the loop would be constructed from south to north), the majority of construction activities would not begin until the late summer or early fall of 2006 and could coincide with the beginning of the 2006 to 2007 school year. Noise and dust generated by construction activities could affect use of the track and field area located immediately adjacent to the pipeline right-of-way and potentially the school buildings located further to the east; however, the duration of the impacts would be short term, lasting several days to several weeks until the end of construction in the area.

The buildings associated with Smith Elementary School would be located about 500 feet west of MP 1382.1 of the Snohomish Loop. Northwest's existing right-of-way is used as a trail in this area (see sections 4.8.3.1 and 4.8.4) and children use the pipeline trail to walk to school; however, the school can be reached by other routes within the nearby subdivisions. Because the school is located near the proposed starting location for the Snohomish Loop, construction activities would overlap with the end of the school year. During this time, access to the school via the pipeline trail would be prohibited; however, all other access points to the school would be maintained. Noise and dust generated by construction activities could affect the school; however, the duration of the impacts would be short term, lasting several days to several weeks until the end of construction in the area. After construction, Northwest would allow the pipeline right-of-way to continue to be used as a trail for children walking to school.

Bethel Junior and Senior High Schools share the same campus but the junior high would be located closest to the Fort Lewis Loop near MP 1336.3 (about 150 feet east). The pipeline right-of-way crosses a portion of the parking lot associated with the school, and temporary extra workspace for the road bore of 38th Avenue would also be located on a portion of the parking lot. Children from nearby neighborhoods use the pipeline right-of-way as a trail to walk to school; however, the schools can be reached by other routes. Because the schools are located at the northern end of the Fort Lewis Loop and the loop would be constructed from north to south, construction activities would overlap with the end of the school year. During this time, access to the school via the pipeline trail would be prohibited; however, all other access points to the school would be maintained. Noise and dust generated by construction activities could affect the schools; however, the duration of the impacts would be short term, lasting several days to several weeks until the end of construction in the area. After construction, Northwest would allow the pipeline right-of-way to continue to be used as a trail for children walking to school.

Solid Waste

Solid waste generated by project activities would include LWD, pipe, or other facilities that have been removed, garbage, and solid human waste. Most woody debris removed as part of the project would be either sold as lumber, chipped and spread over the right-of-way as mulch, given to a landowner, used as barricades to prevent access to the right-of-way, used for fish habitat, or given to other agencies for fish habitat. Northwest does not anticipate that any woody debris would end up in landfills. The portions of the existing 26-inch-diameter pipeline and other related facilities that would be removed as part of the project would be loaded onto trucks and hauled off the right-of-way to an approved pipe storage yard. Northwest would then sell the materials to scrap dealers for recycling. Garbage such as paper, soda cans/bottles, and tin cans would be generated by the construction workers; however, workers would be required to remove anything that they bring to the construction work site. Northwest anticipates that each contractor yard would have two large dumpsters that would be hauled off to an approved landfill about once a week depending on the amount of construction activities occurring at the time. To meet good working conditions and applicable requirements, each crew would have a portable toilet that would be serviced one to two times per week (depending on crew size). Including those facilities located within construction trailers at contractor yards, Northwest estimates that about 15 to 20 portable toilets would be located along a 20-mile-long stretch of right-of-way. The portable toilets would be serviced by a licensed contractor who would be responsible for disposing of the waste in accordance with state laws.

Overall, construction of the project would generate minimal amounts of solid waste over a relatively short time period. Existing landfills and/or recycling programs would be able to accommodate the solid waste generated by the Capacity Replacement Project. Operation of the project would not require any additional employees and would not result in the construction or expansion of any landfills. The project would comply with all federal, state, and local statutes and regulations related to waste disposal.

Sewer and Water

During construction, the project would involve the withdrawal of water for hydrostatic testing activities and dust control. Hydrostatic testing activities would make a one-time, temporary demand on municipal water sources but the volumes would not require the construction or expansion of any municipal systems. Water used for dust control would also be obtained from municipal sources but the total volume of water would be relatively low and the impacts would be insignificant. The discharge of hydrostatic test water would not require the construction or expansion of any wastewater or stormwater facilities because the water would be discharged to well-vegetated upland areas adjacent to the right-of-way and would be allowed to infiltrate into the ground (see section 4.3.1.4). Operation of the project would also not require the construction or expansion of wastewater or stormwater facilities because the proposed facilities would have no permanent wastewater treatment requirements. Northwest would comply with all federal, state, and local statutes and regulations related to wastewater and stormwater.

Other Utilities

Several other utilities (e.g., electric transmission lines, cable lines, telephone lines) are located within or near Northwest's existing right-of-way. Northwest participates in all One-Call systems and would locate and flag all underground utilities (i.e., cables, conduits, and pipelines) during surveying and staking activities to prevent accidental damage to these utilities during construction. Utility lines cut during excavation that were not properly located by the One-Call service would be temporarily repaired the same day. Final repairs would be done before backfilling the trench. Sprinkler system lines cut during excavation would be repaired as soon as practical. Standard safety precautions would also be taken during construction near overhead electric transmission lines.

4.9.4 Transportation and Traffic

The local road and highway system in the vicinity of the project facilities is well developed. The principal north/south roadways are Interstates 5 and 405 and the principal west/east roadway is Interstate 90. Several state highways also traverse the project area. Most local public roads in the vicinity of the proposed project are paved. There is also extensive rail service in the project area; however no active railroad lines would be crossed by the loops. Construction of the Capacity Replacement Project could affect transportation and traffic in the project area during construction across roads and highways, the commuting of the construction workforce to the project area, and the movement of construction vehicles and delivery of equipment and materials to the construction work areas. Maps of the project area are included in Appendix B.

Construction across roads and highways would result in short-term impacts on public transportation while construction activities pass through the project area. Table R-1 in Appendix R lists the roads and highways crossed by the proposed loops and Northwest's proposed crossing method.

Northwest would apply for the permits necessary for road crossings and would comply with all permit stipulations. Paved roads would either be bored or open cut as determined by state or local jurisdiction crossing permits. Boring typically requires temporary extra workspace on both sides of the crossing for excavating bore pits to the depth of the pipeline. The bore pits are typically located just outside of the road right-of-way limits; however, site-specific conditions such as the presence of structures or waterbodies may require the bore pits and temporary extra workspace to be moved within the road right-of-way. There would be little or no disruption of traffic at road crossings that are bored. Most smaller, unpaved roads and driveways would be open cut where permitted by local authorities or landowners. The open-cut method would require temporary closure of the road to traffic and the establishment of detours. If no reasonable detour is feasible, at least one lane of traffic would be left open. However, in a worst-case scenario, the open-cut construction method may require the road to be closed for about 24 hours. Most open-cut crossings would be completed and the road resurfaced in 1 or 2 days. Where project construction crosses roads necessary for access to private residences and no alternative entrance exists, Northwest would implement measures (e.g., plating over the open portion of the trench) to maintain passage for landowners and emergency vehicles. Northwest would place and maintain traffic control measures during construction such as flag persons, warning signs, lights, and barriers to ensure safety and to minimize traffic congestion. As required by the Washington State Department of Transportation (WSDOT), Northwest would hold a preconstruction meeting with the WSDOT to discuss any work within state rights-of-way.

The daily commuting of the construction workforce to the project area could also temporarily affect traffic and create roadside parking hazards. Northwest estimates that a maximum of 350 people would be working on any one loop at any one time and that a maximum of 70 people would be working at a compressor station at any one time. To minimize potential effects on traffic associated with these workers, Northwest would require that construction workers use pipe storage and contractor yards (for pipeline construction) and compressor stations (for modifications at the stations) as the primary parking area for employees' personal vehicles. Table 4.9.4-1 provides a summary of the roads that could potentially be used by the construction workforce to access the pipe storage and contractor yards and compressor stations. A more detailed description of how construction workers could access these areas is provided in tables R-2 through R-6 in Appendix R.

Because pipeline construction work is generally scheduled to take advantage of all daylight hours, workers would commute to and from the pipe storage and contractor yards or the compressor stations during off-peak traffic hours (e.g., before 7:00 AM and after 7:00 PM). Workers would then be transported from the pipe storage and contractor yards to the construction site in buses provided by the contractor. For each loop, approximately 280 workers would be transported from the pipe storage contractor yards to the right-of-way and back again at the end of the day on these buses. The remaining individuals (approximately 70 pickups) would be moving from site to site on the construction right-of-way using local roads and highways on a daily basis. Northwest expects that these vehicles would make two to three daily trips from the pipe storage contractor yards to various areas along the construction right-of-way.

TABLE 4.9.4-1

Summary of Potential Access Routes to Pipe Storage and Contractor Yards and Compressor Stations Associated with the Capacity Replacement Project

Facility	Interstates (I)	State Highways	County Roads
Pipeline Facilities			
Sumas Loop [a]	I-5	State Route (SR) 539 SR 546 SR 9 SR 542 SR 20	Bob Mitchell Avenue Cherry Street Front Street Jones Road Birch Bay Lynden Road Portal Way Baird Road
Mount Vernon Loop	I-5	SR 9 SR 20 SR 2 SR 530 SR-92	N. Garl Street Old Highway 99 N N. Hill Boulevard Park Lane 172nd Street NE 67th Avenue NE 191st Place NE 20th Street SE South Lake Stevens Road Machias Road Division Street 12th Street SE
Snohomish Loop [b]	I-405	SR-522 SR-167 SR-18	Paradise Lake Road/Yew Way 212th Street SE 164th Avenue SE/Main Street Railroad Avenue Simon Road 6th Street SE
Fort Lewis Loop	I-5	SR-512 SR-7 SR-510	176th Street E 38th Avenue E 192nd Street E Nisqually Road/Old Pacific Highway SE 1st Street NE Rhoton Road North Railroad Avenue NW Canyon Road E Marvin Road SE Pacific Highway SE 1st Street NE
Compressor Stations			
Mount Vernon Compressor Station	I-5	SR 538 SR 9	Lange Road Beaver Lake Road Gunderson
Chehalis Compressor Station	I-5	SR 12	Meier Road W. Meier Road
Washougal Compressor Station	I-5	SR 14 SR 140	SE Blair Road NE Zeek Road NE Brown Road

[a] The Sumas Compressor Station is located at the north end of the proposed Sumas Loop.
[b] The Snohomish Compressor Station is located at the north end of the proposed Snohomish Loop.

To access the construction right-of-way from the various pipe storage and contractor yards, Northwest would utilize the same access roads that are currently used for operation of the existing easement. Other roads recently constructed by public and private entities may also be used if they are suitable and landowner approval is received. Northwest indicates that the availability of existing public and private roads is sufficient to preclude the need to construct new roads to access the pipeline right-of-way; however, Northwest would need to construct nine temporary access roads along the construction right-of-way to avoid or minimize impacts on waterbodies and/or wetlands or to provide access to features in order to avoid major move-arounds of construction equipment. In addition, Northwest would construct two permanent access roads to provide operational access to the site of the pig receiver and two MLVs at the end of the Mount Vernon Loop at MP 1408.8 and the site of the pig receiver and two MLVs at the end of the Fort Lewis Loop at MP 1315.6. A list of the access roads proposed for use during construction and the type of equipment expected to use the access roads is provided in table D-2 in Appendix D.

During the scoping process, a comment was received suggesting that 214th Avenue not be used for access during construction. Northwest states that 214th Avenue must be used because it was built on part of the existing easement and use of the road cannot be avoided. Northwest would use the road for access to the work area associated with the bore of Woodinville Duval Road. Northwest would ensure access on 214th Avenue is maintained for residents in the area during construction.

In addition to the construction workforce, the delivery of construction equipment and materials to the construction work areas could temporarily congest existing transportation networks at specific locations. A list of the typical construction crews and the equipment associated with each crew is provided in table R-7 in Appendix R. The construction equipment would be initially staged at a pipe storage or contractor yard and then transported to the construction right-of-way. Once a vehicle leaves the pipe storage or contractor yard, its exact route would vary depending on the current location of construction activity. Equipment would be dropped off in one location and would then move in a linear direction along the right-of-way. As a result, most equipment would be located on the pipeline right-of-way and would not affect traffic on local roads after its initial delivery to the construction site. Northwest estimates that approximately three to four pipe stringing trucks would make two roundtrips per day from the pipe yards to deliver materials to the construction right-of-way for the duration of project construction. Northwest also expects that water trucks and dump trucks would make as many as six trips per day (on average) to deliver materials and equipment to the right-of-way.

Overall, the number and frequency of construction vehicle trips would be low on any particular roadway at any one time because construction would move sequentially along the project right-of-way. Trips by vehicles that would visit the right-of-way on a regular basis (e.g., pickup trucks, crew bus) would be distributed along the length of the loops as the pipe is installed and construction activity progresses to a different part of the right-of-way. Northwest and its contractors would comply with local road weight limits and restrictions and would keep roads free of mud and other debris that may be deposited by construction equipment. Track-driven equipment would cross roads on tires or equipment pads to minimize road damage. Northwest would repair any roadways damaged by construction activities.

To identify any specific traffic-related concerns associated with the project, the county traffic departments where the loops would be constructed were consulted. None of the counties indicated that the proposed project represents a significant impact on traffic (Bloodgood, 2004; Brewer, 2004; and Vandersypen, 2004.). One of the general concerns identified was the importance of maintaining access for homeowners and emergency vehicles in areas of active construction (Bloodgood, 2004). As previously discussed, Northwest would implement measures (e.g., plating over the open portion of the trench) to maintain passage for landowners and emergency vehicles. In addition, the Whatcom County Traffic Engineer stated that road restrictions are placed on roads during the winter months and that no trucks are allowed on these roads during the restrictions (Vandersypen, 2004). The majority of the construction activities associated with Capacity Replacement Project would occur during the spring, summer, and fall months; however, if construction overlaps periods of active road restrictions, Northwest would comply with the local road weight limits and restrictions. The Whatcom County Traffic Engineer also provided a list of road projects that could be occurring during construction of the Capacity Replacement Project. These projects are discussed in section 4.13. Only a logging road used by the

WDNR would be crossed by the Mount Vernon Loop in Skagit County and the peak workforce at the Mount Vernon Compressor Station would only comprise 15 workers. As a result, no significant impacts on traffic are anticipated. Similarly, the relatively small workforces associated with the expansion of the Chehalis Compressor Station, the modifications at the Washougal Compressor Station, and the abandoned facility activities would not result in significant impacts on traffic. To minimize traffic-related impacts in all areas affected by the project, Northwest would apply for and obtain all necessary permits to cross and/or use roads. The permits would contain any special mitigation measures or stipulations identified by the counties to minimize impacts on traffic.

No substantial impacts would be expected during operation of the project because there would be only minimal traffic associated with operation and maintenance of the new loops. Because no new permanent employees would be required to operate the facilities, traffic levels during operation would be the same as currently experienced for operation of Northwest's existing system.

4.9.5 Property Values

Comments were received during the scoping process regarding property devaluation and increases in insurance rates associated with the proposed project. Northwest currently maintains easements to operate its 268-mile-long system from Sumas to Washougal, Washington. In the areas to be looped as part of the Capacity Replacement Project, 26-inch- and 30-inch-diameter pipelines are currently located within the existing easements. The placement of a 36-inch-diameter pipeline in addition to or, in some areas, in replacement of the existing pipelines should not change or affect the value of a property or insurance rates. Overall, about 93 percent of the proposed loops would be located within Northwest's existing easement. As a result, Northwest would not need to acquire new easements or property to operate the proposed facilities for the majority of the project. However, Northwest would need to acquire new easements in the areas where the loops would deviate from the existing right-of-way or where Northwest requests additional operational right-of-way to bring the easement up to 75 feet. Northwest would also need to acquire temporary easements or property to construct the proposed facilities.

Any required easements would be used to convey both temporary (for construction) and permanent rights-of-way to Northwest. The easement gives Northwest the right to construct, operate, and maintain the pipeline, and establish a permanent right-of-way in those areas that deviate from the existing right-of-way. In return, Northwest would compensate the landowner for use of the land. The easement agreement between Northwest and the landowner specifies compensation for damage to property during construction, loss of use during construction, loss of renewable and nonrenewable or other resources, and allowable uses of the permanent right-of-way after construction. Northwest would seek to negotiate a mutually acceptable agreement. However, if the project is approved by the FERC, that approval conveys with it the right of eminent domain. Therefore, if easement negotiations fail to produce an agreement, Northwest could initiate condemnation proceedings in accordance with Washington state law. In this case, the property owner would still be compensated by Northwest, but the amount of compensation would be determined by the courts.

The effect that a pipeline easement may have on property values is a damage-related issue that would be negotiated between the parties during the easement acquisition process. The easement acquisition process is designed to provide fair compensation to the landowner for the right to use the property for pipeline construction and operation. Appraisal methods used to value land are based on objective characteristics of the property and any improvements. The impact a pipeline may have on the value of a tract of land depends on many factors, including the size of the tract, the values of adjacent properties, the presence of other utilities, the current value of the land, and the current land use. Subjective valuation is generally not considered in appraisals. This is not to say that the pipeline would not affect resale values. A potential purchaser of property may make a decision to purchase land based on his or her planned use, such as agricultural, future subdivision, or second home on the property in question. If the presence of a pipeline renders the planned use unfeasible, it is possible that a potential purchaser would decide not to purchase the property. However, each potential purchaser has different criteria and differing capabilities to purchase land.

The Interstate Natural Gas Association of America (INGAA) conducted a national case study to determine if the presence of a pipeline on a piece of property affected the property value or sales price of the property. The *INGAA Foundation Natural Gas Pipeline Impact Study* found that there was not a significant impact on the sales price of properties located along natural gas pipelines (INGAA, 2001). It was further determined that neither the size of the pipeline (diameter) nor the product carried by a pipeline has any significant impact on sales price. Whatcom County also analyzed the impacts on property values associated with pipelines to determine the effect the Olympic pipeline explosion had on sales of real estate on or near the pipeline route. Its analysis determined that the explosion of the pipeline, which transported liquid petroleum fuel, had little effect on property values (Whatcom County, 2001).

Property taxes for a piece of property are generally based on the actual use of the land. Construction of the pipeline would not change the general use of the land, but would preclude construction of aboveground structures on the permanent right-of-way. If a landowner believes that the presence of a pipeline easement reduces the value of his or her land, resulting in an overpayment of property taxes, he or she may appeal the issue of the assessment and subsequent property taxation to the local property tax agency.

4.9.6 Tax Revenues

Construction and operation of the project would have beneficial impacts on local sales tax revenue. Table 4.9.6-1 provides the estimated payroll, cost of materials purchased locally, and sales tax revenues associated with construction of the Capacity Replacement Project. Payroll taxes would also be collected from the workers employed on the project. Northwest anticipates that the total payroll for the project would be approximately $89 million. Purchases of materials associated with the proposed project would generate an estimated $2.6 million in local sales. Construction workers would also purchase goods and services at local businesses generating an estimated $223,000 in sales tax. These activities would temporarily increase the tax revenue for the state.

TABLE 4.9.6-1

Socioeconomic Impact Resulting from Construction and Operation of the Capacity Replacement Project

	Construction			Operation
County	Total Construction Payroll	Cost of Materials Purchased Locally	Sales Tax Revenues	Ad Valorem and Property Taxes Generated
Whatcom	$25,660,000	$780,000	$64,000	$1,030,000
Skagit	$190,000	$12,000	$1,000	$40,000
Snohomish	$24,380,000	$670,000	$60,000	$800,000
King	$14,410,000	$390,000	$34,000	$440,000
Pierce	$14,710,000	$400,000	$35,000	$500,000
Thurston	$7,830,000	$210,000	$18,000	$260,000
Lewis	$1,410,000	$130,000	$10,000	$140,000
Clark	$150,000	$11,000	$1,000	$0
Total	$88,740,000	$2,603,000	$223,000	$3,210,000

Ad valorem and property taxes would vary by county based on the amount of facilities located in the particular county. Northwest estimates that the Capacity Replacement Project would contribute about $3.2 million in ad valorem and property taxes to the various counties affected by the project. This increase in property tax revenue would be permanent. Some of these benefits may be offset by a net increase in the rates paid by customers of the natural gas carried by Northwest's system. Under the FERC's September 15, 1999 Docket No. PL99-3 Statement of Policy, projects designed to improve service for existing customers by replacing existing capacity, improving reliability, or providing flexibility are for the benefit of the existing customers. The costs for these kinds of projects are permitted to be incorporated into the system-wide transmission rate. Northwest anticipates that it would file a new rate case to be effective following the in-service date of the Capacity Replacement Project to recover costs incurred during construction of the project.

4.9.7 Environmental Justice

Executive Order 12898 on Environmental Justice requires that each federal agency address disproportionately high and adverse health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Federal agencies' responsibilities under this order also apply equally to Native American Programs.

Table 4.9.7-1 provides the general economic status and ethnic mix of the counties that would be affected by the proposed project. Both King and Pierce Counties have higher percentages of black populations than the state average and King County also has a higher percentage of Asian populations than the state average. In King County, the majority of the black population is concentrated in the Seattle area and west of Interstate 405. The portion of the county crossed by the Snohomish Loop is classified as having a black population of less than 3 percent (U.S. Census Bureau, 2000d). The Asian population in King County is primarily concentrated in the eastern half of the county, including the area crossed by the Snohomish Loop. The Snohomish Loop would cross areas where the Asian population is up to 13 percent of the total population, which is higher than the county average (U.S. Census Bureau, 2000d). In Pierce County, the black population is primarily concentrated in the Tacoma area. The northern portion of the Fort Lewis Loop would cross areas where the black population is up to 17 percent of the total population but the southern portion of the loop would cross areas where less than 1 percent of the population is black (U.S. Census Bureau, 2000d).

Six of the eight counties have lower percentages of Native Americans than the state average of 1.6 percent. The two counties with a higher percentage of Native Americans are Whatcom County at 2.8 percent and Skagit County at 1.9 percent. The Capacity Replacement Project would cross 1.2 miles of tribal lands all by the Sumas Loop in Whatcom County (see section 4.8.2) and would cross areas with tribal usual and accustomed uses (see section 4.10.3).

King County has the highest non-English speaking population in the project area with 18.4 percent, which is also higher than the state average of 14.0 percent. Within King County, the non-English speaking population is primarily concentrated in the Seattle area and west of Lake Sammamish. The portion of the county that would be crossed by the Snohomish Loop has generally less than 10 percent of the population classified as non-English speaking (U.S. Census Bureau, 2000e).

TABLE 4.9.7-1

Environmental Justice Statistics for the Capacity Replacement Project

State/County	Racial/Ethnic Group, 2000 (percent)								Language other than English Spoken at Home (2000) (percent)	Median Household Income (1999)	Persons Below Poverty (1999) (percent)
	White	Black	Asian	Native American & Alaska Native	Native Hawaiian & Other Pacific Islander	Persons Reporting Some Other Race	Persons Reporting Two or More Races	Persons of Hispanic or Latino Origin [a]			
Washington	81.8	3.2	5.5	1.6	0.4	3.9	3.6	7.5	14.0	$45,776	10.6
Whatcom	88.4	0.7	2.8	2.8	0.1	2.5	2.7	5.2	9.2	$40,005	14.2
Skagit	86.5	0.4	1.5	1.9	0.2	7.2	2.4	11.2	11.7	$42,381	11.1
Snohomish	85.6	1.7	5.8	1.4	0.3	1.9	3.4	4.7	12.2	$53,060	6.9
King	75.7	5.4	10.8	0.9	0.5	2.6	4.1	5.5	18.4	$53,157	8.4
Pierce	78.4	7.0	5.1	1.4	0.8	2.2	5.1	5.5	11.8	$45,204	10.5
Thurston	85.7	2.4	4.4	1.5	0.5	1.7	3.9	4.5	9.2	$46,975	8.8
Lewis	93.0	0.4	0.7	1.2	0.2	2.6	2.0	5.4	6.4	$35,511	14.0
Clark	88.8	1.7	3.2	0.8	0.4	2.0	3.1	4.7	11.5	$48,376	9.1

[a] People who identify their origin as Hispanic or Latino may be of any race. Thus, the percent Hispanic or Latino has not been added to the race as percentage of population categories.

Sources: U.S. Census Bureau. 2000a. Census 2000: MapStats/County Profile. http://www.fedstats.gov/qf.

Note: U.S. Census Bureau numbers are rounded and do not exactly total 100 percent in all cases.

Whatcom, Skagit, Pierce, and Lewis Counties have median household incomes below the state average and Whatcom, Skagit, and Lewis Counties also have higher percentages of persons living below the poverty line compared to the state average. In Whatcom County, the Sumas Loop would cross areas with slightly higher median household income than the county average but still lower than the state average (U.S. Census Bureau, 2000f). Although lower than the state average, the median household income affected is indicative of a large portion of the county and not just those areas that would be crossed by the loop. The percentage of people living below the poverty line in the area surrounding the Sumas Loop is lower than the county and state averages (9.5 to 9.6 percent) (U.S. Census Bureau, 2000g). The Mount Vernon Loop would only cross about 800 feet of land in Skagit County, all of which is managed by the WDNR (see section 4.8.4). As a result, the Mount Vernon Loop would not affect potential environmental justice communities in Skagit County. In Pierce County, the Fort Lewis Loop would cross areas where the median household income is both below and above the county and state averages (U.S. Census Bureau, 2000f). The Chehalis Compressor Station is located in an area of Lewis County that has higher average median household incomes and lower percentages of people living below the poverty line than the county in general (U.S. Census Bureau, 2000f and 2000g).

Overall, none of the communities affected by the proposed Capacity Replacement Project have disproportionately high percentages of minority and/or low-income populations. In addition, the proposed project is a result of a CAO issued by the DOT for an existing pipeline system established in the 1950s and 1970s. The locations for the facilities associated with the Capacity Replacement Project were determined by this existing system and without any distinction based on minority or income status of the populations living in the area. About 93 percent of the proposed pipeline facilities would be located within Northwest's existing right-of-way and the compressor station modifications would all occur at existing facilities. As a result, the project would not have disproportionately high and adverse human health or environmental effects on minority and/or low-income communities or Native American tribes.

Under Executive Order 12898, each federal agency must also ensure that public documents, notices, and hearings relating to human health or the environment are readily available to the public. The mailing list for the project was initiated when the NOI was first issued and has been continuously updated during the EIS process. The original mailing list included all affected property owners along the proposed facilities, as identified by Northwest, without any distinction based on minority or income status. The mailing list also included Native American tribes identified as having an interest in the project area.

In addition, Northwest mailed notification letters to landowners, government officials, and the general public informing them about the project and inviting them to attend open houses to learn about the project and to ask questions and express their concerns. Seven open houses were held in the project area in June and July 2004. These meetings were held in non-government buildings such as community centers and local hotels. Notifications of these open houses were also published in local newspapers. In addition, the FERC staff held three public scoping meetings in the project area in August 2004 to provide property owners, municipalities, counties, special interest groups, and state and federal regulatory agencies an opportunity to comment on the project. The dates and locations of the meetings were included in the NOI and posted on the FERC Internet website.

The distribution list for the draft EIS included Native American tribes; local newspapers, libraries, and television and radio stations; and all landowners, miscellaneous individuals, and environmental groups who provided scoping comments or asked to remain on the mailing list. A formal notice indicating that the draft EIS is available for review and comment was published in the Federal Register and sent to the remaining parties on the mailing list. The distribution list for the draft EIS and formal notice is in Appendix A. Additional public meetings will be held in the project area to receive comments on the draft EIS. Section 1.3 further describes the public notification and participation process.

Section 4.10.3 describes contacts with Native American tribes that traditionally occupied, or currently occupy, the project area.

In summary, information about the Capacity Replacement Project has been readily available to the public and no disproportionately high and adverse human health or environmental effects on minority and/or low-income communities or Native American tribes have been identified. Furthermore, project construction would provide some short-term job opportunities. The only long-term socioeconomic effect of the project is likely to be beneficial, based on the increase in tax revenues that would accrue to the counties affected by the project although some of these benefits may be offset by an increase in the rates paid by customers of the natural gas carried by Northwest's system (see section 4.9.6). A more specific discussion about the impacts associated with the project on residential areas, traffic, air quality, and noise is presented in sections 4.8.3, 4.9.4, 4.11.1, and 4.11.2, respectively. Cumulative impacts are discussed in section 4.13.

4.10 CULTURAL RESOURCES

Section 106 of the NHPA, as amended, requires that federal agencies take into account the effects of their undertakings (including the issuance of permits or Certificates) on properties listed on, or eligible for listing on, the National Register of Historic Places (NRHP) and to provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on the undertaking. Northwest, as a non-federal party, is assisting the FERC in meeting its obligations under section 106 and the implementing regulations in Title 36 CFR Part 800.

4.10.1 Results of Cultural Resources Survey

As part of the FERC's NEPA Pre-Filing Process, Northwest provided its draft overview and survey report for review and comment to the FERC, 22 Native American tribes, the COE, the Bureau of Indian Affairs, Fort Lewis, the Washington State Historic Preservation Office (SHPO), and 4 certified local governments (the King County Historic Preservation Program, the Pierce County Planning and Land Services, Snohomish County, and the Thurston Regional Planning Commission). After incorporating comments from these parties, Northwest filed its final overview and survey report with the FERC on November 8, 2004. Northwest also provided its final overview and survey report to the SHPO and the other reviewing parties listed above. The overview and survey report provides documentation of the results of literature reviews, site-file searches, initial consultations with the SHPO and Native American tribes, and cultural resources inventory for the Capacity Replacement Project facilities. Additionally, the overview and survey report includes Northwest's *Unanticipated Discovery Plan*. In a letter dated September 28, 2004, the SHPO stated that it supports the preliminary recommendations in the draft overview and survey report, but will provide concurrence with the findings in the report after the FERC provides its determinations and requests concurrence (SHPO, 2004).

Northwest subsequently provided three draft addendum reports to the reviewing parties listed above and requested comments. The SHPO has not yet provided comments on these reports, and final versions have not yet been provided to the FERC, the SHPO, or the other reviewing parties.

Northwest generally surveyed a 220-foot-wide corridor along the proposed loops. The survey corridor was centered on the existing 30-inch-diameter pipeline, which is offset 20 feet to the west of the centerline of the proposed loops. Portions of the loops had been previously surveyed by Northwest or other parties. In areas where extra workspace would be needed during construction, the survey corridor width was expanded to cover the larger area. In addition, surveys were completed at the five compressor stations, along the majority of the proposed access roads, and at the majority of the proposed pipe and contractor yards.

Sumas Loop

Surveys of the Sumas Loop identified 18 cultural resources, 1 of which was previously recorded. These include two prehistoric isolates, one historic-period isolate, six historic-period sites, five historic-period buildings or building groups, two historic-period structures, one cemetery, and one multicomponent site. Of these, one of the historic-period building groups (a farmstead) is recommended as eligible for listing on the NRHP. Northwest would avoid impacts on this farmstead during construction. Additional evaluations are recommended at one of the other building groups to determine its eligibility for listing on the NRHP, and further survey is recommended at the cemetery to identify its boundaries in order to avoid impacts on it during construction. The remaining 15 cultural resources are recommended as not eligible for listing on the NRHP, including the previously recorded site, which was previously determined to be not eligible by the SHPO. No further work is recommended at these locations. In addition, surveys have been conducted at the workspaces associated with the crossing of Jim Creek, a tributary to the North Fork Nooksack River, and the North Fork Nooksack River in the event that the HDD fails and the alternative wet open-cut crossing method would be used. No cultural resources were identified during these surveys and no further work is recommended.

Mount Vernon Loop

Surveys of the Mount Vernon Loop identified 12 cultural resources, 1 of which was previously recorded. These include one prehistoric site, one prehistoric isolate, three historic-period buildings or building groups, six historic-period structures, and one cemetery. One of the buildings is recommended as eligible for listing on the NRHP, additional evaluations are recommended at the prehistoric site, and further survey is recommended at the cemetery to identify its boundaries. Northwest would avoid impacts on the NRHP-eligible building and the prehistoric site by use of the HDD method at the North and South Forks Stillaguamish River, respectively. However, these sites would be affected by the alternative wet open-cut crossings of the North and South Fork Stillaguamish Rivers in the event that the HDD crossings fail. The landowner of the cemetery site has expressed concern regarding potential impacts on the cemetery during construction. Northwest's additional research and field work, including remote sensing by ground-penetrating radar, would refine the boundary definition of the cemetery so that burials would be avoided by construction activities. The remaining nine cultural resources are recommended as not eligible for listing on the NRHP and no further work is recommended.

Snohomish Loop

Surveys of the Snohomish Loop identified three new cultural resources, including one historic-period site and two historic-period structures. All of these cultural resources are recommended as not eligible for listing on the NRHP and no further work is recommended.

Fort Lewis Loop

Surveys of the Fort Lewis Loop identified 11 cultural resources. These include one prehistoric site, four historic-period sites, one historic-period isolate, one group of historic-period buildings with a historic-period archaeological component, and four historic-period structures. One of the historic-period sites (a homestead) is located on Fort Lewis and is considered by the Army to be eligible for listing on the NRHP. Additional work is recommended at this site to define its boundaries and determine whether the proposed project would affect the site. One of the historic-period structures (a railroad) is recommended as eligible for listing on the NRHP. Northwest would avoid impacts on this site by boring under it. In addition, further evaluations are recommended at the prehistoric site to determine its eligibility for listing on the NRHP.

The remaining eight cultural resources are recommended as not eligible for listing on the NRHP. Seven of these were previously determined by the SHPO to be not eligible for listing on the NRHP. Based on its current surveys, Northwest recommends that these cultural resources determinations remain unchanged. No further work is recommended at these eight sites.

Compressor Stations, Access Roads, and Pipe and Contractor Yards

The Sumas, Mount Vernon, Chehalis, Snohomish, and Washougal Compressor Station sites and two laydown areas adjacent to the Chehalis Compressor Station were previously surveyed. No cultural resources were identified during the previous surveys, and no additional work is recommended at the compressor stations and the two laydown areas. These surveys were included in the overview and survey report. The SHPO stated that it supports the preliminary recommendations for the Sumas, Mount Vernon, Chehalis, and Washougal Compressor Station sites (SHPO, 2004). The previous survey at the Snohomish Compressor Station is reported in an addendum report and the SHPO has not yet provided comments on this report.

In addition, Northwest conducted survey at a third laydown area adjacent to the Chehalis Compressor Station. No cultural resources were identified during the survey, and no additional work is recommended at this laydown area. The results of this survey were reported in an addendum report and the SHPO has not yet provided comments on this report.

Northwest conducted surveys of 124 access roads that would require modifications during construction. No cultural resources were identified during these surveys. The overview and survey report contained the results of surveys of 112 of the access roads. The results of surveys of the remaining 12 access roads were reported in an addendum report and the SHPO has not yet provided comments on this report. Northwest needs to complete survey of an additional nine access roads.

Northwest conducted surveys of the proposed pipe and contractor yards (see table 2.2.4-1). The overview and survey report contained the results of surveys of six of the yards. No cultural resources were identified during these surveys and no further work is recommended at these yards. The results of surveys of the remaining yards were reported in two addendum reports. These surveys identified one prehistoric and one historic-period cultural resource. The prehistoric site is within a portion of the Bellingham GSX Yard (Staging Site) that is paved and would not be affected. Northwest recommended the historic-period site at the Yelm Yard as not eligible for listing on the NRHP. No further work is recommended at the remaining proposed pipe and contractor yards. The SHPO has not yet provided comments on these recommendations.

Abandoned Facilities

Surveys of the workspaces that would be required for the abandoned facilities were conducted and are reported in two addendum reports. No cultural resources were identified and no further work is recommended. The SHPO has not yet provided comments on the results of these reports.

4.10.2 Unanticipated Discovery Plan

Northwest provided its *Unanticipated Discovery Plan* to be used in the event that cultural resources or human remains are discovered during construction. Northwest's Unanticipated Discovery Plan includes contact information for the FERC, the SHPO, Fort Lewis, the Bureau of Indian Affairs, the state police, and the offices of the county sheriffs. In addition, Northwest has indicated that it would work with the Native American tribes in the project area to develop a list of appropriate contacts and alternate contacts to be included in its *Unanticipated Discovery Plan* before construction. The plan provides for the protection in place of any unanticipated discoveries until appropriate evaluation and consultation have occurred. In the event that the discovery is determined to be of NRHP significance, a treatment plan (such as avoidance, monitoring, and/or scientific data recovery) would be developed and implemented in consultation with the appropriate parties.

4.10.3 Native American Consultation

Table 4.10.3-1 lists Native American tribes that have been contacted regarding the proposed project and summarizes concerns they have raised. These Native American tribes were identified by Northwest and its cultural resources consultant Archaeological Investigations Northwest, Inc. (AINW) as having traditional territories that would be crossed by the project or had been identified by the SHPO or another knowledgeable party as having a potential cultural resources concern in the project area. Concerns regarding potential impacts on cultural resources or traditional cultural properties (TCP) and usual and accustomed use areas, including waterbodies and fisheries, are discussed below.

TABLE 4.10.3-1

Native American Consultations for the Capacity Replacement Project

Native American Tribe/Individual	Contact Date	Contacting Party	Response Date	Status
Chehalis Confederated Tribes				
David Burnett, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Richard Bellon, Business Manager and Tribal Archaeologist	11/12/04	AINW	11/12/04	• Stated that he had received the overview and survey report and that the tribe has no major concerns regarding the proposed project. Stated that the tribe would like to be notified of any unanticipated discoveries so that it can assist with monitoring.
Mark White, Director, Natural Resources Program	4/13/04 9/13/04 10/25/04	AINW [a] FERC FERC Rep.	10/25/04	• Stated that he does not have any comments on the project and that the Chehalis Tribe is satisfied with the efforts to address its issues.
Raman Iyer, Fisheries Program	9/13/04	FERC	NR	
Chinook Indian Tribe				
Gary Johnson, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Paula Frazer, Office Manager, Cultural Resources Program	4/13/04 9/13/04	AINW [a] FERC	NR	
Ray Gardner, Fisheries Program	10/25/04 and 10/28/04	FERC Rep.		• A FERC representative provided Mr. Gardner with a copy of the FERC's September 13, 2004 consultation letter. No subsequent response has been received.
Cowlitz Indian Tribe				
John Barnett, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Mike Iyall, Natural Resources Program	4/13/04 9/13/04 10/25/04	AINW [a] FERC FERC Rep.	10/27/04	• Identified a valve site where an artifact had been previously discovered; requested that a tribal member be present during construction activities; requested notification if human remains or artifacts are discovered during construction.
Kikiallus Indian Nation				
Douglas Paul Lavan, Chief	9/13/04 10/25/04, 10/26/04, and 10/28/04	FERC FERC Rep.	10/25/04, 10/26/04, and 10/28/04	• A FERC representative made various attempts to contact Mr. Lavan and other members of the Kikiallus Tribe. The Affiliated Tribes of Northwest Indians stated that the Kikiallus Tribe is not federally recognized, and provided an additional contact name for an individual with ties to the group trying to obtain federal recognition as Kikiallus. That individual, however, was not familiar with Mr. Lavan. In addition, the WDOE Tribal Liaison stated that the Kikiallus Tribe is not federally recognized and that he had not previously heard of them. He believed that attempts to establish contact were sufficient (Laurie, 2004).

TABLE 4.10.3-1 (cont'd)

Native American Consultations for the Capacity Replacement Project

Native American Tribe/ Individual	Contact Date	Contacting Party	Response Date	Status
Lummi Nation				
Darrel Hillaire, Chair, Lummi Business Council	3/30/04 9/13/04 [b]	Northwest FERC	NR	
Al Scott Johnnie, Director, Lummi Indian Business Council, Schelangen Department	4/13/04 6/29/04 7/1/04 8/3/04 9/13/04	AINW FERC FERC FERC FERC	6/29/04 6/29/04 7/1/04 8/3/04	• AINW met with tribal representatives to discuss the project and provide additional information. • FERC met with tribal representatives at an open house to discuss the project, the environmental review process, and tribal issues and concerns. • FERC met with tribal representatives at an interagency scoping meeting to discuss the project, the environmental review process, and tribal issues and concerns. • FERC met with tribal representatives to discuss the project, the environmental review process, and tribal issues and concerns.
Isaac Blum, Tribal Historic Preservation Office	8/3/04	FERC	8/3/04	• FERC met with tribal representatives to discuss the project, the environmental review process, and tribal issues and concerns.
Mary Rossi, Tribal Historic Preservation Officer	8/3/04 9/13/04	FERC FERC	8/3/04 September and October 2004	• FERC met with tribal representatives to discuss the project, the environmental review process, and tribal issues and concerns. • Stated that the Lummi have no comments on the overview and survey report. Provided contact information to be included in Northwest's *Unanticipated Discovery Plan*. AINW will provide copies of its addendum reports when they are available.
Tom Edwards, Lummi Indian Business Council, Schelangen Department	6/29/04 7/1/04 8/3/04 9/13/04 [b]	FERC FERC FERC FERC	6/29/04 7/1/04 June-October 2004 8/3/04 10/20/04	• FERC met with tribal representatives at an open house to discuss the project, the environmental review process, and tribal issues and concerns. • FERC met with tribal representatives at an interagency scoping meeting to discuss the project, the environmental review process, and tribal issues and concerns. • Multiple contacts regarding the project, the environmental review process, the traditional cultural properties (TCP) study, and the status of comment on the cultural resources survey reports. • FERC met with tribal representatives to discuss the project, the environmental review process, and tribal issues and concerns. • Stated that some TCPs are present along the loops and that the areas would need survey to confirm their presence.
Mark Hovezak, Cultural Contract Services Division	11/8/04 11/9/04	FERC Rep. AINW	11/8/04 11/9/04	• Asked for an explanation of the environmental review process. Discussed the status of the TCP study. • Stated that the Schelangen Department would like to work with AINW to conduct a TCP study, and that he would work with Tom Edwards to prepare a proposal for this work.

TABLE 4.10.3-1 (cont'd)

Native American Consultations for the Capacity Replacement Project

Native American Tribe/ Individual	Contact Date	Contacting Party	Response Date	Status
Tyler Green, Director, Lummi Indian Business Council, Cultural Contract Services Division	9/13/04 [b]	FERC	NR	
Merle Jefferson, Director, Natural Resources Department	9/13/04 [b]	FERC	NR	
William C. Jones, Vice-Chairman, Lummi Indian Business Council, Schelangen Department	9/13/04 [b]	FERC	NR	
Muckleshoot Tribe				
John Daniels, Jr., Chair	3/30/04 9/13/04	Northwest FERC	NR	
Donna Hogerhuis, Cultural Resources Program	4/13/04 9/13/04	AINW [c] FERC	NR	
Isabel Tinoco, Natural Resources Program	9/13/04 10/28/04, 11/9/04, and 11/10/04	FERC FERC Rep.	10/28/04 and 11/10/04	• Stated that the tribe would need detailed maps of the project before it can provide comments. Detailed maps were provided to the tribe on November 10, 2004.
Joann Longwood, Natural Resources Program	9/15/04	FERC	NR	
Karen Walter, Senior Watershed Coordinator, Fisheries Department	9/15/04	FERC	NR	
Nisqually Tribe				
Dorian Sanchez, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Cynthia Iyall, Cultural Resources Program	4/13/04 9/13/04	AINW FERC	5/24/04	• Stated that the tribe would provide comments at a later date.
Thor A. Hoyte, Tribal Attorney	9/13/04 10/15/04	FERC FERC	7/20/04 10/14/04 10/15/04 10/20/04 and 11/3/04	• Requested right-of-way deed information. • Provided comments regarding cultural resources and environmental concerns. • General discussion regarding points of contact. • Discussions with Northwest regarding the Nisqually's October 14, 2004 letter.
David Trout, Director, Fisheries and Natural Resources Programs	9/13/04	FERC	NR	
Nooksack Indian Tribe				
Narcisco Cunanan, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Peter Joseph, Cultural Resources Program	4/13/04 9/13/04	AINW FERC	4/19/04	• Requested that surveys be halted and that a tribal representative be notified if Native American artifacts are found. AINW contacted the tribe regarding discovered cultural resources in April and June 2004.

TABLE 4.10.3-1 (cont'd)

Native American Consultations for the Capacity Replacement Project

Native American Tribe/ Individual	Contact Date	Contacting Party	Response Date	Status
Bob Kelly, Jr., Director, Fisheries/Forestry and Natural Resources Programs	9/13/04	FERC	NR	
George Swanaset	9/13/04	FERC	NR	
Tribal Representative, Nooksack Recovery Team	9/13/04	FERC	NR	
Ned Currance, Habitat Biologist	9/15/04	FERC	NR	
Llyn Doremus, Hydrologist	9/15/04	FERC	NR	
Northwest Indian Fisheries Commission				
Tribal Representative, North Sound Office	9/13/04	FERC	NR	
Joe Pavel	9/13/04	FERC	NR	
Allen Pleus, Forest Practices Coordinator	9/13/04	FERC	NR	
Puyallup Tribe				
William Sterud, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Mary Frank, Director, Museum and Cultural Center	4/13/04 9/13/04	AINW [c] FERC	NR	
Joe Anderson, Director, Fisheries Program	9/13/04	FERC	NR	
Henry John, Natural Resources Program	9/13/04 10/25/04 and 10/28/04	FERC FERC Rep.	10/28/04	• Identified Russ Ladley as the point of contact.
Russ Ladley, Resource Protection Manager	10/28/04, 11/9/04, and 11/22/04	FERC Rep.	NR	
Bill Sullivan, Natural Resources Program	9/13/04	FERC	NR	
Jeffery Thomas, Environmental Program	9/15/04 10/15/04	FERC FERC	10/15/04	• General discussion regarding points of contact.
Samish Indian Nation				
Kenneth Hansen, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Rita Louis, Cultural Committee	4/13/04 9/13/04	AINW FERC	4/22/04	• Indicated that the Samish did not feel a need to monitor cultural resources surveys or have a tribal member on the field crew; requested that it be notified of archaeological finds or burials.
Christine Woodward, Environmental Program	9/13/04	FERC	NR	
Sauk-Suiattle Indian Tribe				
Jason L. Joseph, Chair	3/30/04 9/13/04	Northwest FERC	NR	

TABLE 4.10.3-1 (cont'd)

Native American Consultations for the Capacity Replacement Project

Native American Tribe/ Individual	Contact Date	Contacting Party	Response Date	Status
Shari Brewer, Cultural Resources Program	4/13/04 9/13/04	AINW FERC	4/22/04 7/1/04	• Expressed concern regarding cultural plants. • Expressed concern regarding identifying peeled bark from trees and recording native plants.
James L. Joseph, Natural Resources and Water Quality (Watershed Fisheries) Programs	9/13/04	FERC	NR	
Doug McMurtrie, Environmental Director	9/15/04	FERC	NR	
Shoalwater Bay Tribe				
Tom Anderson, Director, Cultural Resources Program	4/13/04 9/13/04	AINW [a] FERC	NR	
Gary Burns, Director, Environmental Programs	9/13/04 10/25/04 and 10/28/04	FERC FERC Rep.	10/28/04	• Stated that he likely had no concerns regarding the project.
Charlene Nelson, Chair	9/13/04	FERC	NR	
Snoqualmie Tribe of Indians				
Joseph Mullen, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Kellie D. Kvasnikoff, Cultural Resources Director	4/13/04 9/13/04	AINW FERC	April-May 2004 June 2004	• Various discussions with AINW regarding the hiring of a tribal member for the cultural resources survey crew. • Coordination regarding field visits and preparation/finalization of a TCP study.
Ian Kanair, Natural Resources Program	9/13/04	FERC	NR	
Matt Mattson, Administrator	9/15/04	FERC	NR	
Steilacoom Indian Tribe				
Joan K. Ortez, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Danny Marshall, Steilacoom Tribal Cultural Center & Museum	4/13/04 9/13/04 10/25/04, 10/28/04, and 11/9/04	AINW [a] FERC FERC Rep.	11/12/04	• Stated that the tribe's primary concern would be with construction along the Fort Lewis Loop.
Stillaguamish Tribe				
Pat Stevenson, Cultural Resources Program	4/13/04 9/13/04 10/15/04	AINW [c] FERC FERC	10/28/04 and 11/2/04	• Expressed concerns regarding water quality and potential impacts on the chinook salmon at the loop crossings at the North and South Fork Stillaguamish Rivers and Pilchuck Creek and the potential for sinkholes to develop where the loops are installed. Stated that the tribe's historic fishing grounds extend from the mouth of the Stillaguamish River to Darrington. Identified evidence of a large village and traditional use areas.

TABLE 4.10.3-1 (cont'd)

Native American Consultations for the Capacity Replacement Project

Native American Tribe/ Individual	Contact Date	Contacting Party	Response Date	Status
John Drotts, Director, Natural Resources Program	9/13/04 10/25/04	FERC FERC Rep.	10/28/04	• Transferred contact to Pat Stevenson (see above).
Shawn E. Yanity, Chair	9/13/04	FERC	NR	
Suquamish Tribe				
Bennie J. Armstrong, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Charlie Sigo, Cultural Resources Specialist	4/13/04 9/13/04	AINW [a] FERC	NR	
Rob Purser, Director, Fisheries Department	9/13/04	FERC	NR	
Denise Williams, Director, Natural Resources Program	9/13/04 10/25/04	FERC FERC Rep.	10/25/04	• Identified Rich Brooks, Fisheries Department, as the point of contact.
Rich Brooks, Fisheries Department	10/25/04	FERC Rep.	11/1/04	• At Mr. Brooks' request, a FERC representative provided him with a copy of the FERC's September 13, 2004 consultation letter. No subsequent response has been received.
Swinomish Indian Tribe				
Brian Cladoosby, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Linda Day, Cultural Resources Program	4/13/04	AINW [c]	NR	
Ray Williams, Senator, Cultural Resources Program	9/13/04	FERC	NR	
Lorraine Loomis, Director, Fisheries Program	9/13/04	FERC	NR	
Allen Rozema, Director, Natural Resources Program	9/13/04 10/25/04	FERC FERC Rep.	10/28/04	• Identified Larry Wasserman as the point of contact.
Larry Wasserman	10/28/04	FERC Rep.	11/2/04 and 11/4/04	• At Mr. Wasserman's request, a FERC representative provided him with a copy of the FERC's September 13, 2004 consultation letter and detailed maps of the Mount Vernon and Snohomish Loops. Mr. Wasserman stated that he would be able to determine if the tribe had specific comments based on these maps. No subsequent response has been received.
The Confederated Tribes of the Grand Ronde Community of Oregon				
Cheryle A. Kennedy, Chairwoman	3/30/04 9/13/04	Northwest FERC	NR	
June Olson, Manager, Cultural Resources Program	4/13/04 9/13/04 10/25/04 and 10/28/04	AINW [a] FERC FERC Rep.	NR	• See response from Khani Schultz below.

TABLE 4.10.3-1 (cont'd)

Native American Consultations for the Capacity Replacement Project

Native American Tribe/ Individual	Contact Date	Contacting Party	Response Date	Status
Khani Schultz, Cultural Protection Specialist			11/2/04	• Deferred commenting on cultural resources issues to other Native American tribes in the northern part of the state; deferred commenting on natural resources issues for the proposed project.
The Tulalip Tribes				
Hank Gobin, Manager, Cultural Resources Program	4/13/04 9/13/04	AINW FERC	4/26/04	• Requested that cultural resources surveys be conducted and an archaeological monitor be present during all construction activities. • Expressed concern regarding project impacts on native flora and fauna; requested that revegetation occur with indigenous plants. • Expressed concern regarding project impacts on water quality of the Nooksack, Skagit, Stillaguamish, and Snohomish Rivers. • Requested that the tribe be notified of archaeological finds or burials.
Joe Hatch, Fisheries and Natural Resources Program	9/13/04	FERC	NR	
Stanley G. Jones, Sr., Chair	9/13/04	FERC	NR	
Daryl Williams, Environmental Liaison	9/15/04	FERC	NR	
Richard Young, Environmental Department Manager			10/14/04	• Expressed concern regarding project impacts on natural resources of cultural and economic concern; indicated the tribe would like to be consulted on the project and would provide comments in the future.
Umatilla Confederated Tribes				
Tribal Representative	9/13/04	FERC	NR	
Rick George, Manager, Environmental Planning	10/25/04	FERC Rep.	NR	
Carl Merkle			10/26/04	• Responded for Mr. George. At Mr. Merkle's request, a FERC representative provided him with a copy of the FERC's September 13, 2004 consultation letter. No subsequent response has been received.
Upper Skagit Tribe				
Marilyn M. Scott, Chair	3/30/04 9/13/04	Northwest FERC	NR	
Scott Schuyler, Cultural and Natural Resources Programs	4/13/04 9/13/04	AINW FERC	April 2004	• Multiple contacts requesting additional maps and discussing the hiring of a tribal member on the cultural resources survey field crew (follow-up discussions occurred with Doreen Maloney).

TABLE 4.10.3-1 (cont'd)

Native American Consultations for the Capacity Replacement Project

Native American Tribe/ Individual	Contact Date	Contacting Party	Response Date	Status
Doreen Maloney, Manager, Fisheries Program	9/13/04	FERC	4/30/04	• Identified two candidates for AINW's cultural resources survey field crew, but indicated they were committed to another project. Requested that AINW keep them in mind for future work.
Yakama Nation				
Johnson Meninick, Chair, Cultural Resources Program	3/30/04 4/13/04 9/13/04	Northwest AINW [a] FERC	NR	
Carroll Palmer, Natural Resources Program	9/13/04 10/25/04	FERC FERC Rep.	11/9/04	• Identified other contacts within their office including Mr. Ward (see below); no specific response has been received.
Ross Sockzehigh, Chair	9/13/04	FERC	NR	
Paul Ward, Fisheries Program	9/13/04 11/9/04	FERC FERC Rep.	NR	

[a] AINW's follow-up contacts with these tribes are ongoing.

[b] These individuals received copies of the September 13, 2004 letter that was sent to Al Scott Johnnie and Mary Rossi of the Lummi Nation.

[c] During its follow-up telephone contacts with these tribes in April and May 2004, AINW left voicemails when possible, but did not speak directly to a representative of the tribe that was contacted.

NR = To date, no response has been received.
FERC = Federal Energy Regulatory Commission.
AINW = Archaeological Investigations Northwest, Inc. (Northwest's cultural resources consultant).
FERC Rep. = FERC representative.

The FERC NOI dated July 19, 2004 was sent to individuals from 22 Native American tribes and the NWIFC. The NOI described the proposed project and the environmental review process, listed the potential environmental effects, and requested tribal comments on issues and concerns that should be addressed in the EIS. The FERC staff also sent consultation letters on September 13 and 15, 2004 to 76 individuals from the 22 tribes and the NWIFC. These consultations were conducted in accordance with section 101(d)(6)(B) of the NHPA regarding consultation with Native American tribes and identified the FERC as the lead federal agency and the COE as a cooperating federal agency for the project. These consultations included additional representatives (e.g., cultural resources, natural resources, and fisheries program representatives) of the tribes that had been previously contacted by Northwest and AINW. The FERC letters provided a description of the project and requested comments regarding its potential effects on religious or cultural properties, as well as natural resources concerns (e.g., usual and accustomed uses). As a follow-up to these letters, FERC representatives contacted the natural resources and fisheries departments of tribes that had not yet provided comments on the project. These contacts occurred in late October and early November 2004 and were made to discuss the project's potential impacts on waterbodies, fisheries, and other usual and accustomed use areas.

Northwest and AINW sent initial consultation letters to these tribes on March 30, 2004 and April 13, 2004. Northwest's initial letters were sent to tribal chairs and provided an introduction to the project. The letters also provided the tribes with the opportunity to comment on the project and identify sites or places that might be of religious or cultural significance to the tribe. In its letters, AINW indicated that it would be conducting follow-up contacts with the tribes and requested the tribes' assistance regarding the identification of cultural resources concerns. AINW conducted these follow-up contacts by telephone beginning in mid April 2004. These follow-up contacts are ongoing.

To date, 22 of the tribes have responded. Several of these responses were to request additional information in the form of maps or copies of previous correspondence, identify additional points of contact within the tribe, or indicate that comments would be provided at a later date. The Chehalis Confederated Tribes, the Confederated Tribes of the Grand Ronde Community of Oregon, and the Shoalwater Bay Tribe each stated that they did not have any comments regarding the proposed project. However, the Chehalis Tribe did state that it wished to be notified of any unanticipated discoveries.

The Cowlitz Indian Tribe identified a location of concern where artifacts had previously been discovered. This location would be along a portion of the abandoned facilities. No cultural resources were identified during surveys of the workspaces that would be required for the abandoned facilities. In addition, the tribe requested that a tribal member be present during construction activities and that the tribe be notified if human remains or artifacts are discovered during construction.

AINW met with representatives of the Lummi Nation to discuss the design and progress of the cultural resources survey. AINW provided its draft and final overview and survey reports to the Lummi Nation, and stated that it would provide the addendum reports as well. The Lummi Nation Tribal Historic Preservation Officer (THPO) stated that the tribe has no comments on the overview and survey report but would like their contact information included in the *Unanticipated Discovery Plan*. Northwest would revise its *Unanticipated Discovery Plan* with contact information provided by the Lummi Nation THPO. Lummi Nation representatives also stated that there are TCPs along the loops and that the areas would need to be surveyed to determine their exact locations. Northwest is continuing to consult with the Lummi Nation regarding the completion of this survey in conjunction with AINW's field crew.

The FERC staff met with representatives of the Lummi Nation on several occasions in 2004 to discuss the environmental review process and the tribe's issues and concerns regarding the project. These meetings occurred on June 29, 2004, July 1, 2004, and August 3, 2004. The COE also participated in the July 1 and August 3, 2004 meetings.

On October 14, 2004, the Nisqually Tribe provided written comments on the proposed project, including requests that:

- tribal monitors be present during all construction activities along the Fort Lewis Loop, and that these monitors be compensated by Northwest;
- additional surveys be conducted in conjunction with the tribe at the Nisqually River and Muck Creek before construction;
- artifacts found during surveys be returned to the tribe;
- Northwest's *Unanticipated Discovery Plan* be revised to include the tribe in consultations in the event that human remains are discovered;
- the tribe be included in cultural resources orientations that would be conducted for the EIs; and
- Northwest contribute funds to educate the public on cultural issues and the preservation of the culture of the Nisqually People.

Northwest states that it would conduct separate negotiations with the Nisqually Tribe regarding these requests.

The Nooksack Indian Tribe requested that it be notified of any discoveries of possible prehistoric artifacts during survey along the Sumas Loop. As requested, Northwest notified representatives of the tribe when prehistoric artifacts were discovered and conducted field visits with tribal representatives to those areas.

The Samish Indian Nation identified specific issues of concern, including the need for archaeological surveys and prompt notification of the tribes in the event that any human remains are discovered during the surveys or construction, or if any artifacts are discovered during construction. In addition, the Samish Indian Nation stated that it did not feel a need to monitor cultural resources surveys or have a tribal member on the field crew.

The Sauk-Suiattle Indian Tribe identified concerns regarding plants with cultural importance, including peeled trees. AINW instructed its cultural resources survey field crew to look for evidence of peeled trees during orientation sessions before field work began. No peeled trees were encountered during cultural resources surveys.

The Snoqualmie Tribe of Indians requested that a TCP study be conducted for areas of concern to the tribe. The Snoqualmie Tribe of Indians conducted this study and coordinated with AINW to report the results. In addition, AINW hired tribal members to work on its survey field crews. The TCP study identified traditional use areas near the project where important plant foods are present as well as cultural resources that should be monitored during construction.

The Stillaguamish Tribe expressed concerns regarding potential impacts on water quality and chinook salmon at proposed crossings of the North and South Fork Stillaguamish Rivers and Pilchuck Creek and identified the location of the tribe's historic fishing grounds. In addition, the tribe expressed concern regarding the potential for sinkholes to develop where the loops would be installed. The tribe also identified evidence of a large village and traditional use areas along a portion of the Mount Vernon Loop near the confluence of the North and South Forks of the Stillaguamish Rivers. Based on this information, AINW identified both sides of both forks of the river as areas with a high probability for archaeological deposits and shovel tested these areas. One prehistoric site was located in the area that was identified by the tribe. Northwest completed additional work (i.e., additional shovel tests and the excavation of a test unit) at this site to determine its eligibility for listing on the NRHP. No additional archaeological material was identified during this testing. No archaeological deposits were identified at the other locations. AINW has proposed a visit to the project area with Stillaguamish Tribal Elders and other knowledgeable tribal members. In addition, Northwest's *Unanticipated Discovery Plan* would be implemented in the event that any cultural materials are discovered during construction.

The Tulalip Tribe expressed concern regarding impacts on natural resources of cultural and economic concern. In addition, the tribe indicated that it would like to be consulted on the project and would provide additional comments in the future. The Tulalip Tribe also sent a letter to Northwest on April 26, 2004. In that letter, the tribe requested that cultural resources surveys be conducted and an archaeological monitor be present during all construction activities; asked to be notified of any archaeological finds or burials; expressed concern regarding project impacts on native flora and fauna; requested that revegetation occur with indigenous plants; and expressed concern regarding project impacts on water quality of the Nooksack, Skagit, Stillaguamish, and Snohomish Rivers.

Northwest is continuing to work with the Native American tribes and intends to continue consultations and negotiations throughout the environmental review and construction phase of the project. The FERC staff has recommended in section 4.3.2.3 that Northwest consult with appropriate Native American tribes and applicable agencies to prepare a conceptual waterbody crossing mitigation plan that would address tribal issues and concerns about impacts on surface water and aquatic resources. The FERC staff believes Northwest's continued cooperation with these tribes, in addition to its recommendation and continuing consultations, should address tribal issues associated with the proposed project.

4.10.4 General Impact and Mitigation

In order to complete the process of complying with section 106 of the NHPA for the proposed facilities, Northwest would need to conduct cultural resources surveys along portions of the proposed loops where project design changes have occurred, landowner permission has not been obtained, or field conditions prevented adequate survey, as well as nine access roads. In addition, further work is recommended at six cultural resources sites to determine their eligibility for listing on the NRHP and/or to identify their boundaries. Once cultural resources surveys and evaluations are complete, the FERC, in consultation with the SHPO, the COE, and Fort Lewis if applicable, will make determinations of NRHP eligibility and project effects. For affected TCPs, the appropriate Native American tribes would also be consulted. If a property would be affected, mitigation would be proposed. Mitigation may include, but not be limited to, one or more of the following measures: 1) avoidance through the use of realignment of the pipeline, relocation of temporary extra workspace, or changes in construction and/or operational design; 2) data recovery, which may include systematic professional excavation of an archaeological site or the preparation of photographic and/or measured drawings documenting standing structures; and 3) the use of landscaping or other techniques that would minimize or eliminate effects on the historic setting or ambience of standing structures.

The FERC, as the lead federal agency, would comply with section 106 of the NHPA and the implementing regulations in Title 36 CFR Part 800 by notifying the ACHP of adverse effects to afford it an opportunity to participate in consultation. If it is determined that any historic properties would be affected by the proposed project, Northwest would be required to prepare a treatment plan, in consultation with the appropriate parties, to mitigate adverse effects. Once a treatment plan is approved, a Memorandum of Agreement (MOA) would be executed by the appropriate parties. Northwest would implement the specific treatment measures before notice to proceed with project construction is authorized in any given area. Implementation of treatment would occur only after certification of the proposed project. The FERC would ensure that treatment and the terms of the MOA are carried out.

To ensure that the FERC's responsibilities under the NHPA and its implementing regulations are met, **the FERC staff recommends that:**

- **Northwest defer implementation of any treatment plans/mitigation measures (including archaeological data recovery), construction of facilities, and use of all staging, storage, or temporary work areas and new or to-be-improved access roads <u>until</u>:**

  a. Northwest files with the Secretary and the SHPO, and consults with the COE, Fort Lewis, and Native American tribes as applicable, all additional cultural resources survey and evaluation reports and any necessary treatment plans;

  b. Northwest files the comments of the SHPO, the COE, Fort Lewis, and Native American tribes as applicable on all cultural resources survey reports and plans; and

  c. the Director of OEP reviews all cultural resources survey reports and plans, and notifies Northwest in writing that treatment plans/mitigation measures may be implemented or construction may proceed.

  All material filed with the Commission containing <u>location, character, and ownership information</u> about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "<u>CONTAINS PRIVILEGED INFORMATION - DO NOT RELEASE</u>."

4.11 AIR QUALITY AND NOISE

4.11.1 Air Quality

The Capacity Replacement Project would include modifications at five existing compressor stations: the Sumas, Mount Vernon, Snohomish, Chehalis, and Washougal Compressor Stations. The Sumas, Mount Vernon, and Snohomish Compressor Stations would undergo modifications that are insignificant in regards to air quality. Specifically, at the Sumas Compressor Station work would include reconfiguring the existing reciprocating compressors, piping modifications, and replacement of existing ducting and silencers. Work at the Mount Vernon Compressor Station would include piping modifications and replacement of existing ducting and silencers. At the Snohomish Compressor Station, work would include piping modifications. Because the modifications at the Sumas, Mount Vernon, and Snohomish Compressor Stations would not affect air quality, these stations are not discussed further in this section.

The modifications at the Chehalis and Washougal Compressor Stations would be more significant. Modifications at the Chehalis Compressor Station, located in Lewis County, Washington, would include the addition of a Solar Taurus 70 natural gas turbine compressor unit equipped with a low emission combustion system and a fuel gas heater. In addition, Northwest would derate the existing Cooper Bessemer natural gas-fired reciprocating engine from 6,350 hp to 4,800 hp by reducing the operating speed to 250 revolutions per minute (rpm) and the currently permitted Solar Saturn T1300 turbine would be removed from the station's operating permit. Modifications at the Washougal Compressor Station located in Clark County, Washington, would include the rewheel of the existing Solar C337 compressor and replacement of the existing Solar Centaur 50 turbine with a Solar Taurus 60 turbine. These modifications would increase power output at the station from 5,700 hp to 7,700 hp.

The Capacity Replacement Project would also include the construction of approximately 79.5 miles of natural gas pipeline, MLVs, and pig launchers and receivers in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties, Washington. Additionally, abandonment activities (i.e., excavation and tapping or capping of pipeline facilities) at various locations along Northwest's existing 26-inch-diameter pipeline would occur as part of the project. Except for the construction equipment and activities associated with building these facilities and abandoning the existing pipeline, there would be no air emissions generated by these pipeline facilities or activities (i.e., no emissions would occur during operation).

The primary pollutants emitted by natural gas compressor stations and construction activities are NO_x, VOC, particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), sulfur dioxide (SO_2), and carbon monoxide (CO).

4.11.1.1 Existing Air Quality

The western portion of Washington state near the Puget Sound has a climate that is characterized as humid temperate. The area experiences mild temperatures during the winter and summer with rainfall throughout the year. The specific climates for the areas surrounding the Chehalis and Washougal Compressor Stations are described in detail below.

According to the Western Regional Climate Center (WRCC) and data from the Centralia Weather Station located in Centralia, Washington for the period January 1931 through March 2004, the area surrounding the Chehalis Compressor Station receives an annual average of 46.5 inches of precipitation per year. The average maximum temperature is 62° F and the average minimum temperature is 42° F. Based on data from the Olympia Airport, the prevailing wind direction in the area is south at an annual average speed of 6.0 mph.

According to the WRCC and data from the Skamania Fish Hatchery Weather Station located near Washougal, Washington for the period February 1965 through March 2004, the area surrounding the Washougal Compressor Station receives an annual average of 84 inches of precipitation per year. The average maximum temperature is 62° F and the average minimum temperature is 38° F. Based on data from the Vancouver Airport, the prevailing wind direction in the area is east-southeast at an annual average speed of 5.1 mph.

Ambient air quality is protected by federal, state, and local regulations. The EPA has developed National Ambient Air Quality Standards (NAAQS) for certain criteria pollutants. These criteria pollutants are: nitrogen dioxide (NO_2), SO_2, PM_{10}, CO, ozone (O_3), and lead. The PM_{10} NAAQS replaced the total suspended particulate (TSP) NAAQS that were originally established under the CAA. The EPA is currently working towards implementation of an ambient air quality standard for particulate matter less than 2.5 microns in aerodynamic diameter ($PM_{2.5}$). In addition to the federal NAAQS, state ambient air quality standards for criteria pollutants have been established for Washington. Washington ambient air quality standards (WAAQS) are the same as the NAAQS except for the following:

- for TSP, a 24-hour standard of 150 micrograms per cubic meter ($\mu g/m^3$) not to be exceeded more than once per year;
- for TSP, an annual standard of 60 $\mu g/m^3$ not to be exceeded;
- for SO_2, a standard of 0.4 ppm by volume average for a 1-hour period not to be exceeded more than once per 1-year period;
- for SO_2, a standard of 0.25 ppm by volume average for a 1-hour period not to be exceeded more than twice in a consecutive 7-day period;
- for SO_2, a standard of 0.1 ppm by volume average for a 1-day period not to be exceeded more than once per 1-year period; and
- for SO_2, a standard of 0.02 ppm by volume average for a 1-year period not to be exceeded.

Areas are designated Attainment, Unclassifiable, Maintenance, or Nonattainment on a pollutant-by-pollutant basis. Areas where the ambient air pollutant concentration is determined to be below the applicable ambient air quality standard are designated Attainment. Areas where no data are available are designated Unclassifiable. Areas where the ambient air concentration is greater than the applicable ambient air quality standard are designated Nonattainment. Areas that have been designated Nonattainment but have since demonstrated compliance with the ambient air quality standard(s) are designated Maintenance for that pollutant. Maintenance areas are treated similar to Attainment areas for the permitting of stationary sources; however, specific provisions may be incorporated through the state's approved maintenance plan to ensure that the air quality would remain in compliance with the ambient air quality standard(s) for that pollutant.

The status of areas in Washington that would be affected by the Capacity Replacement Project can be found in Title 40 CFR Part 81.348. All counties crossed by the project are designated Attainment or Unclassifiable for the NAAQS for all criteria pollutants.

The existing ambient air concentrations at the Chehalis Compressor Station were evaluated by reviewing representative air monitoring data from various monitoring locations. The closest and most representative data were obtained from the EPA's AirData database for the years 2000 through 2004 from three monitoring stations in close proximity to the Chehalis Compressor Station. $PM_{2.5}$ and O_3 data were taken from a monitoring station located in Lewis County; PM_{10} and CO data were taken from a monitoring station located in Thurston County; and NO_2, SO_2, and lead data were taken from a monitoring station located in King County.

The existing ambient air concentrations at the Washougal Compressor Station were evaluated by reviewing representative air monitoring data from various monitoring locations. The closest and most representative data were obtained from the EPA's AirData database for the years 2000 through 2004 from three monitoring stations in close proximity to the Washougal Compressor Station. $PM_{2.5}$, PM_{10}, O_3, CO, and lead data were taken from a monitoring station located in Clark County; SO_2 data were taken from a monitoring station located in King County; and NO_2 data were taken from a monitoring station located in Multnomah County.

The concentrations measured for each of the pollutants and averaging periods at the Chehalis and Washougal Compressor Stations are summarized in table 4.11.1-1. These monitoring data show that the existing ambient air concentrations for all of the criteria pollutants are below the NAAQS and the WAAQS.

TABLE 4.11.1-1

National and State Ambient Air Quality Standards and Existing Air Quality at the Chehalis and Washougal Compressor Stations

				Existing Air Quality	
Pollutants	Averaging Period	NAAQS	WAAQS	Chehalis Compressor Station	Washougal Compressor Station
$PM_{2.5}$	24-hour	65 $\mu g/m^3$	65 $\mu g/m^3$	34 $\mu g/m^3$	40 $\mu g/m^3$
	Annual	15 $\mu g/m^3$	15 $\mu g/m^3$	11.3 $\mu g/m^3$	10.9 $\mu g/m^3$
PM_{10}	24-Hour	150 $\mu g/m^3$	150 $\mu g/m^3$	41 $\mu g/m^3$	52 $\mu g/m^3$
	Annual	50 $\mu g/m^3$	50 $\mu g/m^3$	15 $\mu g/m^3$	17 $\mu g/m^3$
TSP	24-hour	NA	150 $\mu g/m^3$	NA [a]	NA [a]
	Annual	NA	60 $\mu g/m^3$	NA [a]	NA [a]
O_3	1-Hour	0.12 ppm (235 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)	0.089 ppm	0.084 ppm
	8-hour	0.08 ppm (157 $\mu g/m^3$)	NA	0.079 ppm	0.072 ppm
SO_2	1-hour (1/year)	NA	0.4 ppm	0.049 ppm	0.049 ppm
	1-hour (2/7-day)	NA	0.25 ppm	0.049 ppm	0.049 ppm
	3-Hour	0.50 ppm (1,300 $\mu g/m^3$)	NA	0.041 ppm	0.041 ppm
	24-Hour	0.14 ppm (365 $\mu g/m^3$)	0.1 ppm	0.014 ppm	0.014 ppm
	Annual	0.03 ppm (80 $\mu g/m^3$)	0.02 ppm	0.004 ppm	0.004 ppm
NO_2	Annual	0.05 ppm (100 $\mu g/m^3$)	0.05 ppm (100 $\mu g/m^3$)	0.022 ppm	0.014 ppm
CO	1-Hour	35 ppm (40,000 $\mu g/m^3$)	35 ppm (40,000 $\mu g/m^3$)	8.5 ppm	8.4 ppm
	8-Hour	9 ppm (10,000 $\mu g/m^3$)	9 ppm (10,000 $\mu g/m^3$)	5.4 ppm	6.2 ppm
Lead	Quarterly	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$	0.03 $\mu g/m^3$	0.01 $\mu g/m^3$

[a] No current TSP data are available. The most recent TSP data for the project area were obtained in the late 1980s and are no longer representative. Because the monitored PM_{10} levels have dropped significantly at these locations, it is believed that the TSP levels have also dropped significantly and are well below the NAAQS.

$PM_{2.5}$ = Particulate matter less than 2.5 microns in aerodynamic diameter.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
TSP = Total suspended particulate.
O_3 = Ozone.
SO_2 = Sulfur dioxide.
NO_2 = Nitrogen dioxide.
CO = Carbon monoxide.
$\mu g/m^3$ = Micrograms per cubic meter.
NA = Not applicable.

Regulatory Requirements for Air Quality

Air quality in the United States is regulated by federal statutes in the CAA and its amendments. The provisions of the CAA that are applicable to the Capacity Replacement Project include:

- Prevention of Significant Deterioration (PSD) and Nonattainment New Source Review (NSR);
- Federal Class I Area Protection;
- National Emission Standards for Hazardous Air Pollutants (NESHAPs);
- New Source Performance Standards (NSPS);
- Title V Air Permitting; and
- state air permitting.

Prevention of Significant Deterioration and Nonattainment New Source Review – Ambient air quality is protected by the EPA's PSD and Nonattainment NSR programs. The PSD regulations apply to new major stationary sources or major modifications to stationary sources located in Attainment areas. The Nonattainment NSR regulations apply to new or modified stationary sources located in Nonattainment areas. The PSD regulations, as codified in Title 40 CFR Part 52.21, define a major source or major modification as:

- a source with a potential-to-emit (PTE) of more than 100 tons per year (tpy) of any criteria pollutant for a facility that is one of the 28 industrial source categories listed in Title 40 CFR Part 52.21(b)(1)(i)(a);
- a source with a PTE of more than 250 tpy of any criteria pollutant for a facility that is not one of the 28 industrial source categories listed in Title 40 CFR Part 52.21(b)(1)(i)(a);
- a modification to an existing major source that results in a net emissions increase greater than the PSD significant emission rate specified in Title 40 CFR Part 52.21 (b)(23)(i); or
- an existing minor source proposing a modification that is major by itself.

As stated above, the proposed modifications to the Chehalis and Washougal Compressor Stations are located in Lewis and Clark Counties, respectively. Both of these counties are designated Unclassifiable or Attainment for the NAAQS and the WAAQS for all criteria pollutants. Therefore, Nonattainment NSR does not apply. However, the modifications to the emission sources at both stations would be subject to PSD review under WAC 173-400-113 if the changes represent a major modification to an existing major source or the projects by themselves are major sources.

As part of the Capacity Replacement Project, a permit condition would be obtained making the emission reductions of the existing Cooper Bessemer reciprocating engine at the Chehalis Compressor Station federally enforceable. The permit condition would make the PTE of the remaining existing equipment at the Chehalis Compressor Station less than 250 tpy for all pollutants; therefore, the site would be considered a minor source under the PSD program. The current PTE of the Washougal Compressor Station is less than 250 tpy for all pollutants and it is considered an existing minor source.

As a result, the modifications to the stations would be subject to PSD permitting if they are major sources by themselves.

The potential emissions increase of each regulated pollutant (NO_x, CO, SO_2, VOC, and PM_{10}) from the modifications at both compressor stations are summarized in table 4.11.1-2 in comparison with the applicable major source threshold.

TABLE 4.11.1-2

Estimated Net Emissions Increases for the Capacity Replacement Project

Facility/Pollutant	Project Net Emissions Increase (Decrease) (tpy) [a]	Post Project Facility-Wide Emissions (tpy) [b]	Applicability Threshold (tpy) [c]
Chehalis Compressor Station			
NO_x	13.86	219.26	250
VOC	12.65	49.85	250
CO	41.30	187.80	250
SO_2	(0.51)	7.79	250
PM_{10}	7.35	23.95	250
Washougal Compressor Station			
NO_x	(7.53)	147.46	250
VOC	2.49	29.29	250
CO	8.74	112.29	250
SO_2	0.26	5.98	250
PM_{10}	(6.03)	15.12	250

[a] The net emissions increase is calculated based on manufacturers' emission factors (grams per brake horsepower hour and pounds per hour) and assumes continuous operation.
[b] Includes emissions from the new Solar Taurus 70 turbine unit and fuel gas heater, the existing Cooper Bessemer reciprocating engine, and the mobile Solar Centaur 40 turbine at the Chehalis Compressor Station.
[c] PSD New Source Applicability Threshold.
NO_x = Nitrogen oxides.
VOC = Volatile organic compounds.
CO = Carbon monoxide.
SO_2 = Sulfur dioxide.
PM_{10} = Particulate matter less than 10 microns in aerodynamic diameter.
tpy = Tons per year.

As shown in table 4.11.1-2, the net emissions increases associated with the modifications at both of the compressor stations for each of the criteria pollutants would be less than the major source applicability thresholds; therefore, they would not be subject to PSD review.

Federal Class I Area Protection – Certain lands were designated as Mandatory federal Class I (Class I) Areas as a part of the CAA Amendments of 1977. Class I Areas were designated because the air quality was considered a special feature of the area (e.g., national parks, wilderness areas, national forests). Federal Class I Areas are protected against several types of pollution including criteria pollutant concentrations, visibility degradation, and acidic deposition. If the new source or major modification is subject to the PSD program requirements and is within 62 miles (100 kilometers) of a Class I Area, the facility is required to notify the appropriate federal officials and assess the impacts of the proposed project on the nearby Class I Areas. Because the modifications at the compressor stations associated with the Capacity Replacement Project would not trigger PSD review, an air quality impact determination would not be required.

National Emission Standards for Hazardous Air Pollutants – Title 40 CFR Parts 61 and 63 regulate facilities that emit specific Hazardous Air Pollutants (HAPs). Part 61 was promulgated before the 1990 CAA amendments and regulates only eight hazardous substances. The CAA as amended in 1990 established a list of 189 HAPs and guidelines for regulating these pollutants from any major source, resulting in the promulgation of Part 63. Part 63, also known as the Maximum Achievable Control Technology standards, regulates HAP emissions from major sources and specific source categories. Part 63 defines a major source of HAPs as any source that has the PTE 10 tpy of any single HAP or 25 tpy of HAPs in aggregate.

Subpart HH (National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities) regulates the HAP emissions from glycol dehydration units, storage vessels, and equipment leaks. Subpart HHH (National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage) regulates the HAP emissions from glycol dehydration units. Subpart YYYY (National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines) regulates HAP emissions from combustion turbines. Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines) regulates HAP emissions from reciprocating internal combustion engines. Subpart DDDDD (National Emission Standards for Hazardous Air Pollutants for Industrial/Commercial/Institutional Boilers and Process Heaters) regulates HAP emissions from boilers and heaters. Subparts HH, HHH, YYYY, ZZZZ, and DDDDD apply only to sources located at major sources of HAPs.

The Chehalis Compressor Station is considered a single major source of HAPs under Title 40 CFR Part 63. Therefore, these NESHAPS would be potentially applicable to the proposed facilities. Subpart HH does not apply because the gas leaving the station goes to a local distribution company and/or a final end user. Subpart HHH does not apply because there are no affected sources (i.e., glycol dehydration units), as defined by the regulations, located at the station. Subpart YYYY does not apply to the diffusion flame gas-fired and lean premix gas-fired turbines at the compressor station, per the August 18, 2004 Federal Register, which stated that the EPA has proposed to delete these subcategories from the Subpart YYYY affected source category list. Subpart ZZZZ does not apply to the engine at the compressor station because the engine was installed before the applicability date of the regulation and is not considered an affected unit. In addition, the proposed engine derate does not trigger a regulatory applicability review for the engine. Subpart DDDDD does not apply to either the existing Sellers model boiler at the station or the new fuel gas heater because both units, which have rated capacities well below the 10 million British thermal units per hour (MMBtu/hr) applicability threshold, are not considered affected units.

The Washougal Compressor Station is considered a single major source of HAPs under Title 40 CFR Part 63. Therefore, these NESHAPS would be potentially applicable to the proposed facilities. Subpart HH does not apply because the gas leaving the station goes to a local distribution company and/or a final end user. Subpart HHH does not apply because there are no affected sources (i.e., glycol dehydration units), as defined by the regulations, located at the station. Subpart YYYY does not apply to the diffusion flame gas-fired and lean premix gas-fired turbines at the station, per the August 18, 2004 Federal Register, which stated that the EPA has proposed to delete these subcategories from the Subpart YYYY affected source category list. Subpart ZZZZ does not apply to the engine at the compressor station because the engine was installed prior to the applicability date of the regulation and is not considered an affected unit. Subpart DDDDD does not apply to the existing Sellers model boiler at the station because the unit, which has a rated capacity well below the 10 MMBtu/hr applicability threshold, is not considered an affected unit.

New Source Performance Standards – The NSPS, codified in Title 40 CFR Part 60, apply to new, modified, or reconstructed stationary sources that meet or exceed specified applicability thresholds. The NSPS are divided into several subparts. Each subpart regulates a specific source type and size. The potentially applicable subparts are addressed below.

Subpart GG applies to new, modified, or reconstructed stationary gas turbines with a heat input at peak load of greater than or equal to 10 MMBtu/hr. Both of the new turbines that would be installed at the Chehalis and Washougal Compressor Stations would have a peak load of greater than 10 MMBtu/hr. Therefore, these turbines are subject to NSPS Subpart GG. Subpart GG establishes NO_x emission limits and fuel sulfur content limits. The gas turbines would meet the requirements of Subpart GG by burning only pipeline quality natural gas.

Subpart KKK applies to VOC emissions from equipment leaks at onshore natural gas processing plants. Natural gas processing plants are defined under Subpart KKK as any processing site engaged in the extraction of natural gas liquids from field gas, fractionation of mixed natural gas liquids, or both. Natural gas liquids are defined in Subpart KKK as the hydrocarbons, such as ethane, propane, butane, and pentane, that are extracted from field gas. The Chehalis and Washougal Compressor Stations are not designed for extraction of natural gas liquids; therefore, the proposed modifications are not subject to NSPS Subpart KKK.

Subpart LLL applies to sweetening units and sulfur recovery units at facilities that process natural gas. Sweetening units are defined by Subpart LLL as process devices that separate the hydrogen sulfide and CO_2 contents from sour natural gas. There are no gas sweetening units or sulfur recovery units proposed as a part of this project; therefore, the modifications would not be subject to NSPS Subpart LLL.

Title V Permitting – Title V of the CAA requires each state to develop an operating permit program. The operating permit program is implemented through Title 40 CFR Part 70 and establishes applicability thresholds for criteria pollutants and HAPs. If a facility's PTE exceeds one or more of these thresholds, the facility is considered a "major source." The major source threshold for a source in an Attainment area is 100 tpy of PM_{10}, SO_2, NO_x, VOC, or CO. Both the Chehalis and Washougal Compressor Stations are currently major sources of air emissions and currently have Title V Operating permits. The Title V Operating permits would be required to be modified to include the proposed changes to each station.

State Air Permitting – In accordance with WAC 173-400-110, the proposed modifications at the compressor stations would require Northwest to submit construction permit applications and obtain permits before beginning construction on the project. The construction permit includes information documenting that the proposed modifications would, per WAC 173-400-113(2)(b), install and operate approved Best Available Control Technology (BACT) and demonstrate compliance with the NAAQS and the WAAQS for criteria pollutants and Acceptable Source Impact Levels for toxic and hazardous air pollutants using computer dispersion modeling.

4.11.1.2 Air Emission Impacts

Construction Emissions

Construction activities for the proposed facilities (including the pipeline) would take place in the following four phases: site preparation/trenching; foundation work; installation of equipment, structures, and pipeline; and right-of-way/site restoration. The construction activities that would generate emissions include land clearing, ground excavation, and cut and fill operations. These construction activities would occur 6 days per week for up to 12 hours per day. The intermittent and short-term emissions generated by these activities would include dust from soil disruption and combustion emissions from the construction equipment. The fugitive dust emissions (e.g., PM_{10}) would depend on the moisture content and texture of the soils that would be disturbed. The construction emissions would vary from day to day depending on the level of activity, the specific operations, and prevailing weather. Fugitive dust would be mitigated by the application of water or a chemical dust suppressant on unpaved roadways, unpaved parking areas, and areas disturbed by construction activities (including storage piles). Most of the construction equipment would be powered by diesel engines and would be equipped with typical control equipment (e.g., catalytic converters). Emissions from construction of the pipeline and aboveground facilities are not expected to cause or significantly contribute to a violation of an applicable ambient air quality standard at the property boundaries or the nearest residence (in the case of the pipeline construction) because the construction equipment would be operated on an as-needed basis during daylight hours only and the emissions from gasoline and diesel engines would be minimized because the engines must be built to meet the standards for mobile sources established by the EPA mobile source emission regulations including those in Title 40 CFR Part 85.

Operation Emissions

The proposed turbines and fuel gas heater would operate on natural gas. Therefore, the primary pollutants emitted by these units would be NO_x and CO. As discussed in section 4.11.1.1, the proposed modifications at the Chehalis and Washougal Compressor Stations would not be subject to PSD review. However, during the state permitting process, the modifications would be required to meet currently prescribed BACT requirements, quantitatively assess the ambient air impacts associated with the proposed project, and demonstrate that the project would not cause or significantly contribute to a violation of an applicable air quality standard. Currently, the use of dry low-NO_x technology and good combustion practices have been identified as the emission reduction measures for the proposed turbines that would be installed at the Chehalis and Washougal Compressor Stations. As documented in the Notice of Construction and Application for Approval prepared by Northwest for both stations, the results of the detailed air dispersion modeling analysis demonstrated that the predicted ambient impacts were below applicable toxic air pollutant standards. Additionally, a state level NAAQS/WAAQS dispersion modeling analysis was conducted for the proposed modifications at the Chehalis Compressor Station and showed that predicted impacts of both NO_x and CO were below applicable standards.

4.11.2 Noise

At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. Variation is caused in part by changing weather conditions, the effects of seasonal vegetative cover, and human activities. Two measures used by federal agencies for the time-varying quality of environmental noise known to affect people are the 24-hour equivalent sound level ($L_{eq(24)}$) and the day-night equivalent sound level (L_{dn}). The $L_{eq(24)}$ is the level of steady sound with the same total (equivalent) energy as the time-varying sound of concern, averaged over a 24-hour period. The L_{dn} is the $L_{eq(24)}$ with 10 decibels of the A-weighted scale (dBA) added to nighttime sound levels between the hours of 10:00 PM and 7:00 AM to account for people's greater sensitivity to sound during nighttime hours. The human ear’s threshold of perception for noise change is 3 dBA.

4.11.2.1 Existing Noise Levels

Chehalis Compressor Station

The Chehalis Compressor Station is currently powered by a 6,350-hp Cooper Bessemer reciprocating compressor unit and a 4,700-hp mobile Solar Centaur 40 turbine compressor unit. Noise sources for the Cooper Bessemer reciprocating compressor include the engine exhaust, engine air intakes, engine casing, jacket water cooler, and auxiliary cooler fans. Noise sources for the mobile Solar Centaur 40 turbine compressor include the turbine exhaust, turbine air intake, turbine enclosure, turbine enclosure vents, skid piping, skid deck plate, and skid beams.

There are several noise-sensitive areas (NSAs) located in the vicinity of the existing Chehalis Compressor Station. The closest residence is located about 1,250 feet southwest of the compressor building. The nearest NSAs are listed in table 4.11.2-1 and shown on figure 4.11.2-1.

TABLE 4.11.2-1

Nearest Noise-Sensitive Areas – Chehalis Compressor Station

Description	Distance to Compressor Building	Direction
NSA 1	1,600 feet	East
NSA 4	1,800 feet	South
NSA 6	1,250 feet	Southwest

A study of existing noise levels in the area was conducted by Maki Corporation (2004a) to predict future noise levels after the new equipment becomes operational. The noise study evaluated existing noise levels at the nearest NSAs. The study included an assessment of the impact of the predicted noise levels at the compressor station boundaries and the nearest NSAs, and how they relate to federal and Washington state noise requirements. The noise impact of the compressor station was calculated using the computer programs *Noise* and *Noiseplot*. *Noise* calculates the sound pressure levels at selected points of interest and gives a detailed output of noise contributions for each source. The computer calculations are based on the hemispherical radiation of noise from each source. *Noiseplot* calculates and plots the total dBA noise contours for the compressor station. The barrier effect of the compressor station building and control building was included in the calculations. The noise attenuation attributable to trees in the vicinity of the station was not included. The measured $L_{eq(24)}$ and L_{dn} noise levels are summarized in table 4.11.2-2.

TABLE 4.11.2-2

Background Noise Levels at the Nearest Noise-Sensitive Areas – Chehalis Compressor Station

Monitoring Location	Measured With Highway Noise $L_{eq(24)}$ (dBA)	Estimated Without Highway Noise $L_{eq(24)}$ (dBA) [a]	L_{dn} (dBA) With Highway Noise	L_{dn} (dBA) Without Highway Noise
NSA 1	46.9	43.9	53.3	50.3
NSA 4	53.4	42.5	59.8	48.9
NSA 6	63.9	44.6	70.3	51.0

[a] Because of the high noise levels from Interstate 5, it is not possible to directly measure levels at the station without highway noise.

The measured existing compressor station $L_{eq(24)}$ noise levels at the three nearest NSAs range between 46.9 dBA and 63.9 dBA.

Washougal Compressor Station

The Washougal Compressor Station is powered by one 4,000-hp Cooper Bessemer 12 volt 250 reciprocating compressor unit and one 5,700-hp Solar Centaur 50 turbine compressor unit. Noise sources for the Cooper Bessemer reciprocating compressor include the engine exhaust, engine air intakes, engine jacket, jacket water cooler, and auxiliary fans. Noise sources for the Solar Centaur 50 turbine compressor include the turbine exhaust, turbine air intake, turbine casing, turbine oil cooler, gas cooler fans, and gas piping.

There are several NSAs located in the vicinity of the existing Washougal Compressor Station. As shown in table 4.11.2-3, the closest residence (NSA 10) is located about 450 feet east of the compressor building and the second closest residence (NSA 4) is located about 500 feet west-southwest of the compressor building. The nearest NSAs are listed in table 4.11.2-3 and shown on figure 4.11.2-2.

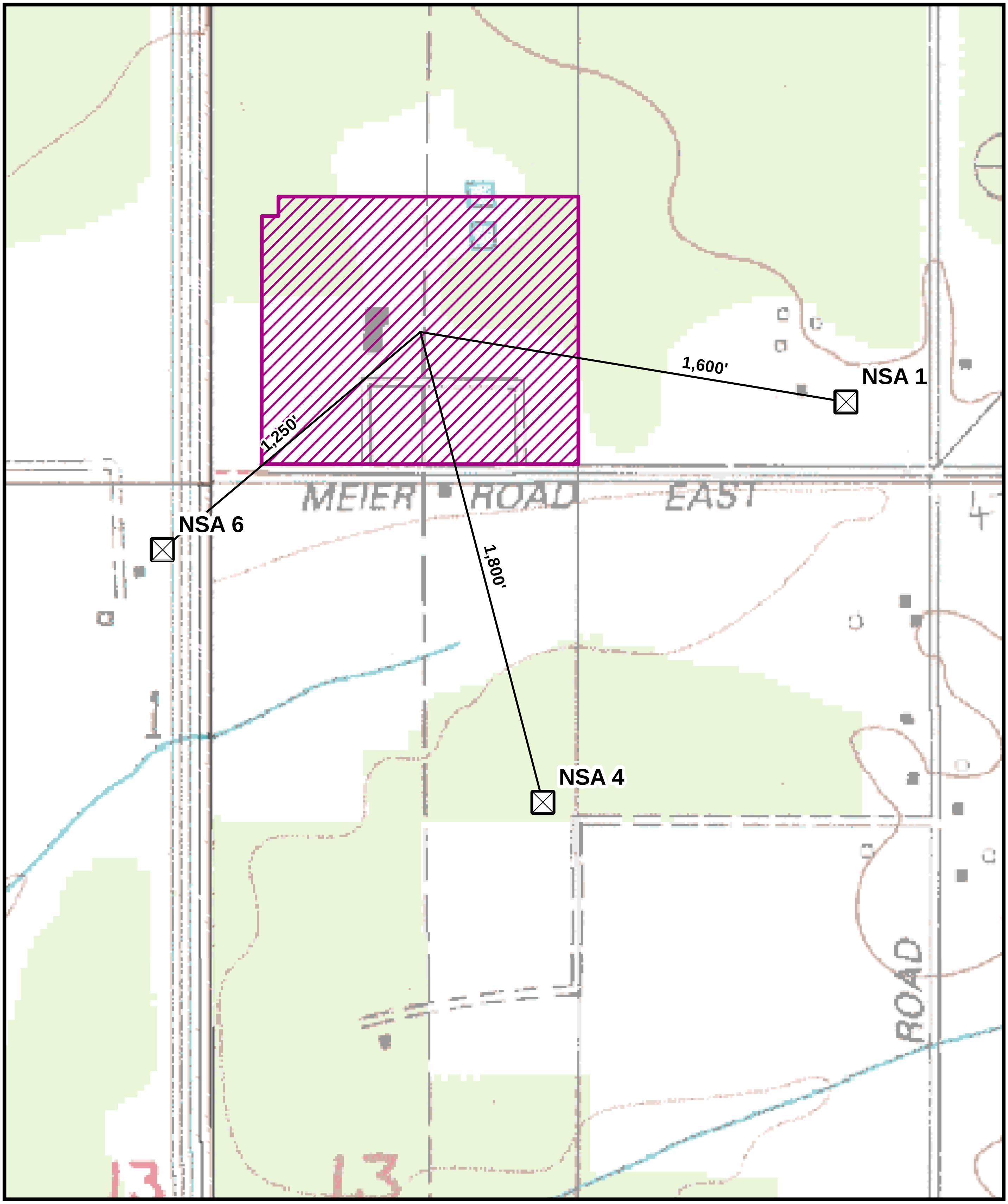

Figure 4.11.2-1
Capacity Replacement Project
Chehalis Compressor Station
Noise-Sensitive Areas

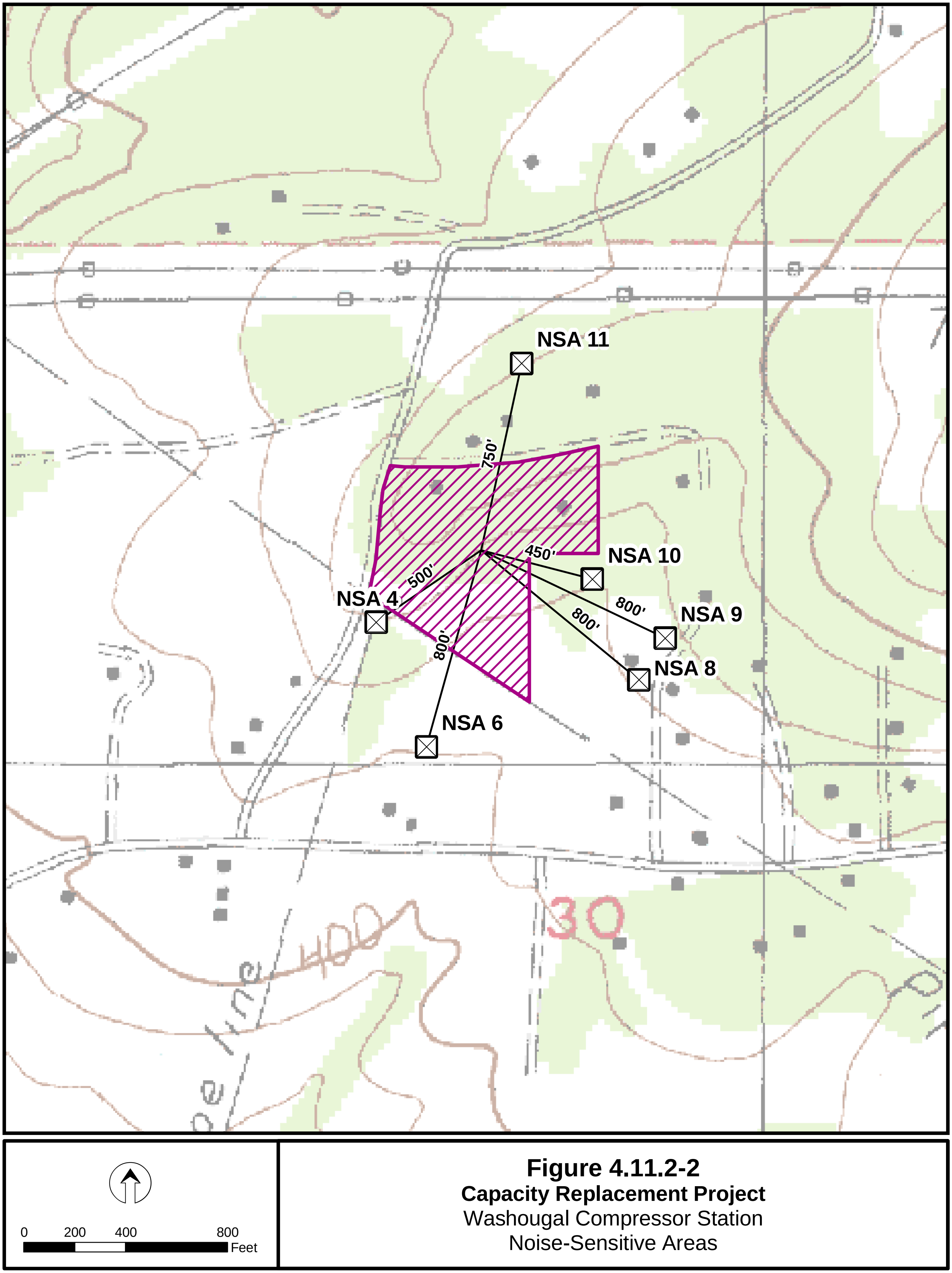

Figure 4.11.2-2
Capacity Replacement Project
Washougal Compressor Station
Noise-Sensitive Areas

A study of existing noise levels in the area was conducted by Maki Corporation (2004b) to predict future noise levels after the new equipment becomes operational. The study evaluated noise levels at the compressor station boundaries and nearest NSAs. The study included an assessment of the impact of the predicted noise levels at these locations and how they relate to federal and Washington state noise requirements. The noise impact of the compressor station was calculated using the computer programs *Noise* and *Noiseplot*. These programs are described above. The barrier effect of the compressor station building and control building was included in the calculations. Ground attenuation was not included. The measured and calculated $L_{eq(24)}$ noise levels and the calculated L_{dn} levels are summarized in table 4.11.2-3.

TABLE 4.11.2-3

Measured and Calculated Background Noise Levels at the Property Boundaries and Nearest Noise-Sensitive Areas – Washougal Compressor Station

Monitoring Location	Distance to Compressor Building	Direction	Measured $L_{eq(24)}$ (dBA)	Calculated $L_{eq(24)}$ (dBA)	Calculated L_{dn} (dBA)
Property Boundary 10	450 feet	East	47.0	47.1	53.5
Property Boundary 4	500 feet	Southwest	44.1	44.0	50.4
NSA 4	500 feet	West-southwest	39.6	42.5	48.9
NSA 6	800 feet	South	43.8	39.1	45.5
NSA 8	800 feet	Southeast	42.7	40.5	46.9
NSA 9	800 feet	East-southeast	40.9	40.7	47.1
NSA 10	450 feet	East	46.1	46.1	52.5
NSA 11	750 feet	Northeast	38.1	43.1	49.5

The existing and calculated noise levels closely match. The calculated noise levels were used for calculating the future noise impact on the NSAs. The calculated existing $L_{eq(24)}$ noise levels at the six nearest NSAs range between 39.1 dBA and 46.1 dBA. The equivalent L_{dn} levels for a steady noise source are between 45.5 dBA and 52.5 dBA. The calculated existing $L_{eq(24)}$ noise levels at the property boundaries range between 42.5 dBA and 47.1 dBA. The equivalent L_{dn} levels for a steady noise source are between 48.9 dBA and 53.5 dBA.

Noise Regulations

In 1974, the EPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. This publication evaluated the effects of environmental noise with respect to health and safety. The EPA has determined that noise levels should not exceed 55 dBA L_{dn}, which is the level that protects the public from indoor and outdoor activity interference. This noise level has been useful for federal and state agencies to establish noise limitations for various noise sources. A 55 dBA L_{dn} noise level equates to 48.6 dBA $L_{eq(24)}$ (i.e., a facility that does not exceed a continuous noise impact of 48.6 dBA $L_{eq(24)}$ would not exceed 55 dBA L_{dn}).

The new equipment that would be installed at the Chehalis and Washougal Compressor Stations must comply with federal and state noise regulations. Noise attributable to any compressor facility cannot exceed an L_{dn} of 55 dBA at any NSA unless the NSA is established after facility construction.

The Washington state noise limit is 50 dBA at any Environmental Designation for Noise Abatement (EDNA) residential Class A property boundary at night or 70 dBA at any EDNA Class C agricultural property boundary day or night. An EDNA Class A applies to lands where humans reside and sleep. An EDNA Class C applies to lands involving economic activities of such a nature that higher noise levels than experienced in other areas is normally to be anticipated. Noise regulations are also implemented by local authorities.

The Chehalis Compressor Station is an EDNA Class C area located in an agricultural EDNA Class C area. The station property boundaries abut agricultural property.

The Washougal Compressor Station is an EDNA Class C area that abuts EDNA Class A areas to the west, north, and northeast. The area to the south and southeast of the Washougal Compressor Station is an EDNA Class C agricultural area.

4.11.2.2 Impact and Mitigation

Noise would be generated during construction of the pipeline, the activities associated with the abandonment of the existing facilities, and during the construction and operation of the modified aboveground facilities. Pipeline construction is similar to an assembly line, with crews conducting separate but sequential activities, each generally proceeding at rates ranging from several hundred feet to 1 mile per day. Depending on the distance between each crew in the assembly line, construction activities in any one area could last from several weeks to several months on an intermittent basis. Construction equipment would be operated on an as-needed basis during this period. While individuals in the immediate vicinity of the construction activities would experience an increase in noise, this effect would be temporary and local. Nighttime noise is not expected to increase during construction because most construction activities would be limited to daytime hours. Northwest would comply with all local noise ordinances during construction of the proposed facilities.

The modified compressor stations would generate noise on a continuous basis once operating (i.e., 24 hours per day). The noise impact associated with the operation of these aboveground facilities would be limited to the vicinity of the facilities. The specific operational noise sources associated with these facilities and their estimated impact at the nearest NSAs are described below.

Chehalis Compressor Station

As part of the Capacity Replacement Project, Northwest is proposing to add a 10,300-hp Solar Taurus 70 turbine compressor unit with a gas after cooler and a fuel gas heater and reduce the speed of the Cooper Bessemer reciprocating compressor unit to 250 rpm, decreasing the maximum power output to 4,800 hp.

Construction activities at the Chehalis Compressor Station would occur over a 7-month period. During this period, construction activities would be limited to daytime hours between 7:00 AM and 7:00 PM, with noise levels that are variable and intermittent throughout the day. No construction activities would take place at night. Construction equipment would typically include cranes, bulldozers, graders, backhoes, front-end loaders, welding machines, trucks, pickups, and other miscellaneous equipment, each of which would have silencers commonly used for these types of equipment. No significant impacts on noise levels are anticipated during construction at this station.

The existing L_{dn} noise levels at NSAs 4 and 6 exceed the federal L_{dn} limit of 55 dBA due to noise associated with the adjacent highway (Interstate 5) (see table 4.11.2-2). The location of Interstate 5 in relation to the Chehalis Compressor Station is shown on figure B-7 in Appendix B. Noise associated with the existing compressor station, excluding the highway noise, is at least 4 dBA below the federal L_{dn} limit of 55 dBA. The proposed compressor station expansion would generate noise on a continuous basis once operating. During normal operations, only one or two compressors would operate at the same time; however, all three compressor units could potentially operate at the same time.

Noise sources for the new Solar Taurus 70 turbine compressor include a turbine exhaust, turbine air intake, turbine casing, turbine cooler, and gas after cooler. The fuel gas heater would not affect noise levels at the station. The Solar Taurus 70 exhaust silencer would be specified so that the maximum $L_{eq(24)}$ noise level at a horizontal distance of 50 feet from the end of the stack would be less than 65 dBA. The exhaust duct between the compressor building and silencer would be acoustically insulated. The Solar Taurus 70 air intake silencer and air intake filter would be specified so that the insertion losses from both the silencer and filter would result in air intake $L_{eq(24)}$ noise levels of less than 65 dBA at a distance of 50 feet horizontally from the center of the air intake filter. The air intake duct between the compressor building and silencer would be acoustically insulated.

The Solar Taurus 70 turbine compressor would be installed in an acoustically treated compressor building that would act as an enclosure to attenuate a large portion of the casing noise. The compressor building would be constructed with a 22-gauge outer shell, 4 inches of 8 pounds per cubic foot density mineral wool insulation, and a 26-gauge perforated metal liner. Doors would be acoustically insulated, windows would be double glazed, and if translucent light panels are installed in the walls they would be doubled with one panel located at the outside edge and the second panel located at the inside edge of the wall. The building would have a large roll-up door that would have a minimum noise reduction rating of sound transmission class (system of measurement of an assembly's ability to reduce sound transmission) of 22. Ventilation openings would be acoustically designed.

The Solar Taurus 70 turbine compressor lube oil cooler would be specified to have noise levels no greater than 59 dBA at a horizontal distance of 50 feet from the center of the cooler. The gas after cooler would be specified to have noise levels no greater than 59 dBA at a horizontal distance of 50 feet from the center of the cooler.

Future noise levels were calculated for four scenarios: the first with only the new Solar Taurus 70 turbine compressor operating to show the additional future noise; the second with the new Solar Taurus 70 turbine compressor and the existing Cooper Bessemer reciprocating compressor operating; the third with the new Solar Taurus turbine compressor and the mobile Solar Centaur 40 turbine compressor operating; and the fourth with the new Solar Taurus 70 turbine compressor, the Cooper Bessemer reciprocating compressor, and the mobile Solar Centaur 40 turbine compressor operating at the same time.

Table 4.11.2-4 compares the existing conditions to the predicted noise levels at the nearest NSAs and the predicted property line noise levels with the Solar Taurus 70 turbine compressor operating.

The predicted L_{dn} noise contribution at the three nearest NSAs with only the new Solar Taurus 70 turbine compressor operating range between 45.3 dBA and 45.4 dBA and are more than 9 dBA below the federal L_{dn} noise limit of 55 dBA. The predicted $L_{eq(24)}$ noise levels at the four compressor station property boundary points range between 41.2 dBA and 52.7 dBA and are more than 17 dBA below the Washington state limit of 70 dBA at an agricultural property boundary.

TABLE 4.11.2-4

Predicted L_{eq} and L_{dn} Noise Levels at the Property Boundaries and Nearest NSAs Associated with the Solar Taurus 70 Turbine Compressor Operating at the Chehalis Compressor Station

Location	Distance and Direction	Existing Ambient L_{dn} (dBA)	Existing Ambient Without Traffic Noise L_{dn} (dBA)	Predicted Facility Contribution L_{dn} (dBA) [a]	Predicted Property Line $L_{eq(24)}$ (dBA) [a]	Predicted Increase in Ambient (dBA)
Point 1	North property boundary	-	-	-	41.2	-
Point 2	East property boundary	-	-	-	45.7	-
Point 3	South property boundary	-	-	-	52.7	-
Point 4	West property boundary	-	-	-	44.2	-
NSA 1	1,600 feet east	53.3	50.3	45.3	-	- 5.0
NSA 4	1,800 feet northeast	59.8	48.9	45.4	-	- 3.5
NSA 6	1,250 feet southwest	70.3	51.0	45.3	-	- 5.7

[a] Without Interstate 5 traffic noise.

Table 4.11.2-5 compares the existing conditions to the predicted noise levels at the nearest NSAs and the predicted property line noise levels with the Solar Taurus 70 turbine compressor and the Cooper Bessemer reciprocating compressor operating at the same time.

TABLE 4.11.2-5

Predicted L_{eq} and L_{dn} Noise Levels at the Property Boundaries and Nearest NSAs Associated with the Solar Taurus 70 Turbine Compressor and the Cooper Bessemer Reciprocating Compressor Operating at the Chehalis Compressor Station

Location	Distance and Direction	Existing Ambient L_{dn} (dBA)	Existing Ambient Without Traffic Noise L_{dn} (dBA)	Predicted Facility Contribution L_{dn} (dBA) [a]	Predicted Property Line $L_{eq(24)}$ (dBA) [a]	Predicted Increase in Ambient (dBA)
Point 1	North property boundary	-	-	-	47.9	-
Point 2	East property boundary	-	-	-	49.3	-
Point 3	South property boundary	-	-	-	54.5	-
Point 4	West property boundary	-	-	-	50.8	-
NSA 1	1,600 feet east	53.3	50.3	48.7	-	- 1.6
NSA 4	1,800 feet northeast	59.8	48.9	46.0	-	- 2.9
NSA 6	1,250 feet southwest	70.3	51.0	50.3	-	- 0.7

[a] Without Interstate 5 traffic noise.

The predicted L_{dn} noise levels at the three nearest NSAs with the new Solar Taurus 70 turbine compressor operating and the existing reciprocating compressor operating at 4,800 hp range between 46.0 dBA and 50.3 dBA and are more than 4 dBA below the federal L_{dn} noise limit of 55 dBA. The predicted $L_{eq(24)}$ noise levels at the four compressor station property boundary points range between 47.9 dBA and 54.5 dBA and are more than 15 dBA below the Washington state limit of 70 dBA at an agricultural property boundary.

Table 4.11.2-6 compares the existing conditions to the predicted noise levels at the nearest NSAs and the predicted property line noise levels with the Solar Taurus 70 turbine compressor and the mobile Solar Centaur 40 turbine compressor operating at the same time.

The predicted L_{dn} noise levels at the three nearest NSAs with the new Solar Taurus 70 turbine compressor and the mobile Solar Centaur 40 turbine compressor operating range between 48.6 dBA and 50.0 dBA and are at least 5 dBA below the federal L_{dn} noise limit of 55 dBA. The predicted $L_{eq(24)}$ noise levels at the four compressor station property boundary points range between 49.1 dBA and 53.2 dBA and are more than 16 dBA below the Washington state limit of 70 dBA at an agricultural property boundary.

TABLE 4.11.2-6

Predicted L_{eq} and L_{dn} Noise Levels at the Property Boundaries and Nearest NSAs Associated with the Solar Taurus 70 Turbine Compressor and the Mobile Solar Centaur 40 Turbine Compressor Operating at the Chehalis Compressor Station

Location	Distance and Direction	Existing Ambient L_{dn} (dBA)	Existing Ambient Without Traffic Noise L_{dn} (dBA)	Predicted Facility Contribution L_{dn} (dBA) [a]	Predicted Property Line $L_{eq(24)}$ (dBA) [a]	Predicted Increase in Ambient (dBA)
Point 1	North property boundary	-	-	-	51.7	-
Point 2	East property boundary	-	-	-	52.1	-
Point 3	South property boundary	-	-	-	53.2	-
Point 4	West property boundary	-	-	-	49.1	-
NSA 1	1,600 feet east	53.3	50.3	50.0	-	- 0.3
NSA 4	1,800 feet northeast	59.8	48.9	48.8	-	- 0.1
NSA 6	1,250 feet southwest	70.3	51.0	48.6	-	- 2.4

[a] Without Interstate 5 traffic noise.

Table 4.11.2-7 compares the existing conditions to the predicted noise levels at the nearest NSAs and the predicted property line noise levels with the Solar Taurus 70 turbine compressor, the Cooper Bessemer reciprocating compressor, and the mobile Solar Centaur 40 turbine compressor operating at the same time.

TABLE 4.11.2-7

Predicted L_{eq} and L_{dn} Noise Levels at the Property Boundaries and Nearest NSAs Associated with the Solar Taurus 70 Turbine Compressor, the Cooper Bessemer Reciprocating Compressor, and the Mobile Solar Centaur 40 Turbine Compressor Operating at the Chehalis Compressor Station

Location	Distance and Direction	Existing Ambient L_{dn} (dBA)	Existing Ambient Without Traffic Noise L_{dn} (dBA)	Predicted Facility Contribution L_{dn} (dBA) [a]	Predicted Property Line $L_{eq(24)}$ (dBA) [a]	Predicted Increase in Ambient (dBA)
Point 1	North property boundary	-	-	-	52.9	-
Point 2	East property boundary	-	-	-	53.2	-
Point 3	South property boundary	-	-	-	54.8	-
Point 4	West property boundary	-	-	-	52.5	-
NSA 1	1,600 feet east	53.3	50.3	51.4	-	1.1
NSA 4	1,800 feet northeast	59.8	48.9	49.1	-	0.2
NSA 6	1,250 feet southwest	70.3	51.0	51.8	-	0.8

[a] Without Interstate 5 traffic noise.

The predicted L_{dn} noise levels at the three nearest NSAs with the new Solar Taurus 70 turbine compressor, the Cooper Bessemer reciprocating compressor, and the mobile Solar Centaur 40 turbine compressor operating range between 49.1 dBA and 51.8 dBA and are at least 3 dBA below the federal L_{dn} noise limit of 55 dBA. The predicted $L_{eq(24)}$ noise levels at the four compressor station property boundary points range between 52.5 dBA and 54.8 dBA and are more than 15 dBA below the Washington state limit of 70 dBA at an agricultural property boundary.

The calculations show that the predicted noise levels from the addition of the Solar Taurus 70 turbine compressor operating with either the Cooper Bessemer reciprocating compressor or the mobile Solar Centaur 40 turbine compressor are lower than the existing noise levels. The predicted noise levels from the addition of the Solar Taurus 70 turbine compressor operating with both the Cooper Bessemer reciprocating compressor and the mobile Solar Centaur 40 turbine compressor are less than a 3 dBA increase, which would not be detectible by the human ear. As a result, there would be no adverse predictable increase in noise associated with the addition of the Solar Taurus 70 turbine compressor.

Washougal Compressor Station

Northwest is proposing to upgrade the existing Solar Centaur 50 turbine compressor at the Washougal Compressor Station to a 7,700-hp Solar Taurus 60 turbine compressor. Construction activities at the Washougal Compressor Station would occur inside the existing compressor building and would take place over a 3-month period. During this period, construction activities would be limited to daytime hours between 7:00 AM and 7:00 PM, with noise levels that are variable and intermittent throughout the day. No construction activities would take place at night. There would not be any adverse impacts on noise associated with construction at this station.

The loudest existing noise level at the nearby NSAs is 2.5 dBA below the federal L_{dn} limit of 55 dBA (see table 4.11.2-3). The proposed modifications at the compressor station would generate noise on a continuous basis once operating.

Noise sources for the future Solar Taurus 60 turbine compressor would include a turbine exhaust, turbine air intake, turbine casing, turbine oil cooler, gas cooler fans, and gas piping. The Solar Taurus 60 turbine compressor would replace the Solar Centaur 50 turbine compressor inside the existing compressor building. The existing Solar Centaur 50 turbine silencing equipment for the turbine air intake and exhaust would be reused for the Solar Taurus 60 turbine compressor. The coolers and gas piping would not change.

The Solar Taurus 60 turbine compressor exhaust stack L_{eq} noise levels would be less than 59 dBA at a horizontal distance of 50 feet from the end of the stack. The exhaust duct between the compressor building and silencer is acoustically insulated. The Solar Taurus 60 turbine compressor air intake system $L_{eq(24)}$ noise levels would be less than 61 dBA at a horizontal distance of 50 feet from the air intake filter. The air intake duct between the compressor building and silencer is acoustically insulated.

The Solar Taurus 60 turbine compressor building would act as an enclosure to attenuate a large portion of the casing noise. The compressor building has a 22-gauge outer shell, 6 inches of 8 pounds per cubic foot density mineral wool insulation, and a 26-gauge perforated metal liner. Doors are acoustically insulated, windows are double glazed, and there are no light panels located in the walls. The building has a large roll-up door that has a noise reduction rating greater than Sound Transmission Class-22. Ventilation openings are acoustically designed.

The existing Solar Centaur 50 turbine compressor lube oil cooler would be reused for the Solar Taurus 60 turbine compressor. It is a Solar 90 dBA low-noise cooler and has $L_{eq(24)}$ noise levels that are less than 59 dBA at a horizontal distance of 50 feet from the center of the cooler. The existing gas after cooler also would be reused. The after cooler has $L_{eq(24)}$ noise levels that are less than 60 dBA at a horizontal distance of 50 feet from the center of the cooler. The existing gas piping has been acoustically insulated but still emits a minor amount of noise from the vicinity of the turbine unit piping. This piping has an overall noise level approximately equal to 60 dBA at a horizontal distance of 50 feet from the mid-point of the piping.

Future noise levels were calculated to show the expected noise with the new Solar Taurus 60 turbine compressor and the existing Cooper Bessemer reciprocating compressor operating. Table 4.11.2-8 compares the existing conditions to the predicted noise levels at the nearest NSAs and the predicted property line noise levels when the Solar Centaur 50 turbine compressor is replaced with the Solar Taurus 60 turbine compressor.

TABLE 4.11.2-8

Predicted L_{dn} Noise Levels at Nearest NSAs When the Solar Centaur 50 Turbine Compressor is Replaced with a Solar Taurus 60 Turbine Compressor at the Washougal Compressor Station

NSA	Distance and Direction	Existing L_{dn} (dBA)	Predicted Facility Contribution L_{dn} (dBA)	Predicted Property Line $L_{eq(24)}$ (dBA)	Predicted Increase (dBA)
Property Boundary 10	450 feet east	53.5	53.9	47.5	0.4 [a]
Property Boundary 4	500 feet southwest	50.4	50.8	44.4	0.4[a]
NSA 4	500 feet southwest	48.9	49.3	-	0.4
NSA 6	800 feet south	45.5	45.9	-	0.4
NSA 8	800 feet southeast	46.9	47.4	-	0.5
NSA 9	800 feet east	47.1	47.5	-	0.4
NSA 10	450 feet east	52.5	52.9	-	0.4
NSA 11	750 feet northeast	49.5	49.9	-	0.4

[a] Predicted increase above the calculated $L_{eq(24)}$.

The predicted L_{dn} noise level at the nearest NSA is 52.9 dBA and is more than 2 dBA below the federal L_{dn} noise limit of 55 dBA. The predicted L_{dn} noise levels at the other nearby NSAs are more than 5 dBA below the federal noise limit. The predicted $L_{eq(24)}$ noise levels at the property boundary points of the two nearest NSAs are 44.4 dBA and 47.5 dBA and are more than 5 dBA and 2 dBA, respectively, below the Washington state limit of 50 dBA for a residential property boundary at night.

The calculations show that the predicted noise levels caused by upgrading the existing Solar Centaur 50 turbine compressor to a Solar Taurus 60 turbine compressor are less than 1 dBA higher than the existing noise levels. This small increase in noise would not be noticeable.

Summary

The predicted operational noise levels at the modified Chehalis and Washougal Compressor Stations are below the FERC guideline of 55 dBA L_{dn} at the nearest NSAs. The predicted property boundary noise level at the Chehalis Compressor Station is also below the Washington state noise limit of 70 dBA at an agricultural property boundary. In addition, the predicted property boundary noise level at the Washougal Compressor Station is below the Washington state noise limit of 50 dBA for a residential property boundary at night.

Northwest would perform post-construction noise surveys to ensure that the actual noise resulting from operation of the Chehalis and Washougal Compressor Stations does not exceed 55 dBA L_{dn} at any nearby NSAs and is in compliance with Washington state noise limits. However, Northwest has not committed to making all reasonable efforts to assure its predicted noise levels at the Chehalis and Washougal Compressor Stations are not exceeded. Northwest has also not committed to providing the results of the noise surveys to the FERC or conducting follow-up measures in the event the surveys indicate that the compressor stations operating at full load exceed an L_{dn} of 55 dBA at any nearby NSA. Therefore, **the FERC staff recommends that**:

- **Northwest make all reasonable efforts to assure its predicted noise levels from the Chehalis and Washougal Compressor Stations are not exceeded at nearby NSAs and file noise surveys showing this with the Secretary <u>no later than 60 days</u> after placing the modified compressor stations into service. However, if the noise attributable to the operation of either compressor station at full load exceeds an L_{dn} of 55 dBA at any nearby NSA, Northwest should file a report on what changes are needed and should install additional noise controls to meet that level <u>within 1 year</u> of the in-service date. Northwest should confirm compliance with this requirement by filing a second noise survey with the Secretary <u>no later than 60 days</u> after it installs the additional noise controls.**

In addition, Northwest would need to demonstrate compliance with the applicable Washington state noise limits.

A comment was received from a landowner in the Yelm area expressing concern about noise/vibration at an existing MLV setting that is located approximately 6.2 miles north of the Chehalis Compressor Station. The landowner noted that the MLV setting makes noise intermittently and asked for the issue to be addressed. According to Northwest, the intermittent noise at the MLV setting is caused by acoustic pulsation and not mechanical vibration transferred down the pipeline from the reciprocating compressor at the station or ground-borne vibration emanating from the station. Sound waves (acoustic pulsations) produced by the reciprocating compressor are present in the gas within the pipeline. The amount of vibration and resulting noise at the MLV setting is a result of the amplification of these acoustic pulsations and is a function of the resonant length of the pipeline, the temperature of the gas within the pipeline, and the frequency and amplitude of the pulsations produced by the compressor.

To address this issue, Northwest would conduct a pulsation study before modifications are made at the Chehalis Compressor Station to avoid or attenuate high acoustic pulsations that might come from the existing reciprocating compressor as a result of the modifications to the unit. Northwest would include the MLV setting and piping between the MLV and the compressor station in the pulsation study. Northwest would incorporate any necessary changes to piping configurations or other modifications indicated by the results of the study into the design plans at the compressor station to minimize impacts associated with pulsation.

4.12 RELIABILITY AND SAFETY

The transportation of natural gas by pipeline involves some risk to the public in the event of an accident and subsequent release of gas. The greatest hazard is a fire or explosion following a major pipeline rupture.

Methane, the primary component of natural gas, is colorless, odorless, and tasteless. It is not toxic, but is classified as a simple asphyxiate, possessing a slight inhalation hazard. If breathed in high concentration, oxygen deficiency can result in serious injury or death.

Methane has an ignition temperature of 1,000^{o} F and is flammable at concentrations between 5 percent and 15 percent in air. Unconfined mixtures of methane in air are not explosive. However, a flammable concentration within an enclosed space in the presence of an ignition source can explode. It is buoyant at atmospheric temperatures and disperses rapidly in air.

4.12.1 Safety Standards

The DOT is mandated to provide pipeline safety under Title 49, USC Chapter 601. The Research and Special Programs Administration's (RSPA), Office of Pipeline Safety (OPS) administers the national regulatory program to ensure the safe transportation of natural gas and other hazardous materials by pipeline. It develops safety regulations and other approaches to risk management that ensure safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. The RSPA ensures that people and the environment are protected from the risk of pipeline incidents. This work is shared with state agency partners and others at the federal, state, and local level. Section 5(a) of the Natural Gas Pipeline Safety Act provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards, while section 5(b) permits a state agency that does not qualify under section 5(a) to perform certain inspection and monitoring functions. A state may also act as the DOT’s agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement action. The majority of the states have either section 5(a) certifications or section 5(b) agreements, while nine states act as interstate agents.

The DOT pipeline standards are published in Parts 190-199 of Title 49 of the CFR. Part 192 of 49 CFR specifically addresses natural gas pipeline safety issues.

Under a Memorandum of Understanding on Natural Gas Transportation Facilities (Memorandum) dated January 15, 1993 between the DOT and the FERC, the DOT has the exclusive authority to promulgate federal safety standards used in the transportation of natural gas. Section 157.14(a)(9)(vi) of the FERC's regulations require that an applicant certify that it will design, install, inspect, test, construct, operate, replace, and maintain the facility for which a Certificate is requested in accordance with federal safety standards and plans for maintenance and inspection, or shall certify that it has been granted a waiver of the requirements of the safety standards by the DOT in accordance with section 3(e) of the Natural Gas Pipeline Safety Act. The FERC accepts this certification and does not impose additional safety standards other than the DOT standards. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum to promptly alert the DOT. The Memorandum also provides for referring complaints and inquiries made by state and local governments and the general public involving safety matters related to pipelines under the Commission's jurisdiction. The FERC also participates as a member of the DOT's Technical Pipeline Safety Standards Committee, which determines if proposed safety regulations are reasonable, feasible, and practicable.

Both the Western Region of the OPS and the WUTC employ full-time employees dedicated to safety inspections and facility audits. These inspectors would complete inspections during construction of the Capacity Replacement Project to ensure that materials and construction methods meet the DOT standards. Following construction, the OPS and WUTC inspectors would conduct audits of Northwest's facilities. These audits would consist of reviewing operation and maintenance records, evaluating emergency procedures, and performing random field inspections.

The pipeline and aboveground facilities associated with the Capacity Replacement Project would be designed, constructed, operated, and maintained in accordance with or to exceed the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

The standards in the federal regulations become more stringent as the human population density increases. Part 192 also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are defined as follows.

- Class 1 – Location with 10 or fewer buildings intended for human occupancy.
- Class 2 – Location with more than 10 but less than 46 buildings intended for human occupancy.
- Class 3 – Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well-defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.
- Class 4 – Location where buildings with four or more stories aboveground are prevalent.

For the Capacity Replacement Project, a total of 41.3 miles (52 percent) of the project would be located in Class 1 areas, 22.5 miles (28 percent) would be located in Class 2 areas, and 15.7 miles (20 percent) would be located in Class 3 areas. The Sumas, Mount Vernon, and Fort Lewis Loops comprise the majority of the Class 1 and Class 2 areas. Of the 15.7 miles, 10.5 miles would be located on the Snohomish Loop. The loops do not cross any Class 4 areas. A summary of class locations based on current population density along Northwest's existing right-of-way is provided in table 4.12.1-1.

TABLE 4.12.1-1

Existing Class Locations for the Loops Associated with the Capacity Replacement Project [a]

Facility	Class 1 Milepost Range	Class 1 Length (miles)	Class 2 Milepost Range	Class 2 Length (miles)	Class 3 Milepost Range	Class 3 Length (miles)
Sumas Loop	1461.8-1466.1	4.3	1466.1-1466.7	0.6	NA	NA
	1466.7-1469.7	3.0	1469.7-1470.6	0.9		
	1470.6-1477.7	7.1	1477.7-1479.1	1.4		
	1479.1-1484.5	5.4				
Mount Vernon Loop	1408.9-1409.3	0.4	1408.8-1408.9	0.1	1409.3-1412.2	2.9
	1412.2-1412.8	0.6	1412.8-1416.5	3.7	1423.9-1424.1	0.2
	1416.5-1418.3	1.8	1418.3-1419.8	1.5		
	1419.8-1420.1	0.3	1420.1-1422.8	2.7		
	1422.8-1423.9	1.1	1426.7-1427.9	1.2		
	1424.1-1426.7	2.6				
	1427.9-1431.3	3.4				
Snohomish Loop	1383.4-1383.9	0.5	NA	NA	1382.0-1383.4	1.4
	1387.9-1388.8	0.9			1383.9-1387.9	4.0
					1388.8-1393.9	5.1
Fort Lewis Loop	1317.2-1318.4	1.2	1315.6-1317.2	1.6	1335.1-1337.2	2.1
	1320.1-1320.3	0.2	1318.4-1320.1	1.7		
	1323.8-1324.3	0.5	1320.3-1323.8	3.5		
	1325.8-1326.5	0.7	1324.3-1325.8	1.5		
	1327.5-1329.0	1.5	1326.5-1327.5	1.0		
	1330.1-1335.1	5.0	1329.0-1330.1	1.1		
	1337.2-1338.1	0.9				
Project Total		41.3		22.5		15.7

[a] No Class 4 areas would be crossed.

Note: The totals shown in this table may not equal the sum of addends due to rounding.

NA = Not applicable.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed on land in Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. All pipelines installed in navigable rivers, streams, and harbors must have a minimum cover of 48 inches in soil or 24 inches in consolidated rock. Class 2, 3, and 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. Northwest would exceed these minimum requirements in some locations by installing its pipeline deeper in select areas (e.g., mass wasting hazard areas) (see section 4.1.3). Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, MAOP, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. Pipe design specifications for the Capacity Replacement Project are provided in table 4.12.1-2.

TABLE 4.12.1-2

Pipe Design Specifications for the Capacity Replacement Project

Class Location	Pipe Wall Thickness (inches)	Design Factor	Grade	Material Specification	Manufacturing Process [a]
1	0.412	0.72	X70	API 5L	DSAW
2	0.412	0.6	X70	API 5L	DSAW
3	0.500	0.5	X70	API 5L	DSAW

[a] DSAW = Double submerged arc welded, straight seam, or spiral weld.

Note: All loops would have an outside diameter of 36 inches.

Before construction, Northwest would inspect the pipe at the mill to ensure that it meets required specifications and standards. During construction, coating inspectors would check the integrity of the factory-applied coating to ensure it was not damaged during transport. Field application of fusion bond epoxy or other suitable coating would correct any coating defects. Field application would also be performed on all welded joints. All welds (100 percent) would be inspected for integrity visually and through the use of x-rays. Any defects would be cut out or repaired.

The new pipeline would be connected to Northwest's existing cathodic protection system to prevent corrosion. Northwest would install additional cathodic protection as required. Once the pipeline is installed in the trench and backfilled, Northwest would hydrostatically test the loops with water in accordance with the criteria dictated by Title 49 CFR Part 192 Subpart J. Any leaks would be repaired or replaced and the pipeline retested. After the loops are successfully tested and dewatered, Northwest would conduct an internal inspection of the pipe using a geometry pig to locate any defects such as construction-related dents and ovality. The geometry pigs would collapse to 75 percent of the nominal pipe outside diameter and would be capable of detecting dents greater than 2 percent with an accuracy of plus or minus 0.2 percent, shop-fabricated elbow radii with an accuracy of plus or minus 5 degrees, and clock position accuracy to within plus or minus 15 degrees. Any defects that are outside of acceptable parameters would be located and repaired or cut out.

During construction and cleanup, Northwest would clearly mark the pipeline at line-of-sight intervals, roads, railroads, and other key points to alert the public to the presence of the pipeline. The markers would provide contact information for Northwest in the event of an emergency. Northwest would also participate in all "One-Call" services to prevent outside damage to the pipeline.

Class locations also specify the maximum distance to MLVs. Part 192 regulations require at least one MLV every 20 miles in Class 1 locations, every 15 miles in Class 2 locations, every 8 miles in Class 3 locations, and every 5 miles in Class 4 locations. Spacing between the MLVs for the Capacity Replacement Project would meet the DOT requirements for the appropriate class location.

In 2002, Congress passed an act to strengthen the Nation's pipeline safety laws. The Pipeline Safety Improvement Act of 2002 (HR 3609) was passed by Congress on November 15, 2002, and signed into law by the President in December 2002. No later than December 17, 2004, gas transmission operators must develop and follow a written integrity management program that contains all the elements described in Part 192.911 and addresses the risks on each covered transmission pipeline segment. Specifically, the law establishes an integrity management program that applies to all HCAs. The DOT (68 Federal Register (FR) 69778, 69 FR 18228, and 69 FR 29903) defines HCAs as they relate to the different class zones, potential impact circles, or areas containing an identified site as defined in Part 192.903 of the DOT regulations.

The OPS published a series of rules from August 6, 2002 to May 26, 2004 (69 FR 29903), that defines HCAs where a gas pipeline accident could do considerable harm to people and their property and requires an integrity management program to minimize the potential for an accident. This definition satisfies, in part, the Congressional mandate in Title 49, USC 60109 for the OPS to prescribe standards that establish criteria for identifying each gas pipeline facility in a high-density population area.

The HCAs may be defined in one of two ways. In the first method an HCA includes:

- current Class 3 and 4 locations;

- any area in Class 1 or 2 locations where the potential impact radius[8] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle;[9] or

- any area in Class 1 or 2 locations where the potential impact circle includes an identified site.[10]

In the second method, an HCA includes any area within a potential impact circle that contains:

- 20 or more buildings intended for human occupancy; or
- an identified site.

Once a pipeline operator has determined the HCAs on its pipeline, it must apply the elements of its integrity management program to those segments of the pipeline within HCAs. The DOT regulations specify the requirements for the integrity management plan at Part 192.911. The pipeline integrity management rule for HCAs requires inspection of the entire pipeline in HCAs every 7 years.

Under the CAO issued by the DOT to Northwest on December 18, 2003 (see section 1.1), Northwest must abandon all segments of its existing 26-inch-diameter pipeline located in HCAs from Sumas to Washougal by December 18, 2006. Assessment of the 26-inch-diameter pipeline identified 44 segments located in HCAs comprising 20.6 miles of pipeline. The locations of HCAs along Northwest's system are shown on figure 4.12.1-1. An amendment to the CAO issued April 9, 2004 clarified that the abandonment requirement would be satisfied by Northwest retiring the 26-inch-diameter pipeline and constructing new pipeline facilities designed to meet its future capacity needs. The proposed loops are designed for the proper class location and would be in service by November 2006, after which the entire existing 26-inch-diameter pipeline would be abandoned. Therefore, all of the existing 26-inch-diameter pipeline in HCAs would be taken out of service by December 18, 2006 as required by the CAO.

Part 192 prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Part 192.615, each pipeline operator must also establish an emergency plan that includes procedures to minimize the hazards in a natural gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;

- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;

- emergency shutdown of the system and safe restoration of service;

- making personnel, equipment, tools, and materials available at the scene of an emergency; and

- protecting people first and then property, and making them safe from actual or potential hazards.

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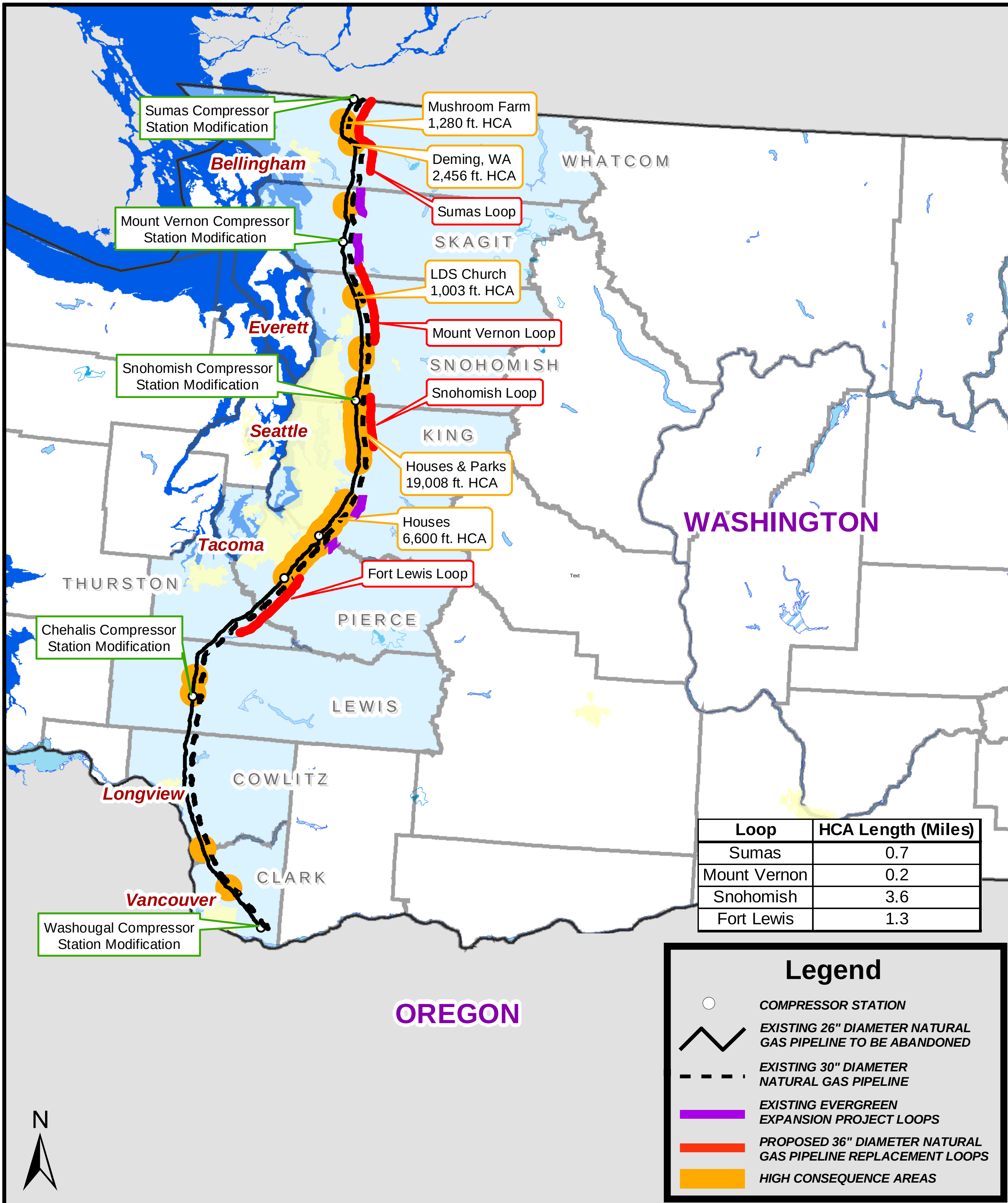
8 The potential impact radius is calculated as the product of 0.69 and the square root of the MAOP of the pipeline in pounds per square inch multiplied by the pipeline diameter in inches.

9 The potential impact circle is a circle of radius equal to the potential impact radius.

10 An identified site is an outside area or open structure that is occupied by 20 or more persons on at least 50 days in any 12-month period; a building that is occupied by 20 or more persons on at least 5 days a week for any 10 weeks in any 12-month period; or a facility that is occupied by persons who are confined, are of impaired mobility, or would be difficult to evacuate.



Loop	HCA Length (Miles)
Sumas	0.7
Mount Vernon	0.2
Snohomish	3.6
Fort Lewis	1.3

Figure 4.12.1-1

Capacity Replacement Project

High Consequence Areas Along the Northwest System

Northwest has a SCADA-based leak detection system that continuously monitors gas pressure, temperature, and volume at specific locations along the pipeline. The SCADA system is monitored 24 hours a day, 7 days a week, 365 days a year from Northwest's Gas Control Center in Salt Lake City, Utah. The system provides continuous information to the control center operators, and would have appropriate threshold and alarm values set such that warnings are provided to the operators when critical parameters are exceeded. Many other parameters are also monitored by the control center and by field personnel that would assist in the evaluation of system changes and potential problems. For instance, if a major disruption in flow occurred, it would be identified almost immediately in the control center through monitoring systems separate from the leak detection system.

The Capacity Replacement Project would be operated from Northwest's existing Sumas, Redmond, and Battleground Districts and continuously monitored by the Gas Control Center in Salt Lake City. The Sumas District has 13 employees trained to operate MLVs. The Redmond District has 11 trained employees; the Battleground District has 14 trained employees. The Battleground District has two automated valves but otherwise the existing Northwest MLVs are manual (a manual valve cannot be opened or closed remotely from the Gas Control Center in Salt Lake City). Each existing manual MLV is equipped with a mechanical actuator that opens or closes the valve in approximately 1 minute. MLVs installed as part of the Capacity Replacement Project would all be manual valves equipped with actuators. An actuator uses gas from the pipeline and hydraulic fluid to manually close the valve. This allows the valve to close in approximately 1 minute rather than Northwest personnel manually turning a wheel to close the valve, which takes approximately 45 minutes. Northwest estimates that should an emergency arise, a trained employee could be dispatched to any MLV on the pipeline and have that valve closed within 1 hour.

Northwest also conducts leak detection surveys using periodic aerial patrols, weather permitting. Leak surveys (with leak detection equipment) in Class 3 locations occur at intervals not exceeding 7.5 months, but at least twice each calendar year. The aerial patrols identify other right-of-way conditions such as damage to the system, slope instability, missing markers and signs, developments or other activities that may affect pipeline safety, and damage to erosion control structures. Northwest's patrols would exceed DOT standards, which require inspection at least once annually. In addition, Northwest would inspect its pipeline with high-resolution magnetic flux leakage pigs capable of detecting metal loss defects including corrosion and gouges. These pigs would collapse to 90 percent of the nominal pipe outside diameter, detect dents, and correlate with the geometry pig run. They are capable of detecting general corrosion larger than 4 times the wall thickness of the pipe (t) by 4t (pitting larger than 2t by 2t), depth with an accuracy of plus or minus 10 percent, length and width with an accuracy of plus or minus 0.8 inch, and clock position accuracy to within plus or minus 15 degrees.

Stress corrosion cracking is a type of cracking that can develop as a result of the environmental conditions in which a buried steel pipeline is located. Stress corrosion cracking was determined to be the cause of two failures of Northwest's existing 26-inch-diameter pipeline in Washington in 2003, although neither failure occurred along the portion of the system that would be looped by the Capacity Replacement Project. For stress corrosion cracking to occur, the following three conditions must be met simultaneously:

- the pipeline must be constructed of a material that is susceptible to corrosion, such as steel;
- the pipeline must be subject to tensile stresses that exceed the specified stress thresholds for the pipeline; and
- soil and groundwater conditions, primarily pH, must support stress corrosion cracking.

The most important step in preventing stress corrosion cracking is the proper application of coatings that remain well-bonded to the pipe yet allow the passage of cathodic protection current in the event of coating damage or separation. Northwest states that fusion-bonded epoxy and three-layer polyolefin coatings meet these criteria and provide effective protection against stress corrosion cracking. Fusion-bonded epoxy or three-layer polyolefin coatings would be applied over the entire length of the buried loops following stringent industry standards in surface preparation and application of the coatings, thereby reducing the potential for stress corrosion cracking to occur on the proposed loops.

Northwest would apply a Risk Management Process as part of its Integrity Management Program to reduce the risk of pipeline failure and the resulting consequences related to a failure. The process uses information from various sources such as a GIS, cathodic protection data, and in-line inspections to identify and analyze threats to pipeline integrity. Through a ranking process, projects and third-party activities are identified to mitigate potential system integrity threats, thereby reducing the likelihood of failure. In addition, the process examines the consequences of potential releases and explores opportunities to minimize impacts.

The process also includes the use of an Integrity Assessment Program that includes a database of risk factors to the pipeline. The data include soil data, depth of cover, geologic hazards, pipe data, appurtenance data, operating data, third-party damage factors, and population density. The program analyzes the data to determine risk levels for different segments of the system. This information is used to assist in determining appropriate maintenance activities, areas that require additional measures, or other integrity evaluation activities. This program assists in determining appropriate intervals for internal inspections, close interval surveys, and other monitoring.

At the existing compressor stations, Northwest personnel would extend operation and maintenance practices to include the new equipment. Station personnel would perform routine checks of the facilities including calibration of equipment and instrumentation, inspection of critical components, and scheduled and routine maintenance of equipment. Safety equipment, such as pressure relief devices, fire detection and suppression systems, and gas detection systems would be tested for proper operation. Corrective actions would be taken for any identified problem.

The existing compressor stations are equipped with combustible gas and fire detection alarm systems, and an emergency shutdown system. These systems would be expanded to include the new equipment. Automatic emergency shutdown of the compressors, evacuation or venting of gas from the station piping, and isolation of the station from the main pipeline would occur in the event of a fire detection alarm or the detection of an unsafe release of combustible gas inside the station. The compressor stations are also equipped with relief valves or pressure protection devices to protect the station piping from overpressure if station or unit control systems failed. A telemetry system would notify personnel locally and at the Gas Control Center in Salt Lake City of the activation of safety systems and alarms, who would in turn instruct maintenance personnel to investigate and take proper corrective actions.

Additional built-in safety factors include, but may not be limited to: perimeter security fencing; controlled access gates; security systems (intruder); vibration and temperature monitoring; emergency lighting; lightning and smoke detectors; on-site fire extinguishers; and the location of all major equipment, instrumentation, and control systems within locked, on-site buildings. All safety systems are tested in accordance with DOT standards to ensure proper operation.

Northwest personnel currently operate the existing pipeline system and would operate the proposed facilities as outlined in its existing Operations and Maintenance Manual. Employees would be trained based on work activities. Employees must also pass operator qualifications for core competency skills. Refresher training would be conducted as needed. Employees would participate in health and safety training during district employee meetings. The training that employees receive would be documented in a computer-based management system.

Part 192 requires that each operator must establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Northwest would send flyers, letters, brochures, and documents to landowners to remind them of the pipeline and its location and to notify Northwest of any activity along the right-of-way. Northwest representatives would also meet with the emergency services departments of the municipalities and counties along its pipeline facilities on an ongoing basis. Fire and safety equipment would be maintained along the pipeline system, and Northwest personnel and local emergency response groups would be trained in response procedures. Northwest personnel would consult with local fire departments and emergency response agencies to determine if additional equipment, training, and support are needed and to provide additional training and preparedness support where necessary. Northwest would also provide these departments with the 24-hour emergency numbers and verbal, written, and mapping descriptions of the pipeline system.

4.12.2 Pipeline Accident Data

Since February 9, 1970, Title 49 CFR Part 191 has required all operators of transmission and gathering systems to notify the DOT of any reportable incident and to submit a report on form F7100.2 within 20 days. Reportable incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization;
- required taking any segment of transmission line out of service;
- resulted in gas ignition;
- caused estimated damage to the property of the operator, or others, or both, of a total of $5,000 or more;
- required immediate repair on a transmission line;
- occurred while testing with gas or another medium; or
- in the judgment of the operator was significant, even though it did not meet the above criteria.

The DOT changed reporting requirements after June 1984 to reduce the amount of data collected. Since that date, operators must only report incidents that involve property damage of more than $50,000, injury, death, release of gas, or that are otherwise considered significant by the operator. Table 4.12.2-1 presents a summary of incident data for the 1970 to 1984 period, as well as more recent incident data for 1986 through 2003, recognizing the difference in reporting requirements. The 14.5-year period from

1970 through June 1984, which provides a larger universe of data and more basic report information than subsequent years, has been subject to detailed analysis, as discussed in the following sections.[11]

TABLE 4.12.2-1

Natural Gas Service Incidents by Cause

Cause	Incidents per 1,000 miles of pipeline (percentage) 1970-1984	1986-2003
Outside force	0.70 (53.8)	0.10 (38.6)
Corrosion	0.22 (16.9)	0.06 (23.9)
Construction or material defect	0.27 (20.8)	0.04 (14.7)
Other	0.11 (8.5)	0.06 (22.8)
Total	1.30	0.26

During the 14.5-year period, 5,862 service incidents were reported over the more than 300,000 total miles of natural gas transmission and gathering systems nationwide. Service incidents, defined as failures that occur during pipeline operation, have remained fairly constant over this period with no clear upward or downward trend in annual totals. In addition, 2,013 test failures were reported. Correction of test failures removed defects from the pipeline before operation.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 4.12.2-1 provides a percentage distribution of the causal factors as well as the annual frequency of each factor per 1,000 miles of pipeline in service.

The dominant incident cause is outside forces, constituting 53.8 percent of all service incidents between 1970 and 1984 and 38.6 percent between 1986 and 2003. Outside forces incidents result from the encroachment of mechanical equipment such as bulldozers and backhoes; earth movements due to soil settlement, washouts, or geologic hazards; weather effects such as winds, storms, and thermal strains; and willful damage. Table 4.12.2-2 shows that, of the service incidents caused by outside forces, human error in equipment usage was responsible for approximately 75 percent of the incidents. Since April 1982, operators have been required to participate in "One-Call" public utility programs in populated areas to minimize unauthorized excavation activities in the vicinity of pipelines. The "One-Call" program is a service used by public utilities and some private sector companies (e.g., oil pipelines, cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts. The 1986 through 2003 data show that the portion of incidents caused by outside forces has decreased to 38.6 percent (see table 4.12.2-1).

TABLE 4.12.2-2

Outside Forces Incidents by Cause (1970-1984)

Cause	Percent
Equipment operated by outside party	67.1
Equipment operated by or for operator	7.3
Earth movement	13.3
Weather	10.8
Other	1.5

[11] American Gas Association. 1986. "An Analysis of Reportable Incidents for Natural Gas Transportation and Gathering Lines 1970 Through June 1984." NG-18 Report No. 158, Pipeline Research Committee of the American Gas Association. D.J. Jones, G.S. Kramer, D.N. Gideon, and R.J. Eiber.

The pipelines included in the data set in table 4.12.2-1 vary widely in terms of age, pipe diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

The frequency of service incidents is strongly dependent on pipeline age. While pipelines installed since 1950 exhibit a fairly constant level of service incident frequency, pipelines installed before that time have a significantly higher rate, partially due to corrosion. Older pipelines have a higher frequency of corrosion incidents, because corrosion is a time-dependent process. Further, new pipe generally uses more advanced coatings and cathodic protection to reduce corrosion potential.

Older pipelines have a higher frequency of outside forces incidents partly because their location may be less well known and less well marked than newer lines. In addition, the older pipelines contain a disproportionate number of smaller diameter pipelines, which have a greater rate of outside forces incidents. Small diameter pipelines are more easily crushed or broken by mechanical equipment or earth movements.

Table 4.12.2-3 clearly demonstrates the effectiveness of corrosion control in reducing the incidence of failures caused by external corrosion. The use of both an external protective coating and a cathodic protection system, required on all pipelines installed after July 1971, significantly reduces the rate of failure compared to unprotected or partially protected pipe. The data show that bare, cathodically protected pipe actually has a higher corrosion rate than unprotected pipe. This anomaly reflects the retrofitting of cathodic protection to actively corroding spots on pipes.

TABLE 4.12.2-3

External Corrosion by Level of Control (1970-1984)

Corrosion Control	Incidents per 1,000 miles per year
None-bare pipe	0.42
Cathodic protection only	0.97
Coated only	0.40
Coated and cathodic protection	0.11

4.12.3 Impact on Public Safety

The service incident data summarized in table 4.12.2-1 include pipeline failures of all magnitudes with widely varying consequences. Approximately two-thirds of the incidents were classified as leaks, and the remaining third classified as ruptures, implying a more serious failure.

Table 4.12.3-1 presents the average annual fatalities that occurred on natural gas transmission and gathering lines from 1970 to 2003. Fatalities between 1970 and June 1984 have been separated into employees and nonemployees, to better identify a fatality rate experienced by the general public. Of the total 5.0 nationwide average, fatalities among the public averaged 2.6 per year over this period. The simplified reporting requirements in effect after June 1984 do not differentiate between employees and nonemployees. However, the data show that the total annual average for the period 1984 through 2003 decreased to 3.8 fatalities per year. Subtracting two major offshore incidents in 1989, which do not reflect the risk to the onshore public, yields a total annual rate of 2.9 fatalities per year for this period.

TABLE 4.12.3-1			
Annual Average Fatalities - Natural Gas Transmission and Gathering Systems [a, b]			
Year	Employees	Nonemployees	Total
1970-June 1984	2.4	2.6	5.0
1984-2003 [c]	-	-	3.8
1984-2003 [c]	-	-	2.9 [d]

a 1970 through June 1984 - American Gas Association, 1986.
b DOT Hazardous Materials Information System.
c Employee/nonemployee breakdown not available after June 1984.
d Without 18 offshore fatalities that occurred in 1989 (11 fatalities resulted from a fishing vessel striking an offshore pipeline and 7 fatalities resulted from an explosion on an offshore production platform).

The nationwide totals of accidental fatalities from various manmade and natural hazards are listed in table 4.12.3-2 in order to provide a relative measure of the industry-wide safety of natural gas pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. Nevertheless, the average 2.6 public fatalities per year is relatively small considering the more than 300,000 miles of transmission and gathering lines in service nationwide. Furthermore, the fatality rate is approximately two orders of magnitude (100 times) lower than the fatalities from natural hazards such as lightning, tornados, floods, earthquakes, etc.

The available data show that natural gas pipelines continue to be a safe, reliable means of energy transportation. Based on approximately 300,000 miles in service, the rate of public fatalities for the nationwide mix of transmission and gathering lines in service is 0.01 per year per 1,000 miles of pipeline. Using this rate, the pipeline facilities associated with the Capacity Replacement Project might result in a public fatality about every 1,250 years. This would represent a slight increase in risk to the nearby public.

TABLE 4.12.3-2	
Nationwide Accidental Deaths [a]	
Type of Accident	Fatalities
All accidents	90,523
Motor vehicles	43,649
Falls	14,985
Drowning	3,488
Poisoning	9,510
Fires and burns	3,791
Suffocation by ingested object	3,206
Tornado, flood, earthquake, etc. (1984 to 1993 average)	181
All liquid and gas pipelines (1978 to 1987 average) [b]	27
Gas transmission and gathering lines Nonemployees only (1970 to 1984 average) [c]	2.6

a All data, unless otherwise noted, reflect 1996 statistics from the U.S. Department of Commerce, Bureau of the Census, "Statistical Abstract of the United States 118th Edition."
b U.S. Department of Transportation "Annual Report on Pipeline Safety - Calendar Year 1987."
c American Gas Association, 1986.

Several scoping comments were received regarding Northwest's past safety history and the likelihood for a catastrophic event to occur on the proposed facilities. Williams acquired Northwest in 1982. Since that time, Northwest has experienced a total of 30 DOT-reportable incidents, including the Lake Tapps and Toledo failures in 2003. These two most recent failures resulted from stress corrosion cracking. The Lake Tapps failure resulted in the initial CAO issued by the DOT, which was subsequently amended as a result of the Toledo failure. Under the amended CAO, Northwest hydrostatically tested 111 miles of the existing 26-inch-diameter pipeline. DOT reportable incidents on the Northwest system since Williams' acquisition are provided in table 4.12.3-3.

TABLE 4.12.3-3

Northwest's DOT Reportable Incidents Since 1982 [a]

	Incident Type	
Cause	Reportable Leaks	Reportable Ruptures
Material and construction	6	0
Material only	0	5
Landslides	0	9
Corrosion	0	1
Stress corrosion cracking	0	3
Operator error	0	1
Third-party	0	5
Total	6	24

[a] Date of acquisition by Williams.

The proposed 36-inch-diameter loops would allow Northwest to abandon the older 26-inch-diameter pipeline in place with the exception of the Snohomish Loop and other select areas where the existing 26-inch-diameter pipeline would be removed and the new 36-inch-diameter loop placed in the same trench. The 36-inch-diameter pipeline would contain the latest steel, coating, and cathodic protection technologies available. Therefore, the potential for leaks and ruptures resulting from materials, corrosion, and stress corrosion cracking would be greatly reduced.

4.12.4 Terrorism

During the scoping process, several comments were received regarding the potential for vandalism or terrorism impacts that could affect the integrity of the pipeline. In the aftermath of the terrorist attacks that occurred on September 11, 2001, terrorism has become a very real issue for the facilities under the Commission's jurisdiction. The FERC, like other federal agencies, is faced with a dilemma in how much information can be offered to the public while still providing a significant level of protection to energy facilities. Consequently, the FERC has removed energy facility design plans and location information from its Internet website to ensure that sensitive information is not readily available (RM02-4-000 and PL02-1-000 issued February 20, 2003).

Since September 11, 2001, the FERC has been involved with other federal agencies in developing a coordinated approach to protecting the energy facilities of the United States, and continues to coordinate with these agencies to address this issue. A Security Task Force has been created and is addressing ways to improve pipeline security practices, strengthen communication within the industry and the interface with government, and extend public outreach efforts.

Increased security awareness has occurred throughout the industry and the nation. The Office of Homeland Security was established with the mission of coordinating the efforts of all executive departments and agencies to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. The FERC, in cooperation with other federal agencies and industry trade groups, has joined in the efforts to protect the energy infrastructure, including the approximately 300,000 miles of interstate natural gas transmission pipelines.

Safety and security are important considerations in any Commission action. The attacks of September 11, 2001 have changed the way pipeline operators as well as regulators must consider terrorism, both in approving new projects and in operating existing facilities. However, the likelihood of future attacks of terrorism or sabotage occurring along the proposed loops, or at any of the myriad of natural gas pipeline or energy facilities throughout the United States, is unpredictable given the disparate motives and abilities of terrorist groups. The continuing need to construct facilities to support the future natural gas pipeline infrastructure is not diminished from the threat of any such future acts. Moreover, the unpredictable possibility of such acts does not support a finding that this particular project should not be constructed.

4.13 CUMULATIVE IMPACTS

Cumulative impacts may result when the environmental effects associated with a proposed project are superimposed on, or added to, either temporary (construction related) or permanent (operation related) impacts associated with past, present, or reasonably foreseeable future projects. Although the individual impact of each separate project may be minor, the additive or synergistic effects of multiple projects could be significant.

Existing conditions in the vicinity of the proposed Capacity Replacement Project reflect the extensive changes brought about by long-term human occupancy and use of the project area. For example, native vegetation communities in the project area have been substantially altered from their pre-Euro-American settlement condition by timber harvest, agricultural practices, introduction of non-native species, and commercial/industrial and residential developments, while fisheries have been affected by commercial harvest and physical alteration of rivers and streams used by anadromous species.

Table 4.13-1 lists present or reasonably foreseeable future projects or activities that may cumulatively or additively impact resources that would be affected by construction and operation of the Capacity Replacement Project. Construction schedules of the future projects depend on factors such as economics, funding, and politics. Projects and activities included in this analysis are generally those of comparable magnitude and nature of impact, and are located within the same counties that would be affected by the Capacity Replacement Project. More geographically distant projects are not assessed because their impact would generally be localized and, therefore, would not contribute significantly to cumulative impacts in the proposed project area.

4.13.1 Geology and Soils

The facilities associated with the Capacity Replacement Project are expected to have a temporary impact on near-surface geology and soils. Because these effects would be highly localized and limited primarily to the period of construction, cumulative impacts on geology and soils would only occur if other projects are constructed at the same time and place as the proposed facilities. The construction of several of the projects listed in table 4.13-1 would coincide with the schedule proposed for the Capacity Replacement Project. Projects that require significant excavation or grading such as the Cherry Point Cogeneration Project, various highway widening projects, gravel mine and stone quarry expansion and construction projects, residential subdivisions, and the Napavine Industrial Park development would also have temporary impacts on near-surface geology and soils. The additive impact of the Capacity Replacement Project on most of these projects would be minimal because they would not occur within the same local vicinity; however, the Sumas Loop would cross a portion of South Pass Road where road reconstruction is proposed and would also be located within 0.6 mile of the proposed reconstruction of Siper Road. The anticipated construction dates of these two road projects are not currently known. While there would be the potential for cumulative impacts on geological resources and soils if these projects were constructed concurrently with the Sumas Loop, any cumulative impact on geology and soils would be minimized by the implementation of erosion control and restoration measures during the construction and restoration of the projects. Consequently, any potential cumulative impacts on geological resources and soils would be minor.

TABLE 4.13-1

Existing or Proposed Activities Cumulatively Affecting Resources of Concern for the Capacity Replacement Project

Activity/Project	County	Description	Anticipated Construction Dates
Washington Department of Transportation – State Route 9 Realignment	Whatcom	Construct a new highway alignment from Nooksack Road to Cherry Street.	Begin 2004
Chehalis Power Inc. – BP Cherry Point Cogeneration Project	Whatcom	Construct and operate a 720-megawatt natural gas-fired combined-cycle combustion turbine cogeneration facility.	To be completed Spring 2006
Washington Department of Transportation – BNSF/Saxon Railroad Crossing	Whatcom	Install crossing arms to upgrade the railroad crossing at Saxon Road.	Begin Spring 2005
Washington Department of Transportation – Innis Creek Road	Whatcom	Construct drainage upgrades and a fish passage from Wickersham Street north for 0.3 mile.	Begin Spring 2005
Washington Department of Transportation – Mosquito Lake Road, Middle Fork Bridge #140	Whatcom	Rehabilitate Middle Fork Bridge #140 over the South Fork Nooksack River.	Begin Spring 2007
Washington Department of Transportation – South Pass Road	Whatcom	Reconstruct South Pass Road from Goodwin Road to State Route 547.	NA [a]
Washington Department of Transportation – Siper Road	Whatcom	Reconstruct Siper Road from State Route 9 to Hopewell Road.	NA [a]
Stone Quarry	Whatcom	Proposed expansion of an existing stone quarry	NA [a]
Puget Sound Energy – Baker River Hydroelectric Project	Whatcom, Skagit	Modifications to an impoundment dam for fish passage.	FERC application submitted July 2004; unknown start date
Washington Department of Transportation – Interstate 5 Bridge Replacement	Skagit	Replace low-clearance 2nd Street Bridge.	Begin 2004
Washington Department of Transportation – State Route 9 Widening	Snohomish	Widen State Route 9 by one lane in each direction between State Route 522 and 176th Street SE.	Begin first half of 2005
Washington Department of Transportation – State Route 527 Widening	Snohomish	Widen State Route 527 from two to five lanes between 132nd SE and 112th SE.	Begin first half of 2005
Snohomish County Public Works – Lundeen Park Way Expansion	Snohomish	Expand and widen Lundeen Park Way between State Route 9 and State Route 204.	To be completed late 2005
Snohomish County Public Works – Little Pilchuck Creek Bridge	Snohomish	Replace the 83-foot-long timber bridge over Little Pilchuck Creek on North Machias Road.	Begin late 2005
Snohomish County Parks Department – Puget Park Drive Extension and Willis SD. Tucker Community Park.	Snohomish	Construct a new 84-acre community park and extend Puget Park Drive to provide access to the new park.	Ongoing
Federal Highway Administration, Washington Department of Transportation, Snohomish Public Works, and City of Granite Falls – Granite Falls Alternate Route	Snohomish	Environmental review of alternatives to divert truck traffic away from downtown Granite Falls.	Begin 2007
Planned Subdivision	Snohomish	Subdivide a parcel into four lots.	2005
Emerald Springs Estate-Subdivision	Snohomish	Subdivide a parcel into an 11-lot rural cluster subdivision.	2005
Bikur-Cholim-Machzikay Hadath Congregation – Proposed Cemetery	Snohomish	Proposal for a conditional use permit to develop 12 acres as a cemetery and construct a 120-person capacity chapel.	2006

TABLE 4.13-1 (cont'd)

Existing or Proposed Activities Cumulatively Affecting Resources of Concern for the Capacity Replacement Project

Activity/Project	County	Description	Anticipated Construction Dates
Gravel Pit	Snohomish	Expand an existing gravel pit.	2005
Washington Department Of Transportation – Interstate 5 widening	King	Widen northbound Interstate 5 from eight to nine lanes.	Begin 2004
Washington Department of Transportation – State Route 161 Widening	King	Widen State Route 161 from four to five lanes between Jovita Boulevard and 360th Street.	Begin 2004
Washington Department of Transportation – State Route 167 Improvements	King	Add high occupancy vehicle (HOV) lanes to northbound State Route 167 and HOV bypass lanes to southbound State Route 167.	Begin 2004
King County Wastewater Treatment Division – Brightwater Regional Wastewater Treatment System	King, Snohomish	Construct and operate a sewage treatment plant, conveyance system, and marine outfall.	Complete by 2010
Washington Department of Transportation – Interstate 5 Widening	King	Add an HOV lane in both directions.	Begin first half of 2005
Washington Department of Transportation – State Route 99 Widening	King	Add HOV lanes in both directions near Shoreline Aurora Avenue.	Begin first half of 2005
Washington Department of Transportation – State Route 520 Bridge Replacement and Highway Widening	King	Replace and widen State Route 520 Bridge.	Currently under environmental review; begin first half of 2005
Washington Department of Transportation – Interstate 5, Pacific Avenue to King County Line Fiber Optic Cable	Pierce	Install fiber optic communications cable along northbound Interstate 5 between Pacific Avenue in Tacoma and the King County line.	Begin September 2004; complete by February 2005
Washington Department of Transportation – State Route 16, New Tacoma Narrows Bridge Project	Pierce	Construct a new suspension bridge across the Tacoma Narrows parallel to an existing bridge.	Began 2002; complete by 2007
Washington Department of Transportation – State Route 161 Widening	Pierce	Widen State Route 161 (Meridian Avenue East) between 234th Street E and 204th Street E from two lanes to four lanes with a two-way left turn lane.	Began September 2003; complete by 2005
Washington Department of Transportation – State Route 510 Intersection Realignment	Thurston	Realign the intersection of State Route 510 at She Nah Num Drive.	Began 2004; complete by 2005
Tilley Road Gravel Mine	Thurston	Develop a gravel mine on a 300-acre parcel off of Tilley Road.	Begin 2005
Deschutes River Highlands Subdivision	Thurston	Construct a 327-lot residential subdivision on a 107.4-acre site.	Begin 2006
Napavine Industrial Park	Lewis	Construct a 925-acre industrial park.	Currently under environmental review
Washington Department of Transportation – Widen Interstate 5 from Salmon Creek to Interstate 205	Clark	Construct four additional lanes on Interstate 5 from Northeast 99th to Northeast 134th.	Begin August 2003; complete by spring 2007
Washington Department of Transportation – Interstate 5, Sound Wall Salmon Creek to 129th Street	Clark	Construct a 12-foot-high sound wall along the west side of Interstate 5 from Salmon Creek to NE 129th Street.	Spring 2005

[a] The anticipated construction schedule was not available for this project.

4.13.2 Waterbodies and Wetlands

The loops associated with the Capacity Replacement Project would require the crossing of 146 waterbodies. The proposed project would not involve construction of permanent diversions or dams and, therefore, is expected to have only temporary impacts on surface water quality. Cumulative effects on surface water resources affected by the proposed project would be limited primarily to waterbodies that are affected by other projects located within the same WRIAs as Northwest's facilities. Direct in-stream effects associated with wet open-cut crossings would result in the greatest impact on water resources. Runoff from construction activities near waterbodies could also result in cumulative impacts, although this effect would be relatively minor and would be controlled by implementation of erosion and sediment control measures and by compliance with federal, state, and local requirements. Several of the projects listed in table 4.13-1 are located within the WRIAs crossed by the Capacity Replacement Project, and some of these projects (e.g., the Innis Creek Road fish passage, the Middle Fork Bridge #140 rehabilitation, the Baker River Hydroelectric Project, the Little Pilchuck Creek Bridge Replacement Project, and the New Tacoma Narrows Bridge Project) would likely involve direct in-stream impacts. However, water quality impacts resulting from construction of the proposed loops would be temporary until restoration was completed. The geographic extent and duration of disturbances caused by construction of the Capacity Replacement Project would be minimal and further minimized by the implementation of the January 17, 2003 version of the FERC staff's Procedures and Northwest's project-specific ECR Plan. Therefore, the collective effects of these projects on surface water resources are expected to be minor.

There would be a permanent loss of some existing wetlands as a result of constructing and operating the proposed Capacity Replacement Project and the other reasonably foreseeable future projects. Specifically, the Cherry Point Cogeneration Project and the gravel mine construction project would impact wetlands, and it is likely that one or more of the highway widening projects would result in the permanent loss of wetland resources. However, some of the projects (including the Capacity Replacement Project) would require, by the terms and conditions of their respective COE and WDOE permits, compensatory mitigation for temporary and permanent wetland impacts. In the recent past, similar projects have been required to create new wetland habitat in the western Washington area. Therefore, although construction and operation of the Capacity Replacement Project along with the other potential projects and activities would result in a reduction in the amount of existing wetlands in the vicinity, the creation of new wetlands and the enhancement of existing wetlands as required by the COE and the WDOE are anticipated to result in a net increase in the regional wetland resources.

4.13.3 Vegetation and Wildlife

When projects are constructed at the same time or close to the same time, they would have a cumulative impact on vegetation and wildlife occurring in the area where the projects would be built. Right-of-way clearing and grading and other construction activities associated with the Capacity Replacement Project along with other construction projects, including the Cherry Point Cogeneration Project, various highway widening projects, gravel mine and stone quarry expansion and construction projects, residential subdivisions, and the Napavine Industrial Park would result in the removal of vegetation; alteration of wildlife habitat; displacement of wildlife; and other secondary effects such as increased population stress, predation, and establishment of invasive plant species. These effects would be greatest where other projects are constructed within the same time frame and area as the proposed project. However, current agricultural and development activities occurring in the project area have substantially altered the vegetative landscape. The cumulative impact of the proposed project on vegetation in the area would be minimal because most of the vegetation cover types crossed by the loops would be allowed to return to preconstruction conditions.

While these projects could potentially fragment vegetation habitat, this effect would be minimal because many of the proposed projects are road improvement projects that, similar to the Capacity Replacement Project, would primarily occur within existing rights-of-way. In addition, fragmentation resulting from the proposed project would be minimal because the majority of the proposed loops would cross vegetation cover types that would be allowed to return to pre-existing conditions. All of the projects would implement mitigation measures designed to minimize the potential for long-term erosion, increase the stability of site conditions, and in many cases control the spread of noxious weeds, thereby minimizing the degree and duration of the cumulative impacts of these projects.

Construction of the Capacity Replacement Project at the same time as other projects listed in table 4.13-1 that would affect waterbodies could cause cumulative impacts on aquatic resources within the project area including coldwater anadromous fisheries, waterbodies designated as EFH, and areas with tribal usual and accustomed uses. The geographic extent and duration of disturbances caused by construction of the Capacity Replacement Project would be minimal and further minimized by the implementation of the January 17, 2003 version of the FERC staff's Procedures and Northwest's project-specific ECR Plan. Additionally, the Capacity Replacement Project and the other projects listed in table 4.13-1 that would involve direct in-stream impacts (e.g., the Innis Creek Road fish passage, the Middle Fork Bridge #140 rehabilitation, the Baker River Hydroelectric Project, the Little Pilchuck Creek Bridge Replacement Project, and the New Tacoma Narrows Bridge Project) on anadromous fisheries and other waterbodies designated as EFH would be required to obtain permits from the COE, the WDFW, the WDOE, and consult with NOAA Fisheries and the FWS. These agencies would require measures to mitigate impacts on aquatic resources. In addition, certain projects such as the modifications to the impoundment dam for fish passage associated with the Baker River Hydroelectric Project and construction of a fish passage at Innis Creek Road would have beneficial impacts on aquatic resources.

Animal and plant species that are federally and/or state-listed threatened and endangered species and their critical habitat would be affected by the Capacity Replacement Project. Cumulative impacts on these species could result if other foreseeable future projects would also affect the same species or their habitats. However, conservation measures would likely be required for each of these projects by the jurisdictional agencies to minimize potential impacts on federally and state-listed species. Additionally, conservation measures may be recommended for candidate species and species of concern. Conservation measures would be project specific and would be expected to reduce impacts such that the projects would not adversely affect special status species or would not jeopardize the continued existence of a species or cause the adverse modification of critical habitat.

4.13.4 Land Use, Recreation and Special Interest Areas, and Visual Resources

The proposed project and several other foreseeable future projects would result in both temporary and permanent changes to current land uses. Much of the land that would be disturbed by construction is presently either developed or agricultural land. The pipeline facilities associated with the Capacity Replacement Project would temporarily disturb about 1,024.1 acres of land of which 54 percent would be developed land, 20 percent would be agricultural land, 14 percent would be open land, 12 percent would be forest land, and less than 1 percent would be open water. The Cherry Point Cogeneration Project and the various road improvement, development, and mining projects listed in table 4.13-1 would disturb hundreds of additional acres of land affecting a variety of land uses. While most of these projects would have permanent impacts on land uses, the majority of land use impacts associated with the Capacity Replacement Project would be temporary, as most land uses would be allowed to revert to prior uses following construction. In addition, 93 percent of the proposed loops would be constructed within Northwest's existing right-of-way and would not require any additional permanent right-of-way for operation. Permanent impacts on land use would be small because only 1.5 acres of additional land would be required for the operation of aboveground facilities.

The proposed project, if built at the same time as other foreseeable future projects, could result in cumulative impacts on recreational or special interest areas if these projects would affect the same area or feature (e.g., trails) at the same time. However, because the Capacity Replacement Project would be constructed primarily within an existing right-of-way and would not substantially affect the current land uses, most project-related impacts would be short term, often lasting only for the duration of construction through that area, after which the area would be restored to its preconstruction condition.

The visual character of the existing landscape is defined by historic and current land uses such as agricultural, recreation, conservation, and development. The visual qualities of the landscape are further influenced by existing linear installations such as highways, railroads, pipelines, and electrical transmission and distribution lines. Within this context, the proposed MLVs and other aboveground facilities would have the most visual impact, while the pipeline portion of the proposed project would be visually subordinate to the existing landscape character and would contribute only incrementally to overall visual conditions, particularly after completion of reclamation and the reestablishment of vegetation in 3 to 5 years. However, the impact would be greater in forested areas where it would take many years to regenerate mature trees. Of the projects listed in table 4.13-1, the Cherry Point Cogeneration Project, the gravel mines and stone quarry, the Napavine Industrial Park, and the residential subdivisions would have the most impact on visual resources in the area. Because 99 percent of the proposed loops would be located within or adjacent to Northwest's existing right-of-way, their visual impact would be minimal. Additionally, only minor aboveground facilities are proposed (primarily MLVs), the majority of which would be collocated with existing facilities. This collocation would lessen the visual impact of the aboveground facilities because their presence would be consistent with the current viewshed in the area. The aboveground facilities that would not be collocated with existing facilities would be painted to match the surrounding landscape. Therefore, the proposed project would not significantly contribute to cumulative effects on visual resources.

4.13.5 Socioeconomics

Present and reasonably foreseeable future projects and activities could cumulatively impact socioeconomic conditions in the project area. Employment, housing, infrastructure, and public services could experience both beneficial and detrimental impacts. No environmental justice issues have been identified.

Economy and Employment

The projects considered in this section would have cumulative effects on employment during construction if more than one project is built at the same time. The Capacity Replacement Project expects to employ up to 1,535 workers during the peak construction months. Northwest estimates that 30 percent of its construction workforce would be local hires. If the larger projects, such as the major road widening and development projects, are built simultaneously, the demand for workers could exceed the local supply of appropriately skilled labor. The eight-county area affected by the project has a civilian labor force of about 2,230,030 people and an average unemployment rate of 6.5 percent. This suggests that the local labor force could meet some of the employment needs induced by construction of these projects, although it is unknown whether a sufficient number of these unemployed persons have the necessary skills to work on these projects. Therefore, if these projects are constructed at the same time, the demand for local workers may exceed supply. It is assumed that the remainder of the employment positions would be filled by non-local hires. Because Northwest currently operates pipeline facilities in the area, permanent employment would not be expected to increase.

In addition to impacts on local employment, these projects would provide an increase in tax revenue for the State of Washington, the counties, and other local economies through the payment of payroll tax, sales tax, property tax, and other taxes and fees. As discussed in section 4.9.6, the estimated payroll for the proposed Capacity Replacement Project would be $89 million during the construction phase and the annual ad valorem and property taxes are anticipated to be $3.2 million. A similar net increase in payroll and tax revenues could be expected from the other projects listed in table 4.13-1. Cumulatively, these projects would have both short- and long-term beneficial impacts on state, county, and local economies.

Temporary Housing

Temporary housing for the construction workers would be needed for the portion of the workforce not drawn from the local area. For the proposed Capacity Replacement Project, it is estimated that a maximum of 1,075 housing units would be needed per month to accommodate the non-resident construction workforce. Given the vacancy rates, the number of rental housing units in the area, and the number of hotel/motel rooms and campgrounds available in the cities and towns in the vicinity of the project, construction crews should not encounter difficulty in finding temporary housing. If construction occurs concurrently with other projects, temporary housing would still be available but may be slightly more difficult to find and/or more expensive to secure. Regardless, these effects would be temporary, lasting only for the duration of construction, and there would be no long-term cumulative effect on housing.

Public Services

The cumulative impact of the Capacity Replacement Project and the other projects listed in table 4.13-1 on infrastructure and public services would depend on the number of projects under construction at one time. The small incremental demands of several projects occurring at the same time could become difficult for police, fire, and emergency service personnel to address. This problem would be temporary, occur only for the length of construction, and could be mitigated by the various project sponsors providing their own personnel to augment the local capability or by providing additional funds or training for local personnel. No long-term cumulative effect on infrastructure and public services is anticipated.

Transportation and Traffic

Where installation of the proposed loops occurs at road crossings, road traffic could be temporarily disrupted or delayed. The transportation system in the eight counties where the proposed facilities would be constructed or abandoned is well developed. Cumulative impacts on traffic congestion in the project area could result if several projects are being constructed at once. However, with the exception of the South Pass Road and Siper Road projects, most of the projects listed in table 4.13-1 are not located within the immediate vicinity of the loops and workers associated with the Capacity Replacement Project would commute to and from the pipe storage and contractor yards or the compressor stations during off-peak traffic hours (e.g., before 7:00 AM and after 7:00 PM). Workers would then be transported from the pipe storage and contractor yards to the construction site in buses provided by the contractor. Moreover, it is unlikely that each project would reach peak traffic conditions simultaneously; therefore, potential cumulative impacts on traffic from construction are expected to be temporary and short term. Once construction of the proposed loops is complete, there would be no impacts on traffic from operation or maintenance of the facilities.

4.13.6 Cultural Resources

Past disturbances to cultural resources in the project area have been related to agricultural practices; intentional destruction or vandalism; and construction and maintenance operations associated with existing roads, railroads, utility lines, and Northwest's existing 26-inch- and 30-inch-diameter pipelines. The currently proposed projects listed in table 4.13-1 that are defined as federal actions would include mitigation measures designed to avoid or minimize additional direct impacts on cultural resources. Where direct impacts on significant cultural resources are unavoidable, mitigation (e.g., recovery and curation of materials) would occur before construction. Non-federal actions would need to comply with any mitigation measures required by the state. Increased access by rights-of-way and service roads would increase the potential for trespass or vandalism at previously inaccessible sites. The proposed loops would only incrementally add to the effects of the other projects on cultural resources in the area.

4.13.7 Air Quality and Noise

Construction of most of the reasonably foreseeable future projects and activities listed in table 4.13-1 would involve the use of heavy equipment that would produce noise, air contaminants, and dust. Operation of the modified compressor stations associated with the Capacity Replacement Project would contribute cumulatively to both air quality and noise. These effects could add to the ongoing air and noise impacts in the project area. The majority of these effects would be mitigated by the large eight-county geographical area over which the various projects are located. Noise impacts are particularly localized and attenuate quickly as the distance from the noise source increases. Therefore, cumulative noise impacts associated with construction and operation would be unlikely. Air impacts, although less localized than noise impacts, would also tend to be regional and confined primarily to the airsheds in which the projects occur. Cumulative impact on air quality, therefore, would be limited primarily to areas where more than one project is proposed within the same airshed. Because the projects listed in table 4.13-1 are located over a large area; have varying construction schedules; and must adhere to federal, state, and local regulations for the protection of ambient air quality, cumulative impacts on air quality are not anticipated.

4.13.8 Reliability and Safety

Impact on reliability and public safety would be mitigated through the use of the DOT Minimum Federal Safety Standards in Title 49 CFR Part 192, which are intended to protect the public and to prevent natural gas facility accidents and failures. No cumulative impacts would be anticipated to occur.

4.13.9 Conclusion

The majority of cumulative impacts would be temporary and minor. Long-term cumulative benefits would be realized from the creation of new wetlands and a boost to the local economy associated with tax revenues. Short-term cumulative benefits would also be realized through jobs and wages and purchases of goods and materials.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF THE STAFF'S ENVIRONMENTAL ANALYSIS

The conclusions and recommendations presented in this section are those of the environmental staff of the FERC. These conclusions and recommendations are based on input from the COE and the WDOE as cooperating agencies in the preparation of this EIS. However, the COE and the WDOE will present their own conclusions and recommendations as part of their permit decisions.

The FERC staff has determined that construction and operation of the Capacity Replacement Project and the associated abandonment activities would result in limited adverse environmental impacts. These limited impacts would be most significant during the period of construction. This determination is based on a review of the information provided by Northwest and further developed from data requests; field investigations; scoping; literature research; alternatives analysis; and contacts with federal, tribal, state, and local agencies, and individual members of the public. The FERC staff has concluded that if the project is constructed and operated in accordance with applicable laws and regulations, Northwest's proposed mitigation, and the FERC staff's additional mitigation recommendations, it would be an environmentally acceptable action. Although many factors were considered in this determination, the principal reasons are:

- 99 percent of the proposed loops would be within or adjacent to Northwest's existing right-of-way and 93 percent of the proposed loops would be within Northwest's existing permanent easement;

- Northwest would abandon the existing 26-inch-diameter pipeline in place in the locations along the non-looped portions of its system, which would eliminate disturbance to 188.5 miles of the right-of-way with the exception of the activities that would occur to isolate the 26-inch-diameter pipeline from other system components;

- Northwest would submit a "federal consistency certification" to the WDOE certifying that the project is consistent with the Washington CZMP;

- the project would be consistent with or in conformance with all identified comprehensive plans and critical areas ordinances;

- Northwest would implement the FERC staff's Plan and Procedures, its ECR Plan, SPCC Plan, HDD Plan, *Groundwater Monitoring and Mitigation Plan*, and *Residential Area Work Plan for the Deer Park Subdivision* to protect natural resources and residential areas during construction and operation of the project;

- use of the HDD method would avoid disturbances to the beds and banks of the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers and associated wetlands/riparian areas. If the HDD method fails and the alternative wet open-cut method were used to cross these waterbodies, the short-term impact of a wet open-cut crossing would be environmentally acceptable;

- Northwest would implement approved waterbody and wetland mitigation plans to compensate for unavoidable stream and wetland impacts;

- the appropriate consultations with the FWS, NOAA Fisheries, the SHPO, Fort Lewis, and Native American tribes, and any appropriate compliance actions resulting from these consultations, would be completed before Northwest would be allowed to begin construction in any given area; and

- an environmental inspection program would ensure compliance with all mitigation measures that become conditions of certification.

In addition, the FERC staff developed specific mitigation measures to further reduce the environmental impact that would otherwise result from construction of the project. The FERC staff is recommending that these mitigation measures be attached as conditions to any authorization issued by the Commission. These mitigation measures are presented in section 5.4.

5.2 ALTERNATIVES CONSIDERED

The No Action or Postponed Action Alternative was considered. If the FERC were to deny or postpone action on Northwest's application, Northwest would not be able to comply with the DOT's CAO unless it were to replace the entire existing 26-inch-diameter pipeline with a new 26-inch-diameter pipeline according to the phased schedule outlined in the CAO. The entire 26-inch-diameter pipeline could be replaced without obtaining a FERC Certificate if Northwest were to either phase its construction into multiple, small projects that would remain within the provisions of the FERC's section 2.55 regulations or replace the entire 268 miles under those provisions.

However, if Northwest were to replace the 26-inch-diameter pipeline under the FERC's section 2.55 regulations, it would still need to obtain other federal, state, and local approvals. The cumulative environmental impact of a phased replacement of the entire 268 miles of 26-inch-diameter pipeline over a 10-year period would be greater than the impact of the 79.5-mile-long Capacity Replacement Project because it would involve more than three times the length of right-of-way and would be constructed in more than 1 year. Therefore, the likely outcome of the FERC, the COE, and the WDOE denying or postponing action on Northwest's applications for the Capacity Replacement Project would be the replacement of the entire 26-inch-diameter pipeline causing greater environmental impacts. Alternatively, if Northwest were to abandon the 26-inch-diameter pipeline without replacing its capacity, Northwest would not be able to meet its contractual obligations and Washington would lose a significant amount of its natural gas supply.

Northwest is currently the sole provider of interstate natural gas in the Interstate 5 corridor in western Washington. If Northwest could not meet its delivery contracts, its customers would likely seek natural gas from other sources. This could necessitate the construction of additional and/or new pipeline facilities in other locations (system alternatives) to transport natural gas to the markets Northwest serves. If other new natural gas pipeline facilities are approved and constructed, each project would result in specific environmental impacts that could be less than, similar to, or greater than those associated with the current proposal.

An insufficient supply of natural gas could cause many of Northwest's customers to use other fossil fuels, such as coal or oil, for its energy supplies. Compared to other fossil fuels, natural gas is a relatively clean and efficient fuel. Combustion of fuels, such as oil or coal, can generate 60 to 110 percent more CO_2 than natural gas. Other emissions from oil or coal combustion, including greenhouse gases, are also significantly higher than those from natural gas. The use of other fossil fuels in place of natural gas would not only increase atmospheric pollution, but would also result in secondary impacts associated with production (e.g., coal mining and oil drilling), transportation (e.g., oil tankers, rail cars, and pipelines), and refining.

Alternatives involving the use of other existing pipeline systems were evaluated. However, because Northwest is the sole provider of interstate natural gas in the western Washington area, there are no other companies or existing systems that could meet Northwest's contractual delivery requirements without constructing significant new transmission facilities.

Northwest system alternatives including new pipeline corridor alternatives and alternative configurations of the Northwest system were evaluated. Because of the significant advantages afforded by collocating with Northwest's existing corridor, the FERC staff eliminated an alternative using a new pipeline corridor from further consideration.

Alternative configurations of the Northwest system evaluated included permanently returning the existing 26-inch-diameter pipeline to service, like-kind replacement of the 26-inch-diameter pipeline, a pipeline looping-only alternative, compression-only alternatives, alternative pipeline sizes, alternative pipeline loop locations, replacement of the 26-inch-diameter pipeline with the 36-inch-diameter loop in the same trench, use of the existing 30-inch-diameter pipeline, inserting a liner or smaller pipe inside the existing 26-inch-diameter pipeline, and a no turn back capacity alternative. These alternatives were found to either be infeasible or not environmentally preferable to the proposed action.

Northwest's standard design calls for installation of the new loops at a 20-foot offset to the east of the existing 30-inch-diameter pipeline. Several non-standard parallel offsets and three minor route variations from the existing 30-inch-diameter pipeline that are proposed by Northwest were analyzed to determine whether they would be environmentally preferable to a route adjacent to Northwest's existing 30-inch-diameter pipeline. All of these offsets and minor route variations were determined to be warranted and environmentally acceptable.

As part of the Capacity Replacement Project, Northwest has proposed to retain as much of the existing 26-inch-diameter pipeline in place as possible for potential future use. Because removing the 26-inch-diameter pipeline in the 188.5-mile-long unlooped portion of Northwest's existing 268-mile-long system would result in significant environmental impact, it was not determined to be environmentally preferable to abandoning the existing 26-inch-diameter pipeline in place.

Alternative construction methods were also evaluated, including the use of an HDD to avoid residential impacts on the Deer Park Subdivision on the Snohomish Loop. This alternative was not found to be a technically feasible or environmentally preferable alternative to the proposed action.

The use of the wet open-cut method at the North Fork Nooksack River, North Fork Stillaguamish River, and South Fork Stillaguamish River was evaluated in the event the proposed HDD crossings fail. The use of the aerial span method at Pilchuck Creek and the Nisqually River was evaluated in the event Northwest is not able to obtain permits to use the proposed wet open-cut crossing method at these two waterbodies. Northwest has filed site-specific crossing plans for the proposed and alternative crossing methods for the North Fork Nooksack River, Pilchuck Creek, North Fork Stillaguamish River, South Fork Stillaguamish River, and the Nisqually River. The FERC staff has reviewed these plans and generally finds them to be acceptable. However, Northwest is still in the process of consulting with other federal and state agencies and applicable Native American tribes to finalize its site-specific crossing plans and specific mitigation requirements. The FERC staff has recommended that Northwest continue to consult with the COE, the FWS, NOAA Fisheries, the WDOE, the WDFW, other applicable agencies, and appropriate Native American tribes to finalize its site-specific crossing plans and prepare a conceptual waterbody crossing mitigation plan for analysis in the final EIS.

5.3 IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES; SHORT- AND LONG-TERM USES OF THE ENVIRONMENT

The major nonrenewable resources that would be consumed by the proposed project are fossil fuels used to power construction vehicles and, over the life of the project, the pipeline itself. Theoretically, the pipeline components could be reclaimed at the end of the pipeline's operational life. However, there would be a number of irretrievable resources committed to the proposal if the necessary authorizations are granted. The primary resources irretrievably lost would include the following:

- soils (water and wind erosion could occur in disturbed areas);
- crop production (crops are generally lost or reduced for one season; however, in the case of orchards and tree plantations, the impacts would be permanent because the crop would be restricted from growing over the permanent easement);
- land use (aboveground facilities and permanent access roads would replace grassland/herbaceous, shrubland, deciduous forest, and landscape cover types for the life of the project);
- special status species (mortalities could occur during construction, and right-of-way maintenance activities would result in the permanent loss of forest habitat);
- vegetation (right-of-way maintenance activities would result in the permanent conversion of forest, riparian, and shrubland cover types);
- visual resources (the loss of forest vegetation, the presence of aboveground facilities, and aerial spans across waterbodies would permanently affect viewsheds);
- wildlife habitat (right-of-way maintenance activities would result in the permanent loss of forest, riparian, and shrubland habitats);
- wetlands (right-of-way maintenance would result in the permanent conversion of forested and scrub-shrub wetland types, and the construction of aboveground facilities would result in permanent fill placed in wetlands); and
- the loss of cultural resources also would be irretrievable, if allowed to occur.

The project would transport significant volumes of natural gas to customers in Washington. Its operation would be consistent with federal policies encouraging competitive natural gas transportation services. For these reasons, the FERC staff considers the irreversible and irretrievable resource commitments to be acceptable.

5.4 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission authorizes the Capacity Replacement Project, the FERC staff recommends that the following measures be included as specific conditions in the Commission's Order. The FERC staff believes that these measures would further mitigate the environmental impacts associated with the construction and operation of the proposed project.

1. Northwest Pipeline Corporation (Northwest) shall follow the construction procedures and mitigation measures described in its applications, supplemental filings (including responses to

staff data requests), and as identified in the environmental impact statement (EIS), unless modified by this Order. Northwest must:

a. request any modification to these procedures, measures, or conditions in a filing with the Secretary of the Commission (Secretary);
b. justify each modification relative to site-specific conditions;
c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
d. receive approval in writing from the Director of the Office of Energy Projects (OEP) **before using that modification**.

2. The Director of OEP has delegation authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the project. This authority shall allow:

   a. the modification of conditions of this Order; and
   b. the design and implementation of any additional measures deemed necessary (including stop work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from project construction and operation.

3. **Prior to any construction,** Northwest shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, environmental inspectors (EIs), and contractor personnel will be informed of the EI's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs before becoming involved with construction and restoration activities.

4. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets and shall include the staff's recommended facility locations, if any. **As soon as they are available, and before the start of construction,** Northwest shall file with the Secretary revised detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by this Order. All requests for modifications of environmental conditions of this Order or site-specific clearances must be written and must reference locations designated on these alignment maps/sheets.

   Northwest's exercise of eminent domain authority granted under Natural Gas Act (NGA) section 7(h) in any condemnation proceedings related to this Order must be consistent with these authorized facilities and locations. Northwest's right of eminent domain granted under NGA section 7(h) does not authorize it to increase the size of its natural gas pipeline to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

5. Northwest shall file with the Secretary detailed alignment maps/sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall

be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area**.

This requirement does not apply to extra workspace allowed by the *Upland Erosion Control, Revegetation, and Maintenance Plan* or minor field realignments per landowner needs and requirements that do not affect other landowners or sensitive environmental areas such as wetlands.

Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

a. implementation of cultural resources mitigation measures;
b. implementation of endangered, threatened, or special concern species mitigation measures;
c. recommendations by state regulatory authorities; and
d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

6. **At least 60 days before the anticipated start of construction,** Northwest shall file an initial Implementation Plan with the Secretary for the review and written approval of the Director of OEP describing how Northwest will implement the mitigation measures required by this Order. Northwest must file revisions to the plan as schedules change. The plan shall identify:

   a. how Northwest will incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
   b. the number of EIs assigned per spread and aboveground facility site, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;
   c. company personnel, including EIs and contractors, who will receive copies of the appropriate materials;
   d. what training and instructions Northwest will give to all personnel involved with construction and restoration (initial and refresher training as the project progresses and personnel change), with the opportunity for OEP staff to participate in the training session(s);
   e. the company personnel (if known) and specific portion of Northwest's organization having responsibility for compliance;
   f. the procedures (including use of contract penalties) Northwest will follow if noncompliance occurs; and
   g. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

      i. the completion of all required surveys and reports;
      ii. the mitigation training of onsite personnel;
      iii. the start of construction; and
      iv. the start and completion of restoration.

7. The Implementation Plan shall specify the individuals selected for the EI positions and include their qualifications and experience. If the Director of OEP finds that the environmental inspection plan is not sufficient, the Director will either require a change in the number of EIs or

individual personnel, or require that Northwest implement a Third-Party Compliance Monitoring Program for the project.

8. Northwest shall file updated status reports with the Secretary on a **weekly** basis **until** all construction-related activities, including restoration, are complete. These status reports shall also be provided to the U.S. Army Corps of Engineers (COE), the Washington State Department of Ecology (WDOE), and other federal and state agencies with permitting responsibilities upon request. Status reports shall include:

   a. the current construction status of each spread, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;
   b. a listing of all problems encountered and each instance of noncompliance observed by the EI(s) during the reporting period (both for the conditions imposed by the FERC and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);
   c. corrective actions implemented in response to all instances of noncompliance, and their cost;
   d. the effectiveness of all corrective actions implemented;
   e. a description of any landowner/resident complaints that may relate to compliance with the requirements of this Order, and the measures taken to satisfy their concerns; and
   f. copies of any correspondence received by Northwest from other federal, state, or local permitting agencies concerning instances of noncompliance, and Northwest's response.

9. Northwest must receive written authorization from the Director of OEP **before commencing** service for each component of the project. Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way is proceeding satisfactorily.

10. **Within 30 days of placing the certificated facilities in service,** Northwest shall file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or
    b. identifying which of the Certificate conditions Northwest has complied with or will comply with. This statement shall also identify any areas along the right-of-way where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

11. Northwest shall prepare a revised *Erosion Control and Revegetation Plan* (ECR Plan) that includes the following tasks in the list of EI responsibilities or specifies an alternative representative of Northwest's organization that would be assigned responsibility for each task:

    a. implementing a soil sampling protocol when contaminated soils are discovered, including conducting soil samples and preparing samples for laboratory analysis or being responsible for overseeing specialists to conduct the samples and prepare them for analysis;
    b. determining the adequacy of Northwest's proposed topsoil segregation method in wetlands;
    c. notifying agencies of permit violations or when permit requirements need to be altered due to field conditions;

d. maintaining an "Environmental Agency Complaint Line" and publicizing it to agencies; and

f. providing credentials of the EI to appropriate state environmental agencies.

Northwest shall file the revised ECR Plan with the Secretary for the review and written approval of the Director of OEP **before construction**.

12. Northwest shall revise its Landowner Complaint Resolution Procedure to outline procedures for landowners to contact a Northwest representative between the hours of 7:00 AM and 7:00 PM each day that construction would occur. The revised Landowner Complaint Resolution Procedure shall be filed with the Secretary for the review and written approval of the Director of OEP **before construction**.

13. Northwest shall file a revised ECR Plan that incorporates the FERC staff's stipulations regarding the variances in table 4.2.2-1 of the EIS with the Secretary for the review and written approval of the Director of OEP **before construction**.

14. Northwest shall consult with the WDOE and prepare a plan for the discovery and management of contaminated soils, sediments, and groundwater. The plan shall include specific protocols for the testing, handling, and reporting of pre-existing contaminated soils, sediments, and groundwater encountered during construction as well as the contact names and telephone numbers of appropriate state and local agency personnel. The plan shall be filed with the Secretary **before construction**.

15. **Before construction**, Northwest shall file with the Secretary and the WDOE the location of all wells and springs within 200 feet of the construction work area.

16. Northwest shall continue to consult with the COE; the U.S. Fish and Wildlife Service (FWS); U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries); the WDOE; the Washington Department of Fish and Wildlife; other applicable agencies; and appropriate Native American tribes to finalize its site-specific waterbody crossing plans and prepare a conceptual waterbody crossing mitigation plan. This plan shall include details regarding the amount, location, and types of mitigation proposed. Northwest shall file any revised site-specific crossing plans and the conceptual waterbody crossing mitigation plan **before the end of the draft EIS comment period** for review and analysis in the final EIS.

17. Northwest shall continue to consult with the COE, the WDOE, and other applicable agencies on wetland mitigation requirements to finalize a conceptual compensatory wetland mitigation plan. The plan shall include details regarding the amount, location, and types of mitigation proposed; specific performance standards to measure the success of the mitigation; and remedial measures, as necessary, to ensure that compensatory mitigation is successful. Northwest shall file the conceptual compensatory wetland mitigation plan **before the end of the draft EIS comment period** for review and analysis in the final EIS.

18. Northwest shall consult with noxious weed control boards in each of the counties crossed by the loops to develop a *Noxious Weed Control Plan* that includes a list of the noxious weed species that would be surveyed for and treated during construction and operation. The *Noxious Weed Control Plan* shall also include measures, developed in consultation with the noxious weed control boards, to prevent the spread of weed propagules during construction and to control weed infestations that develop after construction. This plan shall be incorporated into the ECR Plan.

Documentation of the noxious weed control boards' approval of the *Noxious Weed Control Plan* and an updated ECR Plan shall be filed with the Secretary **before construction**.

19. Northwest shall file with the Secretary for the review and written approval of the Director of OEP a copy of the final compensatory mitigation plan for northern spotted owl critical habitat and documentation of FWS and Fort Lewis Military Reservation (Fort Lewis) concurrence with the plan **before construction of the Fort Lewis Loop**.

20. Northwest shall coordinate with the FWS to determine whether nest surveys for the streaked horned lark should be conducted before construction and, if nests are present, to identify appropriate conservation measures to minimize impacts on the species. Documentation of Northwest's discussions with the FWS and the outcome of those discussions shall be filed with the Secretary **before construction**.

21. Northwest shall not begin construction activities **until**:

    a. Northwest completes any outstanding species-specific surveys and the FERC receives comments from the FWS and NOAA Fisheries regarding the preconstruction survey reports;
    b. the FERC completes formal consultation with the FWS and NOAA Fisheries; and
    c. Northwest receives written notification from the Director of OEP that construction and/or implementation of conservation measures may begin.

22. Northwest shall file with the Secretary the specific locations where Northwest would expand its existing permanent easement to 75 feet. For each area, the request shall include documentation of landowner approval. Each area must be approved in writing by the Director of OEP **before construction in that area.**

23. **Before construction**, Northwest shall file with the Secretary for the review and written approval of the Director of OEP revised site-specific residential construction mitigation plans depicting the individual locations of large specimen trees and other landscaping that would be removed during construction activities within 50 feet of residences and all private water wells and septic systems associated with these residences.

24. Northwest shall paint all aboveground piping surfaces and structures associated with the non-collocated pig receivers at mileposts (MP) 1461.8 and 1408.8 and the mainline valves at MPs 1467.9, 1461.8, and 1408.8 to blend with the surrounding landscape.

25. Northwest shall defer implementation of any treatment plans/mitigation measures (including archaeological data recovery), construction of facilities, and use of all staging, storage, or temporary work areas and new or to-be-improved access roads **until**:

    a. Northwest files with the Secretary and the Washington State Historic Preservation Office (SHPO), and consults with the COE, Fort Lewis, and Native American tribes as applicable, all additional cultural resources survey and evaluation reports and any necessary treatment plans;
    b. Northwest files the comments of the SHPO, the COE, Fort Lewis, and Native American tribes as applicable on all cultural resources survey reports and plans; and
    c. the Director of OEP reviews all cultural resources survey reports and plans, and notifies Northwest in writing that treatment plans/mitigation measures may be implemented or construction may proceed.

All material filed with the Commission containing **location, character, and ownership information** about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: **"CONTAINS PRIVILEGED INFORMATION - DO NOT RELEASE."**

26. Northwest shall make all reasonable efforts to assure its predicted noise levels from the Chehalis and Washougal Compressor Stations are not exceeded at nearby noise-sensitive areas (NSAs) and shall file noise surveys showing this with the Secretary **no later than 60 days** after placing the modified compressor stations into service. However, if the noise attributable to the operation of either compressor station at full load exceeds the day-night equivalent sound level of 55 decibels of the A-weighted scale at any nearby NSA, Northwest shall file a report on what changes are needed and shall install additional noise controls to meet that level **within 1 year** of the in-service date. Northwest shall confirm compliance with this requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls.