Federal Energy Regulatory Commission

Office of
Energy Projects

February 2018

Northwest Pipeline LLC

Docket Nos. CP17-441-000
and CP17-441-001

North Seattle Lateral Upgrade Project

Environmental Assessment

Washington, DC 20426

On the Cover:

This photograph was taken looking east along the right-of-way at approximate milepost 5.8.

FEDERAL ENERGY REGULATORY COMMISSION

WASHINGTON, D.C. 20426

OFFICE OF ENERGY PROJECTS

In Reply Refer To:
OEP/DG2E/Gas Branch 4
Northwest Pipeline LLC
North Seattle Lateral Upgrade Project
Docket Nos. CP17-441-000
and CP17-441-001

TO THE PARTY ADDRESSED:

The staff of the Federal Energy Regulatory Commission (FERC or Commission) has prepared an environmental assessment (EA) for the North Seattle Lateral Upgrade Project (Project), proposed by Northwest Pipeline LLC (Northwest) in the above-referenced docket. Northwest requests authorization to upgrade 5.9 miles of natural gas pipeline from 8- to 20-inch-diameter in Snohomish County, Washington. The North Seattle Lateral Upgrade Project would provide capacity for an additional 159,299 dekatherms of natural gas per day to markets in the Seattle area.

The EA assesses the potential environmental effects of the construction and operation of the Project in accordance with the requirements of the National Environmental Policy Act. The FERC staff concludes that approval of the proposed Project, with appropriate mitigating measures, would not constitute a major federal action significantly affecting the quality of the human environment.

The North Seattle Lateral Upgrade Project would consist of the following facilities:

- replace 5.9-miles of 8-inch-diameter pipeline with 20-inch-diameter pipeline;
- relocate and replace 0.17 mile of 16-inch-diameter pipeline;
- rebuild the existing North Seattle/Everett meter station in order to accommodate the increased delivery capacity of the North Seattle Lateral;
- relocate an existing 8-inch pig launcher and a 20-inch pig receiver[1]; and
- replace an existing 8-inch mainline valve with a 20-inch valve.

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[1] A "pig" is a tool that the pipeline company inserts into and pushes through the pipeline for cleaning the pipeline, conducting internal inspections, or other purposes.

The FERC staff mailed copies of the EA to federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; potentially affected landowners and other interested individuals and groups; and newspapers and libraries in the Project area.

In addition, the EA is available for public viewing on the FERC's website (www.ferc.gov) using the eLibrary link. A limited number of copies of the EA are available for distribution and public inspection at:

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

Any person wishing to comment on the EA may do so. Your comments should focus on the potential environmental effects, reasonable alternatives, and measures to avoid or lessen environmental impacts. The more specific your comments, the more useful they will be. To ensure that the Commission has the opportunity to consider your comments prior to making its decision on this Project, it is important that we receive your comments in Washington, DC **on or before March 13, 2018.**

For your convenience, there are three methods you can use to file your comments with the Commission. In all instances please reference the Project docket numbers CP17-441-000 and CP17-441-001 with your submission. The Commission encourages electronic filing of comments and has expert staff available to assist you at (202) 502-8258 or FercOnlineSupport@ferc.gov.

(1) You can file your comments electronically using the eComment feature located on the Commission's website (www.ferc.gov) under the link to Documents and Filings. This is an easy method for submitting brief, text-only comments on a Project;

(2) You can also file your comments electronically using the eFiling feature on the Commission's website (www.ferc.gov) under the link to Documents and Filings. With eFiling, you can provide comments in a variety of formats by attaching them as a file with your submission. New eFiling users must first create an account by clicking on "eRegister." You must select the type of filing you are making. If you are filing a comment on a particular Project, please select "Comment on a Filing"; or

(3) You can file a paper copy of your comments by mailing them to the following address:

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE, Room 1A
Washington, DC 20426

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).[2] Only intervenors have the right to seek rehearing of the Commission's decision. The Commission grants affected landowners and others with environmental concerns intervenor status upon showing good cause by stating that they have a clear and direct interest in this proceeding which no other party can adequately represent. **Simply filing environmental comments will not give you intervenor status, but you do not need intervenor status to have your comments considered.**

Additional information about the Project is available from the Commission's Office of External Affairs, at **(866) 208-FERC**, or on the FERC 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 (i.e., CP17-441). Be sure you have selected an appropriate date range. For assistance, please contact FERC Online Support at FercOnlineSupport@ferc.gov or toll free at (866) 208-3676, or for TTY, contact (202) 502-8659. The eLibrary link also provides access to the texts of formal documents issued by the Commission, such as orders, notices, and rulemakings.

In addition, the Commission offers a free service called eSubscription, which 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. Go to http://www.ferc.gov/docs-filing/esubscription.asp.

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[2] See the previous discussion on the methods for filing comments.

Table of Contents

List of Figures iii

List of Tables iii

Technical Acronyms iv

A. Proposed Action 1

- **1.** Introduction 1
- **2.** Project Purpose and Need 2
- **3.** Proposed Facilities 4
- **4.** Public Review and Comment 5
- **5.** Construction, Operation, and Maintenance Procedures 7
- **6.** Land Requirements 9
- **7.** Permits, Approvals, and Regulatory Consultations 10

B. Environmental Analysis 13

- **1.** Geology and Soils 13
  - **1.1** Geology 13
  - **1.2** Soils 17
- **2.** Water Resources 18
  - **2.1** Groundwater Resources 18
  - **2.2** Surface Waters 20
  - **2.3** Wetlands 27
- **3.** Vegetation, Fisheries, and Wildlife 32
  - **3.1** Vegetation 32
  - **3.2** Fisheries and Essential Fish Habitat 33
  - **3.3** Wildlife 36
  - **3.4** Migratory Birds 37
  - **3.5** Special Status Species 38
- **4.** Land Use, Recreation, and Visual Resources 47
  - **4.1** Land Use 47
  - **4.2** Recreation and Special Use Areas 55
  - **4.3** Coastal Zone 55
  - **4.4** Visual Resources 56
  - **4.5** Hazardous Waste or Contamination 56

5. Cultural Resources 57
6. Air Quality and Noise 58
6.1 Air Quality 58
6.2 Noise 62
7. **Reliability and Safety** 64
7.1 Safety Standards 64
7.2 Pipeline Accident Data 68
7.3 Impact on Public Safety 70
8. Cumulative Impacts 72
C. Alternatives 80
1. No-Action Alternative 80
2. System Alternatives 81
3. Route Alternatives or Variations 81
D. Conclusions and Recommendations 88
E. References 94
F. List of Preparers 101

LIST OF APPENDICES

Appendix A **Project Maps**
Appendix B **Typical Right-of-Way Cross Sections**
Appendix C **Temporary Extra Work Areas**
Appendix D **Access Roads**
Appendix E **Biological Assessment and Essential Fish Habitat Assessment**
Appendix F **Residential Construction Plans**

LIST OF FIGURES

Figure 1. Project Site Location 3
Figure 2. HUC-12 Subwatershed Boundaries Used to Assess Cumulative Impacts 75
Figure 3. Initially Proposed Fritch Mill Alignment 83
Figure 4. Revised Fritch Mill Alignment (Amended Application).....84

LIST OF TABLES

Table 1. Concerns Identified in Comments on the North Seattle Lateral Upgrade Project.....7
Table 2. Land Requirements for the North Seattle Lateral Upgrade Project.....10
Table 3. Agency Permits, Approvals, and Regulatory Consultations for the North Seattle Lateral Upgrade Project 11
Table 4. List of Affected Waterbodies.....22
Table 5. Project Wetland Impacts.....28
Table 6. Locations Where Northwest has Requested a Modification of the Procedures.....30
Table 7. Federally Listed Species 40
Table 8. Construction and Operation Impacts on Land Use (acres) 49
Table 9. Identified Possible Contractor Yards.....50
Table 10. Estimated Construction Emissions 60
Table 11. Nationwide Natural Gas Transmission Pipeline Significant Incidents (1996-2015)....68
Table 12. Outside Forces Incidents by Cause (1996-2015).....70
Table 13. Annual Injuries and Fatalities – Natural Gas Transmission Pipelines.....72
Table 14. Nationwide Accidental Fatalities by Cause 72
Table 15. Resource-Specific Regions and Temporal Scope for Determining Cumulative Impacts of the Project 76
Table 16. Washington State Department of Transportation Projects Within Cumulative Geographic Scope Area 77
Table 17. Evaluation of Fritch Mill Initially Proposed and Amended Routes 85

TECHNICAL ACRONYMS

BA	Biological Assessment
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalents
Dth/d	dekatherms per day
CEQ	Council on Environmental Quality
CZMA	Coastal Zone Management Act
DOT	U.S. Department of Transportation
EA	environmental assessment
ECRP	Erosion Control and Revegetation Plan
EI	environmental inspector
EFH	essential fish habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
GHG	greenhouse gases
HCA	high consequence area
MP	milepost
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NGA	Natural Gas Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOI	*Notice of Intent to Prepare an Environmental Assessment for the Proposed North Seattle Lateral Upgrade Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Session*
OEP	FERC's Office of Energy Projects
PCBs	polychlorinated biphenyls
PHMSA	Pipeline and Hazardous Materials Safety Administration
Plan	FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan*
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to 2.5 microns in diameter
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns in diameter
ppm	parts per million
Procedures	FERC's *Wetland and Waterbody Construction and Mitigation Procedures*
SHPO	Washington State Historic Preservation Office
SO_2	sulfur dioxide
Spill Plan	Northwest's Spill Plan for Oil and Hazardous Materials
TEWAs	Temporary Extra Work Areas

TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
WSDOT	Washington Department of Transportation

A. Proposed Action

1. Introduction

The staff of the Federal Energy Regulatory Commission (Commission or FERC) has prepared this environmental assessment (EA) to assess the potential environmental impacts of the natural gas facilities proposed by Northwest Pipeline LLC (Northwest). The project is referred to as the North Seattle Lateral Upgrade Project (Project) and involves the abandonment and new construction of pipeline facilities in Snohomish County, Washington. The general Project location is shown on figure 1.

On May 11, 2017, Northwest filed an application with the Commission in docket number CP17-441-000 under sections 7(b) and 7(c) of the Natural Gas Act (NGA). On October 23, 2017, Northwest amended its application, reducing the Project's incremental firm capacity, shortening the proposed replacement pipeline, re-locating certain proposed aboveground facilities, and rerouting a portion of the proposed pipeline route.

Northwest's stated purpose of the Project is to provide additional natural gas delivery capacity (up to 159,299 dekatherms per day[1]) to Puget Sound Energy (PSE), which serves markets in the North Seattle area. As described further below, Northwest proposes to accomplish this purpose by enlarging a segment of its existing pipeline, which would increase the capacity of its pipeline system. Northwest proposes to start Project construction in June 2019, and place the Project into service prior to the 2019 winter heating season.

The FERC is the lead federal agency for authorizing interstate natural gas transmission facilities under the NGA, and is the lead federal agency for preparation of the EA. We[2] prepared this EA in compliance with the requirements of the National Environmental Policy Act (NEPA) (Title 40 of the Code of Federal Regulations, parts 1500-1508 [40 CFR 1500-1508]), and the Commission's implementing regulations under 18 CFR 380.

The assessment of environmental impacts is an important and integral part of the FERC's decision on whether to issue Northwest a Certificate of Public Convenience and Necessity (Certificate) to construct and operate the newly proposed facilities, and authorization to abandon certain facilities. Our principal purposes of preparing this EA are to:

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[1] A dekatherm is a unit of heating value often used by natural gas companies instead of volume for billing purposes. A dekatherm is equivalent to 10 therms or one million British thermal units. For conceptualization purposes only, a natural gas capacity of 74,850 dekatherms per day would be sufficient to power roughly 720,000 homes annually (if it were used solely for residential energy production). This estimate assumes an average household energy consumption of 11,000 kilowatt hours per year. If approved, the natural gas would be used in a variety of applications, not solely for residential energy use.

[2] "We," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

- identify and assess the potential impact on the natural and human environment that would result from the implementation of the proposed Project;
- identify and recommend reasonable alternatives and specific mitigation measures to avoid or minimize Project-related environmental impacts; and
- encourage and facilitate public involvement in the environmental review process.

2. Project Purpose and Need

As indicated above, Northwest's stated purpose of the Project is to provide additional natural gas delivery capacity to PSE and thus markets in North Seattle by up to 159,299 dekatherms per day. Section 7(b) of the NGA specifies that no natural gas company shall abandon any portion of its facilities subject to the Commission's jurisdiction without the Commission first finding the abandonment will not negatively affect the present or future public convenience and necessity. Under Section 7(c) of the NGA, the Commission determines whether interstate natural gas transportation facilities are in the public convenience and necessity and, if so, grants a Certificate to construct and operate them. The Commission is an independent regulatory agency and therefore conducts a complete independent review of project proposals, including an environmental review of proposed facilities. The Commission bases its decision on technical competence, financing, rates, market demand, gas supply, environmental impact, long-term feasibility, and other issues concerning a proposed project.

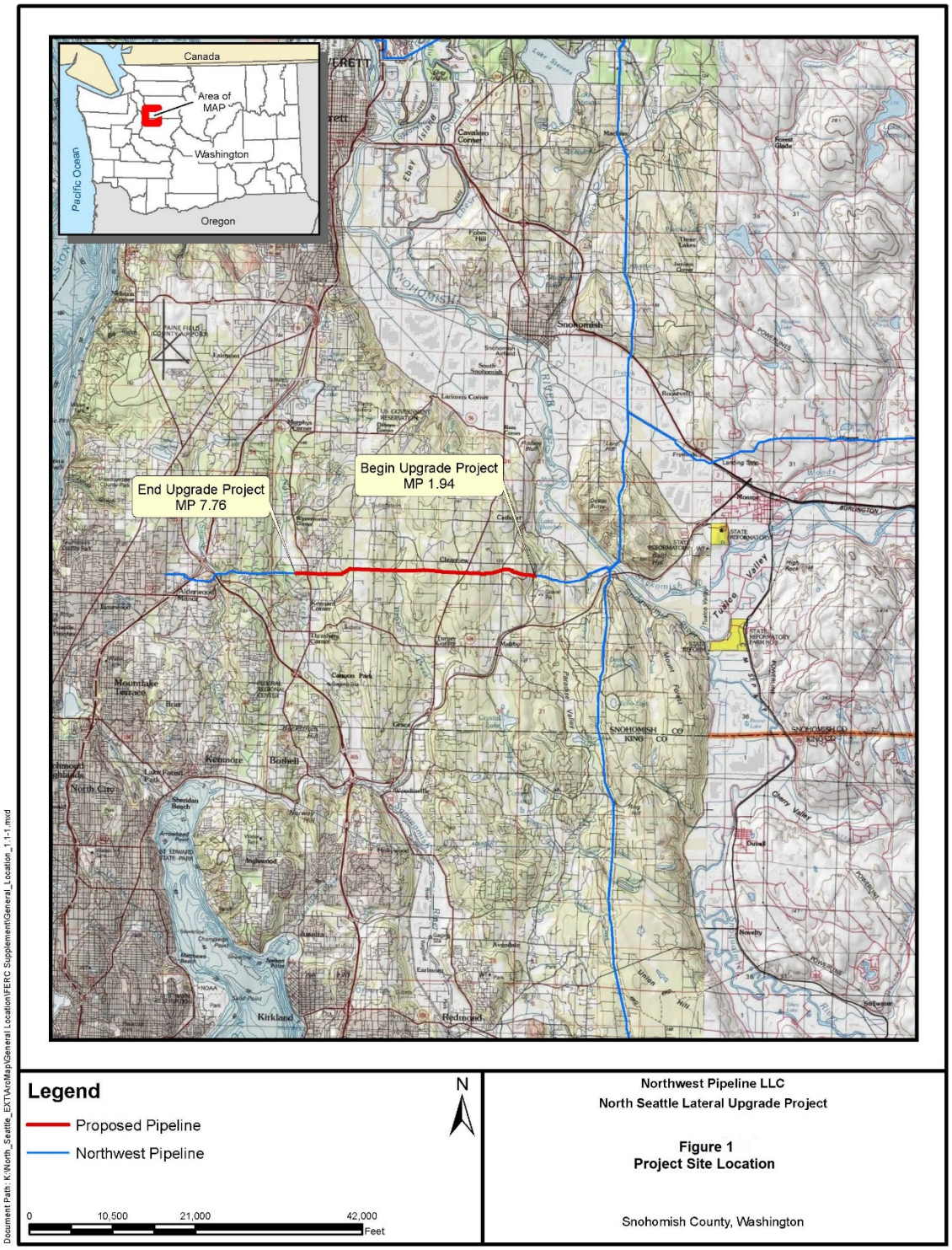

Figure 1. Project Site Location

3. Proposed Facilities

Proposed pipeline facilities

According to its amended application, Northwest proposes to upgrade approximately 5.9 miles of its North Seattle 2428 Mainline Lateral from 8-inch- to 20-inch-diameter in Snohomish County, Washington. Northwest would abandon by removal 5.6 miles of the existing, operating 8-inch-diameter lateral between mileposts (MP) 2.2 and 7.8, and would remove 0.2 mile of 8-inch-diameter pipeline between MPs 1.9 and 2.1 that was previously abandoned in place under FERC Docket No. CP11-520-000[3]. The 8-inch-diameter lateral is located within a 35- to 75-foot-wide right-of-way that also includes Northwest's 16-inch-diameter 2448 Loop[4] pipeline. The 20-inch-diameter pipeline would be installed in the same ditch as the removed 8-inch-diameter pipe. Increasing the diameter of the pipeline from 8 to 20 inches would allow Northwest to increase its gas transportation capacity to PSE by 159,299 dekatherms per day (Dth/d). While the new 20-inch-diameter pipeline would be designed for a maximum allowable operating pressure of 960 pounds per square inch gauge, Northwest states it would operate the pipeline at 600 pounds per square inch gauge.

Northwest also proposes to abandon in place and relocate 0.17 mile of 16-inch-diameter pipeline between MPs 2.0 and 2.2, relocate a pig[5] launcher and receiver from MP 2.2 to MP 7.76, and upgrade miscellaneous aboveground facilities, as further described below. With the exception of the new launcher/receiver facility at MP 7.76, all aboveground facility work would occur within the fenced and graveled footprint of an existing facility.

Proposed aboveground facilities

North Seattle/Everett Meter Station Upgrade (MP 0.61)

The existing North Seattle/Everett Meter Station at MP 0.61 would be modified by replacing the inlet filter/strainer, all yard piping, meters, and regulators. Temporary extra work areas (TEWAs) 0.61 and 0.62 would be located adjacent to this facility to stage construction activities for upgrading the meter station. These TEWAs, previously used in 2012 to complete the North Seattle Delivery Lateral Expansion Project (FERC Docket No. CP11-520-000), would be returned to their prior condition following completion of construction. No additional permanent disturbance would be required to operate the meter station.

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3 Northwest proposes to leave in place approximately 0.1 mile of 8-inch-diameter pipeline on the Fritch Mill between MP 2.07 and MP 2.21.

4 A pipeline loop is a segment of pipe constructed parallel to an existing pipeline to increase capacity.

5 A "pig" is a tool that the pipeline company inserts into and pushes through the pipeline for cleaning the pipeline, conducting internal inspections, or other purposes.

2428 Mainline and 2448 Loop Line Interconnection (MP 1.94)

At MP 1.94, the existing aboveground interconnect facility between the 2428 Lateral and 2448 Loop would be modified (less than 0.01 acre) to interconnect the new 20-inch-diameter pipeline.

Existing Launcher/Receiver/Block Valve and Crossover (MP 2.20)

At MP 2.20, the existing 8-inch pig launcher, 20-inch pig receiver, block valve, and 16-inch-diameter crossover would be removed and relocated to MP 7.76. Northwest has proposed that the existing 0.23-acre graveled and fenced facility would remain. We have included a recommendation in Section B.4.1 that this facility be removed and the land restored to its previous condition.

Existing Clearview Tap (MP 3.91)

At MP 3.91, a new 2-inch tap would be installed on the 20-inch-diameter 2428 Lateral for PSE's Clearview Tap and tied into the 2-inch-diameter feed line from the 2448 Loop line.

Existing Mainline Block Valve 39-2 (MP 5.45)

At MP 5.45, the existing 8-inch mainline valve 39-2 would be replaced with a 20-inch valve assembly; two 12-inch crossovers installed to tie the 20-inch Lateral pipeline to the 16-inch loop line; and a new 4-inch tap for PSE's Jewel Road take-off facility would be constructed.

New Launcher/Receiver, Block Valve and Crossover (MP 7.76)

The pigging facilities and block valve removed from MP 2.2 would be reinstalled at MP 7.76. A 16-inch crossover, to tie the 20-inch Lateral line to the 16-inch Loop line, would also be installed. The new aboveground facility would be graveled and fenced. The total permanent footprint of this facility would be 0.15 acre, located entirely within Northwest's existing permanent easement.

Maps of the proposed Project and construction right-of-way are included in appendix A. There are no non-jurisdictional facilities associated with the Project.

4. Public Review and Comment

FERC issued a Notice of Application for the originally filed Project on May 25, 2017, and motions to intervene were received from the Northwest Industrial Gas Users, the Southwest Gas Corporation, the Public Utility District No. 1 of Snohomish County, the Washington Department of Fish and Wildlife (WDFW), and landowners Michelle McBride, Michelle Lilly, M. Cooper Hart, and Elisha Baker, some of whom provided environmental comments (see discussion below).

On June 21, 2017, the FERC issued a *Notice of Intent to Prepare an Environmental Assessment for the Proposed North Seattle Lateral Upgrade Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Session* (NOI) in Docket No. CP17-441-000. The NOI was mailed to 409 parties, including affected landowners; federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; other interested parties; and local libraries. We also held a public scoping comment session in the Project area on July 13, 2017.

On October 23, 2017 Northwest amended its application, reducing the Project's incremental firm capacity from 196,311 Dth/d to 159,299 Dth/d; reducing the length of the replacement 20-inch-diameter pipeline by about 1 mile and locating the replacement pig launcher/receiver at MP 7.76. The amended Project would also relocate the pipeline route between about MPs 2.1 and 2.2 to be off the Fritch Forest Products (Fritch Mill) property. Northwest states that it has an existing, perpetual easement on the neighboring property (owned by CRE Enterprises) where the new pipelines would be constructed and that the relocation would allow for unencumbered access to the easement for pipeline operation and maintenance purposes. Northwest further states that a portion of the existing pipeline easement on the Fritch Mill tract would be relinquished back to the owner.

While the possible reroute of the proposed 20-inch-diameter line was identified in our NOI, the reduction in Project capacity, location of the new pig launcher/receiver, and the abandonment and relocation of the 16-inch-diameter line were not previously identified. In light of this, on November 21, 2017, we issued a *Supplemental Notice of Intent to Prepare an Environmental Assessment for the Amended North Seattle Lateral Upgrade Project and Request for Comments on Environmental Issues* (NOI) in Docket No. CP17-441-001. The Supplemental NOI was mailed to 312 parties, including affected landowners; federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; Native American tribes; other interested parties; and local libraries.

We received written comments in response to the Notice of Application and both NOIs. We also received verbal comments during the public comment session. Commentors included the U.S. Environmental Protection Agency (EPA); the Snohomish County Public Utilities District, Foster Pepper, PLLC on behalf of CRE Enterprises; as well as landowners Robert Coyne, Eric Fritch, Randy Fritch, M. Lilly, Michelle Scannell, Patricia Thompson, Christine Alexander, Christine Brinton, and Michael Steen. In general, the commentors raised concerns over a variety of topics including how construction may affect their properties, particularly with respect to tree clearing, septic systems, and possible changes in drainage patterns; impacts on residences (including noise, dust, drainage, and vegetation clearing); biological and water resources impacts; alternative routings for crossing the Fritch Mill property; pipeline safety; and impacts on adjacent utility easements and infrastructure. The environmental issues raised are listed in table 1 and discussed in the applicable sections of this EA.

Some of the comments received on the Supplemental NOI were specific to the proposed relocation around the Fritch Mill tract, and questioned the need to relocate the pipeline off the existing right-of-way, which would affect new landowners. Commentors suggested alternative measures that would allow the upgraded pipeline to be constructed on the Fritch Mill property, and identified potential impacts on springs, wetlands, and mature forest that would occur if the

pipelines were relocated onto the CRE Enterprises property. We discuss the Fritch Mill reroute in section C (Alternatives) of this EA.

Table 1.
Concerns Identified in Comments on the North Seattle Lateral Upgrade Project

Comment Type	EA Section Addressing the Comment
Temporary Roadway Construction	A.6
Soils and Geology Seismic risks Blasting	B.1
Water Resources Impacts on groundwater and water supplies Impacts on water use and quality Effects on wetlands and riparian areas	 B.2.1 B.2 B.2.2
Vegetation, Aquatic Resources, and Wildlife Endangered species Site restoration Invasive plants	 B.3 B.3.1 B.3.2
Land Use Impacts	B.4.1
Tribal Consultation	B.5
Air Quality and Noise	B.6
Alternatives	C.3
Safety	B.7
Cumulative Effects	B.8

5. Construction, Operation, and Maintenance Procedures

The proposed facilities would be designed, constructed, tested, operated, and maintained to conform with or exceed federal, state, and local requirements, including the U.S. Department of Transportation's (DOT) Minimum Safety Standards in 49 CFR 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards," and 18 CFR 380.15, "Siting and Maintenance Requirements."

Northwest has developed a Spill Plan for Oil and Hazardous Materials (Spill Plan), and an Unanticipated Discovery Plan for cultural resources. In addition, Northwest has incorporated our *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and a modified version of our *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures)[6] into its

[6] The FERC Plan and Procedures are a set of construction and mitigation measures that were developed to minimize the potential environmental impacts of the construction of pipeline projects

Erosion Control and Revegetation Plan (ECRP) to account for site-specific environmental resources and construction requirements of the Project area. We have reviewed these plans and find them acceptable. We discuss Northwest's proposed alternate measures to the Procedures in sections A.6 and B.2.3, below.

Northwest proposes to begin clearing in the summer of 2019, and that about 260 workers would be required to complete construction of its Project. Northwest estimates that construction would take about 6 months to complete. Northwest would not hire any new permanent employees for day-to-day operation of the new facilities.

Northwest proposes to assign one full-time environmental inspector (EI) for the construction activities. The EI would be responsible for ensuring compliance with all environmental permit requirements from construction through restoration. Northwest would install the new pipeline using conventional pipeline construction methods. This typically consists of a sequential process of surveying, clearing, grading, excavating, stringing and bending, welding, coating, lowering-in and backfilling, hydrostatic testing, cleanup, and restoring the right-of-way. Crews working on each stage would generally follow close behind each other in order to complete the Project in the most time-efficient manner.

Prior to construction, Northwest would survey the route and stake the pipeline centerline, other utilities, approved workspaces, and environmentally sensitive areas. Northwest would terminate gas service in its existing 8-inch-diameter pipeline and pig the pipeline to remove any residual gas or condensed liquids. Clearing crews would then cut vegetation at ground level and excavation crews would uncover the pipeline which would then be cut into segments, removed, and disposed of. The remaining trench would be enlarged to 3 to 4 feet in width and to a depth of at least 3 feet to accommodate the new pipe, depending on the DOT class requirement of the area.

Northwest would then stage the new pipeline segments along the right-of-way and weld the segments together. Crews would then lower the pipeline into the trench and backfill the trench with the excavated subsoil. Northwest would follow the restoration measures identified in its ECRP to grade and re-seed the right-of-way.

A similar process would be employed for the removal and replacement of the 16-inch-diameter 2448 loop pipeline segment between MPs 2.0 and 2.2. After hydrostatic testing and prior to tie-in activities, the 2448 loop-line would be taken out of service and blown down according to Northwest's operational procedures. The line would then be cut and tied-in to the re-routed 0.2-mile-long section of pipe. The 2448 loop-line would then be returned to service according to Northwest's operational procedures. Prior to abandoning in place the 0.2-mile section of the loop-line, it would be cleaned by running foam/swab pigs through it. The pigs

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in general. The Plan and Procedures can be viewed at http://www.ferc.gov/industries/gas/enviro/guidelines.asp.

would be launched and received by temporary barrels located at the ends of the abandoned segment.

Northwest intends to place the new facilities into service in November 2019.

In addition to the standard construction techniques described above, Northwest would use specialized techniques where certain sensitive environmental features such as wetlands, waterbodies, and residential properties are crossed. The details on these specific types of crossings are outlined in section B.2 and B.4 of this EA.

To facilitate periodic inspections as required by federal regulations, Northwest would conduct routine vegetation clearing on the permanent right-of-way. This would consist of mowing the width of the permanent right-of-way in upland areas no more frequently than every three years. In wetland areas, Northwest would keep clear only a 10-foot-wide strip centered over the pipeline and would selectively cut trees encroaching within 15 feet of the pipeline. In addition, certain uses of the easement would continue to be prohibited, such as the construction of buildings and growth of large trees.

6. Land Requirements

Table 2 summarizes the land acreage requirements for construction and operation of Northwest's Project. In order to construct the replacement, Northwest would disturb a total of about 133 acres of land. Northwest would acquire an additional 1.3 acres of land for its system, and would allow the remaining 131.6 acres of land to revert to its previous use following construction.

Typically, Northwest would construct its pipeline using a 100-foot-wide construction right-of-way. This would nominally consist of 60 feet of its existing right-of-way and 40 feet of temporary construction workspace. Within wetland areas, Northwest would reduce its construction right-of-way width to 75 feet. Appendix B contains figures showing representative cross sections of the construction right-of-way.

Northwest has requested permission to use 64 TEWAs in addition to the construction right-of-way. These extra workspaces, totaling approximately 24.6 acres, are generally at road, utility, and waterbody crossings; these are identified in appendix C and discussed more thoroughly in section B.4 of this EA. Our Procedures contain a number of specifications which limit the width of the construction right-of-way through wetlands to 75 feet and specify that TEWAs be set back 50 feet from wetlands, except where the adjacent upland consists of actively cultivated or rotated cropland or other disturbed land (see Procedures sections VI A.3., V.B.2.a., V.B.2.b., VI.B.1.a., and VI.B.1.b.). Northwest has identified four locations where site-specific or topographic constraints would make the 75-foot construction area width and the TEWA 50-foot setback infeasible and has requested alternate measures to the Procedures. These are discussed in section B.2.3 of this EA.

Table 2.
Land Requirements for the North Seattle Lateral Upgrade Project

Project Component	Length or Number of Sites	Land Affected During Construction (acres)	Land Affected During Operation - New Permanent Easement (acres)
Pipeline Facilities (construction right-of-way)	5.85 miles	62.8	1.3
Temporary Extra Work Areas	64	24.6	0.0
Contractor and Pipe Storage Yard[a]	4	44.7	0.0
Existing Aboveground Facility Modifications	4	0.8[b]	0.0[c]
New Aboveground Facilities[d]	1	0.0	0.0
Existing Access Roads Requiring Improvements	0	0.0	0.0
New Permanent Access Roads	0	0.0	0.0
Total		**132.9**	**1.3**

[a] While four potential yards have been identified, Northwest states that not all sites would be used during construction. However, for the purposes of this analysis, we have assumed that all four yards would be used.

[b] Construction impacts associated with the aboveground facility modifications or installation are included in the construction impacts for the pipeline facilities except at the North Seattle Meter Station (MP 0.61), where the existing 0.58-acre facility would be used to complete facility replacement activities.

[c] No new permanent disturbance would be required for operation of the existing aboveground facilities since the facility footprints would not increase.

[d] The existing launcher, receiver and block valve site would be removed from MP 2.2 and relocated to within the existing Northwest easement at MP 7.76. The new facility would be installed within the construction right-of-way, so no additional construction or operation land disturbance or easement is included here.

Additional TEWAs may be identified prior to and during construction to accommodate currently unforeseeable site-specific constraints related to construction, safety, engineering, landowner, and/or environmental concerns. Any additional workspace needs would be subject to review and approval by FERC and the other permitting agencies prior to construction, as appropriate.

Northwest would temporarily affect approximately 95 existing public and private roads through crossing or use for Project access during construction and restoration. All roads would be fully restored after completion of the Project. Access roads are identified in appendix D and further discussed in section B.4.

7. Permits, Approvals, and Regulatory Consultations

Northwest would construct its Project in accordance with all applicable federal, state, and local requirements. Some of the major permits, approvals, and regulatory consultations required are listed in table 3 below. Northwest is responsible for obtaining all applicable permits and approvals, regardless of whether they appear in the table.

Table 3.
Agency Permits, Approvals, and Regulatory Consultations for the North Seattle Lateral Upgrade Project

Agency	Permit/Approval	Status	Anticipated Approval
Federal Permits/Approvals			
Federal Energy Regulatory Commission	Certificate of Public Convenience and Necessity	Filed May 2017	Pending
U.S. Army Corps of Engineers	Clean Water Act Section 404 – NWP 12	To be submitted February 2018	May 2018
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 Consultation	Ongoing	May 2018
	Fish and Wildlife Coordination Act		
	Migratory Bird Treaty Act		
National Marine Fisheries Service	Endangered Species Act Section 7 Consultation	Ongoing	June 2018
	Magnuson-Stevens Act		
State Permits/Approvals			
Washington Department of Ecology	CWA Section 401, Water Quality Certification	To be Filed February 2018	October 2018
	Coastal Zone Management Act	To be Filed February 2018	October 2018
	Construction Stormwater National Pollutant Discharge Elimination System Permit	Following State Environmental Policy Act (SEPA) approval (April 2018)	April 2018
Washington Department of Fish and Wildlife	Hydraulic Project Approval	Following SEPA Approval (April 2018)	June 2018
Washington Department of Natural Resources	Forest Practices	Following SEPA approval (April 2018)	May 2018

Department of Archaeology and Historic Preservation	National Historic Preservation Act – Section 106 Consultation	Filed April 2017	Concurrence Received April 27, 2017
Washington Department of Transportation	State Highway Crossing	Filed July 2017	May 2018
County Permits			
Snohomish County	State Environmental Policy Act	To be filed February 2018	April 2018
	Shoreline Substantial Development Permit	To be filed February 2018	August 2018
	Critical Areas Ordinance	To be filed February 2018	July 2018
	Land Disturbing Activity (Grading Permit)	To be filed February 2018	July 2018
	Flood Hazard	To be filed February 2018	June 2018
	County Road Crossings	To be filed February 2018	March 2018

B. Environmental Analysis

1. Geology and Soils

1.1 Geology

Northwest's proposed replacement is within the Puget Lowland Physiographic Province of Washington State. The area is characterized by broad low-lying regions and gentle to moderately sloping glacial terrain. Local relief along the route is approximately 350 feet, with elevations ranging from approximately 260 to 620 feet above mean sea level. The northern portion of the Puget Lowlands is mainly made up of a flat glacial plain that is interrupted by the bays and inlets of Puget Sound. The southern portion consists of alluvial valleys. Tertiary sedimentary rocks containing coal resources are exposed along the eastern margin of the Puget Lowlands. Extensive deposits of glacial outwash sand and gravel are present throughout the province. In its comments on the NOI, the EPA requested that the EA discuss where blasting would be needed, blasting methods to be used, and how blasting effects would be controlled and mitigated. As Project construction consists primarily of installing a 20-inch-diameter pipeline in the same trench where an 8-inch-diameter pipeline was removed, blasting is not anticipated. However, if blasting is needed, Northwest would follow the provisions of the FERC Plan (III.F.4) and all applicable federal, state, and local regulations, including obtaining all necessary permits. Blasting plans would be filed with the appropriate agencies prior to blasting, and blast vibration monitoring would be performed as required.

1.1.1. Mineral Resources

Databases from the U.S. Geological Survey (USGS), Washington Department of Natural Resources (WDNR), and Snohomish County were used to identify historic and current mining operations as well as mineral processing plants, oil wells, gas wells, and geothermal resources that would be in the vicinity of the Project. The principal mineral resources in the Project area are sand and gravel glacial outwash deposits predominantly mined for aggregate. The closest active open pit mine is located approximately 0.35 mile southeast of the east end of the proposed pipeline alignment. According to the mine owners, this site is no longer actively mining sand and gravel. Therefore, the mine would not impact or be impacted by operation or construction of the Project. No other mineral resources were identified in the vicinity of the Project. Therefore, we conclude the Project would not affect mineral resources.

1.1.2. Seismic Related Hazards and Mitigation

Seismic hazards with potential to affect the pipeline include earthquakes, surface faults, and soil liquefaction. The EPA requested that the EA discuss the potential for seismic risk and should include a seismic map or reference to it, appropriate seismic designs, and construction standards and practices to minimize impacts. These are addressed below. In general, risks of seismic-related hazards resulting in damage to the Project would be avoided or minimized by Northwest's implementation of specific design criteria, ground improvements, other construction techniques, and operating procedures.

Earthquakes

Based on historical records, western Washington experiences relatively frequent earthquakes. More than 1,000 earthquakes are recorded by seismographs each year throughout the Puget Lowland. Of these, 10 or more produce sufficient shaking felt by the public. The epicenters for the last three major earthquakes were near Olympia (1949), Seattle-Tacoma (1965), and Nisqually (2001), with Richter magnitudes of 6.7, 6.7, and 6.8, respectively (USGS, 2016). On a scale of 0 to 4, with 4 being the highest risk, the Puget Lowland is classed as a Seismic Risk Zone 3.

Seismic risk can be quantified by the motions experienced by the ground surface or structures during a given earthquake as expressed in terms of g (the acceleration due to gravity), or peak ground acceleration. 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. The USGS indicates that the Project is in an area where a peak ground acceleration of 0.72 g (severe perceived shaking) has a 2 percent chance of being exceeded in 50 years, and an acceleration of 0.37 g (very strong perceived shaking) has a 10 percent chance of being exceeded in 50 years (USGS, 2008).

Modern steel pipelines with high quality electric arc welded joints have a history of performing well during seismic events with ground displacements up to 60 centimeters because of the restrained, welded joints and the flexibility of the pipeline to move with the earth during ground shaking. Northwest's proposed pipeline would be designed in accordance with all applicable federal and state safety codes, which govern pipeline thickness, welding standards for joints, and pipeline strength. We conclude that this would allow the pipeline to withstand nearly all ground shaking that could be anticipated to occur, with the possible exception of ground movement associated with a fault rupture.

Surface Faults

According to the USGS Quaternary fault and fold database (USGS, 2014) and data and map compilations regarding Quaternary faults and folds in the Project region (Bowman and Czajkowski, 2016) the Project would cross the South Whidbey Island Fault Zone at approximately MP 6.65. This is a 3.1- to 4.3-mile-wide, northwest-trending thrust fault zone that extends across Possession Sound, southern Whidbey Island, Admiralty Inlet, and into the eastern Strait of Juan de Fuca. The fault zone is about 40 miles long and has ruptured within the last 15,000 years. WDNR mapping indicates that the Project would cross the fault zone at approximately MP 6.65. Studies of the fault indicate that, following deglaciation approximately 16,000 years ago, the fault has experienced at least four earthquakes, the most recent event occurring 2,700 years ago. According to a hazard assessment performed by Golder Associates, Inc. (2017), "the potential vertical ground displacement from a rupture of the South Whidbey Island Fault Zone poses little threat to the integrity of the proposed 20-inch pipeline." Therefore, Northwest does not propose to implement mitigation for fault rupture. We conclude this is acceptable.

Soil Liquefaction

Strong ground shaking during an earthquake can cause soil liquefaction, which is the loss of shear strength in saturated soil deposits. The susceptibility of a soil deposit to liquefaction is a function of the degree of saturation, soil grain size, relative density, percent fines, age of deposit, plasticity of fines, earthquake ground motion characteristics, and several other factors. Soils most prone to liquefaction are poorly graded (i.e., have a uniform grain size) and noncohesive. Soil liquefaction can result in a loss of bearing capacity, soil consolidation, settlement, buoyancy of objects buried in the soil, and lateral spreading. Liquefaction can cause pipelines to undergo movement, including buoyancy, which can result in increased stress in the pipeline and possible damage. Lateral spreading is the lateral movement of ground on and within a zone of liquefied soil and can occur on gentle slopes or along an open face when liquefaction occurs in a relatively widespread and continuous layer. Lateral spreading can be hazardous to pipelines, especially if the ground movement occurs perpendicular to the axis of the pipeline.

The soil and groundwater conditions along the proposed pipeline alignment are generally not conducive to liquefaction during an earthquake event because of the density and consolidated nature of the mapped glacial deposits and lack of near surface groundwater. Liquefaction mapping (Washington Division of Geology and Earth Resources, 2004) indicates that the proposed pipeline alignment is within areas mapped as having a low to very low susceptibility to liquefaction. Because the liquefaction susceptibility is low to very low along the proposed pipeline alignment, the lateral spreading susceptibility along sloping portions of the proposed pipeline alignment is also low to very low.

1.1.3. Other Geologic and Natural Hazards

Landslides

A landslide is the downslope movement of soil, rock, and organic materials under the effects of gravity and also the landform that results from such movement. Landslides are commonly caused by earthquakes, volcanic activity, and modification of existing slopes by construction activities; or saturation of soils from rainfall, groundwater changes, leaking water pipes, or other events. Landslides can move very slowly (millimeters per year) in the case of soil creep, or can occur extremely rapidly. As a general rule, the steeper a slope, the more susceptible it is to landslides. The pipeline route falls within an area of low landslide susceptibility based on available landslide mapping (Washington Division of Geology and Earth Resources, 2014; Snohomish County, 2017) and available aerial photographs, LiDAR data, and topographic maps. As a result, we do not consider landslides to be a hazard for the Project.

Flooding, Bank Erosion, and Scour

Flooding can cause buoyancy in pipelines. Flooding can also induce lateral migration of streams and cause scour that can undermine or expose a pipeline. The Project would cross an area designated as Federal Emergency Management Agency Flood Zone A (a special flood hazard area inundated by a 100-year flood) at MP 5.52. In addition, based on observations made

by Northwest during surveys, flooding could also occur at MP 3.91 and MP 6.84. The pipeline would be installed below the ground surface, and the surface of the right-of-way restored and stabilized following construction which would minimize environmental impacts and avoid modification of floodplains.

Northwest conducted a high-level stream channel assessment and scour analysis for waterbodies that would be crossed by the Project (GeoEngineers, Inc., 2017). A total of 19 crossings were evaluated to determine which pipeline crossings have a predisposition for vertical scouring or lateral migration. Two of the crossings had potential for vertical scour lateral migration and two locations had a potential for lateral channel migration.

The results of the stream channel assessment and scour analysis would be used to inform engineers which streams require special attention regarding depth of pipeline during final design. The depth and length that the pipeline would be buried for each severe scour or lateral-migration stream would be addressed during final design. Northwest has committed to burying the pipeline under streams at a depth that would minimize the risk of exposing the pipe in the event of streambed scouring or channel migration. Northwest would also weight the pipeline to counteract buoyancy at waterbody crossings and in floodplains. In addition to regular monitoring of the pipeline, Northwest would inspect the pipeline after significant rain or flooding events. We conclude that stream channel scouring presents little risk to the Project.

The Project would not cross areas where large amounts of groundwater or oil are being extracted and would be more than 0.5 mile from concentrations of oil or gas wells. Further, the Project would not cross any areas known to contain karst topography. If evidence of underground mining features is unexpectedly encountered during Project construction, Northwest would consult with licensed engineers and geologists to determine whether the feature presents a hazard to the pipeline and how to mitigate it. Mitigation measures may include filling underground voids with concrete or engineered fill, bridging small voids, or rerouting the Project around the voids. Northwest would monitor the permanent right-of-way regularly and any subsidence that could pose a risk to the pipeline would likely be quickly identified so that corrective actions could be implemented. Therefore we consider the risk of subsidence to be minimal

1.1.4. Paleontological Resources

Paleontological resources (e.g., fossils) are considered important scientifically because of their contributions to a greater understanding of geological and biological phenomena. Larger fossil specimens or reconstructions also have intrinsic value as educational tools because of their capacity to capture the attention of the public. Because of their status as a nonrenewable scientific and educational resource, paleontological resources are accorded protection under federal statutes when present on federal lands, or when they may be affected by a project using federal funds or requiring a federal entitlement. The most commonly cited of these statutes is the Federal Antiquities Act of 1906. During construction of the Project, glacial till and outwash would be disturbed. Based on the age and type of deposits crossed by the Project, it is unlikely that any paleontological resources would be encountered during Project construction.

1.2 Soils

The soils crossed by the Project were identified and assessed using the Natural Resource Conservation Service Soil Survey Geographic Database and the Soil Survey of Snohomish County. Soils within the Project area primarily formed from glacial till/drift and alluvium deposits. Soils along the Project are generally level to gently sloping, moderately deep to deep and well-drained silty or gravelly sandy loams.

The majority of soils along the Project were initially disturbed during the installation of Northwest's existing pipelines. The Project would not cross any actively farmed crops. As discussed below in section B.4.1, the Project would disturb 11.61 acres of pasture, of which 3.43 acres would be in existing permanent easement and 1.14 acres would consist of new permanent easement. The primary impacts of the Project on soils would occur during construction, and result mostly from erosion or compaction.

Erosion is a natural process where surface soils are worn away, typically by wind or water. This process can be accelerated by human disturbance, such as tillage, over-grazing, or timber harvesting. Factors such as soil texture, structure, slope, vegetation cover, rainfall intensity, and wind intensity can influence the degree of erosion. Soils most susceptible to erosion by water are typified by bare or sparse vegetation cover, non-cohesive soil particles with low infiltration rates, and moderate to steep slopes. Soils typically more resistant to erosion by water include those that occupy low relief areas, are well vegetated, and have high infiltration capacity and internal permeability. Approximately 3.7 percent (0.25 mile) of the soils along the Project are considered susceptible to erosion by water. Wind-induced erosion often occurs on dry soil where vegetation cover is sparse and strong winds are prevalent. Approximately 2.8 percent (0.19 mile) of the soils along the Project are considered susceptible to erosion by wind.

Soil compaction modifies soil structure and can result in a reduction in the porosity and moisture-holding capability of the soil, thus restricting rooting depth. Compaction also decreases infiltration and thus increases runoff and the potential for water erosion. In general, the potential for soil compaction in the Project area is low along the replacement. About 14 percent (0.97 mile) of the soils that would be crossed by the pipeline facilities are considered prone to compaction.

Construction activities such as clearing, grading, trench excavation, backfilling, and the movement of construction equipment along the right-of-way may impact soil resources. Clearing removes protective vegetation cover and exposes the soil to the effects of wind, rain, and runoff, which increases the potential for soil erosion and sedimentation in sensitive areas. Grading, spoil storage, and equipment traffic can compact soil, reducing porosity and increasing runoff potential. Trenching of stony/rocky or shallow-to-bedrock soils can bring stones or rock fragments to the surface that could hinder restoration of the right-of-way. Construction activities can also affect soil fertility and facilitate the dispersal and establishment of weeds. In addition, contamination from spills or leaks of fuels, lubricants, and coolant from construction equipment could adversely affect soils.

To reduce construction impacts on soils, Northwest would implement its ECRP, which includes the following measures:

- installing and maintaining proper erosion and sediment control measures during construction to reduce the velocity of and redirect runoff;
- minimizing the duration and quantity of soil exposure and reestablishing vegetative cover as soon as possible following final cleanup;
- removing excess rock resulting from construction from at least the top 12 inches of soil to the extent practicable in agricultural pastures, residential areas, and other areas at the landowner's request;
- restoring the construction work area to preconstruction contours;
- removing, segregating, and replacing topsoil up to 12 inches deep in all residential areas, cultivated pastures, and other areas at the landowner's or land managing agency's request;
- using corrective measures such as scarifying or discing soils in residential areas and pastures if tests show that compaction has occurred; and
- monitoring the construction right-of-way and maintaining erosion and sediment controls until final stabilization is achieved.

We conclude that Northwest's implementation of its ECRP would adequately minimize erosion and sedimentation during construction and operation of the Project, and impacts on soils would not be significant.

2. Water Resources

2.1 Groundwater Resources

The Project location is over the Puget-Willamette Trough regional aquifer system. Minor unmapped groundwater units and unconsolidated aquifers also occur locally. The aquifers receive recharge primarily from local surface infiltration. Average annual precipitation in the Project area is approximately 38 inches. Water wells in the Project area are within unconsolidated-deposit aquifers (composed largely of glacial sand and gravel deposits), which provide freshwater for public water supplies, industries, homes, and agricultural uses. Well yields vary greatly in the regional aquifer, and yields from sand and gravel aquifers in Snohomish County range from 5 to 1,000 gallons per minute.

Under Section 1424(e) of the Safe Drinking Water Act, the EPA defines a sole or principal source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, and for which there are no other reasonably available alternative drinking water source(s) that could physically, legally, and economically supply all those who depend on the aquifer for drinking water should the aquifer become contaminated. The Project would cross the Cross Valley EPA-designated Sole Source Aquifer from MPs 1.94 to 6.69 (EPA, 2017). Additionally, the Project would cross the Snohomish Groundwater Management Area which covers approximately 850 square miles in the western portion of the county (Snohomish County, 1999). The primary pipeline construction activities that could affect groundwater are soil excavation and trench dewatering, soil mixing and compaction, and fuel and lubricant handling. Northwest's ECRP, Spill Plan, and other best management practices would be implemented to reduce the likelihood that drinking water would be affected by the Project.

The Project is not within 400 feet of any public Wellhead Protection areas (Washington Department of Health, 2017). According to the Washington Department of Ecology (WDOE) water rights database, no springs or seeps would be within 200 feet of the Project area (WDOE, 2017). Water supply wells within the vicinity of the Project were identified based on field surveys and a review of data provided by the WDOE water rights GIS coverage (WDOE, 2017).

A total of 23 private wells were identified within 200 feet of proposed Project workspaces. Construction of the pipeline would generally require the excavation of a trench between 5 and 6 feet in depth to allow for a minimum of 3 feet of soil cover. According to the NRCS soil data, the majority of the Project alignment crosses soils with a seasonally high groundwater table. Although the planned summer construction schedule would minimize the potential need for trench dewatering, some areas of trench excavation may require dewatering if it is necessary for personnel to enter the trench. The potential effect of groundwater withdrawal on private wells would depend on the rate and duration of pumping. Pipeline construction activities within a particular location are typically completed within several days, and any lowering of the groundwater table would be expected to be temporary, short-term, and localized.

Northwest would implement its Groundwater Supply Monitoring and Mitigation Plan for the Project to verify the exact locations of groundwater supply wells, and would detail the measures Northwest would implement to mitigate potential effects to the wells. These measures would include the restriction of fuel storage and refueling activities within 200 feet of private wells, to the extent practical. Northwest would confirm the proximity of the wells to the construction areas and, with landowner approval, would conduct pre- and post-construction well water testing according to the procedures outlined in the Groundwater Supply Monitoring and Mitigation Plan. If it is determined that a well was affected by construction of the Project, Northwest would provide a temporary supply of water until the damaged well is repaired or a permanent alternative source of water is provided. We have reviewed Northwest's Groundwater Supply Monitoring and Mitigation Plan and find it acceptable.

Groundwater within the Project area can be shallow as most groundwater discharges from springs and flows into streams that drain the lowland (USGS, 1994). However, during the dryer summer months (when construction is scheduled) groundwater would likely be at lower levels. Construction would involve shallow, temporary, and localized excavation. Shallow groundwater resources could sustain minor, indirect impacts from changes in overland water flow and recharge caused by clearing and grading of the right-of-way. In addition, soil compaction from construction could reduce the soil's ability to absorb water; however, as identified in section B.1.2 above, the compaction potential of the majority of the Project area is low.

In areas where groundwater is near the surface, trench excavation may intersect the water table resulting in increased turbidity of the surficial aquifer in the immediate area adjacent to the Project. Further, trench dewatering could impact local water table elevations. These minor direct and indirect impacts would be temporary and would not significantly affect groundwater resources. After installation of the pipeline, Northwest would restore the ground surface as closely as practicable to original contours, decompact soils in accordance with its ECRP, and revegetate any exposed soils to ensure restoration of pre-construction overland flow and recharge

patterns. Aboveground facilities would be graveled, which would allow percolation into the underlying water table.

The greatest threat to groundwater from construction would be from a spill of hazardous liquids. Northwest would construct its Project in accordance with the FERC's Plan and Procedures, and Northwest's ECRP and Spill Plan. In accordance with the Spill Plan, Northwest's inspection of equipment prior to construction would minimize the likelihood of a spill. The Spill Plan also details measures to minimize response time and contains agency contacts and reporting protocols. We conclude that no significant impacts on groundwater resources would occur as a result of the Project.

Northwest would withdraw 464,360 gallons of water from a municipal source (a hydrant at MP 2.22) for hydrostatic testing. Once the hydrostatic test is complete, the test water would be discharged to an open field in TEWA 2.17-N, north of the Fritch Mill. The hydrostatic test water would be discharged through a discharge structure to the surface in an upland area as per Northwest's ECRP. Northwest would be responsible for obtaining any permits associated with the withdrawal. Therefore, no impacts on groundwater are expected from hydrostatic testing.

2.2 Surface Waters

The Project is in the Quilceda Creek-Frontal Possession Sound watershed (Hydrologic Unit Code [HUC] 10 - 1711001102), which is within the Snohomish Sub-basin (HUC8 - 17110011) and the Middle Sammamish River watershed (HUC10 - 1711001203), which is in the Lake Washington Sub-basin (HUC8 - 17110012).

The Project would affect 16 waterbodies, with the pipeline crossing 15 waterbodies (8 intermittent and 7 perennial streams) and 1 freshwater pond. A perennial stream at MP 4.86 would not be crossed by the pipeline but is within the proposed construction work area. No major waterbodies (i.e., waterbodies greater than 100 feet wide) would be crossed. Most of the waterbodies are fish-bearing. Table 4 shows the waterbodies affected by the Project.

Northwest proposes to cross waterbodies using a dry-ditch technique (flume or dam-and-pump, which are described below), if water is flowing at the time of construction. If there is no water flowing, Northwest would cross the stream bed using a standard open-cut crossing technique. The freshwater pond at MP 4.86 would be temporarily drained to remove the existing 8-inch-diameter pipe and install the new 20-inch-diameter pipe. No blasting is anticipated because the trench that was originally excavated to install the 8-inch mainline would be re-excavated to remove the 8-inch-diameter pipeline and install the 20-inch-diameter replacement pipeline. Construction is anticipated to take 4 to 5 months during the summer and fall.

The flume crossing method is a standard dry waterbody crossing method that involves diverting the flow of water across the construction work area through one or more flume pipes placed in the waterbody. First, a sufficient number of adequately sized flume pipes would be placed in the waterbody to accommodate the highest anticipated flow during construction. Next, sand bags or equivalent dam diversion structures would be placed in the waterbody upstream and downstream of the trench area 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. Water flow

would be maintained while the pipeline is removed/installed and the trench backfilled. After backfilling, the dams and flume pipe would be removed and the banks restored and stabilized.

The dam-and-pump crossing method is another standard dry waterbody crossing method that 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 after installing the dam. Water flow would be maintained via the pumps while the pipeline is removed/installed and the trench backfilled. After backfilling, the dams, pumps, and hoses would be removed and the banks restored and stabilized.

Construction and operation of the aboveground facilities would take place within the footprint of Northwest's proposed construction right-of-way and TEWAs. With one exception, these previously disturbed areas are within Northwest's existing permanent easement for the original construction and maintenance of the existing North Seattle Lateral 2428 8-inch-diameter mainline and 2448 16-inch-diameter loop line. Neither construction nor operation of the new launcher/receiver facility at the terminus of the Project (at MP 7.76), nor modifications at existing aboveground facilities, would affect any waterbodies. Additionally, no waterbodies would be affected by the use of existing access roads or use of contractor/storage yards.

Table 4.
List of Affected Waterbodies

Milepost	Waterbody Name	Stream Flow	Length of Crossing Width (feet)	FERC Classification	WDOE 2016 305(b) and 303(d) Water Quality Assessment[2,3,4]	Anadromous Fish-Bearing Stream
2.11	Tributary to Evans Creek	Intermittent	4.6	**Minor**	Category 3	No
2.64	Tributary to Evans Creek	Intermittent	4.7	Minor	Category 3	No
3.87	Tributary to Great Dane Creek	Intermittent	4.7	Minor	Category 3	Yes
3.92	Great Dane Creek	Perennial	34.0	Intermediate	Category 3	Yes
4.10	Unnamed stream	Intermittent	9.0	Minor	Category 3	NA
4.28	Tributary to Great Dane Creek	Intermittent	10.0	Intermediate	Category 3	Yes
4.65	Tributary to Little Bear Creek	Intermittent	12.0	Intermediate	Category 3	Yes
4.73	Tributary to Little Bear Creek	Intermittent	12.4	Intermediate	Category 3	Yes
4.86	Tributary to Little Bear Creek	Perennial	Not crossed	Minor	Category 3	Yes
4.86	Freshwater pond	PUBHh[1]	65.0	Intermediate	Category 3	NA
5.52	Little Bear Creek	Perennial	46.6	Intermediate	Category 5 (dissolved oxygen, temperature)	Yes
5.72	Tributary to Little Bear Creek	Perennial	16.8	Intermediate	Category 3	Yes
6.27	Tributary to Tambark Creek	Intermittent	4.2	Minor	Category 3	Yes
6.79	Tributary to Tambark Creek	Perennial	5.2	Minor	Category 3	Yes
6.83	Tambark Creek	Perennial	20.1	Intermediate	Category 2 (Waters of Concern)	Yes
7.35	Silver Creek	Perennial	10.0	Minor	Category 5 (bioassessment)	Yes
		TOTAL	**259.3**			

1 Palustrine unconsolidated bottom, permanently flooded, diked/impounded (Cowardin et al., 1979)
2 Category 2 designates a water of concern where there is insufficient data to require Total Maximum Daily Loads development.
3 Category 3 waterbodies are those that have not been tested and/or are not listed in other categories.
4 Category 5 waterbodies are impaired waterbodies that require the development of a Total Maximum Daily Load..

The current 303(d) impaired waters list prepared by the WDOE does not identify most of the streams crossed by the Project as impaired, but rather as Category 3 streams (insufficient water quality data). Tambark Creek is a Category 2 stream (Waters of Concern) at the crossing location. Two streams are listed as Category 5 streams (polluted waters requiring a total maximum daily load) for the temperature and dissolved oxygen parameters (Little Bear Creek) and bioassessment parameters[7] (Silver Creek) (WDOE, 2016a). None of the streams that would be crossed by the Project are impaired due to contamination by pollutants or sediments.

Snohomish County (2017a) measured monthly values for several water quality parameters in Little Bear Creek between December 1993 and December 2009. Dissolved oxygen concentrations were relatively constant during the period, varying from 6 milligrams per liter (mg/L) to 13.8 mg/L. Turbidity was low ranging from 0 to 19.3 Nephelometric Turbidity Units; however, concentrations of total suspended solids (TSS) peaked at 140 mg/L in September 1995 during a period when turbidity measurements were not reported.

There are limited data available from Snohomish County (2017a) for Silver Creek and Tambark Creek. Discharge data from Tambark Creek measured downstream of the Project area from January through October 2000 indicates that there are occasional limited or no flows between June and September. During that same time period, water temperatures exceeded 60 °F during June through August. Water temperatures measured in Silver Creek upstream of the Project area during June through October 2002 likewise indicate temperatures occasionally exceeding 60 °F from June through September.

No Wild and Scenic Rivers would be crossed by the Project. The closest waterbodies listed as a Nationwide River by the National Park Service are the Skykomish and the Snoqualmie Rivers; both more than 20 miles from the Project area.

None of the waterbodies crossed by the Project is classified as a Shoreline of the State, or Shorelines of Statewide Significance (WDOE, 2016f). However, the existing North Seattle/Everett Meter Station at MP 0.61 and its associated TEWA are within the designated shoreline of the Snohomish River. Northwest would apply for a Shoreline Substantial Development Permit from Snohomish County for the proposed work at this location. Additionally, no surface water intakes are within 3 miles downstream of any waterbodies crossed by the Project.

The Project is within Washington's Coastal Zone Management Area, and as such, the Project would be subject to a Federal Consistency Determination. The WDOE is responsible for determining consistency with the federal Coastal Zone Management Act. The Act provides for the management of the nation's coastal resources by calling for the "effective management, beneficial use, protection, and development" of the nation's coastal zone.

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[7] Impaired waterbody where the pollutant or source of pollution is not known. As part of TMDL development, a stressor identification process determines the cause(s) of impairment.

As noted before, if water is present in the streambed at the time of construction, Northwest would use a dry-ditch technique (flume or dam and pump) to remove the 8-inch-diameter pipeline and install the 20-inch-diameter pipeline or to install the relocated segment of 16-inch-diameter pipeline. Northwest would also use temporary construction bridges to allow equipment to cross waterbodies. Northwest anticipates the need to install and leave equipment bridges in place outside of the WDFW-recommended in-water work period for streams that support anadromous fish species (i.e., July 1 to September 15 for Little Bear and Great Dane Creek, and July 1 to September 30 for Silver and Tambark Creek). As such, Northwest would request permission from the WDFW to install temporary equipment bridges prior to the WDFW-recommended in-water work period and also to keep the bridges in place outside of the recommended in-water work period. Design, installation, use, and maintenance of temporary construction bridges would be in accordance with our Procedures, assuming that Northwest obtain any necessary state timing waiver for in-water work.

Northwest developed a fish salvage plan to minimize potential effects from construction. The plan details how Northwest would attempt to remove all fish from within the work area that would be isolated prior to being pumped dry for dry open-cut construction. The plan is included in appendix E and further discussed in section B.3.2.

Northwest would minimize impacts on water quality by using dry-ditch crossing methods to allow for trenching and backfill activities to occur under relatively dry conditions. This method of crossing also minimizes the re-suspension of sediments, limits downstream turbidity and sedimentation, and avoids disruption to water flow (which minimize impacts on downstream fish). Northwest would determine which dry-ditch crossing technique is most efficient, constructible, and protective based on the site conditions at the time of construction. In general, flumed crossings are often applied to larger watercourses than dam and pump crossings. Larger water crossings would require longer periods of instream activity and the control of larger volumes of both streamflow and trench water.

Temporary construction-related impacts would be limited primarily to short periods of increased turbidity (during the assembly of the upstream and downstream dams before trenching begins, and following installation of the pipe when the dams are removed and flow across the restored work area is re-established).

A study conducted by the USGS (Moyer and Hyer, 2009) investigating the effects of dry-ditch waterbody crossings on downstream sediment loading found that short-term increases in turbidity downstream of construction did occur, but the magnitude of the increase was small and considered to be minimal compared to increased turbidity values measured during natural runoff events. They also concluded that the pipeline crossing did not adversely alter long-term water quality conditions.

Reid et al. (2004) presented information from the study of 46 pipeline waterbody crossings in the United States and Canada assessing the magnitude and timing of suspended sediment produced from waterbody ditching methods. Mean TSS concentrations during dry-ditch fluming construction measured 99 mg/L at 53 meters downstream of the crossing location while TSS concentrations during dam and pump construction averaged 23 mg/L at 53 meters downstream. These values compared to background TSS levels of approximately 4 to 7 mg/L.

Reid also reported that 90 percent of the dam and pump and 50 percent of the flumed crossings resulted in increases of mean TSS concentrations that were less than 25 mg/L above background levels. Sediment release during pipeline crossings was generally restricted to short-term peaks associated with the installation and removal of isolation and bypass structures. The typical time required for construction of a flumed crossing was reported as 64 hours while dam and pump operations may take 38 hours.

For Little Bear Creek, Northwest estimated the distance downstream required for suspended sediment concentrations generated during fluming or dam and pump construction to dissipate and equal ambient TSS concentrations. The largest distance for Little Bear Creek was estimated to be 5,315 feet during fluming in August. The distances would likely vary over time as stream velocities and stream depths change, particularly during the summer months of July, August, and September, when instream construction is planned within WDFW recommended in-water work windows. Northwest modeled the severity-of-ill-effects (SEV)[8] that could occur from a range of TSS concentrations and exposure durations on salmonids in Little Bear Creek. At the full downstream distance, the SEV level is expected to be 0, while at 164 feet (50 meters) downstream of the construction site, the SEV level is expected to be SEV=7 (sublethal effect) during flume crossings and SEV=5 (sublethal effect) during dam and pump crossings. Impacts on fisheries is further discussed in section 3.2.

The 20-inch-diameter pipeline would be installed below potential scour depths at waterbody crossings where streams have a potential for channel migration and/or streambed scour. As estimated in Northwest's scour analysis, the scour depth for the stream crossings analyzed is less than 5 feet below bottom (see section B.1.1.3). Therefore, Northwest proposes to install the new pipeline at a depth of a minimum of 5 feet below the channel bottom to account for any potential for scour and migration. We have reviewed this information and conclude that this depth of cover would be adequate.

Construction of the Project would result in short-term minor impacts on waterbodies. Because Northwest would cross all flowing streams using a dry-ditch method, impacts on water quality and aquatic species and habitat would be limited. Clearing and grading of riparian areas, in-stream trenching, dewatering operations, and backfilling could result in modification of aquatic habitat, increased sedimentation and water temperature, turbidity, and introduction of chemical contaminants such as fuel and lubricants.

Clearing and grading of streambanks could expose soil to erosional forces and would reduce riparian vegetation along the cleared section of the waterbody. Use of heavy equipment for construction could cause compaction of near-surface soils, an effect that could result in increased runoff entering surface waters in the immediate vicinity of the construction right-of-

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[8] SEV scores range from 0 to 14, where an SEV of 0 indicates no effects, an SEV between 1 and 3 indicates behavioral effects, an SEV from 4 to 8 indicates sublethal effects, and an SEV from 9 through 14 indicates lethal and paralethal effects (Newcombe and Jensen, 1996).

way. Increased surface runoff could transport sediment into surface waters, resulting in increased turbidity levels and increased sedimentation rates in the receiving waterbody. To minimize construction-related sediment from entering waterbodies that are crossed, Northwest would install temporary and permanent erosion controls (e.g., silt fence, hay bales, slope breakers, etc.) in accordance with its ECRP and other applicable state or county permit requirements.

During construction, the open trench may accumulate water, either from the seepage of groundwater or from precipitation. Where dewatering is necessary, Northwest would pump the trench water into a stable, vegetated upland area through straw bales or filter bags, as described in its ECRP. This would prevent heavily silt-laden water from flowing into any adjacent waterbodies or wetlands. Water would be discharged in a manner that prevents scour, erosion, and sedimentation, in accordance with Northwest's ECRP and the Project's anticipated National Pollutant Discharge Elimination System permit conditions.

Following construction, waterbody beds and banks would be restored to pre-construction contours, banks would be stabilized with native vegetation, and temporary sediment barriers would be installed. All waterbodies supporting coldwater fisheries (see section 3.2) would be backfilled with clean gravel or spoil excavated from the stream bottom. These measures would minimize changes to the instream habitat at the crossing site.

Accidental spills and leaks of hazardous materials associated with vehicle refueling or maintenance, and the storage of fuel, oil, and other fluids could contaminate a waterbody downstream of the release point and can have an immediate effect on aquatic resources. To prevent or minimize potential impacts associated with spills or leaks of hazardous liquids, Northwest would implement procedures from its Spill Plan including storing hazardous materials in upland areas at least 100 feet from waterbodies and wetlands. Implementation of Northwest's Spill Plan would adequately address the storage and transfer of hazardous materials and petroleum products, and the appropriate response in the event of a spill.

Northwest would verify the integrity of the replacement pipeline before placing it into service by conducting hydrostatic testing. A total of approximately 464,360 gallons of water would be required to test the new 20-inch-diameter pipeline in two test sections. Water would be obtained from a municipal source, a hydrant, located at MP 2.22. Northwest does not plan to add any chemicals to the hydrostatic test water and would contact the Cross Valley Water District prior to construction to determine if there are any additives in the source water. Northwest would conducted a water quality test during withdrawal of the source water to establish a baseline of water quality yields. Following testing, the test water would be discharged into an upland area in a TEWA at a rate to prevent scour, erosion, and sediment migration to sensitive resources, in accordance with the National Pollutant Discharge Elimination System permit conditions and the ECRP.

Long-term impacts associated with pipeline operations and maintenance would be relatively minor. Northwest would stabilize streambanks within 24 hours of completion of instream work and, in accordance with our Procedures, revegetate the disturbed work areas following installation of the pipeline. Post-construction vegetation maintenance would be limited to the permanent rights-of-way pursuant to the ECRP.

Northwest would not significantly or permanently affect any designated water uses; it would bury the new pipeline beneath the bed of all waterbodies, implement erosion controls, and restore and enhance riparian vegetation, the streambanks, and streambed contours to pre-construction conditions. Therefore, we conclude that the Project would not have a significant impact on surface waters.

2.3 Wetlands

Wetlands are areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and normally do support, a prevalence of wetland vegetation adapted for life in saturated soil conditions. Wetlands can be a source of substantial biodiversity and serve a variety of functions that include providing habitat for wildlife, recreational opportunities, flood control, and for naturally improving water quality.

Wetlands that would be affected by the Project are regulated at the federal and state levels. On the federal level, the U.S. Army Corps of Engineers (USACE) has authority under Section 404 of the Clean Water Act to review and issue permits for activities that would result in the discharge of dredge or fill material into waters of the United States, including wetlands. Section 401 of the Clean Water Act requires that proposed dredge or fill activities under Section 404 be reviewed and certified by the designated state agency (in this case, the WDOE) to ensure that the Project would meet state water quality standards.

Northwest performed a 200-foot-wide field wetland delineation extending 100 feet on either side of the existing 8-inch-diameter pipeline between December 2016 and March 2017. Northwest also surveyed potential TEWAs along the alignment, outside of the 200-foot-wide survey area. Removal of the existing pipeline and construction of the new pipeline would temporarily impact about 5.67 acres of wetlands This includes 4.95 acres of Palustrine Emergent (PEM), 0.10 acre of Palustrine Scrub-Shrub (PSS), and 0.62 acre of Palustrine Forested (PFO) wetland types. Pipeline operations would permanently convert less than 0.02 acre of PSS wetland and less than 0.01 acre of PFO wetland (see table 5). No aboveground facilities, access roads or contractor/storage yards would impact wetlands. Descriptions of the wetland habitats the Project would impact are discussed below.

Palustrine Emergent Habitats (PEM): These wetlands in the Project area are dominated by reed canarygrass, soft rush, creeping buttercup, cattail, velvet grass, and pasture grasses. These wetlands also include Himalayan blackberry and salmonberry shrubs that are mowed (less than 6 inches). Other PEM wetlands in the Project area have been modified as lawns and others are heavily grazed pastures.

Palustrine Scrub/Shrub Habitat (PSS): These wetlands contain deciduous shrubs that are sparse along the existing corridor but are beginning to develop around the perimeters of disturbed wetlands. Scrub/shrub wetland species found adjacent to the maintained corridor include spirea, salmonberry, red-osier dogwood, and Nootka rose shrubs, and young Pacific willow and Scouler's willow trees.

Table 5.
Project Wetland Impacts

Wetland Identifier	Milepost	Wetland Type (Cowardin Classification)[1]	Length of Crossing (feet)	Temporary Construction Impact (acre)	Permanent Impact (acre)
Wetland – AN	0.61-0.62	PEM	Not crossed; in TEWA	1.16	0.00
Wetland – AJ	1.96	PEM	147.9	0.39	0.00
Wetland – AP	2.11	PSS/PFO	12.0	0.02 PSS <0.01 PFO	PFO<0.01
Wetland – AI	2.69	PEM/PFO	801.9 (PEM)	PEM 1.22 PFO 0.09	0.00
Wetland – AA	2.93	PEM	52.9	0.06	0.00
Wetland – Z	3.36	PEM	231.9	0.32	0.00
Wetland – Y	3.41	PEM	Not crossed; in construction right-of-way	0.09	0.00
Wetland – U	3.81	PEM	Not crossed; in construction right-of-way	0.01	0.00
Wetland – A	3.91	PEM	29.8	0.08	0.00
Wetland – D	4.56	PEM	23.3	0.03	0.00
Wetland – F	4.57	PEM	Not crossed; in construction right-of-way	0.01	0.00
Wetland – E	4.64	PEM	110.1	0.17	0.00
Wetland – G	4.74	PEM	9.3	0.01	0.00
Wetland – H	4.97	PFO/PSS	31.1 (PSS)	PFO 0.01 PSS 0.05	PSS <0.01
Wetland – AE	5.29	PEM	Not crossed; in construction right-of-way	0.05	0.00
Wetland – AD	5.30	PEM	Not crossed; in construction right-of-way	0.02	0.00
Wetland – AF	5.58	PEM/PFO	675.9 (PEM)	PEM 0.78 PFO 0.45	0.00
Wetland – AG	5.71	PEM/PFO	177.2 (PEM)	PEM 0.22 PFO 0.04	0.00

Table 5.
Project Wetland Impacts

Wetland Identifier	Milepost	Wetland Type (Cowardin Classification)[1]	Length of Crossing (feet)	Temporary Construction Impact (acre)	Permanent Impact (acre)
Wetland – N	6.27	PEM	56.9	0.04	0.00
Wetland – AL	6.59	PEM	191.3	0.14	0.00
Wetland – J	6.78	PFO/PSS	6.6 (PSS)	PFO 0.03 PSS 0.03	PSS <0.01
Wetland – I	7.28	PEM	182.3	0.15	0.00
Totals by Wetland Classification			**PEM**	**4.95**	**0.00**
			PFO	**0.62**	**<0.01**
			PSS	**0.10**	**<0.02**
Overall total			**--**	**5.67**	**<0.03**

[1] PEM – palustrine emergent
PSS – palustrine scrub-shrub
PFO – Palustrine forested

Palustrine Forested (PFO): These wetlands are primarily adjacent to (not crossed) by the maintained corridor, and contain black cottonwood, Pacific willow, western red cedar, Sitka spruce, and red alder trees, with salmonberry and lady fern in the understory.

Northwest would implement its ECRP (which incorporates our Procedures), but has requested modifications to Procedures section VI A.3, which limits the width of the construction right-of-way through wetlands to 75 feet; and section VI.B.1a, which requires workspaces to be at least 50 away feet from wetlands. According to Northwest, modifications to these provisions are warranted due to Project-specific engineering constraints and construction requirements. We have evaluated Northwest's proposed modifications (table 6), and find them acceptable.

Table 6.
Locations Where Northwest has Requested a Modification of the Procedures

MP	Wetland	Cowardin Type	TEWA	Modification Rationale
0.61	Wetland AN	PEM	0.61	TEWA MP 0.61 would be located in a disturbed, emergent pasture Wetland AN and cannot be relocated or reconfigured to avoid the wetland. TEWA 0.61 is necessary to complete modifications at the existing North Seattle/Everett Meter Station and was also previously used to complete the 2.2-mile North Seattle Delivery Lateral Expansion Project in 2012 (CP11-520-000). To minimize potential impacts to this disturbed, emergent pasture wetland, Northwest has scheduled work to occur during the dry summer months and would install mats to minimize compaction and potential rutting from construction traffic.
1.94	Wetland AJ	PEM	1.94-N	Wetland AJ is a disturbed, emergent wetland located entirely within the existing maintained pipeline easement at the start of the Project where there is no ingress/egress to the east. Therefore, equipment and vehicles completing tie-in work at the existing interconnection at MP 1.94, as well as pipeline removal and replacement activities, would need to access and turn around at this location. TEWA 1.94-N cannot be relocated or reconfigured to be set 50 feet back from Wetland AJ.
3.35	Wetland Z	PEM	N/A	The construction right-of-way would be greater than 75 feet through Wetland Z, which is a disturbed, emergent, extensively grazed wetland within confined horse paddocks. Adding TEWAs and necking-down the right-of-way is not a viable option because TEWAs in this area would remove residential tree screens. The additional right-of-way width is required for the crossing of 83RD Ave SE and for ingress/egress onto and from the construction right-of-way.
3.91	Wetland A	PEM	N/A	Northwest states it is infeasible to neck down the construction right-of-way to 75 feet through Wetland A because of the need to install the new 2-inch tap on the 2428 mainline for the Washington Natural Gas Company's Clearwater Tap and to tie-in the 2- inch feed line from the 16-inch 2448 loop line. In addition, Snohomish Ave. and Great Dane Creek (Stream A) are also crossed in this immediate area.

Northwest requested the use of one additional workspace (TEWA 4.95) at MP 4.95 that would impact wetland H, a PFO/PSS wetland. TEWA 4.95 is in a residential yard, and would not require trees to be cut. The workspace is needed to complete construction activities within the confined residential area, with a day care nearby. Northwest would fully restore/landscape the affected parcel according to landowner agreement. This workspace would be used as the primary staging area for construction within this residential area, and during construction it would likely be used for overnight parking and refueling activities.

The proposed use and configuration of this workspace in relation to this wetland is not consistent with the measures in Northwest's ECRP regarding overnight parking and fuel storage within 100 feet of a wetland. Therefore, **we recommend that:**

- **<u>Prior to construction</u>, Northwest should file with the Secretary of the Commission (Secretary), for review and written approval by the Director of the Office of Energy Projects (OEP), a site-specific plan with detailed measures to protect wetland H at MP 4.97 during construction activity.**

Northwest would implement measures from its ECRP to minimize impacts on wetlands, including:

- segregating the top 12 inches of soil from subsoil over the trench line, in all unsaturated wetlands, and replace it to its original elevation during restoration;
- installing trench breakers or sealing the trench bottom to maintain wetland hydrology;
- implementing appropriate erosion and sediment controls to prevent off-right-of-way migration of spoil into wetlands; and
- implementing procedures from its Spill Plan to prevent or minimize potential impacts associated with spills or leaks of hazardous liquids, such as fuels, lubricants, and solvents, including storing hazardous materials and refueling equipment in upland areas at least 100 feet from wetlands.

Most of the Project impacts on wetlands would be temporary as Northwest would install the majority of its pipeline within an existing right-of-way.[9] There could, however, be some minor but long-term loss of wetland function as a result of removal of riparian shade vegetation and increased transport of sediments. Additionally, three wetlands (wetlands H, J, and AP) would have permanent conversion of PSS or PFO wetland habitat to PEM; less than 0.03 acre in total. This does not represent a net loss of wetland habitat, but rather a conversion of wetland type. Emergent and scrub/shrub vegetation would be expected to return to preconstruction conditions within 5 years, while impacts on forested species would be long-term, as these areas could take 20 years to reach a maturity level of the surrounding vegetation. In saturated wetlands, construction equipment would work on timber mats to minimize impacts from rutting and soil mixing; topsoil segregation would not be feasible.

After construction is completed, Northwest would seed the wetlands as specified in its ECRP, with seed mixtures previously used in other projects in western Washington that have been approved by the USACE, WDOE, and Snohomish County. Additionally, Northwest may plant woody species at waterbody and wetland crossings to enhance wetland, riparian, and buffer functions and hasten the recovery of forested or scrub/shrub habitats. Finally, Northwest would compensate for the Project's temporal impacts on PSS and PFO wetlands by purchasing mitigation credits from either the Skykomish Habitat Bank or Snohomish Basin Wetland Bank. Northwest would determine the acreage of mitigation for temporary forested and scrub-shrub wetland impacts in consultation with the USACE. If revegetation is not successful at the end of

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9 We are recommending a route variation (see discussion in section C.3) that, if approved, would result in crossing one fewer wetland, reducing wetland impacts by about 0.2 acre.

3 years within affected wetlands, Northwest would develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate the wetland. With the mitigation measures that Northwest would employ during construction and restoration, as well as the additional compensatory mitigation, we conclude Project impacts on wetlands would be minimized to the extent practicable and would not be significant.

3. Vegetation, Fisheries, and Wildlife

3.1 Vegetation

The general vegetation types found in the Project area include forest-woodland, riparian/wetlands, agricultural areas, and developed (i.e., urban/mixed environs) areas. Most vegetation within the Project area is represented by mixed conifer-hardwood forest (Westside Lowlands Conifer-Hardwood Forest) and riparian/wetlands (Westside Riparian-Wetlands and herbaceous wetlands). Dominant species found in this mixed conifer-hardwood forest include black cotton, red alder, and bigleaf maple, with western redcedar, Douglas-fir, and western hemlock as coniferous components. The same species occur in the areas of Westside-Riparian Wetlands. Common plants present in the understory of deciduous-dominated areas include salmonberry, Indian plum, black twinberry, snowberry and Himalayan blackberry. In more coniferous-dominated areas, the understory is less dense and typically includes sword fern, bracken fern and salal (The Watershed Company, 2017b). Other trees present include willows (weeping willow, Scouler's willow, and Pacific willow), and rarely, Sitka spruce, often within residential yards (The Watershed Company, 2017a).

In total, the Project would impact about 9.11 acres of upland forest vegetation[10] and 1.06 acres of riparian shade vegetation during construction; about 1.92 acres of upland forest vegetation and 0.22 acre of riparian shade vegetation would be affected during operation of the Project. Construction impacts on woody vegetation, while not permanent, would be long term, as these areas could take decades to revegetate and return to pre-construction condition. Impacts on herbaceous or shrubby species would be short-term. Impacts on larger woody vegetation within the operational easement would be permanent, as those areas would be maintained as herbaceous or otherwise open right-of-way. Such impacts would be minor, as Northwest's routing of the pipeline would be about 96 percent within its existing permanent right-of-way; with only 4 percent creating new permanent easement. Most of the areas impacted by construction and operation of the Project are developed and pasture lands, approximately 88 and 84 percent, respectively. Disturbed areas would be revegetated and monitored for at least 2 years following construction, until revegetation is deemed successful. Corrective actions would be taken to ensure successful restoration of vegetation.

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10 We are recommending a route variation (see discussion in section C.3) that, if approved, would result in crossing less forest, reducing forested land impacts by about 1.37 acres.

In its NOI comments, the EPA identified the spread of noxious weeds as a threat to biodiversity and recommended that the EA identify the types and locations of noxious weeds in the Project corridor and identify a plan for controlling such plant intrusions. Reed canarygrass, Himalayan blackberry, evergreen blackberry, yellowflag iris, and nonnative cattails occur within the Project area, generally near patch edges and along wetlands and stream channels. These noxious weeds are widespread in Washington and are subject to weed control requirements in Snohomish County. Other species that Snohomish County requires the control of are yellowflag iris (known occurrence approximately 125 feet north of the Project), and bohemian knotweed (not in Project area but found just north of the Project along 180th street near Little Bear Creek). Scotch broom is found in several wetlands in the Project area; however, Snohomish County does not require its control.

Northwest would implement its ECRP, which includes revegetating disturbed areas with seed mixes that have been approved by the USACE, WDOE, and Snohomish County. Northwest would also implement methods to control noxious weeds, including cleaning construction equipment and vehicles prior to them moving onto the right-of-way, clearing infested areas within the construction workspace, replanting with appropriate seed mixes, and monitoring and controlling weeds after construction, with special procedures for vegetation clearing and grading in areas with yellowflag iris, bohemian knotweed, and Japanese knotweed. We conclude with implementation of these measures, impacts on vegetation would be minimized and not significant.

3.2 Fisheries and Essential Fish Habitat

As discussed in section B.2.2., the Project is in the Quilceda Creek-Frontal Possession Sound watershed and the Middle Sammamish River watershed. The Project does not cross but is within 63 feet of Evans Creek, a fish-bearing tributary to the Snohomish River mainstem in the Quilceda Creek-Frontal Possession Sound Watershed. The Project would cross one of the three major northernmost tributaries to the Sammamish River-Little Bear Creek and its tributaries. These streams provide habitat for coldwater anadromous, coldwater resident, and warm water resident game fish species. Representative game fish species with potential habitat in the Project area include Chinook, coho, pink, and sockeye salmon; steelhead, coastal cutthroat, rainbow, bull, and Dolly Varden trout; mountain whitefish; largemouth and smallmouth bass; and pumpkinseed. Federally listed species (Chinook, steelhead, and bull trout) and species with Essential Fish Habitat (EFH) (Chinook, coho, sockeye, and pink salmon) could occur in Evans Creek. Impacts on EFH are discussed in this section below, and impacts on federally and state-listed fish species are discussed in section B.3.5.

Construction of the Project would increase turbidity immediately downstream of the Project area due to trenching and dewatering activities (see section B.2.2); remove riparian vegetation (which could increase soil erosion and affect water temperature); and may have adverse effects from limited application of herbicides to control noxious weeds near waterbodies. The Project could also result in an accidental release of petroleum products into the water. All of these activities could adversely affect aquatic organisms, including some possible fish mortality.

Northwest proposes to conduct in-stream construction using a dry-ditch method during July, August, and September, which is within WDFW recommended in-water work windows.

Additionally, Northwest would implement its ECRP, which incorporates the FERC's Procedures, to minimize impacts on waterbodies and fisheries. For example, Northwest has committed to:

- conducting construction during WDFW's recommended in-water work period of July 1 to September 15 for Bear, Little Bear, and Great Dane creeks and July 1 to September 30 for Silver and Tambark Creeks using dry-open cut crossings (i.e., flume or dam and pump) of the waterbodies;
- replanting riparian areas up to 25 feet on either side of waterbodies according to our Procedures;
- implementing its Spill Plan and Stormwater Pollution Prevention Plan;
- implementing the Fish Salvage Plan to remove all fish from within aquatic work areas that would be isolated prior to being pumped dry for dry-ditch construction; and
- compensating for long-term wetland impacts on forested wetlands by purchasing mitigation credits from either the Skykomish Habitat Bank or Snohomish Basin Wetland Bank.

We conclude Northwest's implementation of these measures would minimize impacts on fisheries to the extent practicable.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation Management Act mandates the identification of EFH for managed species. EFH is defined by Congress as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The Act 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. Section 302 of the Act establishes eight regional fishery management councils. The Pacific Fishery Management Council is responsible for the creation of management plans for fishery resources in federal waters off the coast of Washington. The Pacific Council has developed a fishery management plan (the Pacific Coast Salmon Plan) to address EFH for Pacific salmon (Chinook, coho, sockeye, and pink); this plan covers the Project area. EFH is present in Evans Creek, North Creek and Little Bear Creek, all of which support spawning habitat for Chinook salmon and coho salmon. Sockeye spawning habitat is also present in North Creek and Little Bear Creek, while pink salmon habitat is present in Evans Creek.

Federal agencies that authorize, fund, or undertake activities that may adversely impact EFH must consult with the National Marine Fisheries Service (NMFS). For purposes of reviewing this Project under NEPA, the FERC is the lead federal agency. Although absolute criteria have not been established for conducting EFH consultations, NMFS recommends consolidating EFH consultations with interagency coordination procedures required by other statutes, such as NEPA and the Endangered Species Act (ESA) to reduce duplication and improve efficiency. As such, the FERC staff proposes to incorporate EFH consultations for the Project with the interagency coordination procedures required under the ESA and NEPA. Thus, we are requesting that NMFS consider this EA and appendix E (Biological Assessment and Essential Fish Habitat Assessment) as our EFH Assessment. With issuance of this EA, we are

requesting initiation of EFH consultation.

Chinook Salmon

Chinook salmon is a federally threated species and state candidate species. Its habitat and impacts from the Project are discussed in the special status species section of this EA (section B.3.5 below).

Coho Salmon

Coho salmon (federal species of concern[11]) use the Snohomish River mainstem for migration and for juvenile rearing. Evans Creek also provides juvenile rearing habitat for coho, as well as spawning habitat (WDFW, 2010a; Haring, 2002; Williams et al., 1975) in the reaches crossed by the existing pipeline easement. Coho salmon are also present during migrations in East Fork Evans Creek in the vicinity of the existing pipeline easement (Haring, 2002). Coho salmon have been documented spawning in Little Bear Creek in the reaches crossed by the Project. Coho begin their spawning migration as 3-year-olds in late summer and fall, and begin spawning in mid-winter. Juveniles rear for about 15 months in freshwater before migrating in the spring to the ocean. Coho generally spend two growing seasons within the ocean before migrating back to their natal stream to spawn (Good et al., 2005).

Sockeye Salmon

Sockeye salmon (state candidate species[12]) were introduced into the Cedar River in the 1930s. Sockeye spawning streams are usually associated with lakes because adults select spawning sites in streams flowing into the lake, in upper sections of the lake's outlet river, or along the lake's shore with some level of flow through gravel substrates (Pauley et al., 1986). After adults spend a period in a lake (up to eight months), adults move to their natal spawning areas. The time for egg incubation depends on water temperature; alevins remain in gravels for several weeks before emerging. Juveniles may migrate to natal lakes, forming schools that move between the lake surface and depths during the day, generally to avoid predation (Pauley et al., 1986). Sockeye fry may spend from one to three years in rearing lakes. Sockeye spawning has been documented in Little Bear Creek in the Project area and is presumed or modeled to be present in most of the other perennial streams crossed. This species is further discussed in section 3.5.2.

Pink Salmon

Pink salmon have a 2-year life cycle; their runs are characterized as either odd-year or even-year, depending on when they return to natal streams, and individuals of one run do not

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[11] "Species of Concern" is an informal term. It is not defined in the federal ESA. The term commonly refers to species that are declining or appear to be in need of conservation.

[12] Candidate species are reviewed by the WDFW for possible listing as state endangered, threatened, or sensitive according to the process and criteria defined in Washington Administrative Code -232-12-297 (WDFW, 2017a).

interbreed with those of the other (Bonar et al., 1989). Pink salmon spawn in the fall when water temperatures range from 46 to 57 °F. Juvenile rearing and juvenile out-migration to salt water occur very soon after fry emerge from incubating in spawning gravels (Bonar et al., 1989). Pink salmon spawn in the mainstem of the Snohomish, Skykomish, and Snoqualmie Rivers. Odd-year pink salmon also spawn in larger tributaries to the Skykomish and Snoqualmie Rivers (WDFW, 2002 and 2010b). The WDFW has modeled Evans Creek for potential pink salmon presence.

Potential effects to EFH

Adverse effects to Pacific Coast Salmon EFH include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. The Project would coincide with species EFH use in the Project area. Chinook, coho, and sockeye adult migration, juvenile rearing, and possibly juvenile out-migration could coincide with the timing for construction across waterbodies in the Little Bear Creek drainage (i.e., July through September). As such, the Project *may adversely affect* the Pacific Coast Salmon EFH.

As described above, best management practices to avoid, minimize, and mitigate impacts on fisheries in general would also reduce impacts on EFH species. These measures include use of dry-ditch construction methods, compliance with the Procedures, and implementation of a Fish Salvage Plan. We believe that the measures above would minimize impacts on EFH to less than significant levels. In addition, we would consider any conservation recommendations the NMFS may make in its review of our EFH assessment.

3.3 Wildlife

The general wildlife habitat types in the Project area are riparian wetlands herbaceous wetlands, mixed conifer-hardwood forest, pasture, developed areas, and open water. Approximately 191 species of wildlife may occur in the Project area, including 11 species of amphibians, 8 species of reptiles, 118 species of birds, and 54 species of mammals. Developed and agricultural areas make up a large percentage of habitat in the Project area, which provides limited natural wildlife habitat. The remaining percentage of the Project area provides habitat for wildlife, including areas of mixed conifer-hardwood forests, wetlands, and waterbodies. Representative wildlife species within the Project area include black-tailed deer, bobcat, northwestern salamander, painted turtle, and various forms of ducks and geese.

Project construction would largely affect areas with altered vegetation (84 percent, including 11.61 acres of pasture and 63 acres of developed lands). Construction would also affect 7.55 acres (8.5 percent) of mixed forest, 5.68 acres of forested and non-forested wetlands (6 percent), and 0.22 acre of streams and open water (less than 1 percent). Our recommended route variation (see discussion in section C.3) would further reduce wildlife impacts, as less forested and wetland habitat would be crossed.

During construction, larger and more mobile animals would leave activity sites in favor of nearby suitable habitats. Noise from construction activities could also result in wildlife leaving the Project area. These individuals are likely to return after construction activities are

complete and/or appropriate vegetation has become reestablished in the Project area. Some small mammals, reptiles, and amphibians could suffer mortality as a direct result of construction. Other individuals may be permanently displaced or perish due to increased competition or other effects of being forced into sub-optimal habitats. However, the populations of affected species are expected to return to previous levels within a short time after construction.

Habitat conversion affects wildlife species differently depending on each species' habitat preferences. Forest-dwelling species would experience long-term or permanent effects, as early successional non-woody vegetation would replace the forested wetland and upland habitats removed from the work area. Operation of the Project would result in permanent impacts on 1.98 acres of mixed forest and 0.01 acre of forested wetlands (converted to non-forested wetland). While the temporary construction work area would be allowed to revegetate with forest vegetation (long-term-effect), the permanent 50-foot-wide right-of-way would continue to be kept clear of trees for operations and maintenance activities (permanent effect). Northwest would minimize impacts on vegetation to the extent practicable through use of its existing rights-of-way (96 percent).

We conclude that construction would not adversely affect the distribution or regional abundance of wildlife species given the amount and distribution of similar habitat types available in the immediate Project area. Once construction is complete, the construction work areas would be stabilized and revegetated in accordance with Northwest's ECRP. Work areas revegetated with herbaceous and shrub cover would provide food, cover, and breeding habitat for species that use open areas. As the pipeline would be installed primarily within Northwest's existing pipeline right-of-way, we conclude the Project's impacts on wildlife would be minimized to the extent practicable.

3.4 Migratory Birds

Migratory birds are protected under the Migratory Bird Treaty Act and Executive Order 13186, which serve to protect migratory birds from adverse impacts. The executive order was enacted, in part, to ensure that environmental analyses of federal actions evaluate the impacts of actions and agency plans on migratory birds. It also states that emphasis should be placed on species of concern, priority habitats, and key risk factors, and it prohibits the take of any migratory bird without authorization from the U.S. Fish and Wildlife Service (USFWS). The intentional destruction or disturbance of a migratory bird nest that results in the loss of eggs or young is also a violation of the Migratory Bird Treaty Act.

The USFWS established Birds of Conservation Concern (BCC) lists for various regions in the country in response to the 1988 amendment to the Fish and Wildlife Conservation Act, which mandated the USFWS to identify migratory nongame birds that, without additional conservation actions, were likely to become candidates for listing under the ESA. The Project falls within Bird Conservation Region (BCR) 5 – Northern Pacific Rainforest.

Habitat in the Project area has the potential to support five species of BCC including foraging habitat for bald eagle and foraging, nesting, and feeding habitat for rufous hummingbird, olive-sided flycatcher, willow flycatcher, and purple finch. Breeding seasons for the BCC species that may be present in the Project area include: rufous hummingbird - end of

May through early August; olive-sided flycatcher - mid-June through end of August; willow flycatcher - beginning of June through early August; and purple finch - beginning of May through mid-July.

Northwest proposes to clear forested areas in May or June, which is after the average start of migratory bird nesting expected in the Project area (April 26), and prior to the average peak when most migratory birds potentially in the Project area are breeding (June 21). Removal of small amounts of native habitat during construction could potentially result in inadvertent effects to nesting adults, nests, and eggs, if present. Because the Project would remove potential migratory bird nesting habitat during the primary nesting season generally considered for protection of migratory birds (April 1 through August 1, Northwest would search for active nests within the construction right-of-way and TEWAs prior to clearing and grading activities. Active nest locations would be flagged and avoided The nearest known bald eagle nests are 1 mile from the Project (WDFW, 2017b) and would not be adversely affected by the Project. Therefore, we conclude the Project's impacts on migratory birds would not be significant.

3.5 Special Status Species

Special status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. For the purposes of this EA, special status species include federally listed species protected under Section 7 of the ESA, species proposed or candidates for listing by the USFWS or NMFS, and those species that are state-listed as threatened, endangered, or otherwise considered sensitive. Section 7(a)(2) of the ESA requires the Commission to ensure that any action it authorizes would not jeopardize the continued existence of federally listed or proposed listed species, or result in the adverse modification or destruction of critical habitat for federally listed and proposed species. As the lead federal agency for the North Seattle Lateral Upgrade Project, the FERC is responsible for ESA consultation with the USFWS and NMFS to determine whether any proposed or federally listed species, or critical or proposed critical habitat may occur in the Project area, and to determine the proposed action's potential impacts on these species and critical habitat. Species protected under state statutes do not carry regulatory protection under the ESA, but we evaluate impacts for state-sensitive species that may be in the Project area, based on state-provided resource information.

Northwest utilized the USFWS' Information for Planning and Conservation system, the WDFW's list of State Listed Species, and the WDFW's interactive computer mapping system, SalmonScape, to determine whether any federally or state-listed threatened or endangered species, species of concern, or designated critical habitats occur in the Project area. Six species listed or proposed under the ESA and within the jurisdiction of the USFWS (Oregon spotted frog, streaked horned lark, yellow-billed cuckoo, bull trout, marbled murrelet, and North American wolverine) have the potential to occur within Snohomish County and the Project area. Two species listed under the ESA within the jurisdiction of NMFS (Chinook salmon and steelhead) also have the potential to occur in the Project area. Critical habitats for the marbled murrelet (USFWS, 2011a) and for bull trout (USFWS, 2010a) have been designated in Snohomish County. Critical habitat for Chinook salmon in the Puget Sound Evolutionarily Significant Unit was designated in 2005 (NMFS, 2005a), and critical habitat for steelhead in the

Puget Sound Distinct Population Segment (DPS) was designated in 2016 (NMFS, 2016a). Table 7 summarizes the federally listed species that may occur in the Project area, their preferred habitat, and our determination of effect. Our BA (appendix F) contains a more detailed species and impacts discussion, along with an identification of best management practices that would limit impacts to species and their habitat. These measures include use of dry-ditch construction methods, compliance with the Procedures, and implementation of a Fish Salvage Plan.

Table 7.
Federally Listed Species

Common Name (*Scientific Name*)	Federal Status	State Status	Habitat Description	FERC's Determination of Effect/Impact
Mammals				
North American wolverine *Gulo gulo luteus*	Proposed Threatened	Candidate	Wolverines occur within a wide variety of alpine, boreal, and arctic habitats, including boreal forests, tundra, and western mountains in the United States and Canada. The WDFW (2012) notes that wolverines historically occurred in alpine and subalpine habitats of the Cascades and animals had been photographically detected near Mt. Adams in 2009 and 2010. Since then, several wolverines have been trapped and fitted with radio collars; three wolverines were found in the vicinity of Stevens Pass in 2012 and another animal detected during August 2012 west of the Cascades Crest near Glacier Peak Wilderness (WDFW, 2012). More Recently, Conservation Northwest (2016) reported wolverines present in the upper Cle Elum River drainage northeast of Snoqualmie Pass in 2014, in the Teanaway Valley in 2015, and in the vicinity of Stevens Pass in 2016. None of these locations are in the Project area.	The Project would have ***no effect*** on the North American wolverine. Presence of a wolverine in the Project area is highly unlikely based on available information about the current distribution of wolverines in Washington, as well as lack of suitable habitats in the region surrounding the Project to support wolverines.
Birds				
Marbled murrelet *Brachyramphus marmoratus*	Threatened	Endangered	The Project is approximately 3 miles east of the Puget Sound coastline where marbled murrelets feed. In Washington, marbled murrelets nest within mature coniferous forests with old-growth characteristics, and nest sites/occupied stands are located as far as 30 and 40 miles from salt water depending on habitat (Mack et al., 2003), although most often sites are found within 12 miles of the ocean (USFWS, 199). Suitable nest trees must have large branches or deformities, such as high, moss-covered branches or branches with growths of dwarf	The Project would have ***no effect*** on marbled murrelet. None are known to occur in the Project area, and there are no mature coniferous forests with old-growth characteristics in the Project area that might provide suitable nesting habitat. The Project would have ***no effect*** on designated critical habitat for the marbled murrelet because no critical habitat is present in the Project area.

Table 7.
Federally Listed Species

Common Name (*Scientific Name*)	Federal Status	State Status	Habitat Description	FERC's Determination of Effect/Impact
			mistletoe, which serve as nest platforms (USFWS, 1997). In Washington, murrelets usually nest in older forests dominated by western hemlock, Sitka spruce, Douglas-fir and western redcedar from April through mid-September in which murrelets make daily flights to/from inland nest sites and marine foraging areas (WDFW, 2016c; Hamer and Nelson, 1995). The closest observations of murrelets from the Project are in the vicinity of Lake Chaplain, more than 14 miles east of the Project area (WDFW, 2010a). The closest designated critical habitat for marbled murrelets to the Project is Critical Habitat Unit WA-09-c in eastern Snohomish County, approximately 12 miles northeast of the Project.	
Streaked horned lark *Eremophila alpestris strigata*	Threatened	Endangered	The streaked horned lark migrates between Oregon and Washington with breeding populations found in the Puget Sound lowlands, Columbia River/coastal Washington, and the Willamette Valley in Oregon from late March to early August. In Washington, nesting habitats include open grasslands, beaches, and dredge spoils islands with sparse vegetation and agricultural fields, with individuals showing preference to bare ground compared to vegetation several inches tall (Stinson, 2005).	The Project would have ***no effect*** on the streaked horned lark. Breeding Bird Survey route number 89072 passes within 1 mile of the Project area and has been surveyed almost annually for the past 20 years; however, no horned larks of any subspecies have been reported (Pardieck et al., 2016). No currently occupied breeding locations have been reported in Snohomish County (Stinson, 2016). There are no native prairies or agricultural areas with mostly bare ground in the Project area that might provide suitable habitats for streaked horned larks.
Yellow-billed cuckoo *Coccyzus americanus*	Threatened	Candidate	The yellow-billed cuckoo is found within low- to moderate-elevation areas west of the crest of the Rocky Mountains in Canada, Mexico, and the western United States. Yellow-billed cuckoos are considered a riparian obligate species and are usually	The Project would have ***no effect*** on the yellow-billed cuckoo. The last confirmed breeding records in Washington are from the 1930s, and the USFWS suggests that yellow-billed cuckoos may be extirpated from Washington (USFWS, 2011b). More recent surveys were conducted in Okanogan and Yakima counties to

Table 7.
Federally Listed Species

Common Name (*Scientific Name*)	Federal Status	State Status	Habitat Description	FERC's Determination of Effect/Impact
			found in large tracts of cottonwood/willow habitats with dense sub-canopies, but may also be found in urban areas with tall trees (USFWS, 2007).	check locations where the species had been historically sighted, but no cuckoos were detected. USFWS (2011b). Presence of a yellow-billed cuckoo in the Project area is highly unlikely.
Amphibians				
Oregon spotted frog *Rana pretiosa*	Threatened	Endangered	Oregon spotted frogs inhabit emergent wetland habitats in forests, and were historically associated with prairie lakes in the Puget lowlands. They breed in shallow pools with grasses, sedges, and rushes that are not dominated by reed canarygrass near or connected with flowing water (USFWS, 2011c). The closest known population to the Project area is 51 miles north in the Samish River, Skagit County.	The Project would have ***no effect*** on the Oregon spotted frog. No suitable Oregon spotted frog breeding habitat occurs in the Project area, and there are no records of their occurrence in the Project vicinity. Presence of an Oregon spotted frog in the Project area is highly unlikely.
Fish				
Bull trout (Coastal-Puget Sound Distinct Population Segment (DPS) *Salvelinus confluentus*	Threatened	Candidate	Bull trout require complex forms of cover including large woody debris, boulders, and pools and undercut banks (WDFW, 2000). Spawning generally occurs during late summer and early fall, utilizing loose, clean gravel substrates in low gradient streams. Depending on the life history form, rearing and overwintering habitat vary, but bull trout still require cool clean water with insects, macro-zooplankton, and small fish for larger adults to consume. None of the North Lake Washington tributaries crossed by the Project provide habitat for bull trout. The WDFW's SalmonScape (WDFW, 2016a) indicates that bull trout are presumed to be present in Evans Creek in the vicinity of the existing permanent easement. Critical habitat for bull trout in the Coastal-Puget Sound DPS has been designated in the Snohomish River about 2.4 miles	The Project is ***not likely to adversely affect*** bull trout. Water for hydrostatically testing the new 20-inch-diameter pipeline would be obtained from a municipal source (a hydrant located at MP 2.22). Once the hydrostatic test is complete, the test water would be discharged to an upland area through an appropriately sized discharge structure. The discharge site is approximately 1,500 feet uphill from Evans Creek; however, Yew Way and Snohomish County Department of Parks and Recreation Rails to Trails are between the discharge site and Evans Creek so there would be little or no risk of hydrostatic water entering the creek. The Project would have ***no effect*** on designated critical habitat for Coastal-Puget Sound DPS bull trout because no designated critical habitat is present in the Project area.

Table 7.
Federally Listed Species

Common Name (*Scientific Name*)	Federal Status	State Status	Habitat Description	FERC's Determination of Effect/Impact
			downstream from the existing pipeline easement crossing of Evans Creek, but not in Evans Creek. No critical habitat was designated within the Middle Sammamish River Watershed.	
Chinook salmon (Puget Sound Evolutionarily Significant Unit) *Oncorhynchus tshawytscha*	Threatened	Candidate	Spawning bed characteristics utilized by Chinook vary considerably. Depths can range from a few centimeters to several meters, and can be located in streams from a couple of meters wide to sections of larger rivers like the Columbia River in Oregon. Preferred water depth ranges vary widely for Chinook during different life cycle phases. SalmonScape shows that fall Chinook salmon are present within streams crossed or proximate to the Project. SalmonScape includes fall Chinook salmon documented spawning in Little Bear Creek and presumed presence in most of the other perennial streams crossed by the Project. Critical habitat for Puget Sound Chinook has been designated in the Project area including Little Bear Creek ending approximately 150 feet downstream from the Project area. Critical habitat has also been designated for Puget Sound Chinook in the Snohomish River, approximately 2.4 miles downstream from the existing easement crossing of Evans Creek, but not in Evans Creek itself.	The Project is ***likely to adversely affect*** the Chinook salmon. Juvenile Chinook salmon may be present within the Project area during in-stream construction across Little Bear Creek. Juvenile Chinook salmon may be salvaged from surface water in the Project area with some risk of mortality or injury during capture and/or in storage containers or when released. Mortality or injury of juvenile Chinook salmon from either source would affect a very small portion of the population present within the Lake Washington Sub-basin. The Project is ***likely to adversely affect*** designated critical habitat for Chinook salmon with the Puget Sound Evolutionarily Significant Unit because the Project crosses Little Bear Creek 150 feet upstream from designated critical habitat.
Steelhead (Puget Sound DPs) *Oncorhynchus mykiss*	Threatened	-	Steellhead are anadromous rainbow trout that utilize coastal streams and tributaries to the Columbia River. Steelhead require cool, clear, well-oxygenated streams for spawning with suitable gravels and water flows (Pauley et al., 1986). Steelhead in the Snohomish River winter-run populations are among the most abundant within the Puget	The Project is ***not likely to adversely*** affect Puget Sound DPS steelhead. Steelhead may be present in Little Bear Creek during Project construction; however, juvenile or adult winter steelhead are not expected within the Project are during in-stream construction across Little Bear Creek or tributaries. Additionally, juvenile or adult steelhead are not likely to be salvaged from surface water in the Project

Table 7.
Federally Listed Species

Common Name (*Scientific Name*)	Federal Status	State Status	Habitat Description	FERC's Determination of Effect/Impact
			Sound DPS, averaging over 3,000 natural spawners per year between 2000 and 2004 (NMFS, 2005b). Winter steelhead are presumed to occur in in Evans Creek downstream from the existing pipeline crossing. Additionally, winter steelhead are presumed to occur in most streams crossed by the Project within the Middle Sammamish River). The WDFW (2016a) has modeled winter steelhead presence in Little Bear Creek, which would be crossed by the Project. Critical habitat has been designated for Puget Sound steelhead in the Snohomish River and tributaries including Evans Creek (NMFS, 2016) approximately 0.8 mile downstream from where Northwest's existing permanent easement crosses the creek.	area, hence, risk of mortality or injury during capture is unlikely. The Project would have ***no effect on*** designated critical habitat for steelhead within the Puget Sound DPS because the Project does not affect designated critical habitat associated with Evans Creek, which is 0.8 mile downstream from where Northwest's permanent easement crosses the creek.

3.5.1 Federally Listed Species

As mentioned above, the FERC is responsible for completing ESA section 7 consultation with the USFWS and NMFS for listed species and critical habitat that could be affected by Northwest's proposed action. Accordingly, we have prepared a BA to enter into formal and informal consultation with the USFWS and NMFS for three species: bull trout (managed by the USFWS), and Chinook salmon and steelhead (managed by the NMFS). Specifically, we are requesting that the NMFS and USFWS consider this analysis (including table 7 and appendix E) as our BA and that the NMFS enter into formal Section 7 consultation for the Chinook salmon. We also request that the USFWS and NMFS concur with our determination of *not likely to adversely affect* for the bull trout and steelhead.

We are still consulting with the USFWS and NMFS regarding federally listed threatened and endangered species that may be affected by the Project. In response to our BA, the NMFS would issue a Biological Opinion as to whether or not the federal action would jeopardize the continued existence of the Chinook salmon, or result in the destruction or adverse modification of this species' designated critical habitat. To ensure compliance with our responsibilities under Section 7 of the ESA regarding federally listed species, **we recommend that:**

- **Northwest <u>should not begin</u> construction or abandonment activities and/or use of any work areas <u>until</u>:**

  a. **the FERC staff receives comments from the USFWS and NMFS regarding the proposed action;**
  b. **the FERC staff completes Section 7 consultation with the USFWS and NMFS; and**
  c. **Northwest has received written notification from the Director of OEP that construction and/or use of mitigation (including implementation of any conservation measures) may begin.**

3.5.2 State-Listed Species of Concern

State-listed species of concern that have been identified by the state agencies as having potential habitat in the Project area are discussed below.

River Lamprey

The anadromous river lamprey (*Lampetra ayresi)* is a state candidate species and has been identified as a priority species under the WDFW's Priority Habitats and Species Program. Little is known about river lamprey biology or the species' distribution in Washington, but it historically likely occurred in most major rivers, including rivers throughout Puget Sound (Wydoski and Whitney, 1979). It is suspected that river lamprey spawn in small nests dug in the sand and gravel at the upstream end of riffle habitat (Wydoski and Whitney, 1979).

Anadromous adults begin migration from salt water between April and June and spawn during June and July; spawning is complete by September. Spawning occurs in nests formed as depressions in the small gravel of riffles generally upstream from young larvae (ammocoete)

habitat. Ammocetes burrow, grow, and live in areas of low velocity and fine sediments as filter feeders for 2 to 7 years before metamorphosing into juveniles that emigrate to the ocean where they mature into adults and remain for 1 to 3 years (USFWS, 2004a).

River lamprey may possibly occur in the streams within the Project area. As discussed in section B.3.2, construction of the Project would increase turbidity immediately downstream of the Project area; remove riparian vegetation which could affect water temperature; result in adverse effects from limited application of herbicides to control noxious weeks near waterbodies; and could potentially include an accidental release of petroleum products into the water. All of these activities could adversely affect aquatic organisms, including fish mortality. Northwest proposes to conduct in-stream activities in July, August, and September, which is within WDFW recommended in-water work windows. Northwest would implement its ECRP and additional minimization measures, described in section B.3.4, during construction to minimize impacts on waterbodies and fisheries. Therefore, we conclude that the Project would not significantly impact the river lamprey.

Sockeye Salmon

Sockeye salmon (*Oncorhynchus nerka*) were introduced into the Cedar River in the 1930s. Sockeye spawning streams are usually associated with lakes because adults select spawning sites in streams flowing into the lake, in upper sections of the lake's outlet river or along the lake's shore with some level of flow through gravel substrates (Pauley et al., 1989). After adults spend a period in a lake (up to eight months), adults move to their natal spawning areas. The time for egg incubation depends on water temperature; alevins remain in gravels for several weeks before emerging. Juveniles may migrate to natal lakes, forming schools that move between the lake surface and depths during the day, generally to avoid predation (Pauley et al., 1989). Sockeye fry may spend from one to three years in rearing lakes. Sockeye spawning has been documented in Little Bear Creek in the Project area and is presumed or modeled to be present in most of the other perennial streams crossed.

Impacts on sockeye salmon would be similar to those described for river lamprey, above. In-stream activities are within WDFW recommended in-water work windows. Northwest would implement its ECRP and additional measures during construction to minimize impacts on waterbodies and fisheries. Therefore, we conclude that the Project would not significantly impact the sockeye salmon.

4. Land Use, Recreation, and Visual Resources

4.1 Land Use

During construction Northwest proposes to use a 100-foot-wide right-of-way in upland areas and a 75-foot-wide right-of-way in wetlands, where technical constraints allow. Pipeline facilities would be constructed within Northwest's existing easement. As more fully described in section A.5, new pipeline would generally replace the abandoned pipeline in the existing trenchline, except for two State highway crossings where the existing line would be abandoned in place and a new segment of pipe installed by boring alongside it, and the proposed routing around the Fritch Mill between approximate MPs 2.1 and 2.2.

Northwest's existing permanent right-of-way varies between 35 and 75 feet wide. Northwest's current operations of the easement would continue post-construction; i.e., certain uses would continue to be prohibited, such as the construction of buildings within the easement and growth of large trees. Additionally, to facilitate periodic inspections as required by federal regulations, Northwest would conduct routine vegetation clearing on the permanent right-of-way. This would consist of mowing the width of the permanent right-of-way in upland areas. In wetland areas, Northwest would keep clear only a 10-foot-wide strip centered over the pipeline and would selectively cut trees encroaching within 15 feet of the pipeline.

Northwest would require approximately 88.4 acres of land to construct the pipeline facilities, of which 1 acre would be required for aboveground facilities. Northwest would also require up to 45 acres of land for use as a contractor storage yard, resulting in a total construction area of about 133 acres. Following construction, Northwest would allow 132 of the 133 acres of land (composed of temporary construction right-of-way, additional workspaces, and storage yards) to revert to its previous use (table 8).

Northwest would use about 90 private and public roads to access the pipeline right-of-way during construction (appendix D). These roads are primarily paved roads that would not require improvements; however, some grading could be necessary on unpaved roads. If the work corridor crosses a road or driveway, Northwest would maintain residents' ingress/egress to their homes. If the road is proposed to be open cut, one lane would remain open during construction. There may be short periods of time where the entire road or driveway would be closed to install a joint of pipe. Alternate points of access to neighborhoods would be maintained during temporary road closures.

Northwest would implement a traffic management plan, appropriate signage, and flaggers to facilitate road crossings and use of public roadways. Road work would be scheduled during non-peak travel hours (outside of 6:00 – 8:00 AM and 4:00 – 6:00 PM) to minimize construction impacts on landowners and commuters. At night, steel plates typically would be placed over the road ditch so traffic can flow on all lanes.

Northwest has proposed use of 64 TEWAs to perform specialized construction techniques where the pipeline route crosses wetlands and waterbodies, existing utilities, roads, and pipeline interconnections. A list of the extra workspaces is included in appendix C along

with a description of their purpose and the land use that would be temporarily affected. Land use impacts associated with extra workspaces are included in table 8 below and would account for about 25 acres of disturbance. Northwest would follow the restoration measures outlined in its ECRP at these workspaces, and prior use of these areas would resume following construction.

Table 8.
Construction and Operation Impacts on Land Use (acres)

Facility		Agriculture	Developed			Forest - Woodland	Riparian and Wetland		Open Water		Total
		Cropland and Pasture	Other Urban or Built-up Land	Residential	Transportation, Communication, Utilities Corridors	Mixed Forest Land	Forested Wetlands	Non-Forested Wetlands	Lakes	Streams and Canals	
CONSTRUCTION											
Construction Right-of-Way	Existing Permanent Easement [1]	3.43	22.65	7.90	3.99	1.33	0.33	3.35	0.07	0.27	43.36
	Construction Right-of-Way	1.56	6.13	0.56	5.54	4.80	0.23	0.55	0.01	0.05	19.39
Construction Right-of-Way Sub-Total		**4.99**	**28.78**	**8.46**	**9.53**	**6.13**	**0.56**	**3.90**	**0.08**	**0.32**	**62.75**
Temporary Extra Work Areas		6.62	10.83	1.92	2.44	1.42	0.05	1.17	0.14	0.00	24.57
Aboveground Facilities [2]			1.07								1.07
Contractor Storage Yards [5]			42.0		0.32	2.39					44.71
Total		**11.61**	**82.68**	**10.38**	**12.29**	**9.94**	**0.61**	**5.07**	**0.22**	**0.32**	**133.1**
OPERATION											
Aboveground Facilities [3]			0.23		0.06	0.01					0.30
Existing Permanent Easement [4]		2.89	22.79	6.93	3.41	1.36	0.20	3.57	0.07	0.25	41.47
New Permanent Easement (MP 2.1 to MP 2.2)		0.7				0.61					1.31
Total		**3.59**	**23.02**	**6.93**	**3.47**	**1.98**	**0.20**	**3.57**	**0.07**	**0.25**	**43.08**

[1] A portion of the construction right-of-way occurs would be location in Northwest's existing permanent easement which is currently maintained in an herbaceous condition, but in some areas forested lands have encroached along the edges of the existing permanent easement.
[2] Considers construction disturbance associated with two existing aboveground facilities at MP 0.61 and MP 11.14 that are located outside of the proposed construction right-of-way disturbance and are graveled and fenced. All other disturbance to existing aboveground facilities would be within Northwest's existing permanent easement and are included in construction right-of-way effects.
[3] Includes construction disturbance at MP 2.2 where all aboveground appurtenances would be removed and relocated to MP 7.76. The graveled yard and existing fence (0.23 acre at MP 2.2 would remain in place after construction.
[4] After construction, Northwest's existing permanent easement would be maintained in vegetation types currently within the Project footprint, identified under "Operation."
[5] Northwest has identified 4 possible storage yards for use, however, Northwest expects that it would only use one of these, thus impacts would be less than presented.

Northwest has proposed to use up to four contractor storage yard areas (table 9). Northwest does not expect to need to use all four areas and would determine which yard to use based on availability prior to construction. However, because we cannot determine with certainty which yards would be used, we have included all four yards in our analysis. These four yards range in size between 3.19 and 15.81 acres and consist of developed lands, although the Bothell Everett Highway and 173rd St SE yard would impact 2.36 acres of mixed forest. These contractor yards/storage areas would be used for storing construction materials and pipe, as well as for parking and office trailers. Northwest would follow the restoration measures outlined in its ECRP, and prior use of these areas would continue following construction.

Table 9.
Identified Possible Contractor Yards

Name	Size (acres)	Description	Land Use
Maltby - Quarry	15.81	Commercial quarry. Approximately 2.4 miles south of MP 3.5.	Other Urban or Built-up Land
RV-Storage at North Creek	3.19	Commercial RV storage facility. Coincides with the construction right-of-way between MPs 7.6 and 7.7.	Other Urban or Built-up Land
Bothell Everett Hwy & 183rd St SE	11.77	Previously graded vacant lot. Parcel is connected to 15th Ave SE (Private Rd), which intersects the construction right-of-way at MP 7.7.	Other Urban or Built-up Land (11.45 acres) and Transportation, Communication, Utilities Corridors (0.32 acre)
Bothell Everett Hwy & 173rd St SE	13.91	Previously developed vacant lot. Approximately 1.0 mile north of the Project on Bothell Everett Hwy at MP 7.54.	Other Urban or Built-up Land (11.55 acres) and Mixed Forest Land (2.36 acres)
Total	44.68		

We have reviewed the four potential contractor yards and find them acceptable; however, because Northwest has not finalized which specific yards it would use and to ensure Commission staff have accurate information on proposed workspaces, **we recommend that:**

- **<u>Prior to construction</u>, Northwest should file with the Secretary, for review and written approval by the Director of OEP, finalized locations for contractor storage yards and the status of landowner negotiations for their use.**

In order to access Project workspaces and the right-of-way, Northwest would utilize mostly paved county roads, although some private roads would be used. These are listed in appendix D. Northwest would use the same roads it currently uses to access its existing right-of-way, and thus no new permanent access roads would be necessary.

Land use in the Project area is attributed to several categories based on USGS classifications. For Northwest's Project, these categories are Developed – Urban or Built-up Land, Agricultural Land, Forested Land, and Water and Wetlands; these are discussed below.

Developed – Urban or Built-up Land

Developed lands account for the largest land use that would be encumbered by the Project during construction (63.03 acres). Much of this is accounted for by Northwest's existing right-of-way, in which the replacement pipeline would be constructed. Of the total 63 acres, the Project would affect 40.68 acres of urban or built up lands, 10.38 acres of residential land and 11.97 acres of transportation or utility corridors. During scoping we received comments from the Snohomish County Public Utility District No. 1 concerning potential Project impacts on its electrical transmission and distribution facilities. The District identified certain facilities of concern and provided Northwest with guidelines and standards for work in and adjacent to their facilities. Northwest provided a response on August 9, 2017, stating that it would work with the Public Utility District to address their concerns during Project design. We do not anticipate any negative impacts on utility corridors during construction or operation of the Project.

In general, following construction, developed lands would be able to return to their prior uses. However, at MP 2.20, Northwest proposes to remove the existing 8-inch pig launcher, 20-inch pig receiver, block valve, and crossover and relocate them to MP 7.76. Northwest proposes to continue maintaining the existing 0.23-acre graveled and fenced facility at MP 2.2. Because Northwest would remove all its existing facilities from this site, **we recommend that:**

- **Northwest remove the graveled yard and fencing along Waverly Drive and restore the area to its previous condition; and**

- **Prior to construction, Northwest should file with the Secretary, for review and written approval by the Director of OEP, an updated site plan showing the removal and restoration of the former pig launcher/receiver and valve site.**

Agricultural Lands

Construction would affect about 11.61 acres of agricultural land which is characterized as predominantly pastureland, of which 3.43 acres falls within the existing permanent easement used to operate Northwest's pipeline. Following construction, the presence of the pipeline and permanent easement would not prohibit a return to agricultural/pasture use; although any grazing activities would be suspended during construction. Landowners may need to divert their livestock or horses to other areas for grazing; however, Northwest committed to working with landowners to identify appropriate mitigation measures such as grazing deferments, select fencing, or offsite boarding. In order to minimize long-term impacts and to increase vegetation success, Northwest would segregate topsoil from subsoil during construction and backfill as appropriate. The relocated pigging facilities would not affect or convert any agricultural lands.

Forested Lands

Construction of the Project would affect a total of 7.55 acres of upland forest (and an additional 0.61 acre of forested wetlands), the majority of which is adjacent to the existing easement and needed for safe construction. Following construction, all forested lands within the temporary construction areas would be permitted to return to a forested state. These impacts, however, would be long-term given that forested lands would take about 10 to 20 years to be fully restored. In some areas, forested lands have encroached upon the existing right-of-way and these areas would not be permitted to reforest during Project operation. These areas account for 1.98 acres of forested lands.

Northwest would continue to conduct maintenance of its right-of-way no more frequently than once every three years in accordance with the FERC Plan. Continued maintenance of vegetation would interrupt normal forest succession, and vegetation on the permanent right-of-way would be prevented from reaching a mature height.

Wetlands and Waterbodies

A total of 5.68 acres of wetlands would be affected by construction. This includes 0.61 acre of forested wetland and 5.07 acres of non-forested wetlands. A full discussion of wetland and waterbody impacts is included in sections B.2.2 and B.2.3. These impacts would be temporary and Northwest would fully restore these areas in accordance with its ECRP and the FERC Procedures.

Residential Construction

Northwest's Project would involve construction in residential areas. There are 187 residences within 50 feet of construction workspaces (appendix F). In order to minimize impacts on residents, Northwest has developed a Neighborhood Residential Construction Plan and has prepared site-specific plans for residences within 50 feet of the construction work area or TEWAs. This plan and the residential drawings are also included in appendix F. Some of these measures in Northwest's Neighborhood Residential Construction Plan include:

- written landowner notifications 45 days prior to construction;
- surrounding the construction area with chain link security fences to provide a physical barrier;
- limiting the hours of construction from 7:00 AM to 6:00 PM;
- implementing dust and mud control measures as described in Northwest's ECRP as well as using sweepers (mechanical or by hand) to keep roads free from debris; and completing final cleanup, grading, and topsoil replacement within 10 days following backfill operations. Full restoration of landscaping in residential areas would be completed within 45 to 60 working days following cleanup and final grading.

Northwest expects that residential areas would not be impacted more than 30 days in any one given location.

A number of nonresidential structures are located within the existing easement or within the proposed construction work area. Landowner negotiations would determine the type and location of structures that would need to be removed to facilitate construction and whether they would be removed, relocated, or replaced. All structures within Northwest's existing permanent easement would be removed, whereas structures within the construction right-of-way and TEWAs would be removed, relocated, or replaced in accordance with landowner negotiations.

Northwest has also prepared a site-specific Residential Construction Plan for the Waterstone at Silver Creek Apartment Homes development between MPs 7.39 and 7.52. At this neighborhood, the right-of-way crosses parking and landscaped areas at the north end of the property. As identified in its plan, Northwest would ensure that the north covered and uncovered parking stalls are available during construction and that access to 186th Place SE is maintained. Additionally, foot access would be maintained to all residences. Because some parking would be displaced during construction, Northwest has committed to securing additional offsite parking for the tenants at a lot located across 186th Place SE. Northwest would also provide for security at the lot during night hours. Construction work hours would be from 7:00 AM to 6:00 PM and Northwest expects that restoration within the apartment complex would take approximately 30-45 working days. Final grading, topsoil replacement, and placement of new imported sod would occur within 10 days of backfill in accordance with Northwest's ECRP.

Northwest's proposed restoration measures at the apartment complex would also include repairs or replacement of landscaping sprinkler systems and other utilities, restoration of landscaping, and restoration of apartment complex fences.

We received comment letters concerning possible impacts on residential areas in response to the FERC's Notice of Application and the two NOIs. Concerns included construction noise, dust and equipment emissions, construction safety measures, tree clearing and other vegetation removal, and residential area alternatives. We also received property-specific concerns regarding loss of trees (including fruit trees); disturbance to site landscaping; and impacts on house foundations, drainage patterns, and a residential septic system.

Northwest provided a response to these comments on August 9, 2017, committing that it would: review the residential construction plans with affected landowners; determine the extent that trees can be avoided during construction; offer temporary housing (hotel) arrangements for residents within 25 feet of the construction right-of-way; comply with the Snohomish County Noise ordinance; monitor dust emissions during construction; and employ dust control measures. With respect to the septic system, Northwest stated that it would reduce the construction workspace to avoid impacting the septic system and that it would test the system before and after construction to ensure it has not been adversely impacted.

Because of the increased potential for construction activities to disrupt residences within 10 feet of construction activities and to ensure that a property owner has adequate input to a construction activity occurring so close to his or her residence, **we recommend that**:

- **<u>Prior to construction</u>, Northwest should file with the Secretary evidence of landowner concurrence with the site-specific residential construction plan for any residence within 10 feet of the proposed construction workspaces.**

Based on landowner comments received to date, as well as proximity of construction work areas to the residential structures listed and shown in appendix F, **we further recommend that:**

- **Northwest should develop and implement project-specific environmental complaint resolution procedures. The procedures should provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the Project, and during restoration of the rights-of-way. Prior to construction of the Project, Northwest should mail the complaint procedures to each landowner whose property would be crossed.**

  a. In its letter to affected landowners, Northwest should:

  (1) provide a local contact that the landowners should call first with their concerns; the letter should indicate how soon a landowner should expect a response;

  (2) instruct the landowners that if they are not satisfied with the response, they should call Northwest's Hotline (the letter should indicate how soon to expect a response); and

  (3) instruct the landowners that if they are still not satisfied with the response from Northwest's Hotline, they should contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.

  b. In addition, Northwest should include in its weekly status report a copy of a table that contains the following information for each problem/concern:

  (1) the identity of the caller and date of the call;

  (2) the location by milepost and identification number from the authorized alignment sheet(s) of the affected property;

  (3) a description of the problem/concern; and

  (4) an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

Northwest's site-specific residential construction plans and drawings are included in appendix F for landowners to review and comment. Of the residences listed in appendix F, 57 are within 10 feet of the construction workspace due to construction constraints along the right-of-way of the North Seattle Lateral. In addition, approximately 16 non-residential structures (e.g. sheds, garages) are within the proposed construction area. All structures within Northwest's existing permanent easement would be removed, while non-residential structures within the construction right-of-way and TEWAs would be avoided if possible. Some non-

residential structures may be removed, relocated, or replaced in accordance with landowner negotiations.

We conclude that implementation of Northwest's proposed construction methods for working in proximity to residences, its site-specific residential construction plans and commitments expressed in its responses to comments, and our recommendation above would minimize disruption on residents within close proximity to construction to the extent practicable. Further, Northwest's implementation of its ECRP would facilitate restoration along this segment as soon as reasonably possible upon completion of construction.

4.2 Recreation and Special Use Areas

Northwest's Project would not result in permanent impacts on recreation or special interest areas. The closest recreational area to the Project is Silver Creek Park which is 0.19 mile from the Project. The Project would not cross the park, and we do not expect that construction would impact any recreational activities at the park, given the distance from the right-of-way and Northwest's implementation of dust and noise control measures. There are no designated National or State Wild and Scenic Rivers, natural areas, scenic areas, or natural landmarks within 0.25 mile of the Project.

4.3 Coastal Zone

The Project falls within the state of Washington's designated Coastal Zone Management area. In accordance with the Coastal Zone Management Act (CZMA), the WDOE is the governing body that determines whether the Project meets state consistency standards for construction and operating the Project within the coastal zone. Northwest has begun coordinating with the WDOE regarding the Project's coastal zone consistency. However, at this time Northwest has not yet submitted its certification of consistency to the WDOE for its review, nor has the WDOE made a final determination. Therefore, to ensure the Project is consistent with the CZMA, **we recommend that:**

- **<u>Prior to construction</u>, Northwest should file with the Secretary documentation of concurrence from the WDOE that the Project is consistent with the CZMA.**

4.4 Visual Resources

The Project would result in temporary and long-term impacts on visual resources. While construction activities would be similar throughout the approximately 5.9 miles of replacement, visual impacts would vary based on the nature of the activity, the vantage point of the viewer, and the proximity to the work area.

The Project's primary impacts on visual resources would occur during active construction, and would mostly result from clearing of the right-of-way, the presence of personnel and heavy construction equipment, and storage of construction materials. These impacts would be greater within the residential subdivisions and apartment complexes due to the proximity of a large number of residences. These construction impacts would be temporary, as

removal and replacement of the pipeline would take approximately 4 months, beginning in the summer of 2019 and concluding in November of 2019 (according to Northwest's anticipated schedule). In the immediate period following completion of construction activities, the right-of-way would be characterized by a patchwork of new vegetation and bare soils. Vegetation would begin to recolonize the right-of-way early in the spring of 2020 and would return to preconstruction condition within 2 to 3 years in agricultural lands, wetlands (shrub-scrub and emergent), and open lands. As per Northwest's Neighborhood Residential Construction Plan, restoration of landscaping in residential areas would be completed in 45 to 60 working days following cleanup and final grading.

The clearing of forested lands would result in long-term and permanent visual changes. Impacts could also result from the removal of large trees with particular aesthetic value; removal of vegetation that provides visual barriers to roadways or industrial facilities; or landform changes that introduce contrasts in visual scale, spatial character, color, or texture. The primary visual impact of this Project would be a minor widening of Northwest's existing utility corridor where existing forested lands are already fragmented due to the pipeline easement. Following construction, cleared areas outside the permanent easement would be permitted to reforest; however, this could take upwards of 20 years.

The Project would result in some permanent visual impacts as a result of the installation of the new pigging facilities at MP 7.76. The pig launcher/receiver facility would be enclosed by a 6-to 8-foot-high precast concrete fence, presenting a new visual element to an area characterized by commercial development along the Bothell Everett Highway, the pipeline right-of-way, a recreational vehicle storage yard, and a densely-developed residential neighborhood. Northwest also proposes to remove an existing pig receiver at MP 2.2.

Given that the Project would utilize the existing easement for construction, resulting in minimal permanent impacts on forested lands, and otherwise result in minimal visual impact, we conclude that visual impacts from the Project would not be significant.

4.5 Hazardous Waste or Contamination

There are no National Priorities List sites or landfills within 0.25 mile of the Project. If any hazardous waste is encountered during pipeline construction, Northwest would dispose of it according to Washington Administrative Code sections 173-303. Sampling data from a previous Northwest pipeline project indicate that the existing pipeline coating may contain polychlorinated biphenyls (PCBs) in excess of 50 parts per million (ppm) and asbestos-containing materials. Northwest would take confirmation samples of each coating type prior to, or during, removal of the 8- and 16-inch-diameter pipelines to determine concentrations of PCBs and presence of asbestos.

All removed pipeline with a coating having PCB concentrations above 50 ppm would be managed in accordance with PCB rules and regulations issued by the EPA and contained within 40 CFR 761. Northwest would oversee all aspects of coating removal and testing prior to disposal, sale, or reuse of the pipe, to ensure compliance with all applicable requirements under the Toxic Substances Control Act, the Resource Conservation and Recovery Act, and the National Emission Standards for Hazardous Air Pollutants. The removal of any pipe coated with

asbestos-containing material would be managed in accordance with EPA requirements in 40 CFR 763, and Occupational Safety and Health Administration rules under 29 CFR 1926.1101.

Personal protective equipment would be used by workers to prevent exposure to asbestos along with adherence to the measures in the Project-specific safety plan and William's (Northwest's parent company) *Standard Operating Procedure 620.2 - Asbestos*. These procedures include respiratory protection and methods for preventing asbestos releases to the environment. Specific requirements include:

- contractor personnel must have asbestos removal certification; and
- specific containment procedures to be followed when coating is removed from the pipe, when pipe with an asbestos-containing coating is removed from the pipe trench, and during pipe transportation and storage.

The use of personal protective equipment by workers during pipe removal containing PCBs and/or asbestos, and the implementation of Northwest's Project-specific safety plan and company standard operating procedures, would minimize risk to workers and ensure proper disposal of contaminated pipe or coating.

5. Cultural Resources

Section 106 of the National Historic Preservation Act, as amended, requires the FERC to take into account the effect of its undertaking on properties listed, or eligible for listing on the National Register of Historic Places (NRHP) and to afford the Advisory Council on Historic Preservation an opportunity to comment. Northwest, as a non-federal party, is assisting the FERC in meeting our obligations under Section 106 and its implementing regulations at 36 CFR 800.

Northwest completed a cultural resources survey for the Project, and provided the resulting Cultural Resources Assessment report to the FERC and Washington State Historic Preservation Office (SHPO). The survey employed surface inspection augmented by shovel probes, and included both archaeological and architectural resources. The survey covered a generally 200-foot-wide corridor for the pipeline, as well as extra workspaces and access roads. Approximately 528 acres were examined.

As a result of the survey, one newly recorded historic archaeological site (45SN678) consisting of a car body and scatter of mid-20th century structural and domestic debris was identified. This site was recommended as a not eligible for the NRHP. Eight architectural resources were identified, including seven residences (dating from ca. 1887 to ca. 1972) and one historic railroad (the Seattle, Lakeshore, and Eastern Railway, currently active). The seven residences were recommended as not eligible, and the railroad was recommended as eligible for the NRHP. Current plans are to open-cut the railroad tracks, but because the tracks and bed would be restored to the original condition and elevation, Northwest recommended there would be no adverse effect on the railroad. In a letter dated April 26, 2017, the SHPO concurred with the recommendations in the report. We concur also and have determined that the Project would have no adverse effect on historic properties. Therefore, the process of complying with Section 106 is complete.

Northwest contacted the following Native American tribes, and followed up with telephone calls and emails: Muckleshoot Indian Tribe; Samish Indian Nation; Sauk-Suiattle Tribe; Snoqualmie Tribe; Stillaguamish Tribe; Suquamish Tribe; Swinomish Indian Tribal Community; Tulalip Tribes of Washington; and Upper Skagit Indian Tribe. The Samish Indian Nation indicated it was not interested in consulting on the Project. The Stillaguamish Tribe and Tulalip Tribes of Washington expressed interest in the Project. The Suquamish Tribe indicated it did not have any concerns with the Project, but requested a copy of the survey report. The Swinomish Indian Tribal Community requested a copy of the survey report. Northwest provided the survey report to the tribes who requested it. No other responses have been received. We also sent our NOI to the nine tribes. No responses to the NOI have been received.

Northwest provided a plan to address the unanticipated discovery of cultural resources and human remains during construction. We reviewed the plan and found it acceptable.

6. Air Quality and Noise

6.1 Air Quality

Air quality would be affected by construction and operation of the Project. The Project would result in temporary emissions of regulated air pollutants and other air contaminants generated from construction activities including operation of equipment, land disturbance, and increased traffic from worker and delivery vehicles. Northwest does not propose any new operating emission sources or modifications to existing emission sources; therefore, no air permitting actions are required.

Ambient air quality is protected by federal and state regulations. Under the Clean Air Act and its amendments, the EPA has established National Ambient Air Quality Standards (NAAQS) for carbon monoxide (CO), lead, nitrogen dioxide, ozone, particulate matter less than 10 microns (PM_{10}), particulate matter less than 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2). These standards incorporate short-term (hourly or daily) levels and long-term (annual) levels to address acute and chronic exposures to the pollutants, as appropriate. The NAAQS include primary standards, which are designed to protect human health, including the health of sensitive subpopulations such as children and those with chronic respiratory problems. The NAAQS also include secondary standards designed to protect public welfare, including economic interests, visibility, vegetation, animal species, and other concerns not related to human health. The State of Washington has adopted all of the NAAQS.

Areas of the country in violation of the NAAQS are designated by the EPA as nonattainment areas. Areas formerly designated as nonattainment that have subsequently reached attainment are designated maintenance areas for that pollutant. New sources proposed within or near nonattainment or maintenance areas may be subject to more stringent air permitting requirements. The EPA and state and local agencies have established a network of ambient air quality monitoring stations to measure and track the background concentrations of criteria pollutants across the United States. The Project is within the Puget Sound Intrastate Air Quality Control Region, which is designated as Attainment/Unclassifiable for all criteria pollutants.

The EPA defines air pollution to include greenhouse gases (GHG). The most common GHGs emitted during fossil fuel combustion and natural gas transportation are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Emissions of GHGs are typically expressed in terms of CO_2 equivalents (CO_{2e}), where the potential of each gas to increase heating in the atmosphere is expressed as a ratio relative to carbon dioxide over a specific timeframe, or its global warming potential (GWP). Thus, the GWP of CO_2 is 1, CH_4 is 25, and N_2O is 298.[13] During construction of the Project, these GHGs would be emitted from non-electrical construction equipment. Because the Project involves the replacement of existing pipelines, we anticipate little if any net increase of fugitive methane leaks from the Project replacement pipeline, further discussed below. Emission estimates of GHGs and other constituents generated by Project construction activities are presented in table 10.

Construction of the Project would result in short-term increases in emissions of some pollutants from the use of fossil fuel-fired equipment (primarily diesel) and the generation of fugitive dust due to earthmoving activities. Some temporary indirect emissions, attributable to construction workers commuting to and from work sites during construction and from on-road and off-road construction vehicle traffic, could also occur. Large earth-moving equipment and other mobile equipment are sources of combustion-related emissions, including criteria pollutants (i.e., NO_x, CO, VOC, SO_2, and PM_{10}). Table 10 presents the combustion emissions from operation of construction equipment, on-road vehicles, off-road vehicles, as well as earthmoving fugitive particulate matter emissions. Detailed emissions for each activity are provided in Northwest's Resource Report 9 within its Certificate application.

Construction of the Project, if approved, would likely take place between summer 2019 and November 2019, with activities typically lasting no more than a few days at any given location. The air quality impacts of Project construction would be short-term, highly localized to the immediate vicinity of construction sites, and minimized by Northwest's implementation of fugitive dust control measures such as limiting ground disturbance to that needed to perform construction activities; applying water to disturbed areas and soil stockpiles as needed to control fugitive dust releases into areas adjacent to construction sites; limiting and enforcing construction vehicle speeds; halting ground disturbance activities when wind speed exceeds 30 miles per hour; applying gravel to construction access entrances; and cleaning up mud or dirt tracked out of the construction areas in accordance with Northwest's ECRP.

Northwest would also contract for mobile construction equipment with catalytic converters; require its contractor to maintain all equipment in a properly functioning and tuned condition to minimize exhaust emissions; and limit operation of all equipment to an as-needed basis. In addition, based on Northwest's estimated SO_2 emissions summarized above in table 10, construction equipment would be fueled with ultra-low sulfur diesel fuel.

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[13] These GWPs are based on a 100-year time period. We have selected their use over other published GWPs for other timeframes because these are the GWPs EPA has established for reporting of GHG emissions and air permitting requirements.

Table 10.
Estimated Construction Emissions

Source(tons) a/, b/, c/	**CO**	**NOx**	**SO2**	**VOC**	**PM10**	**PM2.5**	**HAP** d/	**CO2e**
Construction Equipment	13.73	34.25	0.24	7.70	2.15	1.40	1.93	4,356
Deliveries/Commutes	2.19	0.11	0.002	0.09	0.006	0.003	0.004	89
Fugitive Dust	-	-	-	-	3.17	0.20	-	-
Blowdown releases	-	-	-	0.86	-	-	-	633
Total e/	**15.9**	**34.4**	**0.24**	**8.65**	**5.33**	**1.60**	**1.93**	**5,080**

a/ Emissions were estimated using EPA's AP-42 emission factors, the Midwest Research Institute publication "Control of Fugitive and Hazardous Dusts" (storage pile fugitives), engineering calculations, EPA Mobile6 emission factors, and EPA NONROAD emission factors and associated guidance documents.

b/ Northwest provided detailed emission calculations within its application filed on May 11, 2017, under Accession Number 20170511-5028.

c/ Emission estimates are based on approximately 6.8 miles of pipe construction proposed in Northwest's original application. Northwest's amended application involves approximately 1.03 fewer miles of pipeline construction (5.76 miles); therefore, emission estimates in this EA for construction equipment and fugitive dust are somewhat conservative.

d/ As formaldehyde.

e/ Rounded totals.

In general, fugitive dust and exhaust-related emissions from Project construction would dissipate quickly from construction sites, limiting the potential for such emissions to impact nearby residences, and would occur primarily during periods of active ground disturbance.

For a discussion concerning the procedures Northwest would follow in the event that any pipe segments abandoned by removal are found to be coated with asbestos, refer to section B.4.5.

The EPA's Natural Gas STAR Methane Challenge Program is a voluntary program for the reduction of methane emissions in the U.S. oil and gas sectors whereby companies make specific and transparent commitments to reduce methane emissions. The Program provides a platform for partners to showcase efforts to reduce methane emissions, improve air quality, and monetize savings made as a result of this participation. Northwest is not a member of the EPA's Methane Challenge Program; however, Northwest would minimize methane emissions associated with operation and maintenance of the Project facilities, estimated to be approximately 136.1 metric tons of CO_{2e} per year,[14] by following the pipeline pump down techniques recommended by the STAR Program.

With respect to downstream GHG emissions, we assumed all of the gas to be transported is eventually combusted. While not part of the proposed Project, we estimated the GHG

[14] Estimates are based on methane emission factors obtained from the Interstate Natural Gas Association of America's *Greenhouse Gas Emission Estimation Guidelines for Natural Gas Transmission and Storage, Vol. 1 – Greenhouse Gas Emission Estimation Methodologies and Procedures, Revision 2*, September 28, 2005.

emissions from the end-use combustion[15] of the incremental increase of natural gas (196,311 Dth/day) that could be transported by the Project. Assuming that the full incremental pipeline capacity would be used every day, about 3.8 million metric tons of CO_2e per year would be emitted by downstream users. We note that this annual CO_2e estimate represents an upper bound for the amount of end-use combustion that could result from the gas transported by this Project and it is likely that the downstream GHG emissions would be lower than the above estimate. For context, the nationwide and State of Washington's GHG emission inventories for calendar year 2015 are approximately 5,415 and 75.7 million metric tons of CO_2e, respectively. Therefore, the Project could result in a 0.07% and 5.0% increase in the nationwide and State of Washington GHG emission inventories, respectively.

The nearest federally designated Class I areas are approximately 40 kilometers (km) (Alpine Lakes Wilderness), 58 km (Mount Rainier National Park), 63 km (Glacier Peak Wilderness), 66 km (Olympic National Park), and 98 km (North Cascades National Park) away from proposed Project construction sites. Emissions generated from Project construction would effectively dissipate over the distances to each of these federally protected areas and disperse to existing ambient concentrations of criteria pollutants at these locations. Due to the limited nature of construction activities that would take place intermittently over a period of several months, we expect that the Project would not result in any meaningful impacts on any federally designated Class I area.

The EPA requested that the EA quantify and disclose Project emissions and consider mitigation measures to reduce those emissions. The EPA also requested the EA to address air quality protection, including air quality impacts and mitigation measures, potential impacts on Class I areas, and measures to minimize the release of methane and other emissions. Each of these comments is addressed above. Additionally, the EPA stated that the EA should discuss the potential of Project-related HAP emissions to impact public health. As summarized in table 10, the HAP emissions generated by Project construction would be far less than the EPA's major source threshold for stationary sources. Unlike stationary sources, emissions generated by Project construction would be dispersed over the Project linear footprint, would occur intermittently and only during times of active Project construction, and would cease after Project construction activities are complete. Therefore, we conclude that HAP emissions from Project construction would negligibly impact public health. Lastly, the EPA commented that the EA should discuss how changes in climate could potentially impact the proposed Project and how the proposed Project could impact the climate. We discuss this in section B.8.

We received comments concerning the potential for the Project's construction-related air emissions to impact nearby residences. As stated above, we expect that emissions of fugitive dust and exhaust generated during Project construction would dissipate rapidly after leaving the immediate vicinity of any active construction site, and construction activity would typically last no more than a few days at each site during day time hours. Therefore, combined with Northwest's commitments to minimize emissions from Project construction specified above, we

[15] This estimate assumes the maximum capacity is transported 365 days per year, which is rarely the case because many projects are designed for peak use.

conclude that emissions from Project construction activities would not significantly impact nearby residences.

Given the temporary nature of construction and the intermittent nature of construction emissions, we find that emissions from construction-related activities for the Project are not expected to cause or significantly contribute to a violation of any applicable ambient air quality standard, would minimally and temporarily affect local air quality, and have a negligible impact on regional air quality.

6.2 Noise

Construction of the Project would affect the local noise environment. The ambient sound level of a region, defined by the total noise generated within the specific environment, is usually comprised of sounds emanating from natural and artificial sources. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of a day and throughout the week, caused in part due to changing weather conditions and the effect of seasonal vegetation cover.

In 1974, the EPA published its Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety (EPA, 1974). Noise levels are expressed as decibels on the A-weighted scale (dBA) to put more emphasis on frequencies in the range that humans hear best. Because noise levels are perceived differently, depending on length of exposure and time of day, the day-night sound level (L_{dn}) takes into account the duration and time the noise is encountered. Specifically, the L_{dn} adds 10 dBA to nighttime sound levels between the hours of 10 PM and 7 AM to account for a people's greater sensitivity to sound during the night. The EPA has indicated that an L_{dn} of 55 dBA protects the public from indoor and outdoor activity interference. We have adopted this criterion and use it to evaluate the potential noise impacts from the proposed Project at noise sensitive areas (NSAs), such as residences, schools, or hospitals. In general, a person's threshold of perception for a perceivable change in loudness on the A-weighted sound level is about 3 dBA, whereas a 5 dBA change is clearly noticeable, and a 10 dBA change is perceived as either twice or half as loud.

Adjacent NSAs would be subject to noise generated by Project construction activities at varying levels, depending upon the construction phase. Impacts on NSAs from construction activities would be temporary and intermittent. Pipeline construction would primarily be limited to daytime hours (7:00 AM to 10:00 PM); therefore, nighttime noise levels would remain unaffected by most construction activities.

The Project does not involve the construction or use of any new permanent noise sources. Therefore, there would be no impact on noise levels during operation of the Project.

On its website, the State of Washington Department of Ecology states that it "does not have the authority to enforce noise rules or local noise ordinances," and defers to local governments.[16] Snohomish County sets forth noise control standards applicable to the Project

[16] http://www.ecy.wa.gov/laws-rules/noise.html

within Snohomish County Code sections 10.01.020, 10.01.030, and 10.01.050. These standards exempt noise from construction activities insofar as Project activities are consistent with the State Environmental Policy Act determination issued to Northwest by Snohomish County (see table 3). Northwest has stated that it would comply with the applicable provisions of the Snohomish County noise standards.

Construction activities would be intermittent and temporary, involving operation of equipment including bulldozers, graders, backhoes, front end loaders, welding machines, trucks, pickups, and other miscellaneous equipment typically used at construction sites. Noise from construction activities may be noticeable at nearby NSAs; however, construction equipment would be operated on an as-needed basis during the short-term construction period. Measures to mitigate construction noise would include limiting construction activities primarily between the hours of 7:00 AM and 6:00 PM, operating equipment only when necessary to carry out Project activities, limiting construction vehicle speeds, maintaining all construction equipment in a properly functioning condition, and equipping all fossil fuel-powered equipment with mufflers and other noise-dampening devices. Northwest's Neighborhood Residential Construction Plan is provided in appendix F.

We received comments regarding the potential of noise generated by Project construction activities to contribute to the hearing loss of individuals at NSAs. Based on the types of construction activities anticipated for the proposed Project, and the distance of noise receptors from any construction site, we estimate that the instantaneous noise contribution from Project construction at nearby NSAs would not exceed a level of 85 dBA under most circumstances.[17] Due to the intermittent nature of construction activities, and the expectation that construction activities on linear projects such as the proposed Project typically do not occur at any one location for an extended period of time, noise impacts at nearby NSAs would last only for short bursts of time as equipment is activated. For repeated exposures of 85 dBA, hearing loss is not expected even for relatively frequent occurrences of noise at this level over a 24-hour period (Shaheen, 1992). We expect that the Project would contribute brief bursts of noise at any single NSA attaining 85 dBA only infrequently and only during times that construction activities are in the immediate vicinity of an NSA, and only during daytime hours (7:00 AM to 6:00 PM) throughout the proposed summer to fall 2019 construction period.

Based on the analysis above, we conclude that the Project would not result in significant noise impacts on residents, surrounding communities, or regional parks and nature preserves.

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[17] This noise estimate is based on a distance of 50 feet from the receptor and the construction equipment. Construction workspaces would be within 50 feet of many residences, measured from the edge of the construction right-of-way to the edge of the residential structure (house, etc.). For those residences keeping doors and windows closed during construction activities, the residential structure itself would substantially reduce construction noise detected within the interior of each residence, including the brief period of time that construction equipment may operate in proximity to any residence. In addition, Northwest would install safety fencing in accordance with its site-specific residential construction plans to ensure a safe barrier and distance between construction areas and residences.

7. Reliability and Safety

The transportation of natural gas by pipeline involves some incremental risk to the public due to the potential for an accidental release of natural 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 auto-ignition temperature of 1,000 ºF and is flammable at concentrations between 5.0 percent and 15.0 percent in air. An unconfined mixture of methane and air is not explosive; however, it may ignite if there is an ignition source. A flammable concentration within an enclosed space in the presence of an ignition source can explode. Methane is buoyant at atmospheric temperatures and disperses rapidly in air.

7.1 Safety Standards

The DOT is mandated to prescribe minimum safety standards to protect against risks posed by pipeline facilities under Title 49, U.S.C. Chapter 601. The DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) 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, which set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve safety. PHMSA's safety mission is to ensure 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.

Title 49, U.S.C. Chapter 601 provides for a state agency to assume all aspects of the safety program for intrastate facilities by adopting and enforcing the federal standards. A state may also act as DOT's agent to inspect interstate facilities within its boundaries; however, the DOT is responsible for enforcement actions. The state of Washington has delegated authority to inspect interstate pipeline facilities, including the proposed Project.

The DOT pipeline standards are published in 49 CFR 190-199. Part 192 specifically addresses natural gas pipeline safety issues. Under a Memorandum of Understanding on Natural Gas Transportation Facilities 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. Alternatively, an applicant must 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. If the Commission becomes aware of an existing or potential safety problem, there is a provision in the Memorandum of Understanding to promptly alert the DOT. The Memorandum of Understanding 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.

The pipeline and aboveground facilities associated with the Project must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The DOT 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 below:

- 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.

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. For instance, pipelines constructed within Class 1 locations must be installed with a minimum depth of cover of 30 inches in normal soil and 18 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.

Class locations also specify the maximum distance to a sectionalizing block valve (*e.g.*, 10.0 miles in Class 1, 7.5 miles in Class 2, 4.0 miles in Class 3, and 2.5 miles in Class 4). Pipe wall thickness and pipeline design pressures, hydrostatic test pressures, maximum allowable operating pressure, inspection and testing of welds, and frequency of pipeline patrols and leak surveys must also conform to higher standards in more populated areas. The Project would consist of about 0.2 mile of Class 1 and 5.65 miles of Class 3 pipe.

If a subsequent increase in population density adjacent to the right-of-way results in a change in class location for the pipeline, Northwest would reduce the maximum allowable operating pressure or replace the segment with pipe of sufficient grade and wall thickness, if required to comply with the DOT requirements for the new class location.

The DOT Pipeline Safety Regulations require operators to develop and follow a written integrity management program that contain all the elements described in 49 CFR 192.911 and address the risks on each transmission pipeline segment. The rule establishes an integrity management program that applies to all high consequence areas (HCA).

The DOT has published rules that define 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 for DOT 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 where the potential impact radius[18] is greater than 660 feet and there are 20 or more buildings intended for human occupancy within the potential impact circle,[19] or
- any area in Class 1 or 2 where the potential impact circle includes an identified site.

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.

In the second method, an HCA includes any area within a potential impact circle which contains:

- 20 or more buildings intended for human occupancy, or
- an identified site.

Once a pipeline operator has determined the HCAs along 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 section 192.911. For the proposed Project, HCAs have been determined based on the

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18 The potential impact radius is calculated as the product of 0.69 and the square root of: the maximum allowable operating pressure of the pipeline in psig multiplied by the square of the pipeline diameter in inches.

19 The potential impact circle is a circle of radius equal to the potential impact radius.

relationship of the pipeline centerline to other nearby structures and identified sites. Of the approximate 5.9 miles of proposed replacement pipeline, Northwest has identified approximately 1.27 miles that would be classified as an HCA. The pipeline integrity management rule for HCAs requires inspection of the pipeline every 7 years.

The DOT prescribes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards of 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 system shutdown 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.

The DOT requires that each operator 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 provide the appropriate training to local emergency service personnel before the pipeline is placed in service.

Northwest operates area offices along its pipeline system that allow Northwest personnel to provide a quick response to any emergency situation and to direct safety operations as necessary. Northwest would also monitor the Project facilities from its gas control center, which is maintained in Salt Lake City, Utah, and monitors system pressures, flows, and customer deliveries 24 hours per day, 365 days per year.

Northwest also conducts aerial patrols at least once per year, depending on the feature(s) inspected. Additional ground surveys are conducted on an as-needed basis to respond to issues such as landowner concerns and third-party encroachment on the pipeline right-of-way. In accordance with DOT regulations, Northwest also regularly inspects its facilities for leakage as part of scheduled operations and maintenance. The Project would be subject to these regulations.

7.2 Pipeline Accident Data

The DOT requires all operators of natural gas transmission pipelines to notify the DOT of any significant incident and to submit a report within 30 days. Significant incidents are defined as any leaks that:

- caused a death or personal injury requiring hospitalization; or
- involve property damage of more than $50,000 (1984 dollars).[20]

During the 20-year period from 1996 through 2015, a total of 1,310 significant incidents were reported on the more than 300,000 total miles of natural gas transmission pipelines nationwide.

Additional insight into the nature of service incidents may be found by examining the primary factors that caused the failures. Table 11 provides a distribution of the causal factors as well as the number of each incident by cause.

Table 11.
Nationwide Natural Gas Transmission Pipeline Significant Incidents (1996-2015)

Cause of Incident a/	Number of Incidents	Percentage
Pipeline material, weld, or equipment failure	354	27.0
Corrosion	311	23.7
Excavation	210	16.0
All other causes b/	165	12.6
Natural forces c/	146	11.1
Outside force d/	84	6.4
Incorrect operation	40	3.1
Total	**1,310**	**100**

a/ All data gathered from PHMSA's Oracle BI Interactive Dashboard website for Significant Transmission Pipeline Incidents, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages&NQUser=PDM_WEB_USER&NQPassword=Public_Web_User1&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FSC%20Incident%20Trend&Page=Significant&Action=Navigate&col1=%22PHP%20-%20Geo%20Location%22.%22State%20Name%22&val1=%22%22 (DOT, 2016a). Accessed on 2/17/2016.

b/ All other causes include miscellaneous, unspecified, or unknown causes.

c/ Natural force damage includes earth movement, heavy rain, floods, landslides, mudslides, lightning, temperature, high winds, and other natural force damage.

d/ Outside force damage includes previous mechanical damage, electrical arcing, static electricity, fire/explosion, fishing/maritime activity, intentional damage, and vehicle damage (not associated with excavation).

The dominant causes of pipeline incidents are corrosion and pipeline material, weld or equipment failure constituting 50.7 percent of all significant incidents. The pipelines included in the data set in table 11 vary widely in terms of age, diameter, and level of corrosion control. Each variable influences the incident frequency that may be expected for a specific segment of pipeline.

[20] $50,000 in 1984 dollars is approximately $112,955.73 as of May 2015 (CPI, Bureau of Labor Statistics, 2015).

The frequency of significant incidents is strongly dependent on pipeline age. Older pipelines have a higher frequency of corrosion incidents and material failure, because corrosion and pipeline stress/strain is a time-dependent process.

The use of both an external protective coating and a cathodic protection system,[21] required on all pipelines installed after July 1971, significantly reduces the corrosion rate compared to unprotected or partially protected pipe.

Outside force, excavation, and natural forces are the cause in 33.5 percent of significant pipeline incidents. These 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 12 provides a breakdown of external force incidents by cause.

Table 12.
Outside Forces Incidents by Cause (1996-2015)

Cause a/	**Number of Excavation, Natural Forces, and Outside Force Incidents**	**Percentage of All Incidents** b/,c/
Third party excavation damage	172	13.1
Heavy rain, floods, mudslides, landslides	74	5.7
Vehicle (not engaged with excavation)	49	3.7
Earth movement, earthquakes, subsidence	32	2.4
Lightning, temperature, high winds	27	2.1
Operator/contractor excavation damage	25	1.9
Unspecified excavation damage/previous damage	13	1.0
Other or unspecified natural forces	13	1.0
Fire/explosion	9	0.7
Fishing or maritime activity	9	0.7
Other outside force	9	0.7
Previous mechanical damage	6	0.5
Electrical arcing from other equipment/facility	1	0.1
Intentional damage	1	0.1
Total	**440**	**33.5**

a/ All data gathered from PHMSA's Oracle BI Interactive Dashboard website for Significant Transmission Pipeline Incidents, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?Portalpages&NQUser=PDM_WEB_USER&NQPassword=Public_Web_User1&PortalPath=%2Fshared%2FPDM%20Public%20Website%2F_portal%2FSC%20Incident%20Trend&Page=Significant&Action=Navigate&col1=%22PHP%20-%20Geo%20Location%22.%22State%20Name%22&val1=%22%22 (DOT, 2016a). Accessed on 2/17/2016.

b/ Percentage of all incidents was calculated as a percentage of the total number of incidents natural gas transmission pipeline significant incidents (i.e., all causes) presented in table 11.

c/ Due to rounding, column does not equal 33.6 percent.

[21] Cathodic protection is a technique to reduce corrosion (rust) of the natural gas pipeline through the use of an induced current or a sacrificial anode (like zinc) that corrodes at faster rate to reduce corrosion.

Older pipelines have a higher frequency of outside force 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 movement.

Since 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 and cable television) to provide preconstruction information to contractors or other maintenance workers on the underground location of pipes, cables, and culverts.

7.3 Impact on Public Safety

We received comments regarding the potential for ground disturbance-related activities associated with the Project pipe replacement of the existing 8-inch-diameter pipeline to cause damage to Northwest's existing 16-inch-diameter Loop Line, as well as general pipeline safety concerns. As mentioned previously, the Project pipeline would be constructed in accordance with the DOT's requirements set forth in 49 CFR 192. Northwest's adherence to the DOT requirements would ensure that Project construction would not cause damage to any existing pipelines or other utilities in the vicinity of the Project construction workspaces.

In addition, we received comments regarding the ability of the Fritch Forest Products Mill to continue its practice of storing logs within Northwest's existing pipeline easement within the mill's property. In its application, Northwest has not identified any state or local codes and standards that prohibit the storage of logs within the easement. Further, according to the commenters, Northwest has allowed log storage within its existing easement transecting the mill for greater than 15 years. We can identify no specific federal regulations, including those found in 49 CFR 192, prohibiting such log storage activities within the easement; however, as stated in this section, Northwest would be required to assure compliance with all applicable requirements of 49 CFR 192 for the Project facilities. In general, pipeline operators are free to accommodate the site-specific needs of landowners within their easement agreements as much as practicable, including allowing various uses and activities occurring within their easements, as long as these activities do not conflict with the FERC Plan and Procedures or other federal, state, and local requirements.

Table 13 shows the annual number of injuries and fatalities attributed to natural gas transmission pipelines. The service incidents data summarized in the table include natural gas transmission system failures of all magnitudes with widely varying consequences. Table 14 presents the annual injuries and fatalities that occurred on natural gas transmission lines from incidents for the 5-year period between 2011 and 2015.

The majority of fatalities from pipelines are due to local distribution pipelines not regulated by FERC. These are natural gas pipelines that distribute natural gas to homes and

businesses after transportation through interstate natural gas transmission pipelines. In general, these distribution lines are smaller diameter pipes and/or plastic pipes which are more susceptible to damage. Local distribution systems do not have large rights-of-way and pipeline markers common to the FERC regulated natural gas transmission pipelines. Therefore, incident statistics inclusive of distribution pipelines are inappropriate to use when considering natural gas transmission projects.

The nationwide totals of accidental fatalities from various anthropogenic and natural hazards are listed in table 14 in order to provide a relative measure of the industry-wide safety of natural gas transmission pipelines. Direct comparisons between accident categories should be made cautiously, however, because individual exposures to hazards are not uniform among all categories. The data presented in tables 13 and 14 nonetheless indicate a low risk of death due to incidents involving natural gas transmission pipelines compared to the other categories. Furthermore, the fatality rate is much lower than the fatalities from natural hazards such as lightning, tornados, or floods.

Table 13.
Annual Injuries and Fatalities – Natural Gas Transmission Pipelines

Year a/	Injuries		Fatalities	
	Employees	Public	Employees	Public
2011	1	0	0	0
2012	3	4	0	0
2013	0	2	0	0
2014	1	0	1	0
2015	12	2	6	0

a/ All data gathered from PHMSA Pipeline Incident Flagged Files website on March 6, 2015 http://phmsa.dot.gov/pipeline/library/data-stats/flagged-data-files (DOT, 2015).

Table 14.
Nationwide Accidental Fatalities by Cause

Type of Accident	Annual Number of Deaths
Motor vehicle a/	35,369
Poisoning a/	38,851
Falls a/	30,208
Drowning a/	3,391
Fire, smoke inhalation, burns a/	2,760
Floods b/	81
Tornado b/	72
Lightning b/	49
Hurricane b/	47
Natural gas distribution lines c/	13
Natural gas transmission pipelines c/	2

a/ Accident data presented for motor vehicle, poisoning, falls, drowning, fire, smoke inhalation, and burns represent the annual accidental deaths recorded in 2013 (Centers for Disease Control and Prevention, 2013; Deaths: Final Data for 2013; http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_02.pdf. Accessed 2/17/2016.)

b/ Accident data presented for floods, tornados, lightning, and hurricanes represent the 30 year average of accidental deaths between 1985 and 2014 (NOAA, 2016. National Weather Service, Office of Climate, Water and Weather Services, National Hazard Statistics, 30 year average (1985-2014); Available at: http://www.nws.noaa.gov/om/hazstats.shtml. Accessed 2/17/2016.

c/ Accident data presented for natural gas distribution lines and transmission pipelines represent the 20-year average between 1996 and 2015 (DOT, 2016. PHMSA, Pipeline Significant Incident 20 Year Trend: 20-Year Average (1996-2015); Available at: http://opsweb.phmsa.dot.gov/primis_pdm/significant_inc_trend.asp. Accessed 2/17/2016.

The available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation. From 1996 to 2015, there were an average of 65.8 significant incidents, 9.1 injuries, and 2.3 fatalities per year. The number of significant incidents over the more than 300,000 miles of natural gas transmission lines indicates the risk is low for an incident at any given location.

8. Cumulative Impacts

In accordance with NEPA and FERC policy, we evaluated the potential for cumulative impacts of the Project. Cumulative effects generally refer to impacts that are additive or synergistic in nature and result from the construction of multiple Projects in the same vicinity and time frame. Cumulative impacts represent the incremental effects of a proposed action when added to other past, present, or reasonably foreseeable future actions, regardless of the agency or party undertaking such actions. Cumulative impacts can result from individually minor, but collectively significant actions, taking place over a period of time. In general, small-scale Projects with minimal impacts of short duration do not significantly contribute to cumulative impacts.

This cumulative impact analysis generally follows the methodology set forth in guidance from the Council on Environmental Quality (CEQ, 2005) and EPA (1999). Under these guidelines, inclusion of other projects in the analysis is based on identification of impacts from other projects that would result in similar effects as the proposed Project. We undertook this assessment considering the following factors:

- A past, present, or future project must impact a resource potentially affected by the proposed action. Distant projects were not considered because their impacts would not likely overlap.
- The time in the past or future of other projects was considered, since the potential for cumulative effects is dependent on the duration of the impact, and whether it be short-term, long-term, or permanent. Present projects would be considered to overlap in time of occurrence.
- The cumulative impacts discussed herein have been based on information found in other FERC filings, agency and public input, and other publicly accessible information, as well as information provided by Northwest.

The CEQ issued an interpretive memorandum on June 24, 2005, regarding analysis of past actions, which stated: "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." In order to understand the contribution of past actions to the cumulative effects of the proposed action, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

In this analysis, we generally consider the impacts of past projects within the resource-specific geographic scopes as part of the affected environment (environmental baseline) which was described under the specific resources discussed throughout section B. However, this analysis does include the present effects of past actions that are relevant and useful, as discussed further below.

The proposed Project would affect a confined east to west corridor within Snohomish County, Washington. We assessed the potential cumulative effects of the proposed Project with other projects within a geographic scope as defined in table 15. We defined the geographic region within which cumulative impacts on certain resources may occur as being the area comprising the HUC 12 subwatersheds that contain the Project activities. The HUC 12 watershed provides a natural boundary, as recommended by CEQ, and can serve as a geographic proxy for impacts on water quality, vegetation, and wildlife. This geographic scope area is shown on figure 2.

In general, the pipeline replacement activities associated with the North Seattle Lateral Upgrade Project would take place within an existing, previously disturbed pipeline easement, thereby minimizing the associated environmental impacts of Project activities.

As discussed above, geology and soil impacts would be highly localized and limited primarily to the Project footprint during the period of construction. In addition, Project-related construction activities would not result in significant impacts on groundwater resources, as the Project would not adversely affect any public or private wells. Further, the one identified NHRP-eligible site would not be adversely affected. Visual impacts associated with the Project would be minimized, as construction activities would take place in and adjacent to the existing right-of-way and no new aboveground facilities would be constructed. Additionally, the Project

would not generate air or noise emissions during operation, and construction period air and noise emissions are minor and below any reporting thresholds.

Therefore, we conclude that the impacts from the Project, when considered cumulatively with past, present, and reasonably foreseeable projects, would not contribute to cumulative impacts on geology, soils, groundwater, visual resources, cultural resources, air quality, and noise. Accordingly, these resources are not discussed further in this section.

For the remaining resource areas (see table 15), we assessed cumulative impacts for the Project along with other projects in the general area, using information obtained from Northwest's consultations with local authorities, and through our own research. We used public sources to obtain information on any planned future developments in Snohomish County or municipalities crossed by the proposed pipeline route. Building permit information from 1993 through 2017 was obtained from Snohomish County by Northwest for permit requests within the HUC 12 subwatersheds that contain the Project site.

Snohomish County has experienced rapid population growth in recent years with the County's population increasing by 29 percent between 2000 and 2016 (U.S. Census Bureau, 2017). This increase in population has resulted in numerous land development projects being undertaken in the Project area. Since 1993, approximately 525 permits have been applied for or issued by Snohomish County for work involving the alteration of land or structures in the Project geographic scope area. The listing of these projects can be obtained from the FERC public docket.[22]

[22] Northwest's information on cumulative projects can be accessed under CP17-441 at https://elibrary.ferc.gov/idmws/search/fercgensearch.asp. See Accession number 20171023-5241.

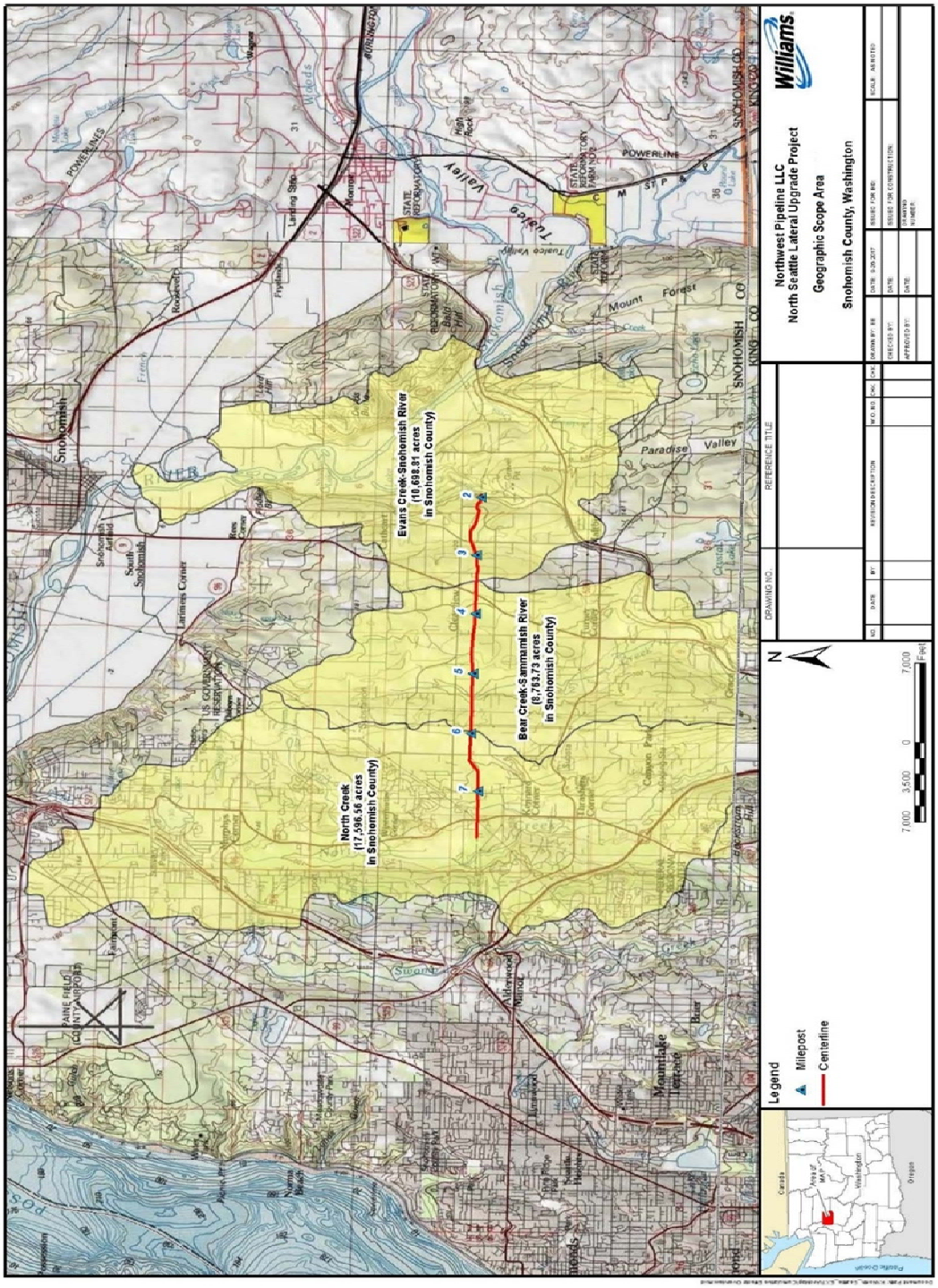

Figure 2. HUC-12 Subwatershed Boundaries Used to Assess Cumulative Impacts

The projects under review by Snohomish County within the Project's geographic scope since 1993 involved 1,522 acres of development (for reference, the entire geographic scope area encompasses an area of 37,060 acres). The proposed Project would involve the disturbance of 88.4 acres, or approximately 0.2 percent of the geographic scope area. The projects approved or under review by the County are primarily residential development projects ranging in size from 1 to 36 acres, commercial development, or timber harvesting. Most of these have long since been completed, and even the current ones are of such a small scale that we can conclude that cumulative impacts with the proposed Project would be negligible.

Table 15.
Resource-Specific Regions and Temporal Scope for Determining Cumulative Impacts of the Project

Environmental Resource	Geographic Area	Time Frame
Surface Water, Wetlands, and Fisheries	Impacts on surface waters can result in downstream contamination or turbidity affecting surface water quality, wetlands, and fisheries; therefore, the geographic scope we used to assess cumulative impacts on waterbodies are the HUC-12 subwatersheds crossed by the Project.	Within 2 years of estimated construction period – 2019 – 2021, or until vegetation restoration largely completed (50+ percent cover)
Vegetation and Wildlife	Vegetation clearing can temporarily reduce or permanently eliminate wildlife habitat; affecting both resident and transient species. The geographic scope we used to assess cumulative impacts on vegetation and wildlife are the HUC-12 subwatersheds the Project occupies. Watersheds can serve as a geographic proxy for impacts on vegetation and wildlife and provides a natural boundary, as recommended by CEQ.	Within 3 years of completion of restoration, except forest clearing which is 25 years for TEWAs and permanent for the right-of-way and aboveground facility sites
Land Use and Recreation	Project impacts on general land uses would be restricted to the construction workspaces. The Project would also not result in any new permanent land conversion for aboveground facilities. Land use in the Project area is mainly residential and open/pasture land, along with existing rights-of-way. Therefore, we considered a 0.5-mile distance from the Project for the geographic scope because this would cover any land use/recreational impacts which could be incremental to the Project.	Following completion of construction and restoration – estimated as winter of 2019
Traffic	Due to the Project's limited scope and the short construction duration, the geographic scope for assessing contributions to cumulative impacts on traffic were evaluated by considering roadway projects in Snohomish County that may be under construction concurrent with the proposed Project.	Within estimated construction period – summer 2019 – fall 2019

No other FERC-jurisdictional projects or oil and gas development are currently proposed or ongoing in Snohomish County. However, through our evaluation of the public record of potential projects within the HUC 12 subwatersheds, we identified four Washington State Department of Transportation (WSDOT) projects that warranted further consideration for potential cumulative impacts with the proposed Project (see table 16).

Two projects in the geographic scope area would involve widening State Route (SR) 9 and SR 522 from 2 to 4 lanes; however, these projects have not been funded by the state legislature and therefore are not considered further in this analysis. WSDOT plans to repave and make other improvements to the portion of SR 96 located in the North Creek watershed. The work is scheduled to be completed between the spring and fall of 2018, and any construction period impacts on water resources or traffic would be complete by the time Northwest's Project construction is anticipated to begin in the summer of 2019. WSDOT also plans to rebuild the Great Dane Creek culvert under SR 524 to enhance fish passage. This work, which is located downstream of the Project crossing, is scheduled to occur between spring 2018 and the fall of 2018, and any impacts to traffic should be finished before Northwest's Project begins in the summer of 2019. The culvert replacement may continue to affect water quality and fisheries until the work area is completely stabilized and revegetated; however any overlapping impacts with Northwest's Project should be minor. Northwest would be required to implement measures (e.g., from its ECRP and the FERC Procedures) to minimize aquatic impacts, and we anticipate that WSDOT would likewise implement resource protection measures. Therefore, we conclude that Northwest's Project would not contribute to cumulative impacts in conjunction with WSDOT projects.

Table 16.
Washington State Department of Transportation Projects Within Cumulative Geographic Scope Area

DOT Project Name	Description	Time Frame	Resources Affected
SR 9 – 176th Street SE to SR 96 - Widening	Widen SR 9 to two lanes in each direction	Unknown (project not yet funded)	N/A
SR 96 – I-5 Interchange to SR 9	Paving and Americans with Disabilities Act Compliance	Spring 2018 to Fall 1018	Water resources, vegetation, traffic
SR 522 Paradise Lake Road Widening	Widen SR 522 to four lanes between Paradise Lake Road and the Snohomish River	Unknown (project not yet funded)	N/A
SR 524 Great Dane Creek Fish Passage Project	Replace SR 524 box culvert on SR 524 to enhance fish passage.	Summer 2018 to Fall 2018	Water resources, vegetation, fisheries, traffic

Source: https://www.wsdot.wa.gov/Projects/

Cumulative Impact of Project on Climate Change

Climate change is the change in climate over time, whether due to natural variability or as a result of human activity, and cannot be represented by single annual events or individual anomalies. While a single large flood event, or particularly cold or summer are not necessarily

strong indications of climate change; a series of floods or warm years that statistically change the average precipitation or temperature over years or decades may indicate climate change. However, recent research has begun to attribute certain extreme weather events to climate change.[23]

Climate change has already resulted in a wide range of impacts across every region of the country and those impacts extend beyond atmospheric climate change alone, and include changes to water resources, transportation, agriculture, ecosystems, and human health. These changes are driven by accumulation of GHG in the atmosphere through combustion of fossil fuels (coal, petroleum, and natural gas), combined with agriculture and clearing of forests. These impacts have accelerated throughout the end of the 20th, and into the 21st century. Although climate change is a global concern, for this analysis, we will focus on the potential cumulative impacts on the Project area.

The following observations of environmental impacts with a high or very high level of confidence are attributed to climate change in the Northwest region (Melillo, 2014; NOAA, 2014; USGRCP, 2017).

- changes in the timing of streamflow related to changing snowmelt are already observed and will continue, reducing the supply of water for many competing demands and causing far-reaching ecological and socioeconomic consequences;
- in the coastal zone, the effects of sea level rise, erosion, inundation, threats to infrastructure and habitat, and increasing ocean acidity collectively pose a major threat to the region;
- the combined impacts of increasing wildfire, insect outbreaks, and tree diseases are already causing widespread tree die-off and are virtually certain to cause additional forest mortality by the 2040s and long-term transformation of forest landscapes. Under higher emissions scenarios, extensive conversion of subalpine forests to other forest types is projected by the 2080s; and
- while the agriculture sector's technical ability to adapt to changing conditions can offset some adverse impacts of a changing climate, there remain critical concerns for agriculture with respect to costs of adaptation, development of more climate resilient technologies and management, and availability and timing of water.

The FERC staff has presented the direct and indirect GHG emissions associated with construction and operation of the Project in section B.6.1. The emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to future climate change impacts. There is no standard methodology to determine whether, and to what extent, a project's incremental

[23] USGCRP, 2017: *Climate Science Special Report: Fourth National Climate Assessment, Volume I, Chapter 3 Detection and Attribution of Climate Change* [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, doi: 10.7930/J0J964J6.

contribution to GHG emissions would result in physical effects on the environment for the purposes of evaluating the Project's impacts on climate change, either locally or nationally. Further, we cannot find a suitable method to attribute discrete environmental effects to greenhouse gas emissions. We have looked at atmospheric modeling used by the Intergovernmental Panel on Climate Change, Environmental Protection Agency, National Aeronautics and Space Administration, and others and we found that these models are not reasonable for project-level analysis for a number of reasons. For example, these global models are not suited to determine the incremental impact of individual projects, due to both scale and overwhelming complexity.

We also reviewed simpler models and mathematical techniques to determine global physical effects caused by GHG emissions, such as increases in global atmospheric CO_2 concentrations, atmospheric forcing, or ocean CO_2 absorption. We could not identify a reliable, less complex model for this task and we are not aware of a tool to meaningfully attribute specific increases in global CO_2 concentrations, heat forcing, or similar global impacts to project-specific GHG emissions. Similarly, the ability to determine localized or regional impacts from GHGs by use of these models is not possible at this time.

Conclusion on Cumulative Impacts

In conclusion, Northwest's contribution to cumulative impacts would be temporary, primarily restricted to the 6 month construction period, and minor when considered in combination with the past, present, and reasonably foreseeable projects in the Project area. Through the implementation of best management practices, the short construction and restoration period, and as Northwest's Project consists of the replacement in the same ditch of 5.8 miles of existing pipeline, no significant contributions to cumulative impacts are anticipated from the North Seattle Lateral Upgrade Project.

C. Alternatives

In accordance with NEPA and Commission policy, we considered and evaluated alternatives to the proposed action, including the no-action alternative, system alternatives, and alternate routes. These alternatives were evaluated using a specific set of criteria. The evaluation criteria applied to each alternative include a determination whether the alternative:

- meets the objectives of the proposed action (i.e., providing 159,299 (Dth/d) of natural gas transportation capacity to markets in North Seattle);
- is technically and economically feasible and practical; and
- offers a significant environmental advantage over the proposed action.

Through environmental comparison and application of our professional judgment, each alternative is considered to a point where it becomes clear if the alternative could or could not meet the three evaluation criteria. For example, an alternative that cannot achieve the purpose for the Project cannot be considered as an acceptable replacement for the Project. We do not consider the cost of an alternative as a critical factor unless the added cost to design, permit, and construct the alternative would render the project economically impractical or non-viable (in effect, resulting in the no-action alternative). Determining if an alternative provides a significant environmental advantage requires a comparison of resource impacts, balancing the overall impacts with other relevant considerations (e.g., permitting requirements, land availability, land use conflicts, etc.). Taking into account these factors, our alternatives analysis is presented below.

1. No-Action Alternative

The purpose of the proposed Project is to provide additional transportation capacity of 159,299 Dth/d to Puget Sound Energy (PSE). The current firm delivery capacity of the North Seattle Lateral is 253,120 Dth/d, which, according to PSE, is insufficient to meet its customers demand for natural gas in Snohomish and King Counties. The no-action alternative would not be consistent with the purpose of providing the necessary delivery capacity to meet current and future residential growth on PSE's system in southern Snohomish County and northern King County.

Although a Commission decision to deny the proposed action would avoid the environmental impacts addressed in this EA, Northwest's customer, PSE, would be forced to search for other sources of natural gas to meet its objectives, and in turn, other natural gas projects could be implemented to provide a substitute to the facilities proposed by Northwest. These substitute projects could require the construction of additional and/or new pipeline facilities in the same or other locations as the proposed Project, which would result in their own set of specific environmental impacts that would likely be greater than those associated with the current proposal, given that Northwest's Project involves replacement of pipe in the same trench. Therefore, we conclude that the no-action alternative would not be preferable to the proposed action.

2. System Alternatives

System alternatives differ from major route alternatives or route variations in that they would make use of existing or modified natural gas systems to meet the stated objective of the proposed Project. The point of identifying and evaluating system alternatives is to determine if the potential environmental impact could be avoided or reduced by using another pipeline system or configuration. Between Sumas and Washougal, Washington, the operating Northwest pipeline system is comprised of an active 30-inch-diameter loop line (Line 1401) and 108 miles of an active 36-inch-diameter loop line (Line 1408), primarily within a common right-of-way. No other pipeline system currently exists or is proposed in western Washington that could duplicate the capacity and service that Northwest's existing system provides to PSE. There is no reasonable system alternative that can be considered as a substitute for the Project and therefore system alternatives are not considered further.

3. Route Alternatives or Variations

The primary objective in evaluating route alternatives or variations is to avoid, minimize, and mitigate site-specific adverse effects while satisfying the overall objectives of the Project. Northwest's proposed pipeline route involves same ditch replacement which would limit the permanent impacts of the Project on landowners and resources affected by the operation of the existing pipeline. Replacement of an existing pipeline within an existing easement is an accepted strategy for reducing environmental impacts compared to the development of new greenfield pipeline rights-of-way or the expansion of an existing right-of-way by looping. Therefore, we do not recommend an alternative that would create new or expanded right-of-way for the Project.

Route variations, on the other hand, are typically more limited in scope and involve minor deviations from the existing right-of-way to avoid engineering constraints or sensitive resources such as residential areas, wetlands, or land use conflicts.

Landowner-Suggested Route Variation

In response to our NOI, we received a comment from landowner Michelle Lilly who suggested a route variation between approximate MPs 6.4 and 7.5 using 180th Street SE to avoid construction through a dense residential area. We considered a route that would divert off the existing easement at MP 6.4 and run north along 35th Avenue SE to 180th Street SE. This route would then follow 180th Street SE in a westerly direction for about 4,000 feet before turning southwest along a transmission line right-of-way, rejoining the existing pipeline easement where it crosses the Bothell-Everett Highway at about MP 7.5. This route variation would largely be along heavily travelled roadways, and the area encompassed by the route is primarily residential, with highway commercial development along Bothell-Everett Highway.

The primary differences between the suggested variation and the Proposed Route involves the amount of new pipeline right-of-way that would be necessary for the suggested variation. We compared potential impacts on residents and local roads and determined both routes were similar for these factors. For example, the Proposed Route would require construction within 50 feet of 69 residences between MP 6.42 and 7.54, while the suggested

variation would be within 50 feet of about the same number of residences, just in a different location. The Proposed Route would cross six County roads by open cutting, whereas the suggested variation would also cross six County roads, presumably by open cutting as well. The suggested variation would parallel 180th Street SE, between the edge of pavement and residences along 180th Street for a distance of 4,000 feet. According to WSDOT, 180th Street SE is a Minor Arterial and has an average annual daily traffic volume of 26,000 (2016).

The suggested variation would require approximately 1.5 miles of new pipeline right-of-way and the length of this deviation would be approximately 0.5 mile longer than if the pipeline were replaced in the existing easement. Given that the suggested route variation would result in the creation of about 1.5 miles of new greenfield pipeline right-of-way with an equivalent amount (i.e., no obvious advantage) of residential construction and disruption of local roadways, we do not find this variation to offer any significant environmental advantages compared to the Proposed Route and do not recommend this alternative.

Fritch Mill Route Variation

In its initial filing in April 2017, Northwest proposed to construct the 20-inch-diameter mainline replacement pipeline within Northwest's existing easement as it crosses the Fritch Mill property between approximate MPs 2.1 and 2.2. Here, the previously abandoned in place 8-inch-diameter pipeline would have been excavated and the replacement 20-inch-diameter line installed within the same trench. The existing active 16-inch-diameter Loop Line would have been left in place. Figure 3 depicts this Initially Proposed Alignment with the replacement 20-inch-diameter line shown in red and the 16-inch-diameter Loop Line shown in blue.

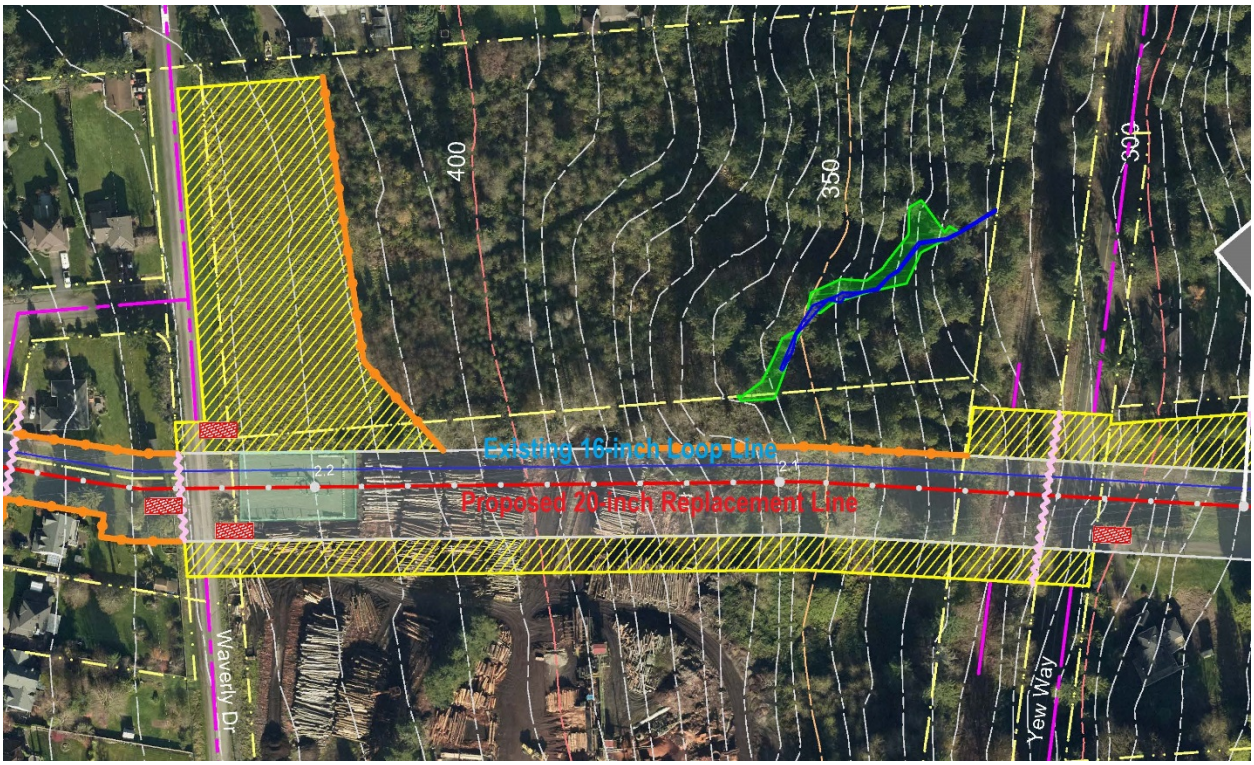

Figure 3. Initially Proposed Fritch Mill Alignment

Northwest amended its Certificate application on October 23, 2017, to propose a change in the Project as it crosses the Fritch Mill parcel. Northwest, for its amended Fritch Mill Alignment, proposes to instead construct the 20-inch-diameter pipeline in a new right-of-way to the north of the Fritch Mill site. The previously abandoned 8-inch-diameter on the Fritch Mill would be left in place. Northwest also proposes to abandon in place the existing 16-inch-diameter Loop Line on the Fritch Mill parcel and installing a new 16-inch-diameter Loop Line in the new easement alongside the new 20-inch-diameter replacement pipeline (see figure 4).

For the purposes of our evaluation in this EA, the Amended Route is considered the proposed action, and the Initially Proposed Alignment is now evaluated as an alternative.

As shown in the figures, the existing permanent easement is used by the mill owner to store logs, and Northwest states that the mill property does not have alternative storage yards where the logs could be moved during pipeline removal and replacement activities. Northwest further states that using HDD to install the pipeline beneath the log storage area is not feasible as Northwest unsuccessfully attempted to replace the 8-inch-diameter line through the Fritch Mill by HDD in late 2012 as part of Docket No. CP11-520-000.

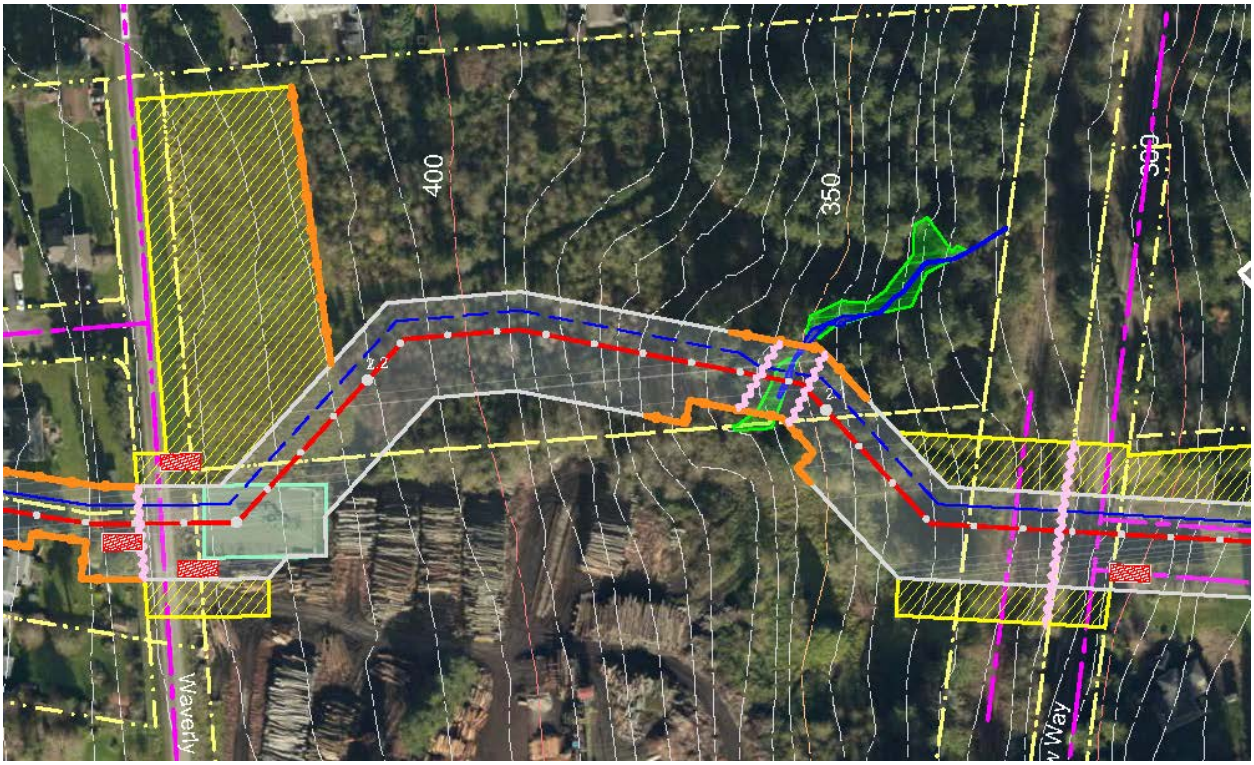

Figure 4. Revised Fritch Mill Alignment (Amended Application)

According to Northwest, placing the two new pipelines on the adjacent property would:

- allow Northwest to install the pipelines on an existing easement obtained in 1956 with the initial construction of its 8-inch-diameter pipeline;
- provide Northwest with unencumbered access to the easement for operation and maintenance of the pipelines;
- eliminate disruptions to the operation of the Fritch Mill; and
- allow Northwest to relinquish a portion of the right-of-way back to the landowner.

The Initial Proposed Alignment would be located within Northwest's existing easement on the industrial Fritch Mill parcel and construction would disturb 4.2 acres of previously disturbed land. In contrast, approximately 70 percent (660 feet) of the proposed amended route (Revised Fritch Mill Alignment) would be on new right-of-way traversing forested lands, and require one PSS/PFO wetland crossing (0.02 acre) and one intermittent stream crossing. No forest, wetlands, or streams would be crossed by the Initially Proposed Alignment. Despite it being shorter, the total area of construction disturbance (construction right-of way and TEWAs) for the Initially Proposed Alignment would be greater than for the Revised Fritch Mill Alignment due to slopes and the need to excavate and stockpile substantial amounts of wood debris in the easement on the Fritch Mill parcel. The permanent operational easement for each alternative would be about the same. Table 17 provides a comparison of the Initially Proposed Alignment and the Revised Fritch Mill Alignment (i.e., the amended route).

Table 17. Evaluation of Fritch Mill Initially Proposed and Amended Routes

Impact/Issue		Initially Proposed Route	Amended Route (Revised Fritch Mill Alignment)[1]
General			
Total length (feet)		745	950
Acres of construction right-of-way[2]		1.9	1.9
Number of TEWAs		2	2
Acres of TEWAs[3]		2.3	1.3
Total acres of construction disturbance		**4.2**	**3.2**
Acres affected during operations (permanent easement)[4]	Existing	1.03[5]	0.00
	New	0.00	1.31[6]
	Total	**1.03**	**1.31**
Landowner parcels crossed		1	2
Number of residences within 50 feet of construction right-of-way		0	0
Waterbodies and Wetlands[7]			
Number of waterbodies crossed		0	1
Total waterbody crossing length (feet)		0	4.6
Number of wetlands crossed		0	1
Total wetland crossing length (feet)		0	12.0
Land Use			
Agricultural land affected (acres)		0	1.42
Forest lands affected (acres)		0	1.37
Length of construction right-of-way that would be within existing rights-of-way (feet)		745	0
Cultural Resources		None	None
Geotechnical		None	None

[1] Mileposts correspond with Initial Proposed Route.
[2] The construction right-of-way width for the Initially Proposed Route and the Revised Fritch Mill Alignment is 100 feet, except where a 75-foot-wide wetland neck down has been incorporated.
[3] For comparison purposes, only portions (acres) of TEWAs on tracts 005 001WS and 006 000CL were included in the analysis.
[4] The assumed permanent easement width is 60 feet.
[5] The 1.03 acres of permanent easement on the Initially Proposed Route is Northwest's existing permanent easement for the existing 8-inch-diameter mainline and 16-inch-diameter loop.
[6] If the Revised Fritch Mill Alignment is implemented, Northwest would acquire 1.31 acres of new permanent easement for the 20-inch-diameter replacement line and the 16-inch-diameter replacement line. Most of the existing permanent easement on the Fritch Mill parcel (approximately 1.0 acre) would be relinquished to the landowner.
[7] Wetland delineation surveys were completed in 2017.

As part of our June 21, 2017 initial NOI, a possible alternative where the 20-inch-diameter replacement line only would be installed north of the Fritch Mill parcel was presented for comment. Comments on this alternative to the Initially Proposed Alignment were submitted during scoping by Christine Brinton and Randy Fritch on behalf of CRE Enterprises, the owner of the adjacent property the alternative would be routed through. They expressed concerns that a new pipeline and easement on their property would disrupt mature forest, wildlife habitat, wetlands, site hydrology, and that development of a new pipeline easement would result in a loss

of timber value for an extended period and introduce invasive species to the property. They also identified alternatives for keeping the pipeline on the existing mill property including installing the replacement pipeline along but within the northern boundary of the mill property; developing a new log storage area on the existing mill site; or developing an off-site log storage location.

A comment was also submitted by another adjacent landowner (Patricia Thompson) who requested the preparation of an environmental impact statement, and provided a list of bird species and mammals observed by herself (a professional wildlife biologist) on the CRE and adjacent properties. A comment letter was also submitted by Dr. Robert Coyne, environmental scientist, on behalf of CRE Enterprises, identifying impacts on hydrology, erosion issues, and wetlands, and wildlife impacts that would occur if the pipeline were constructed on the CRE property.

Eric Fritch, owner of the Fritch Mill, submitted a comment letter objecting to the off-easement alternative being considered and requested that the replacement pipeline be constructed within the existing easement on the mill property. Mr. Fritch stated that he had presented Northwest with alternative log storage options on the mill site that would enable the replacement pipeline to be installed within the existing easement while keeping the mill operating.

Following the publication of the Supplemental NOI on November 21, 2017, which presented Northwest's amended proposal to relocate both the 20-inch-diameter mainline and the 16-inch-diameter loop onto the CRE parcel, we received additional comments from Christine Brinton, Randy Fritch, and Robert Coyne reiterating their earlier comments. We also received a letter from Foster Pepper, PLLC, on behalf of CRE Enterprises incorporating by reference the above-cited letters and stating that the Fritch Mill had presented Northwest with options for keeping the pipeline on the Mill property to avoid impacts on sensitive resources on the CRE parcel.

We have considered 1) the possible impacts associated with the amended alignment that diverts off the existing easement onto the CRE property, 2) comments submitted by and in support of the affected owners of the CRE parcel, and 3) comments submitted by the owner of the Fritch Mill, who does not object to (and indeed, prefers) the Project to stay on the Fritch Mill parcel. Our evaluation shows that impacts on waterbodies, wetlands, forested land (and associated bird and other wildlife habitat), as well as land use considerations would be less if the Initial Proposed Alignment were selected. Therefore, we conclude that the Initially Proposed Alignment (i.e., the alternative route under evaluation) is preferred over the Amended Fritch Mill Alignment (i.e., the current proposed action). This recommendation meets the Project objective, does not present any significant constructability issues, and is environmentally preferable. As such, **we recommend that:**

- **Northwest should construct the 20-inch-diameter replacement line within the existing easement between approximate MPs 2.1 and 2.2 (i.e., on the Fritch Mill Property), and the 16-inch-diameter Loop Line on the Fritch Mill parcel should remain in place, as presented in Northwest's original application and generally depicted on figure 3 of the EA**. **<u>Prior to construction</u>**, **Northwest should file with the Secretary for review and written approval by the Director of the OEP an updated site plan adopting the originally proposed route**.

No other alternatives were suggested during the scoping process. As the proposed Project involves the replacement of an existing 8-inch-diameter pipeline with a 20-inch-diameter pipeline within the same existing, disturbed right-of-way, we have determined that Northwest's proposed Project, as modified by our recommended mitigation measures and our recommendation to construct the alternative route on the Fritch Mill tract, is the preferred alternative that can meet the Project objectives.

D. Conclusions and Recommendations

Based on the analysis in this EA and our review of Northwest's application and supplements, we conclude that if Northwest constructs and operates the facilities in accordance with its application and supplements, along with our recommended mitigation measures listed below, approval of this proposal would not constitute a major federal action significantly affecting the quality of the human environment. We recommend that the Commission Order contain a finding of no significant impact and include the following mitigation measures as conditions to any Certificate the Commission may issue.

1. Northwest shall follow the construction and abandonment procedures and mitigation measures described in its application and supplements (including responses to staff data requests) and as identified in the EA, unless modified by the Order. Northwest must:

    a. request any modification to these procedures, measures, or conditions in a filing with the 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 OEP before using that modification.

2. The Director of OEP, or the Director's designee, has delegated authority to address any requests for approvals or authorizations necessary to carry out the conditions of the Order, and take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the Project, and abandonment activities. This authority shall allow:

    a. the modification of conditions of the Order;
    b. stop-work authority; and
    c. the imposition of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of the Order as well as the avoidance or mitigation of unforeseen adverse environmental impact resulting from Project construction and operation.

3. **Prior to any construction or abandonment activities**, Northwest shall file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, 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 EA, as supplemented by filed alignment sheets, and shall include the staff's recommended Fritch Mill route variation identified in section C.3. of the EA. **As soon as they are available, and before the start of construction or abandonment**, Northwest shall file with the Secretary any revised

detailed survey alignment maps/sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All requests for modifications of environmental conditions of the 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 NGA section 7(h) in any condemnation proceedings related to the 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 Commission's Plan and/or minor field realignments per landowner needs and requirements which 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. **Within 60 days of the acceptance of the Certificate and before construction or initiation of abandonment activity begins**, Northwest shall file an Implementation Plan with the Secretary for review and written approval by the Director of OEP. Northwest must file revisions to the plan as schedules change. The plan shall identify:

   a. how Northwest will implement the construction procedures and mitigation measures described in its application and supplements (including responses to staff data requests), identified in the EA, and required by the Order;

b. 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;
c. how Northwest will ensure that sufficient personnel are available to implement the environmental mitigation;
d. company personnel, including EIs and contractors, who will receive copies of the appropriate material;
e. the location and dates of the environmental compliance 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);
f. the company personnel (if known) and specific portion of Northwest's organization having responsibility for compliance;
g. the procedures (including use of contract penalties) Northwest will follow if noncompliance occurs; and
h. for each discrete facility, a Gantt or PERT chart (or similar Project scheduling diagram), and dates for:

(1) the completion of all required surveys and reports;
(2) the environmental compliance training of onsite personnel;
(3) the start of construction; and
(4) the start and completion of restoration.

7. Northwest shall employ at least one EI for the Project. The EI shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;
b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 6 above) and any other authorizing document;
c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;
d. a full-time position, separate from all other activity inspectors;
e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and
f. responsible for maintaining status reports.

8. Beginning with the filing of its Implementation Plan, Northwest shall file updated status reports with the Secretary on a **biweekly basis until all construction and restoration activities are complete**. On request, these status reports will also be provided to other federal and state agencies with permitting responsibilities. Status reports shall include:

a. an update on Northwest’s efforts to obtain the necessary federal authorizations;

b. the construction status of the Project, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;
c. a listing of all problems encountered and each instance of noncompliance observed by the EIs during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);
d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;
e. the effectiveness of all corrective actions implemented;
f. a description of any landowner/resident complaints which may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and
g. 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 shall develop and implement an environmental complaint resolution procedure. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the Project, and restoration of the rights-of-way. **Prior to construction of the Project**, Northwest shall mail the complaint procedures to each landowner whose property would be crossed.

a. In its letter to affected landowners, Northwest shall:

(1) provide a local contact that the landowners should call first with their concerns; the letter should indicate how soon a landowner should expect a response;

(2) instruct the landowners that if they are not satisfied with the response, they should call Northwest's Hotline (the letter should indicate how soon to expect a response); and

(3) instruct the landowners that if they are still not satisfied with the response from Northwest's Hotline, they should contact the Commission's Landowner Helpline at 877-337-2237 or at LandownerHelp@ferc.gov.

b. In addition, Northwest shall include in its weekly status report for the Project a copy of a table that contains the following information for each problem/concern:

(1) the identity of the caller and date of the call;
(2) the location by milepost and identification number from the authorized alignment sheet(s) of the affected property;
(3) a description of the problem/concern; and

(4) an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

10. Northwest must receive written authorization from the Director of OEP **before commencing abandonment activities or construction of any Project facilities.** To obtain such authorization Northwest must file with the Secretary documentation that it has received all applicable authorizations required under federal law (or evidence of waiver thereof).

11. **Prior to commencing abandonment or construction activities**, Northwest shall file with the Secretary, for review and written approval by the Director of OEP, an updated site plan showing the removal and restoration of the former pig launcher/receiver and valve site at MP 2.2.

12. Northwest must receive written authorization from the Director of OEP **before placing the Project into service**. Such authorization will only be granted following a determination that rehabilitation and restoration of the right-of-way and other areas affected by the Project are proceeding satisfactorily.

13. **Within 30 days of placing the authorized 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 affected by the Project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

14. **Prior to construction,** Northwest shall file with the Secretary for review and written approval by the Director of OEP, a site-specific plan with detailed measures to protect wetland H at MP 4.97 during construction activity.

15. Northwest **shall not begin** construction or abandonment activities and/or use of any work areas **until**:

    a. the FERC staff receives comments from the USFWS and NMFS regarding the proposed action;
    b. the FERC staff completes Section 7 consultation with the USFWS and NMFS; and
    c. Northwest has received written notification from the Director of the OEP that construction and/or use of mitigation (including implementation of any conservation measures) may begin.

16. **Prior to construction**, Northwest shall file with the Secretary, for review and written approval by the Director of OEP, finalized locations for contractor storage yards and the status of landowner negotiations for their use.

17. **Prior to construction,** Northwest shall file with the Secretary for review and written approval by the Director of OEP, evidence of landowner consultation and/or concurrence with the site-specific residential construction plans for all locations where construction work areas would be within 10 feet of a residence.

18. **Prior to construction**, Northwest shall file with the Secretary documentation of concurrence from the WDOE that the Project is consistent with the CZMA.

19. Northwest shall construct the 20-inch-diameter replacement line within the existing easement between approximate MPs 2.1 and 2.2 (i.e., on the Fritch Mill Property), and the 16-inch-diameter Loop Line on the Fritch Mill parcel shall remain in place, as presented in Northwest's original application and generally depicted on figure 3 of the EA. **Prior to construction**, Northwest shall file with the Secretary for review and written approval by the Director of the OEP an updated site plan adopting the initially proposed route.

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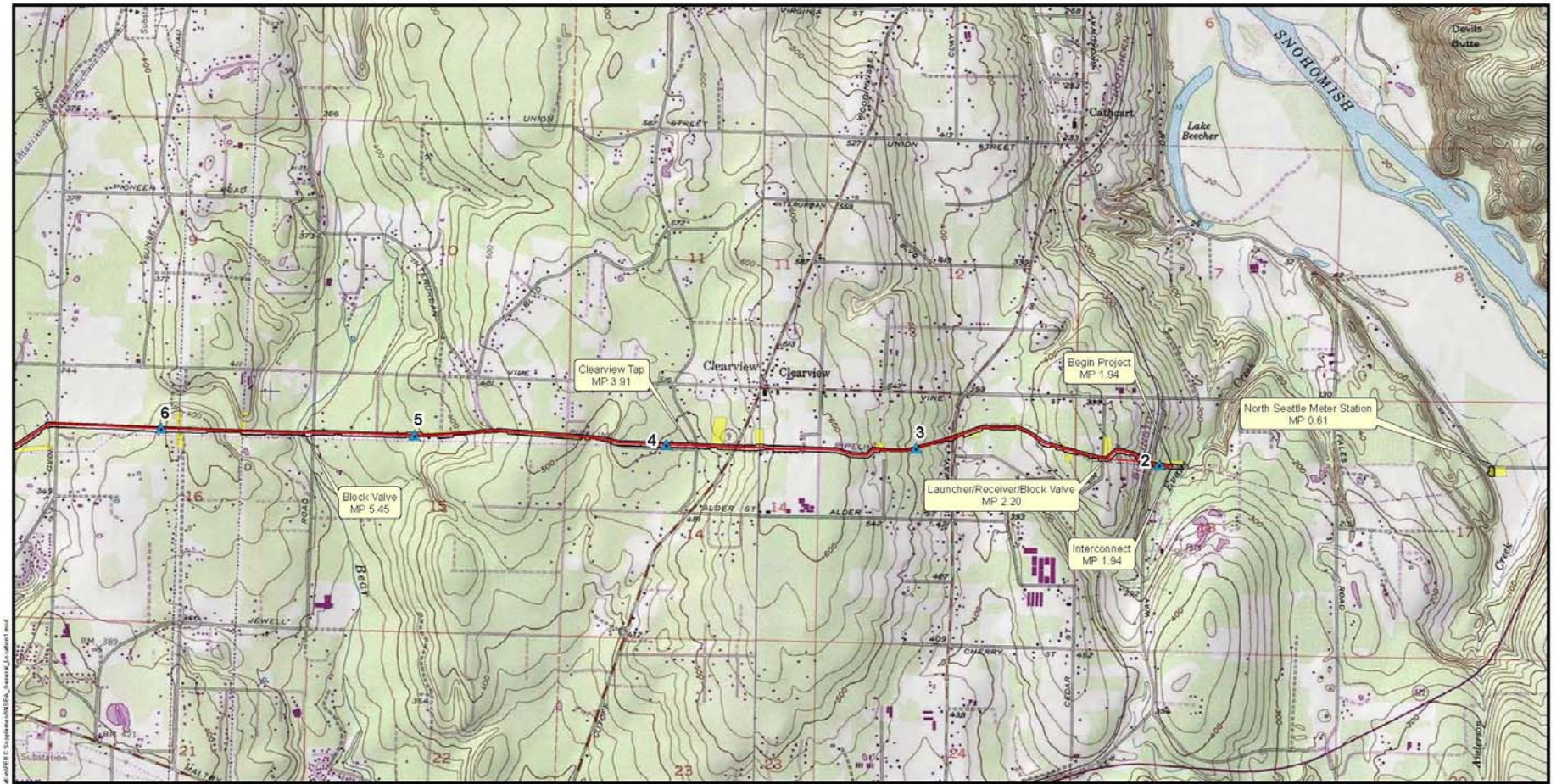
APPENDIX A

PROJECT MAPS



Legend

- Milepost
- Proposed Pipeline

Right-of-Way
- Aboveground Facility
- Construction Right-of-Way
- Permanent Access Road
- Pipe Yards
- Temporary Extra Work Area

N

2,000 1,000 0 2,000 Feet

DRAWING NO.	REFERENCE TITLE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	CHK.
1	04-15-2017	EE	For Review			
2	10-02-2017	EE	FERC Supplement			

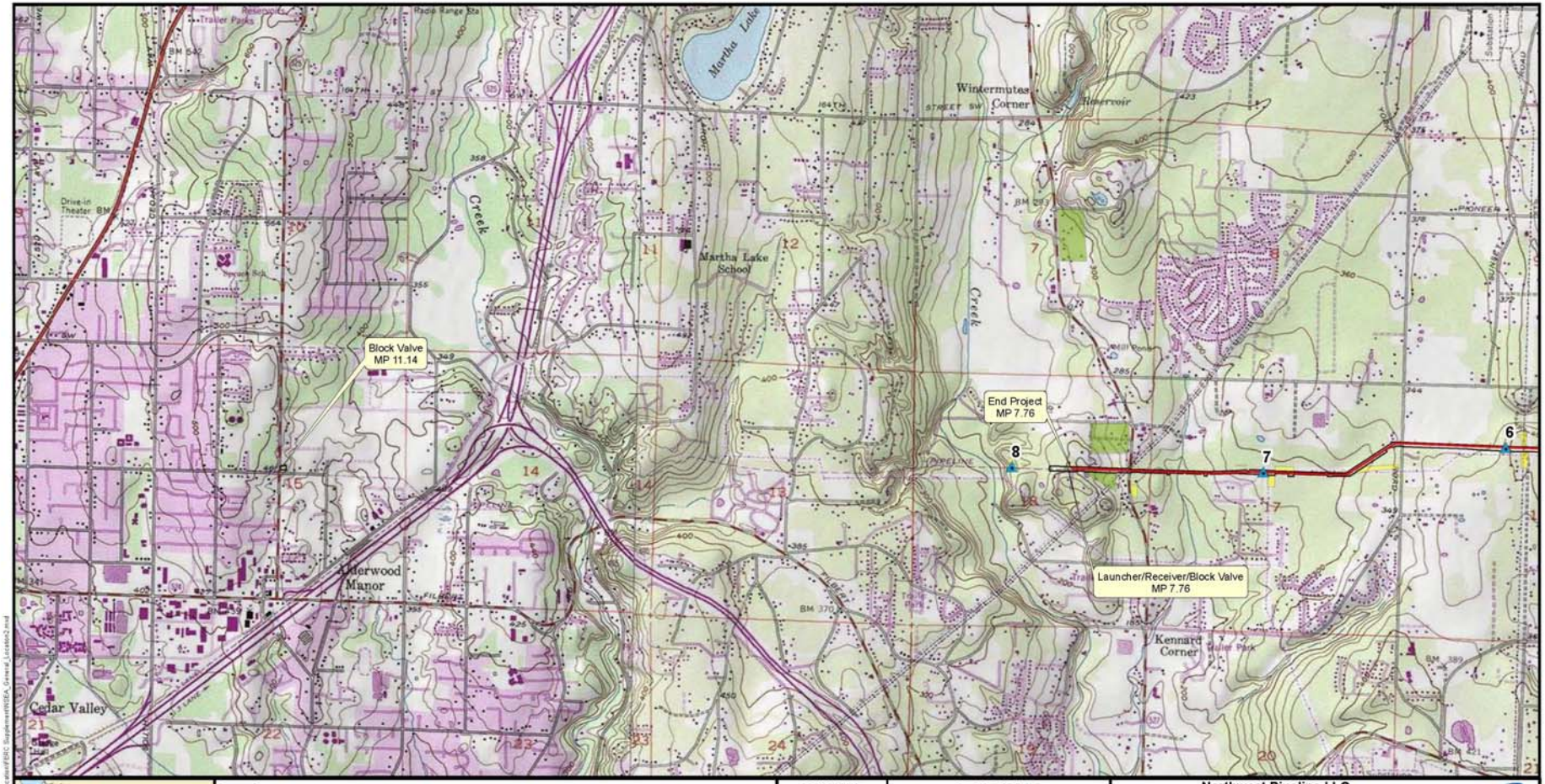
Northwest Pipeline LLC
North Seattle Lateral Upgrade Project

Appendix A
General Location

Snohomish County, Washington

Williams

DRAWN BY: EE	DATE:	ISSUED FOR BID:	SCALE: AS NOTED
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.22-GL01	SHEET 1 OF 2



Legend

- Milepost
- Proposed Pipeline

Right-of-Way
- Aboveground Facility
- Construction Right-of-Way
- Permanent Access Road
- Pipe Yards
- Temporary Extra Work Area

N

2,000 1,000 0 2,000 Feet

DRAWING NO.	REFERENCE TITLE

Northwest Pipeline LLC
North Seattle Lateral Upgrade Project

Williams

Appendix A
General Location

Snohomish County, Washington

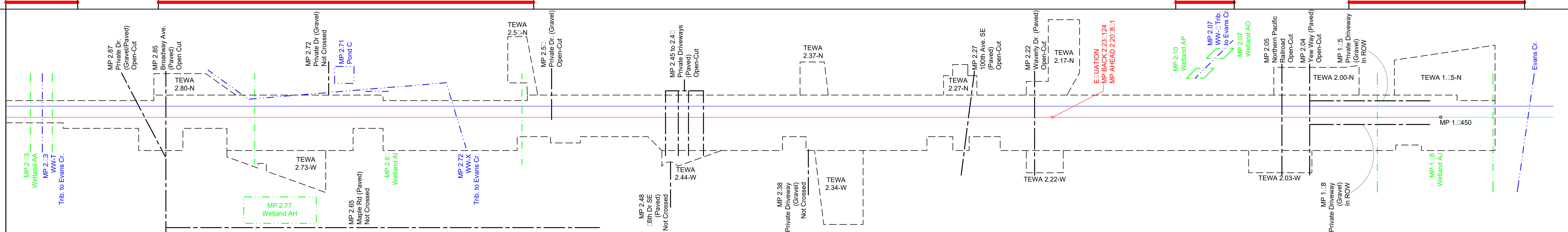
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK	CHK
1	04-15-2017	EE	For Review			
2	10-03-2017	EE	FERC Supplement			

DRAWN BY: EE	DATE	ISSUED FOR BID	SCALE: AS NOTED
CHECKED BY:	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE	DRAWING NUMBER: 2428.22-GL02	SHEET 2 OF 2

Row	Entries
Legal Location	T27N R5E Section 13; T27N R6E Section 18
Ownership / Management (potential well and/or septic)	031.000CL; 027.000CL; 02.000CL; 028.000CL; Broadway Ave 026.500CR; 026.000CL; 024.000CL; 024.000CL; 023.000CL; 022.000CL; 01.000CL; 021.000CL; 018.000CL; 016.000CL; 015.000CL; 013.000CL; 014.000CL; 011.000CL; th Ave SE 010.500CR (Proposed); 010.000CL; 00.000CL; 100th Ave SE 008.500CR; 007.000CL; 008.000CL; Waverly Dr 006.500CR; 005.001WS; 006.000CL; Snohomish County Parks 005.000CL; Yew Way 004.500CR; 004.000CL; 003.000CL; 002.000CL
Jurisdiction	Snohomish County
Vegetation	20, 20, 20, 4, 20, 4, 20, 1, 20, 19, 22, 20, 22, 21, 22, 20, 20, 4, 20, 20, 19, 20, 4, 20, 4, 20, 4, 20, 4, 20, 4, 20, 4, 19, 20, 20, 2, 1, 4, 20, 22, 20, 22, 20
Landuse	17, 17, 11, 14, 17, 14, 11, 43, 11, 21, 62, 11, 62, 51, 62, 17, 11, 14, 11, 17, 21, 11, 14, 11, 14, 11, 14, 11, 14, 11, 14, 11, 14, 21, 17, 17, 14, 43, 14, 17, 62, 17, 62, 17
Wetland / Waterbody	AA; Trib. to Evans Cr.; AH; Pond C; AI; Trib. to Evans Cr.; AP; Trib. to Evans Cr.; AO; AJ
Crossing Method	Not Crossed; Dry Open-Cut; Not Crossed
In-Water Work Window	August 1 to August 31
Topsoil Salvage	
Aboveground Facilities	Existing PIG Facility Location / MP 2.20 / Figure 1.4-3; Tie-in Location / MP 1.4 / Figure1.4-2
Residential	2428.33-X-007; 2428.33-X-006; 2428.33-X-005; 2428.33-X-004; 2428.33-X-003; 2428.33-X-002; 2428.33-X-001
Waterbars / Mulch / EC Matting	
Hydro Test Source Discharge	Source / Discharge

No Fueling Zones

Environmental Schematic (NOT TO SCALE - See Photo Band for Actual Survey)



No Fueling Zones

Environmental Schematic (NOT TO SCALE - See Photo Band for Actual Survey)

Public

NOTES:

1. Environmental Inspector to verify the need, location, and proper installation of erosion control measures in all areas based on site specific conditions.
2. In wetlands cut vegetation off at ground level, leaving existing root systems in place and remove the cut vegetation from the wetland for disposal.
3. In wetlands limit pulling of tree stumps and grading activities to directly over the trench. Do not grade or remove stumps or root systems from the rest of the construction right-of-way.
4. In wetlands segregate the top one foot of topsoil from the trench, except in areas where standing water or saturated soils are present.
5. Topsoil will be stripped from the trench and spoil storage area in croplands, hayfields, pastures and residential areas. Topsoil may be imported in residential areas as necessary or as stipulated by landowner to assure adequate reclamation.
6. If streams proposed to be dry open cut (i.e. flume, dam & pump, etc.) are not flowing at the time of construction, they will be open cut.
7. Construction right-of-way grading or vegetation clearing will occur as necessary.
8. Seed mixes in the ECRP or according to landowner agreements or as directed by the EI.
9. Northwest Pipeline LLC understands that recommended fisheries' construction windows only apply to those waterbodies flowing at the time of construction.
10. Figures for aboveground facilities at MPs 0.61 and 11.14 are provided in Resource Report 1 (Figures 1.4-1 and 1.4-7).

LEGEND

- 20-inch Proposed Loop Pipeline
- 16-inch Existing 2436 Pipeline
- 16-inch Existing 2436 Pipeline (new location)
- Construction Right-of-Way
  - Temporary Construction Right-of-Way *(Shown white on photography)*
  - Temporary Extra Work Area
- Aboveground Facility
- Tax Parcel Boundaries
- Wetland
- Waterbody
- Access Road
- BMP Placement Determined by Environmental Inspector
  - Drivable Berm or Straw Logs / Wattles (DB) (STB)
  - Silt Fence or Safety Fence/Panels as determined by EI (SF)
  - Construction Entrance Pad

LANDUSE CATEGORIES

- 11 - Residential
- 14 - Trans, Comm, Utilities Corridors
- 17 - Other Urban or Built-up Land
- 21 - Cropland / Pasture
- 43 - Mixed Forest Land
- 51 - Streams and Canals
- 61 - Forested Wetlands
- 62 - Nonforested Wetlands

VEGETATION CATEGORIES

- 1 - Westside Lowlands Conifer-Hardwood Forest
- 2 - Railroad
- 4 - Roads
- 12 - Commercial Services
- 19 - Agriculture, Pasture and Mixed Environs
- 20 - Urban and Mixed Environs
- 21 - Open Water - Lakes, Rivers, Streams
- 22 - Herbaceous Wetlands
- 23 - Westside Riparian-Wetlands

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	08-May-2017	EE	Issued for FERC Filing and Permitting		DD	DD
2	26-Sept-2017	EE	Issued for FERC Filing Supplement and Permitting		DD	DD

200 0 200 400 600 FEET

NORTHWEST PIPELINE LLC
NORTH SEATTLE LATERAL UPGRADE PROJECT
20-INCH PROPOSED PIPELINE

ENVIRONMENTAL ALIGNMENT
FROM MP 1.4 TO MP 2.6

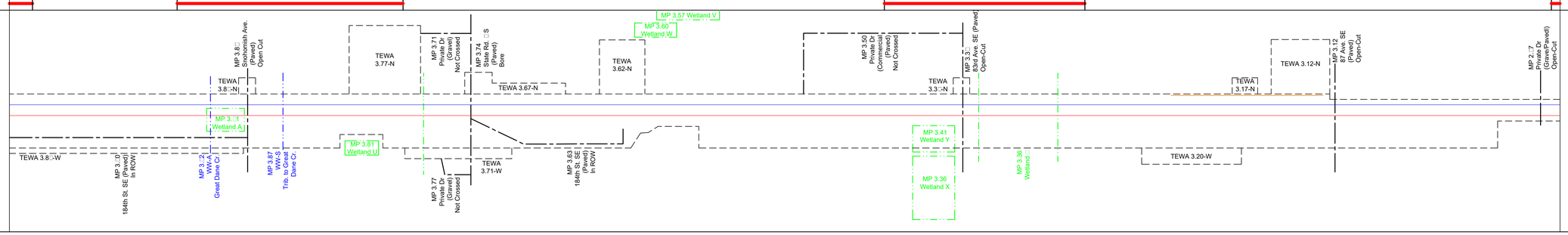
SNOHOMISH COUNTY WASHINGTON

DRAWN BY: EE	DATE: 26-Sept-2017	ISSUED FOR BID:	24x36 SCALE:1 Inch 200 Feet
CHECKED BY: EE	DATE: 26-Sept-2017	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch 450 Feet
APPROVED BY: EE	DATE: 26-Sept-2017	DRAWING NUMBER: 2428.22-001	SHEET 1 OF 6

Legal Location	T27N□R5E□Section 14	T27N□R5E□Section 13	Legal Location
Ownership / Management □potential well and/or septic	043.000CL; Snohomish Ave 042.510CR; 042.000CL; 041.001WS; 041.002WS; 042.001AB*; State Route □ 041.500SR; 041.000CL; 040.000CL; 03□.000CL; 038.000CL; 037.000CL; 83rd Ave SE (035.500CR (Proposed)); 036.000CL; Snohomish Co Public Works / 184th St. SE (033.500CR (Proposed)); 035.000CL; Snohomish Co Public Works / 184th St. SE 033.500CR (Proposed); 034.000CL; 033.000CL; 87th Ave SE (032.500CR (Proposed)); 032.000CL□; 028.000CL; 030.000CL; 031.000CL	Ownership / Management □potential well and/or septic
	Snohomish County Public Works / 184th St. SE (Proposed)		
Jurisdiction	Snohomish County		Jurisdiction
Vegetation	20; 20 21 20 20 12 4 20 21; 20; 4; 20; 12; 20; 12 20 12; 20; 12; 4 19; 22; 19; 20; 19 4 19 1 19 4; 20; 20 4 20		Vegetation
Landuse	17; 17 52 17 17 17 14 17 51; 17; 14; 17; 17; 17; 17 17 17; 17; 17; 14 21; 62; 21; 17; 21 14 21 43 21 14; 17; 11 14 17		Landuse
Wetland / Waterbody	Great Dane Cr. A; Trib. to Great Dane Cr. U; W; V; X Y		Wetland / Waterbody
Crossing Method	Dry Open-Cut; Dry Open-Cut		Crossing Method
In-Water Work Window	July 1 to September 15; July 1 to September 15		In-Water Work Window
Topsoil Salvage			Topsoil Salvage
Aboveground Facilities	Existing Tap Location / MP 3.□1 / Figure 1.4-4		Aboveground Facilities
Residential	2428.33-Y-010; 2428.33-X-00□; 2428.33-X-008		Residential
Waterbars / Mulch / EC Matting			Waterbars / Mulch / EC Matting
Hydro Test Source □ Discharge			Hydro Test Source □ Discharge

No Fueling Zones

Environmental Schematic
(NOT TO SCALE - See Photo Band for Actual Survey)



No Fueling Zones

Environmental Schematic
(NOT TO SCALE - See Photo Band for Actual Survey)

Public

NOTES:

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10. Figures for aboveground facilities at MPs 0.61 and 11.14 are provided in Resource Report 1 (Figures 1.4-1 and 1.4-7).

LEGEND

- 20-inch Proposed Loop Pipeline
- 16-inch Existing 2436 Pipeline
- 16-inch Existing 2436 Pipeline (new location)

Construction Right-of-Way
- Temporary Construction Right-of-Way (Shown white on photography)
- Temporary Extra Work Area
- Aboveground Facility
- Tax Parcel Boundaries
- Wetland
- Waterbody
- Access Road
- BMP Placement Determined by Environmental Inspector
- Drivable Berm or Straw Logs / Wattles (DB) (STB)
- Silt Fence or Safety Fence/Panels as determined by EI (SF)
- Construction Entrance Pad

LANDUSE CATEGORIES

11	- Residential
14	- Trans, Comm, Utilities Corridors
17	- Other Urban or Built-up Land
21	- Cropland / Pasture
43	- Mixed Forest Land
51	- Streams and Canals
61	- Forested Wetlands
62	- Nonforested Wetlands

VEGETATION CATEGORIES

1	- Westside Lowlands Conifer-Hardwood Forest
2	- Railroad
4	- Roads
12	- Commercial Services
19	- Agriculture, Pasture and Mixed Environs
20	- Urban and Mixed Environs
21	- Open Water - Lakes, Rivers, Streams
22	- Herbaceous Wetlands
23	- Westside Riparian-Wetlands

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	08-May-2017	EE	Issued for FERC Filing and Permitting		DD	DD
2	26-Sept-2017	EE	Issued for FERC Filing Supplement and Permitting		DD	DD

200 0 200 400 600 FEET

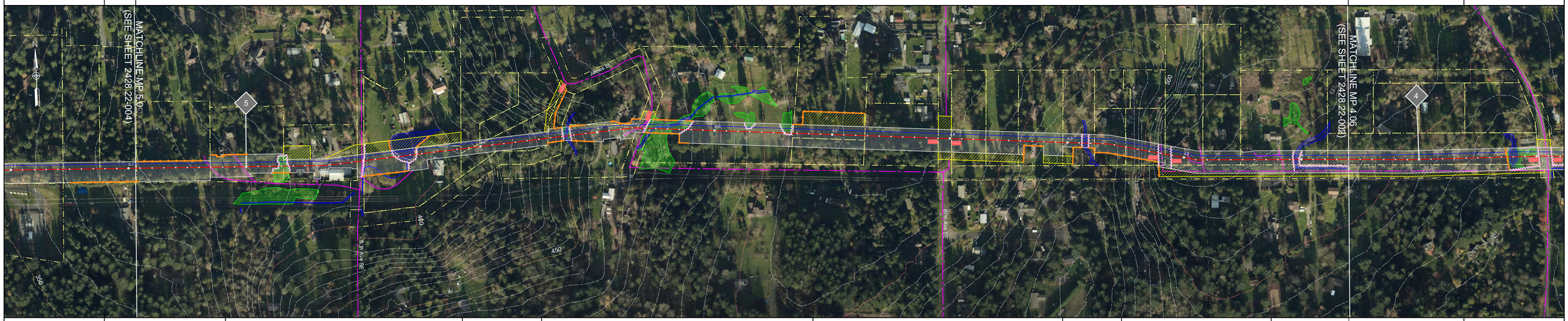
NORTHWEST PIPELINE LLC
NORTH SEATTLE LATERAL UPGRADE PROJECT
20-INCH PROPOSED PIPELINE

ENVIRONMENTAL ALIGNMENT
FROM MP 2.□6 TO MP 4.06

SNOHOMISH COUNTY□WASHINGTON

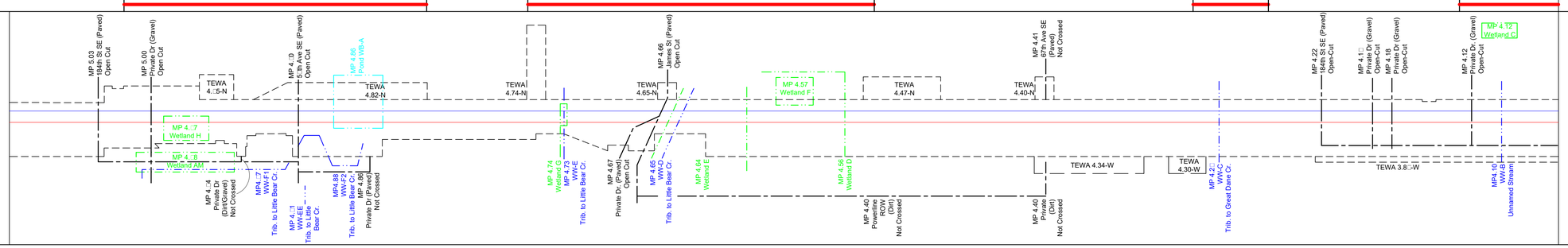
DRAWN BY: EE	DATE: 26-Sept-2017	ISSUED FOR BID:	24x36 SCALE:1 Inch □200 Feet
CHECKED BY: EE	DATE: 26-Sept-2017	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch □450 Feet
APPROVED BY: EE	DATE: 26-Sept-2017	DRAWING NUMBER: 2428.22-002	SHEET 2 OF 6

Legal Location	T27N□R5E□Section 15	T27N□R5E□Section 14
Ownership / Management □potential well and/or septic	064.000CL; 063.000CL; 062.000CL; 5□th Ave SE 061.500CR; 061.000CL; 060.000CL; 061.000CL; 059.000CL; 058.000CL; 057.000CL*; James Place 056.500CR (Proposed); 055.000CL; 056.000CL; James St 054.500CR; 054.000CL; 053.000CL; 053.000CL; 053.001WS; 052.000CL	67th Ave SE 051.500CR; 051.000CL; 04□.000CL; 050.000CL; 04□.000CL; 048.000CL; 047.000CL; 046.000CL; 045.000CL; 044.000CL; 043.000CL
Jurisdiction	Snohomish County	
Vegetation	20; 4; 20; 4; 20; 22; 20; 4; 20; 4; 20; 21; 20; 20; 21; 22; 20; 20; 20; 4; 20; 22; 21; 22; 22; 19; 20; 4; 19; 21; 19; 20; 4; 20; 4; 20; 4; 20; 21; 20	
Landuse	17; 14; 17; 14; 17; 62; 11; 14; 11; 14; 11; 52; 11; 17; 51; 62; 17; 11; 17; 14; 17; 52; 51; 62; 62; 21; 17; 14; 21; 51; 21; 11; 14; 11; 14; 11; 14; 17; 51; 17	
Wetland / Waterbody	AM; H; Tributaries to Little Bear Cr.; Pond; Trib. to Little Bear Cr.; G; Trib. to Little Bear Cr.; Trib. to Little Bear Cr.; E; F; D; Trib. to Great Dane Cr.; C; Unnamed Stream	
Crossing Method	Not Crossed; Dry Open Cut; Not Crossed; Dry Open-Cut; Dry Open-Cut; Dry Open-Cut; Dry Open-Cut	
In-Water Work Window	July 1 to September 15; July 1 to September 15; July 1 to September 15; July 1 to September 15	
Topsoil Salvage		
Aboveground Facilities		
Residential	2428.33-X-016; 2428.33-X-015; 2428.33-X-014; 2428.33-X-013; 2428.33-X-012; 2428.33-Y-011; 2428.33-Y-010	
Waterbars / Mulch / EC Matting		
Hydro Test Source □ Discharge		



No Fueling Zones

Environmental Schematic
(NOT TO SCALE - See Photo Band for Actual Survey)



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LEGEND

- 20-inch Proposed Loop Pipeline
- 16-inch Existing 2436 Pipeline
- 16-inch Existing 2436 Pipeline (new location)

Construction Right-of-Way
- Temporary Construction Right-of-Way *(Shown white on photography)*
- Temporary Extra Work Area

- Aboveground Facility
- Tax Parcel Boundaries

- Wetland
- Waterbody

- Access Road

BMP Placement Determined by Environmental Inspector
- Drivable Berm or Straw Logs / Wattles (DB) (STB)
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- Construction Entrance Pad

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4	- Roads
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REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	08-May-2017	EE	Issued for FERC Filing and Permitting		DD	DD
2	26-Sept-2017	EE	Issued for FERC Filing Supplement and Permitting		DD	DD

200 0 200 400 600 FEET

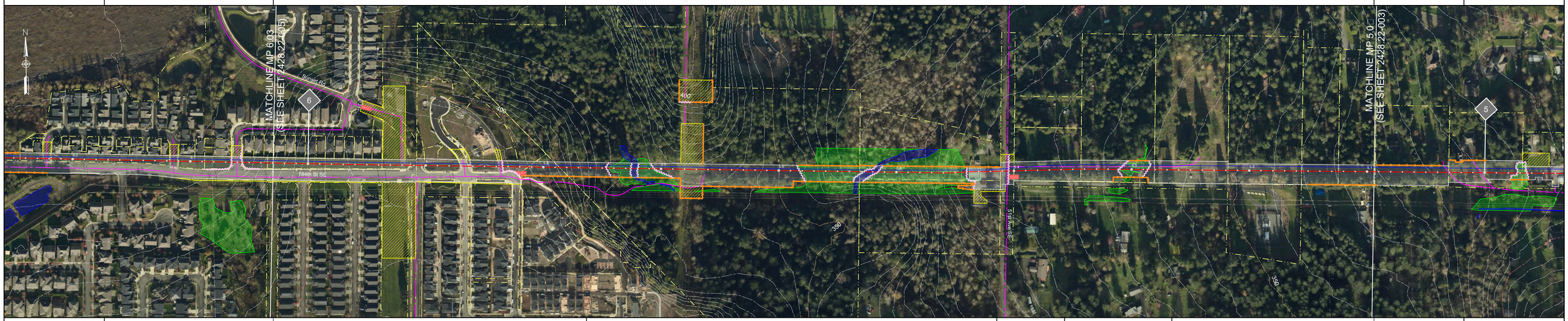
NORTHWEST PIPELINE LLC
NORTH SEATTLE LATERAL UPGRADE PROJECT
20-INCH PROPOSED PIPELINE

ENVIRONMENTAL ALIGNMENT
FROM MP 4.06 TO MP 5.0□

SNOHOMISH COUNTY□WASHINGTON

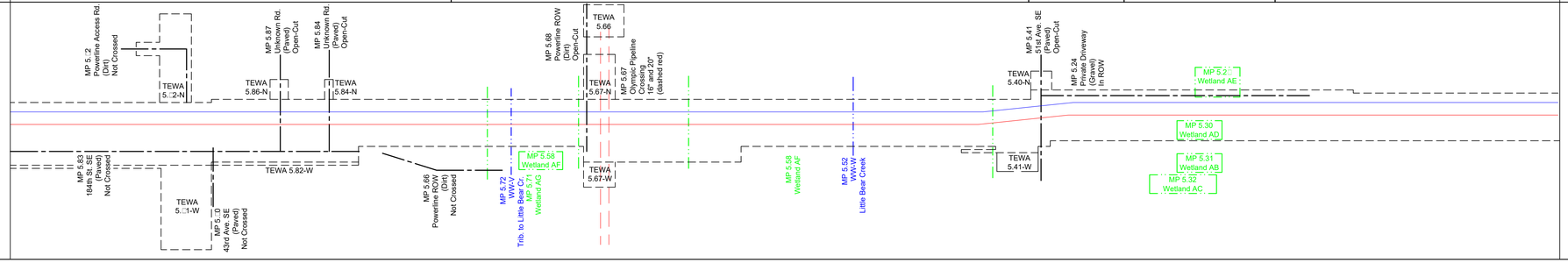
DRAWN BY: EE	DATE: 26-Sept-2017	ISSUED FOR BID:	24x36 SCALE:1 Inch □200 Feet
CHECKED BY: EE	DATE: 26-Sept-2017	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch □450 Feet
APPROVED BY: EE	DATE: 26-Sept-2017	DRAWING NUMBER: 2428.22-003	SHEET 3 OF 6

Legal Location	T27N□R5E□Section 16 / T27N□R5E□Section 15
Ownership / Management □potential well and/or septic	075.000CL; 073.600WS; 073.200CL; 074.000CL; 073.002WS; 073.007WS; Sno Cnty 73.500RD; 073.150CL; Sno Cnty Pub Works 073.500RD; 073.400WS; 073.300WS; 073.000CL; 073.150CL; 073.150CL; 073.000CL; 072.000CL; 072.001WS; 51st Ave SE 071.500CR; 071.000CL; 070.000CL; 06□.000CL; 067.000CL; 066.000CL; 065.000CL
Jurisdiction	Snohomish County
Vegetation	20; 4; 20; 4; 20; 4; 20; 4; 20; 22; 21; 22; 20; 22; 21; 22; 20; 4; 20; 4; 20
Landuse	17; 14; 17; 14; 17; 14; 17; 14; 17; 62; 51; 62; 17; 62; 51; 62; 17; 14; 17; 14; 17
Wetland / Waterbody	AG Trib. to Little Bear Cr. AF; AF; Little Bear Cr.; AC AB AD AE
Crossing Method	Dry Open-Cut; Dry Open-Cut
In-Water Work Window	July 1 to September 15; July 1 to September 15
Topsoil Salvage	
Aboveground Facilities	Existing Valve 3□-2 Location / MP 5.45 / Figure 1.4-5
Residential	See Residential Exhibits 2428-X 01□- 22; 2428.33-X-018; 2428.33-X-017
Waterbars / Mulch / EC Matting	
Hydro Test Source □ Discharge	



No Fueling Zones

Environmental Schematic
(NOT TO SCALE - See Photo Basis for Actual Survey)



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- Temporary Construction Right-of-Way *(Shown white on photography)*
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- Aboveground Facility
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- Waterbody
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REVISIONS

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200 0 200 400 600 FEET

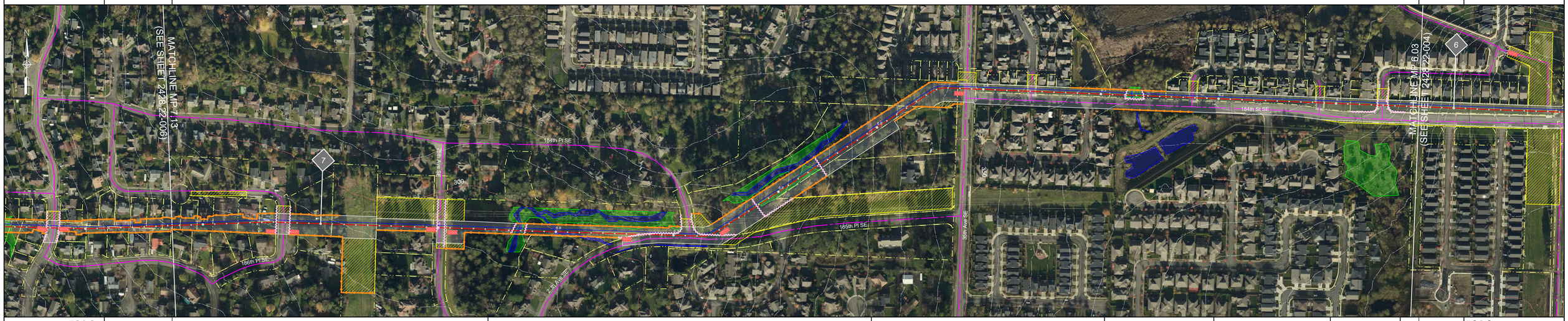
NORTHWEST PIPELINE LLC
NORTH SEATTLE LATERAL UPGRADE PROJECT
20-INCH PROPOSED PIPELINE

ENVIRONMENTAL ALIGNMENT
FROM MP 5.0□TO MP 6.03

SNOHOMISH COUNTY□WASHINGTON

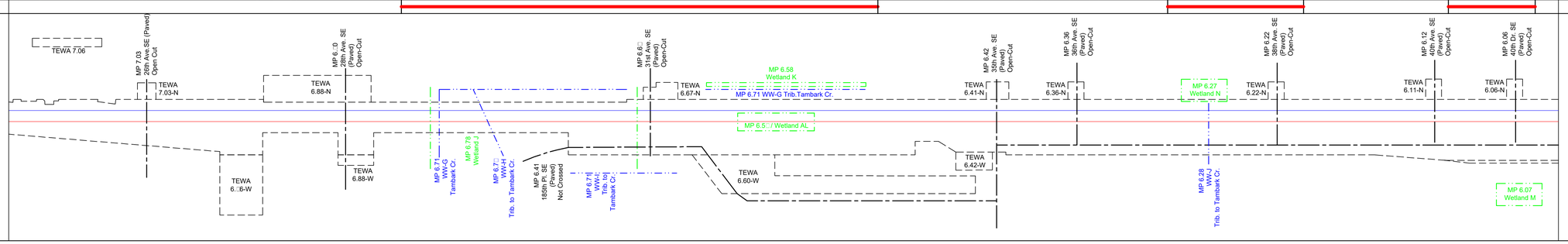
DRAWN BY: EE	DATE: 26-Sept-2017	ISSUED FOR BID:	24x36 SCALE:1 Inch □200 Feet
CHECKED BY: EE	DATE: 26-Sept-2017	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch □450 Feet
APPROVED BY: EE	DATE: 26-Sept-2017	DRAWING NUMBER: 2428.22-004	SHEET 4 OF 6

Legal Location	T27N R5E Section 17	T27N R5E Section 16	Legal Location
Ownership / Management potential well and/or septic	083.000CL; 084.000CL; 081.003WS; 082.200CL; 081.200CL; 081.100CL; 081.000CL; 186th Pl SE 080.500CR; 080.000CL; 07 .000CL; 078.000CL; 28th Ave SE 078.502CR; 078.000CL; 31st Ave SE / 185th Pl SE 078.501CR; 078.000CL; 078.001WS; 076.100CL; 077.000CL	35th Ave SE 075.505CR; 076.000CL; 36th Ave SE 075.504CR; 076.000CL; 38th Ave SE; 076.000CL; 184th St. SE / 035.500CR; 40th Ave SE; 076.000CL; 075.200CL; 073.300CL; 075.100CL; 075.000CL	Ownership / Management potential well and/or septic
Jurisdiction	Snohomish County		Jurisdiction
Vegetation	20; 4; 20; 20; 4; 20; 22; 21; 22; 21; 20; 20; 4; 20; 22; 20	4; 20; 4; 20; 22; 21; 22; 20; 4; 20; 4; 20; 4; 20	Vegetation
Landuse	11; 14; 11; 17; 14; 17; 62; 51; 62; 51; 17; 17; 14; 17; 62; 17	14; 17; 14; 17; 62; 51; 62; 17; 14; 17; 14; 17; 14; 17	Landuse
Wetland / Waterbody	J Tambark Cr.; Trib. to Tambark Cr. J; Tambark Cr	N Trib. to Tambark Cr.; M	Wetland / Waterbody
Crossing Method	Dry Open-Cut; Dry Open-Cut; K Not Crossed K AL	Dry Open Cut	Crossing Method
In-Water Work Window	July 1 to September 30; July 1 to September 30	July 1 to September 30	In-Water Work Window
Topsoil Salvage			Topsoil Salvage
Aboveground Facilities			Aboveground Facilities
Residential	2428.33-X-037 038; 2428.33-X-036; 2428.33-X-035; 2428.33-X-034; 2428.33-X-033; 2428.33-X-032	See Residential Exhibit Drawing Numbers 2428.33-X023 through 031	Residential
Waterbars / Mulch / EC Matting			Waterbars / Mulch / EC Matting
Hydro Test Source Discharge			Hydro Test Source Discharge



No Fueling Zones

Environmental Schematic
(NOT TO SCALE - See Photo Band for Actual Survey)



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REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	08-May-2017	EE	Issued for FERC Filing and Permitting		DD	DD
2	26-Sept-2017	EE	Issued for FERC Filing Supplement and Permitting		DD	DD

200 0 200 400 600 FEET

Williams

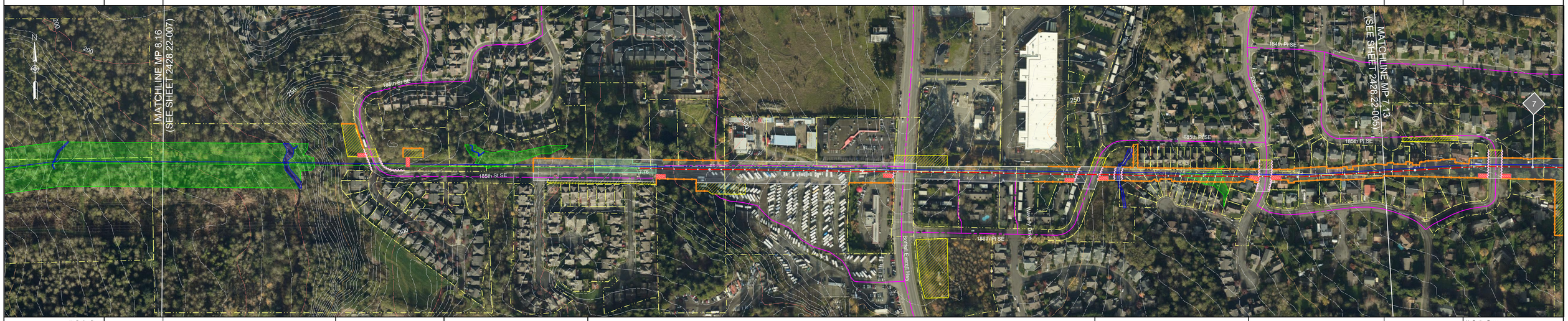
NORTHWEST PIPELINE LLC
NORTH SEATTLE LATERAL UPGRADE PROJECT
20-INCH PROPOSED PIPELINE

ENVIRONMENTAL ALIGNMENT
FROM MP 6.03 TO MP 7.13

SNOHOMISH COUNTY WASHINGTON

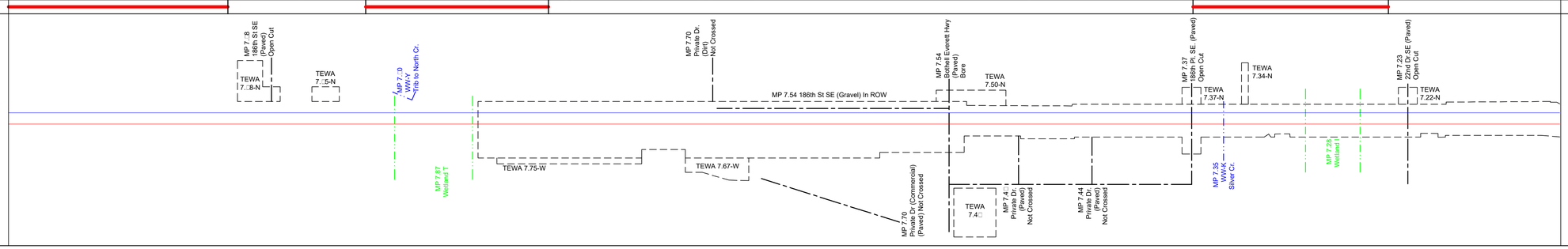
DRAWN BY: EE	DATE: 26-Sept-2017	ISSUED FOR BID:	24x36 SCALE:1 Inch 200 Feet
CHECKED BY: EE	DATE: 26-Sept-2017	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch 450 Feet
APPROVED BY: EE	DATE: 26-Sept-2017	DRAWING NUMBER: 2428.22-005	SHEET 5 OF 6

Legal Location	T27N□R5E□Section 18	T27N□R5E□Section 17
Ownership / Management □potential well and/or septic	146.000CL; 186th St SE; 145.000CL; 144.000CL; 143.000CL; 142.000AB; 141.000CL; 140.000CL; 138.000CL; 137.000CL; 134.000CL; 13□.000CL; 136.000CL; 135.000CL; Bothell Everett Hwy; 131.000WS; 130.000CL; 186th St SE	129.000CL; 127.000CL; 125.000CL; 127.000CL; 186th Pl SE; 125.000CL; See Landowner Legend Below (N M L K J I H G F E D C B A); 0: 8.000CL; 22nd Dr SE 0: 6.500CGR; 095.000CL; 094.000CL; 097.000CL; 098.000CL; 099.000CL; 100.000CL; 101.000CL; 102.000CL; 103.000CL; 104.000CL; 105.000CL; 106.000CL; 107.000CL; 108.000CL; 109.000CL; 110.000CL; 111.000CL; 112.000CL; 113.000CL; 114.000CL; 115.000CL; 116.000CL; 117.000CL; 118.000CL; 119.000CL; 120.000CL; 121.000CL; 124.000CL
Jurisdiction	Snohomish County	
Vegetation	22; 21; 22; 20; 4; 20; 4; 20; 22; 20; 4; 20; 12; 4; 20; 21; 20; 20; 1; 20; 22; 20; 4; 20	
Landuse	62; 51; 62; 17; 14; 17; 14; 17; 62; 17; 14; 17; 17; 14; 17; 17; 14; 17; 51; 17; 11; 43; 11; 62; 11; 14; 11	
Wetland / Waterbody	North Cr.; Trib. to North Cr.; Silver Cr.	
Crossing Method	Dry Open-Cut; Not Crossed; Dry Open-Cut	
In-Water Work Window	July 1 to September 15; July 1 to September 30	
Topsoil Salvage		
Aboveground Facilities		
Residential	See Residential Exhibit Drawing Numbers 2428.33-X-044 through 047; 2428.33-X-043A; See Residential Exhibit Drawing Numbers 2428.33-X037 through 043	
Waterbars / Mulch / EC Matting		
Hydro Test Source □ Discharge		



No Fueling Zones

Environmental Schematic
(NOT TO SCALE - See Photo Baird for Actual Survey)



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10. Figures for aboveground facilities at MPs 0.61 and 11.14 are provided in Resource Report 1 (Figures 1.4-1 and 1.4-7).

LEGEND

- 20-inch Proposed Loop Pipeline
- 16-inch Existing 2436 Pipeline
- 16-inch Existing 2436 Pipeline (new location)

Construction Right-of-Way
- Temporary Construction Right-of-Way (Shown whitel on photography)
- Temporary Extra Work Area
- Aboveground Facility
- Tax Parcel Boundaries
- Wetland
- Waterbody
- Access Road

BMP Placement Determined by Environmental Inspector
- Drivable Berm or Straw Logs / Wattles (DB) (STB)
- Silt Fence or Safety Fence/Panels as determined by EI (SF)
- Construction Entrance Pad

Landowner Legend:

A: 097.000CL
B: 099.000CL
C: 101.001CL
D: 103.000CL
E: 106.000CL
F: 108.000CL
G: 110.001CL
H: 112.000CL
I: 114.000CL
J: 116.000CL
K: 118.000CL
L: 119.000CL
M: 120.000CL
N: 122.000CL
O: 123.000CL

LANDUSE CATEGORIES

11 - Residential
14 - Trans, Comm, Utilities Corridors
17 - Other Urban or Built-up Land
21 - Cropland / Pasture
43 - Mixed Forest Land
51 - Streams and Canals
61 - Forested Wetlands
62 - Nonforested Wetlands

VEGETATION CATEGORIES

1 - Westside Lowlands Conifer-Hardwood Forest
2 - Railroad
4 - Roads
12 - Commercial Services
19 - Agriculture, Pasture and Mixed Environs
20 - Urban and Mixed Environs
21 - Open Water - Lakes, Rivers, Streams
22 - Herbaceous Wetlands
23 - Westside Riparian-Wetlands

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
1	08-May-2017	EE	Issued for FERC Filing and Permitting		DD	DD
2	26-Sept-2017	EE	Issued for FERC Filing Supplement and Permitting		DD	DD

200 0 200 400 600 FEET

NORTHWEST PIPELINE LLC
NORTH SEATTLE LATERAL UPGRADE PROJECT
20-INCH PROPOSED PIPELINE

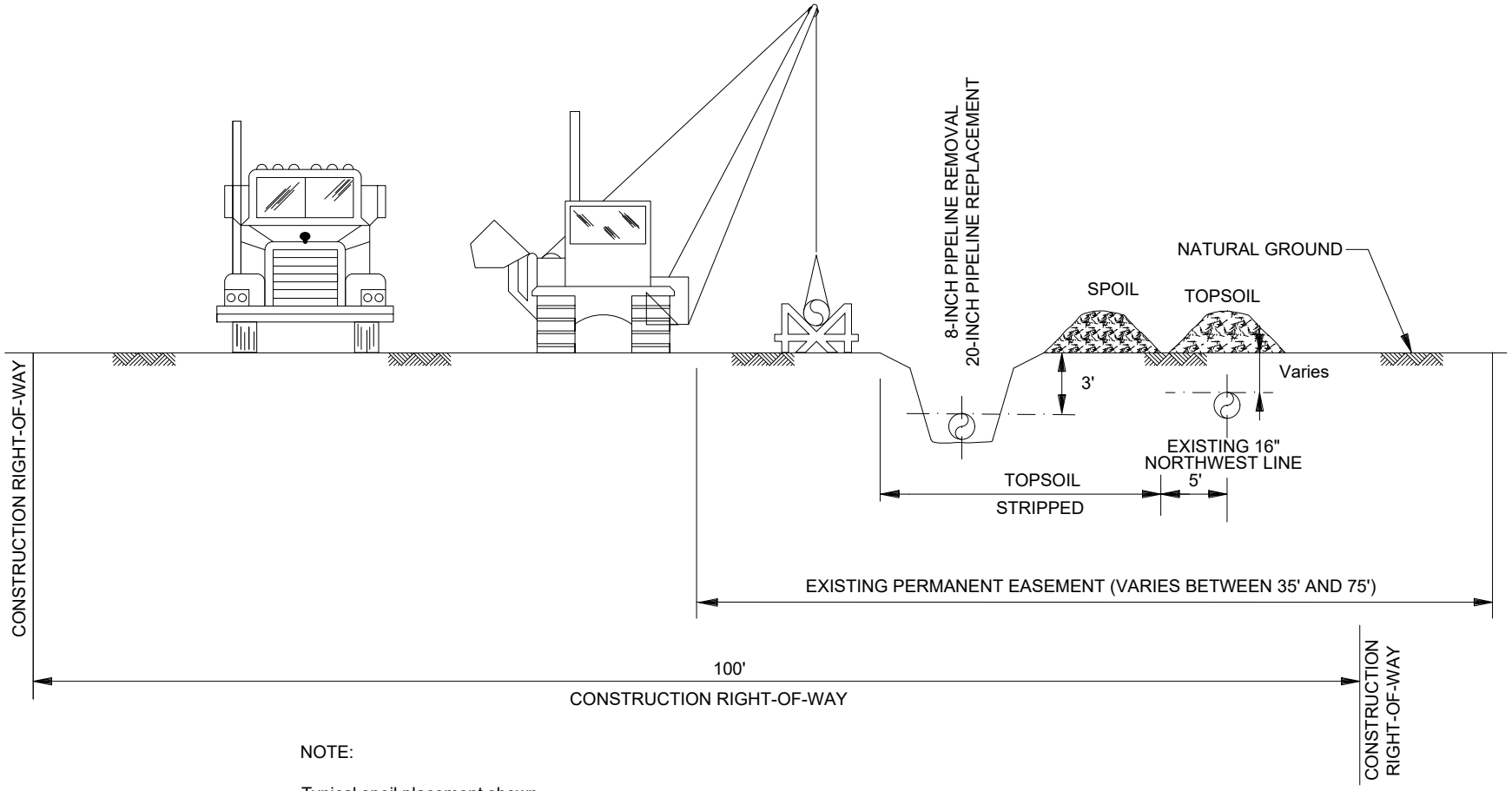
ENVIRONMENTAL ALIGNMENT
FROM MP 7.13 TO MP 8.16

SNOHOMISH COUNTY□WASHINGTON

DRAWN BY: EE	DATE: 26-Sept-2017	ISSUED FOR BID:	24x36 SCALE:1 Inch □200 Feet
CHECKED BY: EE	DATE: 26-Sept-2017	ISSUED FOR CONSTRUCTION:	11x17 SCALE:1 Inch □450 Feet
APPROVED BY: EE	DATE: 26-Sept-2017	DRAWING NUMBER: 2428.22-006	SHEET 6 OF 6

APPENDIX B

TYPICAL RIGHT-OF-WAY CROSS SECTIONS



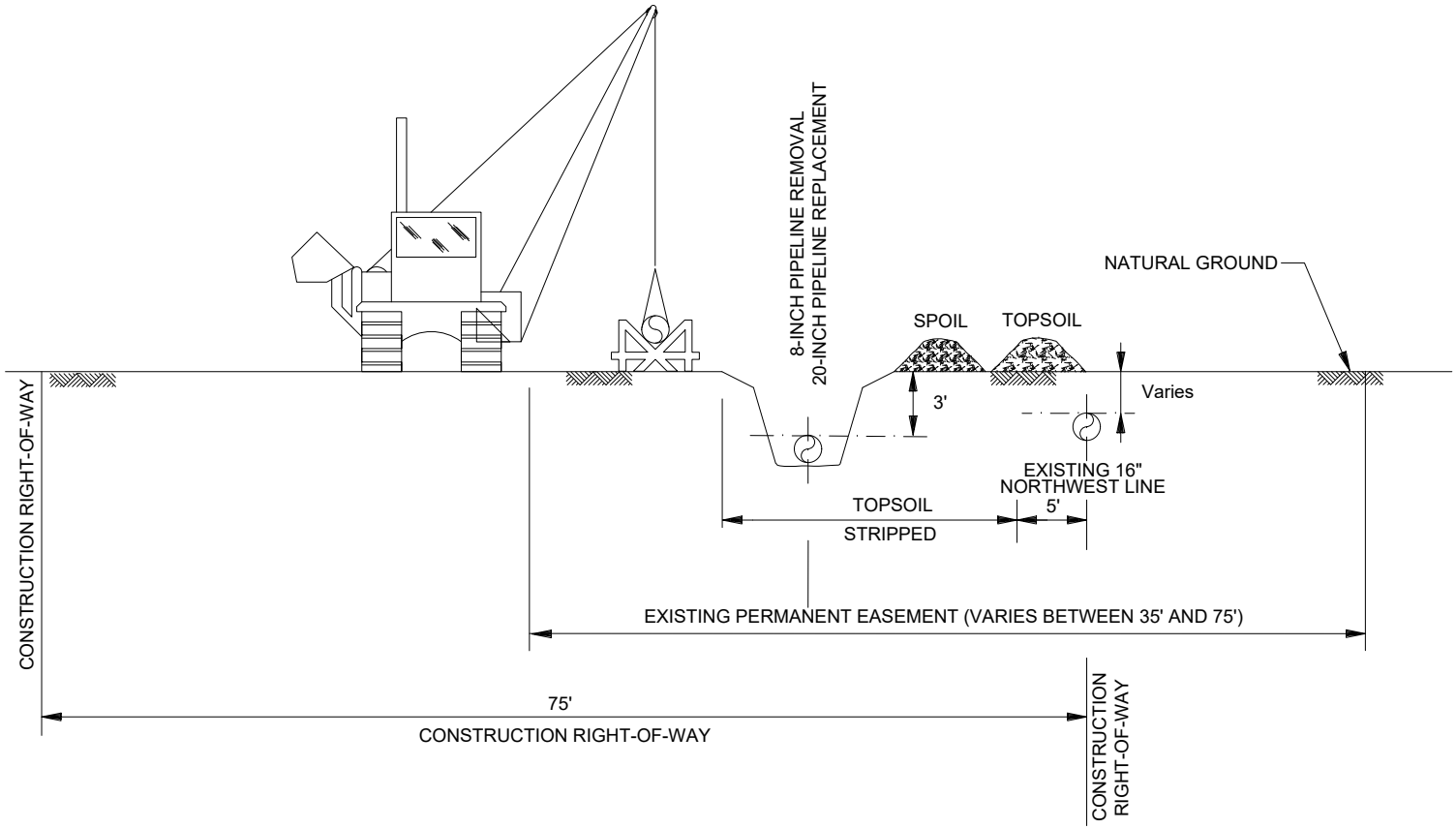
NOTE:

Typical spoil placement shown.

Spoil placement may also occur on the working side of the construction right-of-way as determined by site specific conditions.

NORTHWEST PIPELINE LLC
TYPICAL RIGHT-OF-WAY CROSS SECTION
LOOP PIPELINE
NORTH SEATTLE LATERAL UPGRADE PROJECT
SNOHOMISH COUNTY WASHINGTON

DRAWN BY: EE	DATE: 05/08/2017	ISSUED FOR BID:	SCALE: NO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: STD_EE_1.5-1	



NOTE:
Typical spoil placement shown.

Spoil placement may also occur on the working side of the construction right-of-way as determined by site specific conditions.

NORTHWEST PIPELINE LLC
TYPICAL RIGHT-OF-WAY CROSS SECTION
LOOP PIPELINE
NORTH SEATTLE LATERAL UPGRADE PROJECT
SNOHOMISH COUNTY WASHINGTON

DRAWN BY: EE	DATE: 05/08/2017	ISSUED FOR BID:	SCALE: NO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: STD_EE_1.5-2	

APPENDIX C

TEMPORARY EXTRA WORK AREAS

Temporary Extra Work Areas Necessary for Construction of the Project

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 0.61	1.21	275' x 210' (irregular)	N. Seattle Meter Station Upgrade staging, parking	Nonforested Wetlands Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Commercial Services Herbaceous Wetlands Road Urban and Mixed Environs
TEWA 0.62	0.01	30 ' x 22'	N. Seattle Meter Station Upgrade staging, parking	Mixed Forest Land Other Urban or Built-up Land	Commercial Services Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 1.94-N	0.78	360' x 104' (irregular)	Staging, equipment turn around, road and railroad crossing, spoil storage, 16" crossover 39L-1X	Mixed Forest Land Other Urban or Built-up Land Nonforested Wetlands	Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest Herbaceoous Wetland
TEWA 2.0-N	0.48	404’ x 65’ (irregular)	Ingress/ egress, road and railroad crossings staging, spoil storage.	Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Railroad Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 2.03-W	0.21	1035' x 40'	Ingress/ egress, road and railroad crossings staging, spoil storage.	Mixed Forest Land Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Railroad Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 2.21-N	1.55	415' x 175' (irregular)	Staging, equip/material storage, hydrostatic water source (fire hydrant) & discharge, existing N. Seattle launcher & receiver and block valve removal	Cropland and Pasture Mixed Forest Land Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Agriculture, Pasture and Mixed Environs Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 2.22-W	0.12	50’ x 132’	Ingress/ egress, road crossing staging, existing N. Seattle launcher & receiver and block valve removal	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Commercial Services Road Urban and Mixed Environs

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 2.27-N	0.14	122' x 55'	Road crossing and residential staging, parking	Mixed Forest Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 2.34-W	0.68	175' x 200' (irregular)	Residential area staging, spoil storage, parking	Mixed Forest Land Residential	Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 2.37-N	0.18	90' x 112' (irregular)	Residential area staging, spoil storage, parking	Residential	Urban and Mixed Environs
TEWA 2.44-W	0.11	235' x 38' (irregular)	Residential area staging and spoil storage, parking, driveway crossing	Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 2.59-N	0.20	175' x 89' (irregular)	Residential area and wetland AI crossing staging, parking	Mixed Forest Land Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 2.73-W	0.57	345' x 188' (irregular)	Residential area and wetland AI crossing staging, spoil storage, parking	Cropland and Pasture Mixed Forest Land Transportation, Communication, Utilities Corridors	Agriculture, Pasture and Mixed Environs Road Westside Lowlands Conifer-Hardwood Forest
TEWA 2.80-N	0.27	290' x 57' (irregular)	Road crossing and residential staging, parking	Cropland and Pasture Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Agriculture, Pasture and Mixed Environs Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 3.12-N	0.59	215' x 120'	Residential area staging, parking, spoil storage	Cropland and Pasture Mixed Forest Land	Agriculture, Pasture and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 3.17-N	0.07	127' x 30' (irregular)	Residential area staging, spoil storage, pipeline bend/curve tie-ins	Cropland and Pasture Other Urban or Built-up Land	Agriculture, Pasture and Mixed Environs Urban and Mixed Environs

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 3.20-W	0.21	375' x 28'	Residential area staging, spoil storage, pipeline bend/curve tie-ins	Mixed Forest Land Other Urban or Built-up Land Residential	Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 3.39-N	0.05	60' x 35'	Road crossing, staging, parking	Cropland and Pasture Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Agriculture, Pasture and Mixed Environs Commercial Services Road
TEWA 3.62-N	1.21	160' x 353'	Staging, spoil storage	Mixed Forest Land Other Urban or Built-up Land	Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 3.67-N	0.18	383' x 38'	Road bore staging, spoil storage	Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Commercial Services Road Urban and Mixed Environs
TEWA 3.71-W	0.32	397' x 45'	Road bore staging, spoil storage, parking	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Commercial Services Road Urban and Mixed Environs
TEWA 3.77-N	3.36	260’ x 562’	Staging, material/pipe storage	Cropland and Pasture Other Urban or Built-up Land	Agriculture, Pasture and Mixed Environs Commercial Services Urban and Mixed Environs
TEWA 3.89-N	0.05	1,730’ x 45’	Road crossing staging	Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Commercial Services Road Urban and Mixed Environs
TEWA 3.89-W	0.65	59’ x 35’	Road co-location traffic control, parking, N. Seattle Clearview Tap tie-in, and wetland AI crossing	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 4.30-W	0.11	133’ x 35’	Residential and stream crossing staging, spoil storage, parking	Other Urban or Built-up Land	Agriculture, Pasture and Mixed Environs

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 4.34-W	0.31	385’ x 35’	Ingress/egress, parking, spoil storage, staging	Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Agriculture, Pasture and Mixed Environs Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 4.40-N	0.08	59’ x 60’	Ingress/egress, parking, spoil storage	Mixed Forest Land Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Agriculture, Pasture and Mixed Environs Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 4.47-N	0.38	276’ x 60’	Residential area staging, spoil storage, parking	Cropland and Pasture Mixed Forest Land Other Urban or Built-up Land	Agriculture, Pasture and Mixed Environs Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 4.65-N	0.05	57’ x 36’	Ingress/egress, driveway crossing, parking, staging	Cropland and Pasture Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Agriculture, Pasture and Mixed Environs Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 4.74-N	0.20	147’ x 50’ (irregular)	Ingress/egress	Mixed Forest Land Other Urban or Built-up Land	Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 4.82-N	0.57	617’ x 45’	Pond crossing staging, spoil storage, road and residential/business crossing staging	Mixed Forest Land Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 4.95-N	0.17	120’ x 60’	Residential/business area staging, spoil storage, parking	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 5.40-N	0.05	60’ x 35’	Road crossing staging	Mixed Forest Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 5.41-W	0.08	139’ x 63’ (irregular)	Mainline Block Valve 39-2 replacement, road crossing staging, parking	Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 5.66	0.34	150’ x 100’	Parking, staging	Mixed Forest Land Other Urban or Built-up Land	Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 5.67-N	0.41	100’ x 180’	Pipeline (Olympic) & Powerline crossings staging, spoil storage	Other Urban or Built-up Land	Urban and Mixed Environs
TEWA 5.67-W	0.13	100’ x 55’	Pipeline (Olympic) & Powerline crossings staging, spoil storage	Other Urban or Built-up Land	Urban and Mixed Environs
TEWA 5.82-W	0.05	70’ x 52’ (irregular)	Road colocation and crossing staging, residential staging	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 5.84-N	0.02	20’ x 50’	Road crossing staging	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 5.86-N	0.06	70’ x 52’ (irregular)	Road crossing staging	Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 5.91-W	1.32	1,050’ x 340’ (irregular)	Residential area staging, spoil storage, parking	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 5.92-N	0.87	200' x 330' (irregular)	Residential area staging, spoil storage, ingress/egress, parking	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 6.06-N	0.06	51' x 50'	Road crossing staging	Transportation, Communication, Utilities Corridors	Road
TEWA 6.11-N	0.05	40' x 50'	Road crossing staging	Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 6.22-N	0.05	40' x 50'	Road crossing staging	Transportation, Communication, Utilities Corridors	Road
TEWA 6.36-N	0.05	40' x 50'	Residential area and road crossing staging, parking	Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 6.41-N	0.09	80' x 50'	Road crossing staging	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 6.42-W	0.05	135' x 30' (irregular)	Road crossing / PI staging, ingress/egress, residential staging	Mixed Forest Land Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 6.60-W	1.92	382' x 103' (irregular)	Residential area staging, spoil storage, parking	Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 6.67-N	0.13	130’ x 60’ (irregular)	Road crossing / PI staging, spoil storage, parking	Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 6.88-N	0.86	124’ x 25’	Residential area and road crossing staging, spoil and material storage, ingress/egress, parking	Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 6.88-W	0.07	393’ x 95’	Residential area and road crossing staging, spoil storage, parking	Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 6.96-W	0.84	149’ x 245’	Residential area and powerline crossing staging, spoil and material storage	Other Urban or Built-up Land Residential	Urban and Mixed Environs
TEWA 7.03-N	0.05	60’ x 35’	Road crossing staging	Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 7.06	0.11	247’ x 20’	Connect access between 185th Pl SE and 26th Ave SE	Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 7.22-N	0.06	60’ x 41’	Road crossing staging	Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 7.34-N	0.05	20’ x 105’	Ingress/egress, residential area staging	Mixed Forest Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 7.37-N	0.05	53’ x 42’	Road crossing staging	Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest

Name	Acres	Dimensions	Purpose	Land Use	Vegetation
TEWA 7.49	0.78	140’ x 265’	Staging, parking, Waterstone Apartment complex parking	Mixed Forest Land Other Urban or Built-up Land	Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 7.50-N	0.24	235’ x 35’	Road bore staging, spoil storage	Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Commercial Services Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
TEWA 7.67-W	0.23	220’ x 50’	Staging, parking	Mixed Forest Land Other Urban or Built-up Land	Commercial Services Westside Lowlands Conifer-Hardwood Forest
TEWA 7.75-W	0.11	1230’ x 10’	Road colocation staging, traffic control and parking	Other Urban or Built-up Land Residential Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 7.95-N	0.08	90’ x 40’	Staging, parking	Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs
TEWA 7.98-N	0.29	138’ x 149’ (irregular)	Staging, parking	Mixed Forest Land Other Urban or Built-up Land Transportation, Communication, Utilities Corridors	Road Urban and Mixed Environs Westside Lowlands Conifer-Hardwood Forest
Total	**24.57**				

APPENDIX D

ACCESS ROADS

Access Roads to and Roads Crossed by the North Seattle Lateral Upgrade Project					
Milepost	**Name`**	**Jurisdiction**	**Surface**	**Ingress/ Egress**	**Crossing Method**
0.61	Elliot Rd	Snohomish County	Paved	Yes	Not Crossed
1.95	In right-of-way	Private	Gravel	Yes	In right-of-way
1.98	Private Driveway	Private	Gravel	Yes	In right-of-way
2.00	180th St SE	Snohomish County	Paved	Yes	Not Crossed
2.04	Yew Way	Snohomish County	Paved	Yes	Open Cut
2.05	Northern Pacific Railroad	Snohomish County	Rail	No	Open Cut
2.22	Waverly Drive	Snohomish County	Paved	Yes	Open Cut
2.23	183RD Pl SE	Snohomish County	Paved	Yes	Not Crossed
2.27	100th Ave SE	Snohomish County	Paved	Yes	Open Cut
2.38	Private Driveway	Private	Gravel	Yes	Not Crossed
2.45	Private Driveway	Private	Paved	Yes	Open Cut
2.47	Private Driveway	Private	Paved	Yes	Open Cut
2.48	96th Drive SE	Snohomish County	Paved	Yes	Not Crossed
2.48	Private Driveway	Private	Paved	Yes	Open Cut
2.49	Private Driveway	Private	Paved	Yes	Open Cut
2.55	Maple Rd	Snohomish County	Paved	Yes	Not Crossed
2.59	Private Drive	Private	Gravel	Yes	Open Cut
2.65	188th St SE	Snohomish County	Paved	Yes	Not Crossed
2.72	Private Drive	Private	Gravel	Yes	Not Crossed
2.85	Broadway Ave	Snohomish County	Paved	Yes	Open Cut
2.87	Private Drive	Private	Gravel/Pave	Yes	Open Cut
2.97	Private Drive	Private	Gravel/Pave	Yes	Open Cut
3.12	87th Ave SE	Snohomish County	Paved	Yes	Open Cut
3.39	83rd Ave SE	Snohomish County	Paved	Yes	Open Cut
3.50	Private Drive (Commercial)	Private	Paved	Yes	Not Crossed
3.63	184th St SE	Snohomish County	Paved	Yes	In right-of-way
3.71	Private Drive	Private	Gravel	Yes	Not Crossed
3.74	State Route 9 SE	WA State	Paved	Yes	Bore

Milepost	Name`	Jurisdiction	Surface	Ingress/ Egress	Crossing Method
3.77	Private Drive	Private	Gravel	Yes	Not Crossed
3.89	Snohomish Ave	Snohomish County	Paved	Yes	Open Cut
4.12	Private Driveway	Private	Gravel	Yes	Open Cut
4.18	Private Driveway	Private	Gravel	Yes	Open Cut
4.19	Private Driveway	Private	Gravel	Yes	Open Cut
4.22	184th St SE	Snohomish County	Paved	Yes	Open Cut
4.40	67th Ave SE	Snohomish County	Paved	Yes	Not Crossed
4.40	Powerline right-of-way	SnoPUD	Dirt	Yes	Not Crossed
4.40	Private	Private	Dirt	Yes	Not Crossed
4.41	67th Ave SE	Snohomish County	Paved	Yes	Not Crossed
4.66	James Street	Snohomish County	Paved	Yes	Open Cut
4.67	Private Driveway	Private	Paved	Yes	Open Cut
4.86	Private Driveway	Private	Paved	Yes	Not Crossed
4.90	59th Ave SE	Snohomish County	Paved	Yes	Open Cut
4.94	Private Dive	Private	Dirt/Gravel	Yes	Not Crossed
5.00	Private Drive	Private	Gravel	Yes	Open Cut
5.03	184th St SE	Snohomish County	Paved	Yes	Open Cut
5.24	Private Driveway	Private	Gravel	Yes	In right-of-way
5.40	196th St SE	Snohomish County	Paved	Yes	Not Crossed
5.41	51St Ave SE	Snohomish County	Paved	Yes	Open Cut
5.66	Powerline right-of-way	SnoPUD	Dirt	Yes	Not Crossed
5.68	Powerline right-of-way	SnoPUD	Dirt	Yes	Open Cut
5.83	184th St SE	Snohomish County	Paved	Yes	Not Crossed
5.84	Unknown Rd (44th Dr SE)	Snohomish County	Paved	Yes	Open Cut
5.87	Unknown Rd (43Rd Dr SE)	Snohomish County	Paved	Yes	Open Cut
5.90	43rd Ave SE	Snohomish County	Paved	Yes	Not Crossed
5.92	Powerline right-of-way	Snohomish County	Dirt	Yes	Not Crossed
5.95	Sunset Rd	Snohomish County	Paved	Yes	Not Crossed
5.96	183rd Pl SE	Snohomish County	Paved	Yes	Not Crossed

Milepost	Name`	Jurisdiction	Surface	Ingress/ Egress	Crossing Method
5.97	42ND Dr SE	Snohomish County	Paved	Yes	Not Crossed
6.06	40th Dr SE	Snohomish County	Paved	Yes	Open Cut
6.12	40th Ave SE	Snohomish County	Paved	Yes	Open Cut
6.22	38th Ave SE	Snohomish County	Paved	Yes	Open Cut
6.36	36th Ave SE	Snohomish County	Paved	Yes	Open Cut
6.41	185th Pl SE	Snohomish County	Paved	Yes	Not Crossed
6.42	35th Ave SE	Snohomish County	Paved	Yes	Open Cut
6.69	31St Ave SE	Snohomish County	Paved	Yes	Open Cut
6.70	184th Pl SE	Snohomish County	Paved	Yes	Not Crossed
6.75	29th Ave SE	Snohomish County	Paved	Yes	Not Crossed
6.82	187th Pl SE	Snohomish County	Paved	Yes	Not Crossed
6.90	28th Ave SE	Snohomish County	Paved	Yes	Open Cut
7.03	26th Ave SE	Snohomish County	Paved	Yes	Open Cut
7.03	186th Pl SE	Snohomish County	Paved	Yes	Not Crossed
7.10	185th Pl SE	Snohomish County	Paved	Yes	Not Crossed
7.10	186th Pl SE	Snohomish County	Paved	Yes	Not Crossed
7.18	23RD Dr SE	Snohomish County	Paved	Yes	Not Crossed
7.23	185th Pl SE	Snohomish County	Paved	Yes	Not Crossed
7.23	22nd Dr SE	Snohomish County	Paved	Yes	Open Cut
7.30	20th Dr SE	Snohomish County	Paved	Yes	Not Crossed
7.30	180th Pl SE	Snohomish County	Paved	Yes	Not Crossed
7.37	186th Pl SE	Snohomish County	Paved	Yes	Open Cut
7.44	Private Drive	Private	Paved	Yes	Not Crossed
7.49	Private Drive	Private	Paved	Yes	Not Crossed
7.52	183rd St SE	Snohomish County	Paved	Yes	Not Crossed
7.54	Bothell Everett Hwy	WA State	Paved	Yes	Bore
7.54	186th St SE	Snohomish County	Gravel	Yes	In right-of-way
7.70	Private (commercial)	Private	Paved	Yes	Not Crossed
7.70	Private (15th Ave SE)	Private	Dirt	Yes	Not Crossed

Milepost	Name`	Jurisdiction	Surface	Ingress/ Egress	Crossing Method
7.85	12th Dr SE	Snohomish County	Paved	Yes	Not Crossed
7.86	184th Pl SE	Snohomish County	Paved	Yes	Not Crossed
7.90	11th Dr SE	Snohomish County	Paved	Yes	Not Crossed
7.90	185th St SE	Snohomish County	Paved	Yes	Not Crossed
7.95	10th Dr SE	Snohomish County	Paved	Yes	Not Crossed
7.95	183rd Pl SE	Snohomish County	Paved	Yes	Not Crossed
7.98	186th St SE	Snohomish County	Paved	Yes	Open Cut
11.00	188th St SW	Snohomish County	Paved	Yes	Not Crossed
11.00	36th Ave W	Snohomish County	Paved	Yes	Not Crossed

APPENDIX E

BIOLOGICAL ASSESSMENT

Biological Assessment
and
Essential Fish Habitat Assessment

North Seattle Lateral Upgrade Project

Northwest Pipeline, LLC
Docket No. CP17-441-001

January 2018

Federal Energy Regulatory Commission
Office of Energy Projects
Washington, DC 20426

Table of Contents

1.0 Introduction ... 1
1.1 Background ... 1
1.2 Project Location ... 2
1.3 Project Setting ... 2
1.4 Permits, Approvals and Regulatory Requirements ... 11
2.0 Species ... 12
2.1 ESA Listed Species ... 12
2.2 Species with Essential Fish Habitat ... 12
3.0 Project Description ... 14
3.1 Purpose and Need ... 14
3.2 Schedule ... 14
3.3 Location and Description of Proposed Removal and Replacement Activities ... 14
3.3.1 Pipeline Facilities ... 14
3.3.2 Aboveground Facilities ... 16
3.3.3 Access Roads ... 18
3.3.4 Pipe Storage and Contractor Yard ... 18
3.4 Construction Procedures ... 19
4.0 Action Area ... 21
4.1 Aquatic Action Area ... 21
4.2 Terrestrial Action Area ... 24
5.0 Species' Accounts, Critical Habitat, Project Effects and Determinations of Effect ... 24
5.1 Determinations of No Effect ... 24
5.1.1 Marbled Murrelet ... 24
5.1.2 Streaked Horned Lark ... 25
5.1.3 Yellow-billed Cuckoo ... 26
5.1.4 Oregon Spotted Frog ... 27
5.1.5 North American Wolverine ... 28
5.2 Determinations of Effect ... 29
5.2.1 Chinook Salmon ... 29
5.2.1.1 Species Account and Critical Habitat ... 29
5.2.1.2 Environmental Baseline ... 33
5.2.1.3 Environmental Effects ... 34
5.2.1.4 Conservation Measures ... 44
5.2.1.5 Determination of Effects ... 45
5.2.2 Steelhead ... 46
5.2.2.1 Species Account and Critical Habitat ... 46
5.2.2.2 Environmental Baseline ... 50
5.2.2.3 Environmental Effects ... 50
5.2.2.4 Conservation Measures ... 54
5.2.2.5 Determination of Effects ... 55
5.2.3 Bull Trout ... 55
5.2.3.1 Species Account and Critical Habitat ... 55
5.2.3.2 Environmental Baseline ... 59
5.2.3.3 Environmental Effects ... 60
5.2.3.4 Conservation Measures ... 60

5.2.3.5 Determination of Effects 61
6.0 Essential Fish Habitat 62
6.1 Other Species with EFH 62
6.2 Effects to Essential Fish Habitat 68
6.3 EFH Effects Determination 69
7.0 References 70

List of Figures

Figure 1.3-1 Average, Maximum and Minimum Daily Water Temperatures in Evans Creek Measured at Elliot Road during June through September, 2000 6
Figure 1.3-2 Average Monthly Discharge in Little Bear Creek During 2015 in the Vicinity of the Project 6
Figure 1.3-3 Average Monthly Temperatures in Little Bear Creek from 1993 through 2009 and during 2015 in the Vicinity of the Project 7
Figure 1.3-4 Relationship between Turbidity and Total Suspended Solids in Little Bear Creek in the Vicinity of the Project with data collected from 1993 through 2009 8
Figure 1.3-5 Average Monthly Discharge in North Creek during 2014 at 196th Street 10
Figure 1.3-6 Average Monthly Temperatures in North Creek from 1992 through 2009 at the King-Snohomish County Line, and in 2014 at 196th Street 11
Figure 5.2-1 Abundance Estimates of Natural and Hatchery Chinook Spawners for the Sammamish Stock since 2004 31
Figure 5.2-2 Approximate Timing of Summer-Fall Chinook Salmon Use in the Snohomish and Lake Washington Sub-basins 32
Figure 5.2-3 Estimates of Total Natural Spawners for Winter Steelhead in the Snohomish-Skykomish Rivers since 1981 48
Figure 5.2-4 Estimates of Total Natural Spawners for North Lake Washington Winter Steelhead from 1984 through 1999 49
Figure 5.2-5 Estimates of Bull Trout Abundance in the Skykomish River since 1988 and Trend from 2000 to 2015. 58
Figure 6.1-1 Approximate Timing of Coho Salmon Use in the Snohomish and Lake Washington Sub-basins 63
Figure 6.1-2 Estimates of Total Natural Coho Escapement for the Entire Snohomish River Basin since 1965 and Trend from 2000 to 2015. 64
Figure 6.1-3 Approximate Timing of Sockeye Salmon Use in the Lake Washington Sub-basin 66
Figure 6.1-4 Estimates of Total Natural Sockeye Spawners in the Lake Washington/Sammamish Tributaries since 1982 66
Figure 6.1-5 Approximate Timing of Odd-Year Pink Salmon Use in the Snohomish Basin 68

List of Tables

Table 1.3-1 Vegetation Cover Types and Corresponding Wildlife Habitat Categories Mapped within the Project Area 4
Table 1.3-2 Waterbodies Crossed in the Little Bear Creek Drainage Complex 8
Table 1.3-3 Waterbodies Crossed in the North Creek Drainage Complex 9
Table 1.4-1 Permits and Approvals Necessary for Construction and Operation 11

Table 2.1-1 Anadromous ESA Species and Species with EFH Occurrence within the Project Area 13
Table 3.3-1 Summary of Pipeline Facilities 15
Table 3.3-2 Aboveground Facility Modifications 17
Table 4.1-1 Monthly Discharge Measured in Little Bear Creek with Estimates for Stream Depths and Velocities Derived from Modeled Bankfull Conditions [1] 23
Table 4.1-2 Estimated Downstream Transport Distances for Particles in Little Bear Creek Using Maximum Estimates for Stream Velocities and Stream Depths 23
Table 4.2-1 Average Maximum Noise at 50 feet from Construction 24
Table 5.2-1 The Extent of Habitats Utilized by Fall-run Chinook in the Lake Washington Sub-basin, the Middle Sammamish 5th Field Watershed and Little Bear Creek 33
Table 5.2-2 Estimates of Distances Downstream for Very Fine Silt Suspended during Fluming and Dam & Pump Pipeline Construction to Equal Average Ambient TSS Concentrations in Little Bear Creek during Months of Construction 37
Table 5.2-3 Extent (stream miles) of Fall Chinook Migration, Rearing and Spawning Habitats in Little Bear Creek Relative to the Species' Habitats the Lake Washington Sub-basin (HUC 17110012) 38
Table 5.2-4 Percentages of Fall Chinook Rearing and Spawning Habitats in the Lake Washington Sub-basin and Streams[1] Impacted by Turbidity Generated during In-stream Construction in Little Bear Creek 39
Table 5.2-5 Extent (stream miles) of Winter Steelhead Rearing and Spawning Habitats in Little Bear Creek Relative to the Species' Habitats in the Lake Washington Sub-basin (HUC 17110012) 52
Table 6.1-1 Extent (stream miles) of Coho Salmon Rearing and Spawning Habitats in Little Bear Creek Relative to the Species' Habitats in the Lake Washington Sub-basin (HUC 17110012) 64
Table 6.1-2 Percentages of Coho Rearing and Spawning Habitats in the Lake Washington Sub-basin and Streams Impacted by Turbidity Generated during In-stream Construction In Little Bear Creek 65
Table 6.1-3 Extent (stream miles) of Sockeye Salmon Rearing and Spawning Habitats in Little Bear Creek Relative to the Species' Habitats the Lake Washington Sub-basin (HUC 17110012) 67
Table 6.1-4 Percentages of Sockeye Rearing and Spawning Habitats in the Lake Washington Sub-basin and Streams Impacted by Turbidity Generated during In-stream Construction in Little Bear Creek 67

List of Attachments

Attachment A Erosion Control and Revegetation Plan
Attachment B Spill Plan for Oil and Hazardous Materials
Attachment C Fluming and Dam and Pump Procedures
Attachment D Fish Salvage Plan

List of Abbreviations

BA	Biological Assessment
BBS	Breeding Bird Survey
BMP	best management practice
CBC	Christmas Bird Count
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
dBA	decibels
DOT	U.S. Department of Transportation
DPS	Distinct Population Segment
ECRP	Erosion Control and Revegetation Plan
EFH	Essential Fish Habitat
EPAct	Energy Policy Act of 2005
ESA	Endangered Species Act
EPA	U.S. Environmental Protection Agency
ESU	Evolutionarily Significant Unit
FERC	Federal Energy Regulatory Commission
FMP	Fishery Management Plans
HADD	harmful alteration, disturbance or destruction of habitat
HUC	Hydrologic Unit Code
IPaC	Information for Planning and Conservation
LWD	large woody debris
MAOP	maximum allowable operating pressure
MLV	mainline valve
mg/L	milligrams per liter
MP	milepost
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
NTU	Nephelometric Turbidity Units
Northwest	Northwest Pipeline LLC
PAR	permanent access road
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
Project	North Seattle Lateral Upgrade Project
PSE	Puget Sound Energy
SEV	severity-of-ill-effects
SOC	species of concern
Spill Plan	Spill Plan for Oil and Hazardous Substances
SS	Suspended Solids
SWPPP	Stormwater Pollution Prevention Plan
TEWA	temporary extra work area
TSS	Total Suspended Solids
USFWS	U.S. Fish and Wildlife Service

USGS	U.S. Geological Survey
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WDOE	Washington Department of Ecology
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

1.0 Introduction

1.1 Background

Pursuant to Section 7 of the Endangered Species Act (ESA), the Federal Energy Regulatory Commission (FERC or Commission) prepared this Biological Assessment (BA) to address effects of the North Seattle Lateral Upgrade Project (Project) on species listed under the ESA and their designated critical habitats. This BA is being submitted to the United States Department of the Interior, Fish and Wildlife Service (USFWS) and the United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS). Our[1] effects determinations are presented for species under the jurisdiction of the NMFS and USFWS. We request that the NMFS accept this BA, enter into formal consultations with the FERC, and formulate a Biological Opinion that determines whether or not the Project would jeopardize the continued existence of any federally listed or proposed threatened or endangered species or result in the destruction or adverse modification of designated critical habitat for those species.

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), which was reauthorized and amended in 1996, requires NMFS to recommend conservation and enhancement measures for any federal or state activity that may adversely affect Essential Fish Habitat (EFH). This BA also provides information for NMFS on potential effects to EFH, pursuant to Section 305(b) of the Magnuson-Stevens Act.

On May 11, 2017, Northwest Pipeline LLC (Northwest) filed an application with the Commission in docket number CP17-441-000 under sections 7(b) and 7(c) of the Natural Gas Act (NGA). Northwest's proposed Project is referred to as the North Seattle Lateral Upgrade Project (Project). Northwest amended its application on October 23, 2017 in docket number CP17-441-001. The Project would consist of removing up to 5.6 miles of the existing, operating 8-inch-diameter lateral between mileposts 2.2 and 7.8 and 0.3 mile of 8-inch-diameter pipeline between mileposts 1.9 and 2.2 that was previously abandoned in place under FERC Docket No. CP11-520-000. The 8-inch-diameter lateral is located within a 35 to 75-foot wide right-of-way that also includes Northwest's 16-inch-diameter 2448 loop pipeline. Northwest proposes to remove approximately 5.9 miles of 8-inch-diameter pipeline and install in its place a 20-inch-diameter pipeline in the same ditch. The Project would also include upgrading the existing North Seattle/Everett delivery meter station, installing a new mainline valve, and installing a new pig launcher/receiver site at the terminus of the 20-inch-diameter pipeline. The Project would provide an additional 159,299 dekatherms per day of delivery capacity on the existing North Seattle Delivery Lateral system as requested by Puget Sound Energy (PSE).

The Federal Energy Regulatory Commission (FERC) is the federal agency responsible for authorizing interstate natural gas transmission facilities, as specified in section 311(e)(1) of the Energy Policy Act of 2005 (EPAct) and the Natural Gas Act. For this Project, in accordance with section 313(b)(1) of the Energy Policy Act, FERC is the lead federal agency for the coordination of all applicable federal authorizations, and is also the lead federal agency for

[1] The pronoun "we," "us," and "our" refer to the environmental staff of the FERC's Office of Energy Projects.

preparation of an environmental assessment in compliance with the requirements of the National Environmental Policy Act of 1969 (NEPA).

Six species listed under the ESA are within the jurisdiction of the USFWS and included in the agency's *Information for Planning and Conservation* (IPaC) system as potentially occurring within Snohomish County and the Project area. Listed species include the North American wolverine (*Gulo gulo luscus*) proposed for listing as threatened; and five threatened species including, marbled murrelet (*Brachyramphus marmoratus*), streaked horned lark (*Eremophila alpestris strigata),* yellow-billed cuckoo *(Coccyzus americanus*), Oregon spotted frog (*Rana pretiosa*) and bull trout (*Salvelinus confluentus*). Two species listed under the ESA within the jurisdiction of NMFS, the Chinook salmon (*Oncorhynchus tshawytscha)* and steelhead (*Oncorhynchus mykiss*), also have the potential to occur in the Project area.

Critical habitats for the marbled murrelet (USFWS, 2011a) and for bull trout (USFWS, 2010a) have been designated in Snohomish County. Critical habitat for Chinook salmon in the Puget Sound Evolutionarily Significant Unit (ESU) was designated in 2005 (NMFS, 2005a) and critical habitat for steelhead in the Puget Sound Distinct Population Segment (DPS) was designated in 2016 (NMFS, 2016).

We have concluded, based on the documentation and analytical results contained herein, that the Project would have no effect on the North American wolverine, marbled murrelet, streaked horned lark, yellow-billed cuckoo, and Oregon spotted frog. We have also concluded that the Project may affect, but is not likely to adversely affect the bull trout and steelhead, and that the Project may affect and is likely to adversely the Chinook salmon. Additionally, the Project would have no effect on designated critical habitat for Coastal-Puget Sound DPS bull trout or designated critical habitat for Puget Sound DPS steelhead, and is likely to adversely affect designated critical habitat Chinook salmon with the Puget Sound ESU. Lastly, the Project may adversely affect freshwater Pacific Coast Salmon EFH.

1.2 Project Location

The Project would occur entirely within Snohomish County, Washington. The general location of the Project is shown on Figure 1.2-1. The Project would begin at the interconnection of the 20-inch-diameter North Seattle 2428 mainline lateral and 16-inch-diameter 2448 loop line at milepost (MP) 1.94 in Section 18, Township 27 North, Range 6 East and would be within the existing and maintained right-of-way. The upgrade would start where the North Seattle Delivery Lateral Expansion Project ended in 2012 (CP11-520, filed under Prior Notice in 2011). The Project would require new appurtenances and existing appurtenance modifications to tie the proposed 20-inch-diameter replacement pipeline into the existing 20-inch-diameter pipeline.

1.3 Project Setting

The Project area is within the Puget Sound Basin portion of the Puget Trough Province, a glaciated depression in which prairies, oak woodlands and pine forests are intermixed with western hemlock and Douglas-fir coniferous forests (Franklin and Dyrness, 1988). The Project generally traverses gentle to moderately sloping glacial terrain, with elevations ranging from 195 to 610 feet. The Project is near Seattle and its more urban setting generally supports the following land uses: residential and light industrial with some agriculture (pasture).

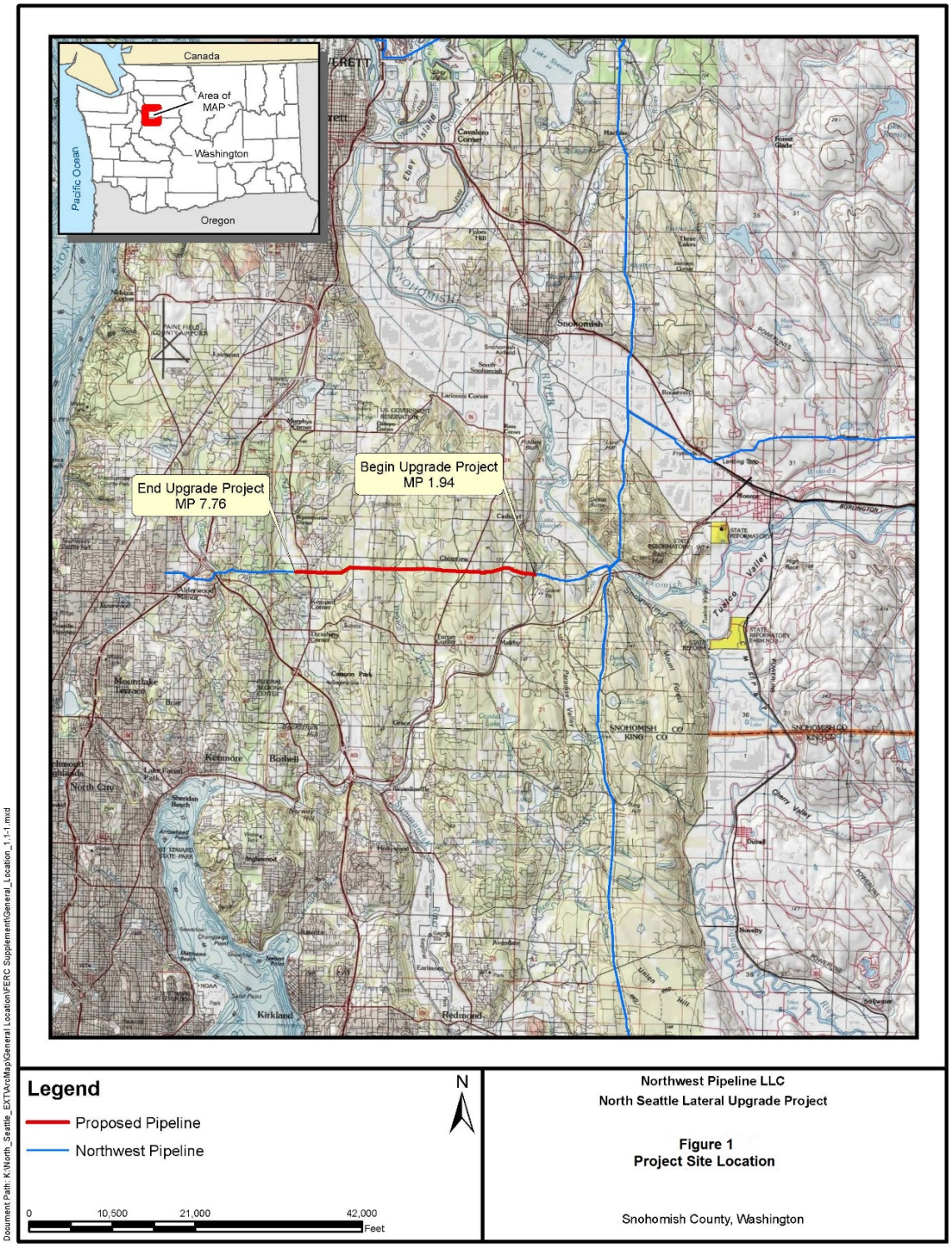


Figure 1.2-1
General Location Map

Terrestrial Conditions. The Project area is dominated by residential and other light industrial areas that are interspersed with a mosaic of forested and non-forested vegetation types. In most non-forested locations, vegetation within Northwest's permanent easement is continuous with adjacent vegetation, which often occurs in residential yards (Urban and Mixed Environs). Non-forested vegetation types in the Project area also include herbaceous Wetlands and Agriculture, Pasture and Mixed Environs. Where the permanent easement passes through Westside Lowland Conifer-Hardwood Forest type, the corridor is generally maintained in a condition where trees or shrubs are trimmed or cut within 15 feet on either side of the existing 8-inch-diameter and 16-inch-diameter pipelines. Five general vegetation types are found in the Project area and include, in order of dominance: developed, forest-woodland, agriculture, riparian-wetlands and open water (see Table 1.3-1).

Table 1.3-1
Vegetation Cover Types and Corresponding Wildlife Habitat Categories Mapped within the Project Area

General Vegetation Type	Mapped Vegetation/Habitat Category [1]
Developed	Urban and Mixed Environs
	Roads
Agriculture	Agriculture, Pastures, and Mixed Environs
Riparian and Wetlands	Westside Riparian-Wetlands
	Herbaceous Wetlands
Forest-Woodland	Westside Lowlands Conifer-Hardwood Forest
Open Water	Open Water - Lakes, Rivers, and Streams

[1] Source: Johnson and O'Neil, 2001.

Much of the landscape is associated with medium to high-density residences (from 2 to 6 single family homes per acre) in the Urban and Mixed Environs type interspersed with Westside Conifer-Hardwood Forest. These areas are generally located near roads and within Northwest's maintained corridor. Vegetation is dominated by disturbed grasslands and shrublands and Himalayan blackberry is prevalent. In some locations, pastures, undeveloped fields and agricultural areas occur. Herbaceous wetlands also occur throughout the Project area. Most herbaceous wetlands in the Project area have been highly modified as lawns and others are heavily grazed horse pastures dominated by various native and introduced graminoids especially reed canarygrass (*Phalaris arundinacea*), soft rush (*Juncus effusus*) and creeping buttercup (*Ranunculus repens*) (The Watershed Company, 2017a and 2017b).

Westside Lowlands Conifer-Hardwood Forest is interspersed throughout the Project area and is typically isolated by existing development. More expansive forest is generally located in the vicinity of North Creek and Little Bear Creek. Tree species that comprise the Westside Lowlands Conifer-Hardwood Forest type in the Project area include black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), red alder (*Alnus rubra*) and bigleaf maple (*Acer macrophyllum*), as well as sub-dominant coniferous trees such as western redcedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) (The Watershed Company, 2017b; GeoEngineers, Inc., 2017). These same species occur in the Westside Riparian-Wetlands vegetation, which occurs throughout the Project area. Common plants present in the understory of deciduous-dominated areas include salmonberry (*Rubus spectabilis*), Indian plum (*Oemieria cerasiformis*), black twinberry (*Lonicera involucrata*), snowberry (*Symphoricarpos* sp.) and Himalayan blackberry (*Rubus armeniacus*). In more coniferous-dominated areas, the understory

is less dense and typically includes sword fern (*Polystichum munitum*), bracken fern (*Pteridium* sp.) and salal (*Gaultheria shallon*) (The Watershed Company, 2017b). Other trees present include various willows (*Salix* spp.), and rarely, Sitka spruce (*Picea sitchensis*), often within residential yards (The Watershed Company, 2017a).

Aquatic Conditions. The Project crosses two 5th field watersheds in two different sub-basins. The eastern 1.5 miles are located in the Quilceda Creek-Frontal Possession Sound Watershed (Hydrologic Unit Code [HUC] 1711001102), which is within the Snohomish Sub-basin (HUC 17110011). The western 4.35 miles are within the Middle Sammamish River Watershed (HUC 1711001203) and the Lake Washington Sub-basin (HUC 17110012).

The Project crosses or is adjacent to 15 streams (and one manmade freshwater pond): two streams within the Quilceda Creek-Frontal Possession Sound Watershed and 13 within the Middle Sammamish River Watershed. Neither of the streams within the Quilceda Creek-Frontal Possession Sound Watershed are fish-bearing. Of the 13 streams within the Middle Sammamish River Watershed, 12 streams have been determined to be fish-bearing by WDNR; only four of which support anadromous salmonid species according to WDFW SalmonScape. The Project would cross one of the three major northernmost tributaries to the Sammamish River – Little Bear Creek, as well as several tributaries to Little Bear Creek and tributaries to North Creek (another major tributary to the Sammamish River). The streams provide important habitat for all life stages of several salmonid species (Fevold et al., 2001).

Evans Creek. The Project does not cross but is within 63 feet of Evans Creek, a fish-bearing tributary to the Snohomish River mainstem in the Quilceda Creek-Frontal Possession Sound Watershed. The Project would cross two small non-fish bearing intermittent streams at MPs 2.11 and 2.64, assumed tributaries to Evans Creek.

The U.S. Geological Survey (USGS) sampled stream flows in Evans Creek (USGS Gage 12151000) 11 times during late spring and summer between 1957 and 1971. The average flow rate for the limited measurements was 3.9 cubic feet per second (cfs), ranging from 2.4 to 6.4 cfs. Water temperatures in Evans Creek were measured at Elliot Road, downstream from the existing pipeline easement crossing, during June through September, 2000 (Snohomish County, 2017). During that period the warmest water temperatures occurred between late June and early August, often exceeding 60 degrees Fahrenheit (°F) (see Figure 1.3-1).

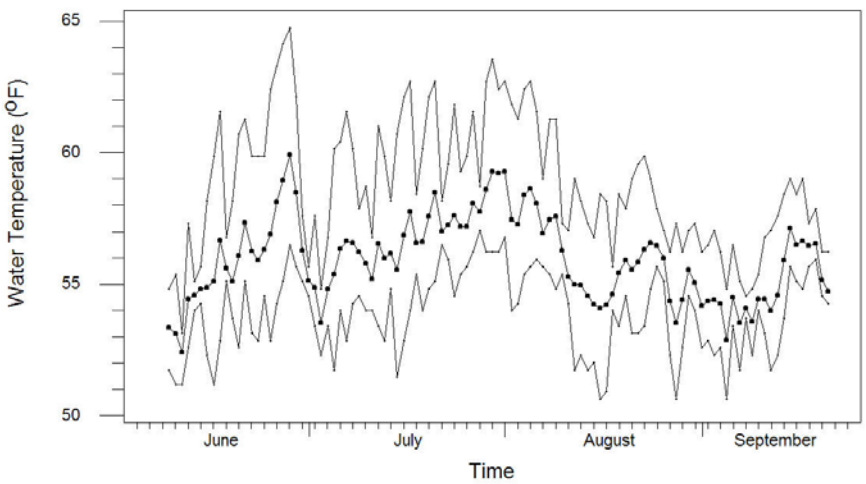


Figure 1.3-1
Average, Maximum and Minimum Daily Water Temperatures in Evans Creek Measured at Elliot Road during June through September, 2000

Little Bear Creek. Little Bear Creek is a perennial stream. On-site surveys conducted during December 2016 and January 2017 reported an average width of 19.5 feet in the Project vicinity with streambed mix of silt, sand and cobble (The Watershed Company, 2017a).

Water quality and flow data have been collected by Snohomish County Division of Surface Water Management (2017) in Little Bear Creek south of 180th Street in the vicinity of the existing pipeline easement crossing. Average monthly flows compiled from stream gage data collected during 2015 are shown in Figure 1.3-2. Dashed lines indicate maximum and minimum values. Lowest flows occurred during July (1.52 cfs) followed by August (1.83 cfs) and September (1.86 cfs), although flows in the latter two months were more variable. The highest discharges were recorded during winter months, January through March, November and December. The maximum flow reported during 2015 was 62 cfs in December.

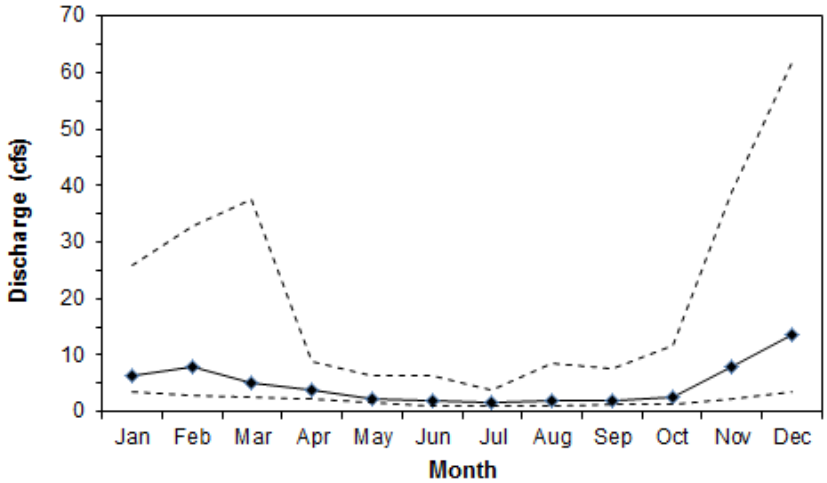


Figure 1.3-2
Average Monthly Discharge in Little Bear Creek During 2015 in the Vicinity of the Project

Average monthly water temperatures reported during that period are shown in Figure 1.3-3 with the warmest (56°F average, 61°F maximum) occurring during August. Since 2009, Snohomish County (2017) has measured water temperatures with data loggers. Average water temperature data in degrees Fahrenheit for 2015 are included in Figure 1.3-3 and show that the 2015 average data are higher than average monthly temperatures observed from 1993 to 2009. Dashed lines indicate maximum and minimum values from 1993 through 2009. During several months (i.e. May, June and July) the average temperature in 2015 equaled or exceeded the maximum monthly temperatures observed during the earlier period. Maximum temperatures in 2015 exceeded 60°F from May through August (2015 maxima not shown).

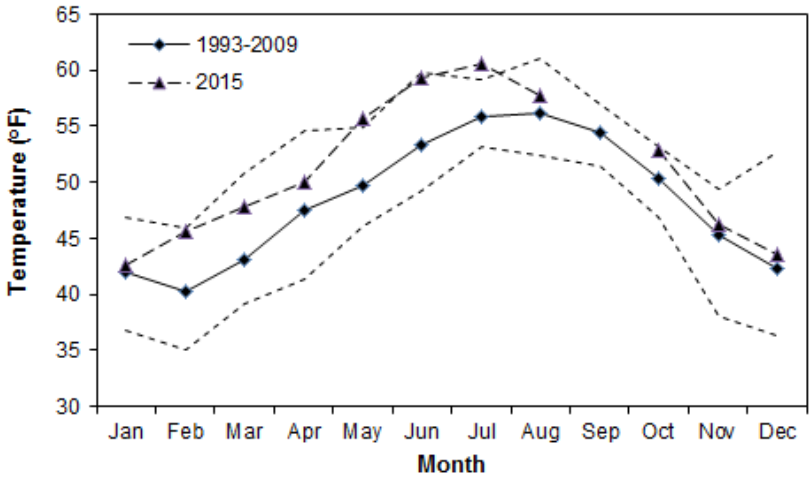


Figure 1.3-3
Average Monthly Temperatures in Little Bear Creek from 1993 through 2009 and during 2015 in the Vicinity of the Project

Snohomish County (2017) also measured monthly values for several water quality parameters at the same gage location between December 1993 and December 2009. Dissolved oxygen concentrations were relatively constant during that period, varying from a minimum of 6 milligrams per liter (mg/L) to maximum of 13.8 mg/L. Ambient turbidity (measured in Nephelometric Turbidity Units or NTUs) and Total Suspended Solids (TSS measured in mg/L) were measured concurrently in Little Bear Creek at 51st Street SE, approximately 900 feet upstream from the project crossing location each month from 1993 to 2009. The data show highest TSS concentrations during September (mean 14.4 mg/L ranging from 1 to 140 mg/L) with average concentrations at 3.5 mg/L in July and 3.0 mg/L in August. The positive relationship between NTU and TSS concentration (see Figure 1.3-4) is significant ($P<0.001$).

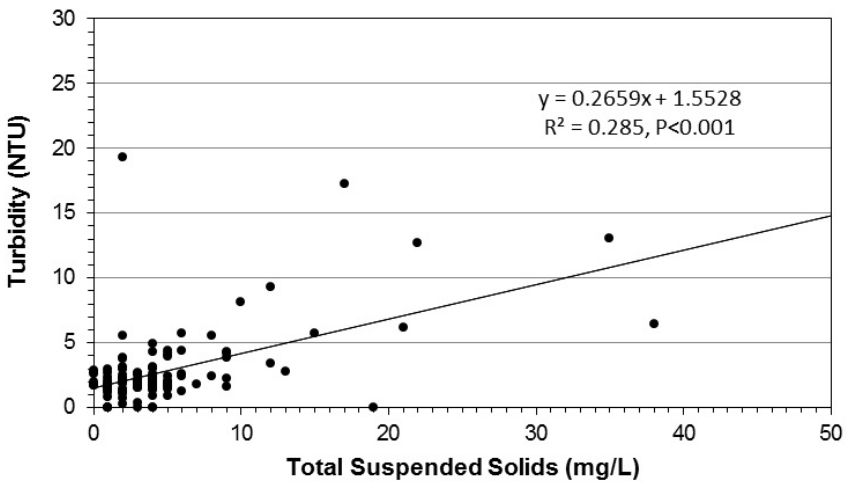


Figure 1.3-4
Relationship between Turbidity and Total Suspended Solids in Little Bear Creek in the Vicinity of the Project with data collected from 1993 through 2009

Tributaries to Little Bear Creek. Field surveys indicate the Project would cross eight tributaries to Little Bear Creek (see Table 1.3-2). Most of the tributaries are small, less than five feet wide, with intermittent flows. Great Dane Creek is the largest tributary and is known to be fish-bearing, although presence of salmonids in the vicinity of the Project has not been documented. The total length of Great Dane Creek is approximately 2.2 miles. Great Dane Creek traverses rural or lightly developed residential areas; 58 percent of the Great Dane drainage basin is covered by forest (Northwest Hydraulic Consultants, 2016). In the Project area, the Great Dane Creek stream channel is poorly-defined and has a moderately steep gradient. The creek passes through a culvert just downstream of the existing pipeline easement crossing, forming a plunge pool below the culvert (GeoEngineers, Inc., 2017). The culvert may limit anadromous salmonids from accessing the reach crossed by the existing pipeline easement and the Project. The Washington State Department of Transportation (WSDOT) has announced plans to replace this culvert in the summer of 2018 to enhance fish passage (WSDOT 2017).

Table 1.3-2
Waterbodies Crossed in the Little Bear Creek Drainage Complex

Waterbody [1]	Stream ID [1]	Milepost	Flow [1]	Average Bank Width (ft) [1]	Comment
Trib. to Great Dane Ck.	S	3.87	Intermittent	3.3	Stream is partially ditched; no barriers to fish passage from Great Dane Creek. [1]
Great Dane Creek	A	3.92	Perennial	22.2	Stream channel is poorly-defined; moderately steep gradient (≥3%). [2]
Trib. to Great Dane Ck.	B	4.10	Intermittent	6.7	Partially ditched and appears to terminate and infiltrate along 184th Street SE.
Trib. to Great Dane Ck.	C	4.28	Intermittent	5.3	Largest pool with an estimated residual pool depth of 0.75 ft; moderate gradient 1 to 4%. [2]
Trib. to Little Bear Ck.	D	4.65	Intermittent	3.2	Stream D is upstream of Stream F; no natural barriers to fish passage were observed. [1]

Waterbody [1]	Stream ID [1]	Milepost	Flow [1]	Average Bank Width (ft) [1]	Comment
Trib. to Little Bear Ck.	E	4.73	Intermittent	3.5	Stream E is upstream of Stream F; no natural barriers to fish passage were observed. [1]
Trib. to Little Bear Ck.	F2	4.86	Perennial	2.6	Undefined channel through a wetland implies no concentration of flow. [2]
Little Bear Creek	W	5.52	Perennial	19.2	Pools are dominantly wood-forced, formed by channel-spanning large-woody debris pieces and debris jams. Pools range from 2-3 ft deep. [2]
Trib. to Little Bear Ck.	V	5.72	Perennial	6.7	Poorly-defined channel with wetland areas observed upstream and downstream. [2]
Sources: [1] The Watershed Company, 2017a. [2] GeoEngineers, Inc., 2017.					

Tributaries to North Creek. Field surveys indicate the Project would cross four tributaries to North Creek (see Table 1.3-3). Silver Creek and Tambark Creek are the two main tributaries to North Creek that would be crossed. Together, the two tributaries' lengths total approximately 3.2 miles. In 2001, mixed forest cover in the two tributaries' drainage basin was six percent; aquatic habitat quality was rated as medium-to-low; and large woody debris (LWD) frequency and quality were also low in these tributaries (Fevold et al., 2001).

Table 1.3-3
Waterbodies Crossed in the North Creek Drainage Complex

Waterbody [1]	Stream ID [1]	Milepost	Flow [1]	Average Bank Width (ft) [1]	Comment
Trib. to Tambark Creek	J	6.27	Intermittent	4.4	Connected via Wetland N to Tambark Creek [1]
Trib to Tambark Creek	H	6.79	Perennial	5.8	May be fish-bearing due to proximate connection with Tambark Creek.[1]
Tambark Creek	G	6.83	Perennial	13.3	Moderate to large wood in the channel and on banks upstream and downstream of the Project crossing that steers flow. [2]
Silver Creek	K	7.35	Perennial	12.5	Riprap and protective fabric are present in the channel bed at the Project crossing. [2]
Sources: [1] The Watershed Company, 2017a. [2] GeoEngineers, Inc., 2017.					

There is limited data available from Snohomish County (2017) for Silver Creek and Tambark Creek. Discharge data from Tambark Creek measured downstream of the Project area from January through October 2000 indicates that there are occasional limited or no flows between June and September. During that same time period, water temperatures exceeded 60°F during June through August. Water temperatures measured in Silver Creek upstream of the Project area during June through October 2002 likewise indicate temperatures occasionally exceeding 60°F from June through September.

Although extensive water quality data is not available for the four tributaries, data was collected by Snohomish County (2017) in North Creek at the Snohomish-King County line, about 4.6 miles downstream from the Project, from December 1992 to December 2009 and may

reveal similar patterns for conditions in the tributaries. Dissolved oxygen concentrations were relatively constant during that period, varying from a minimum of 6.48 mg/L to maximum of 14.06 mg/L. Likewise, turbidity was low ranging from 0 to 25.7 NTU; however, concentrations of TSS peaked at 130 mg/L in November 1996. Additionally, flow data in North Creek were collected by Snohomish County (2017) at 196th Street. Average monthly flows compiled from stream gage data collected during 2014 are shown in Figure 1.3-5. The dashed lines indicate maximum and minimum values. The lowest flows occurred during August followed by July and June. The highest discharges were recorded during winter months, February through March and November through December. Similar patterns of monthly flows are expected in the tributaries although flow rates would be considerably less than shown in Figure 1.3-5.

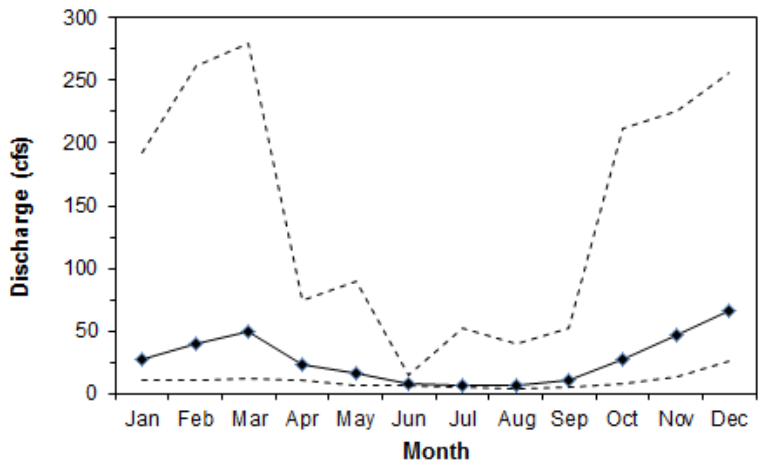


Figure 1.3-5
Average Monthly Discharge in North Creek during 2014 at 196th Street

Average monthly water temperatures reported during the period from 1992 to 2009 are shown in Figure 1.3-6 with the warmest (60.6°F average, 65.5°F maximum) occurring during July, approximately 4.6 miles downstream from the Project. The dashed lines indicate maximum and minimum values. Similar patterns of monthly water temperatures are expected in the tributaries although temperatures would likely be greater than in Figure 1.3-6, due to shallower depths and lower flows in the tributaries.

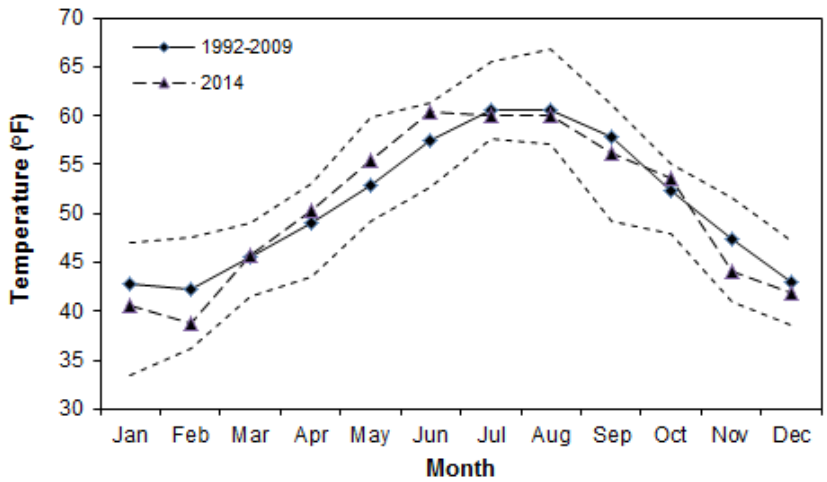


Figure 1.3-6
Average Monthly Temperatures in North Creek from 1992 through 2009 at the King-Snohomish County Line, and in 2014 at 196th Street

1.4 Permits, Approvals and Regulatory Requirements

Table 1.4-1 provides a list of permits, approvals and consultations required for construction and operation of the Project.

Table 1.4-1
Permits and Approvals Necessary for Construction and Operation

Agency	Permit/Approval
Federal Permits/Approvals	
Federal Energy Regulatory Commission	Certificate of Public Convenience and Necessity
	NEPA
U.S. Army Corps of Engineers	Clean Water Act (CWA) Section 404 (Nation-wide Permit 12)
U.S. Fish and Wildlife Service	ESA Section 7 Consultation
	Fish and Wildlife Coordination Act
	Migratory Bird Treaty Act
National Marine Fisheries Service	ESA Section 7 Consultation
	Magnuson-Stevens Fishery Conservation and Management Act
State Permits	
Washington Department of Ecology	CWA Section 401, Water Quality Certification
	Construction Stormwater National Pollution Discharge Elimination System (NPDES) Permit
	Coastal Zone Management Act
Washington Department of Fish and Wildlife	Hydraulic Project Approval
	Bald Eagle Management
Washington Department of Natural Resources	Forest Practices Act
Department of Archaeology and Historic Preservation	National Historic Preservation Act – Section 106 Consultation
Washington Department of Transportation	State Highway Crossing
County Permits	
Snohomish County	State Environmental Policy Act
	Shoreline Substantial Development Permit
	Critical Areas Ordinance
	Land Disturbance (Grading Permit)
	Forest Practices

2.0 Species

2.1 ESA Listed Species

Five species listed under the ESA are within the jurisdiction of the USFWS and included in the agency's Information for Planning and Conservation (IPaC) system as potentially occurring within Snohomish County and the Project area (USFWS, 2016a). Listed species include Oregon spotted frog (*Rana pretiosa*), marbled murrelet (*Brachyramphus marmoratus*), streaked horned lark (*Eremophila alpestris strigata*), yellow-billed cuckoo (*Coccyzus americanus*) and bull trout (Salvelinus confluentus). Critical habitats for the marbled murrelet (USFWS, 2011a) and for bull trout (USFWS, 2010a) have been designated in Snohomish County. Additionally, USFWS (2016a) included the North American wolverine (*Gulo gulo luscus*) that is proposed for listing as potentially occurring in the Project area.

Two other threatened species, both with designated critical habitat, also occur in the Project area but are under NMFS' jurisdiction: Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*). Critical habitat for Chinook salmon in the Puget Sound Evolutionarily Significant Unit (ESU) was designated in 2005 (NMFS, 2005a) and critical habitat for steelhead in the Puget Sound Distinct Population Segment (DPS) was designated in 2016 (NMFS, 2016a).

The Washington Department of Fish and Wildlife's (WDFW's) interactive computer mapping system, SalmonScape (WDFW, 2016a), indicates that coho salmon have been documented spawning in Evans Creek (Quilceda Creek-Frontal Possession Sound Watershed, Snohomish Sub-basin) in the vicinity of the existing pipeline easement. Fall Chinook salmon, winter steelhead and odd-year pink salmon (*Oncorhynchus gorbuscha*) (presence has been modeled), and bull trout are presumed to be present in Evans Creek in the Project vicinity. Similarly, SalmonScape provides information about the documented use and modeled or presumed presence of anadromous coldwater species in Bear Creek and its tributaries, Tambark Creek, Silver Creek and North Creek. That information is included in Table 2.1-1.

2.2 Species with Essential Fish Habitat

The Sustainable Fisheries Act of 1996 amended the MSFCMA and requires federal agencies, in part, to consult with NMFS about activities that may adversely affect EFH (NMFS, 1997). The MSFCMA established guidelines for Regional Fishery Management Councils to identify and describe EFH in Fishery Management Plans (FMPs) to responsibly manage exploited fish and invertebrate species in federal waters. The Pacific Fishery Management Council (PFMC) has developed a FMP that addresses EFH for managed species in the Project area, including the FMP for Salmon on the Pacific Coast (PFMC, 1999). EFH for Chinook salmon, coho and odd-year pink salmon is present within the Snohomish River Sub-basin. Likewise, within the Lake Washington Sub-basin, EFH for Chinook salmon, coho and sockeye salmon (*Oncorhynchus nerka*) includes habitats for spawning and incubation, juvenile rearing, juvenile migration corridors and adult migration corridors (and adult holding habitat for Chinook salmon; PFMC, 1999). Potential EFH for those species in the Project area are included in Table 2.1-1.

Table 2.1-1
Anadromous ESA Species and Species with EFH Occurrence within the Project Area

Waterbody Name	Milepost	Flow	Anadromous Species Present	Level of Documented Presence	ESA Species	EFH Species
Quilceda Creek-Frontal Possession Sound Watershed						
Evans Creek	300 feet east of MP 1.94	Perennial	Fall Chinook salmon	modeled presence	Yes	Yes
			Coho	documented spawning		Yes
			Winter steelhead	modeled presence	Yes	
			Pink (odd-year)	modeled presence		Yes
			Bull trout	presumed presence	Yes	
Middle Sammamish River Watershed						
Great Dane Creek	3.92	Perennial	Fall Chinook salmon	none [1]	Yes	Yes
			Coho	none [2]		Yes
			Winter steelhead	none [1]	Yes	
			Sockeye	none [3]		Yes
Little Bear Creek	5.52	Perennial	Fall Chinook salmon	documented spawning [4]	Yes	Yes
			Coho	documented spawning		Yes
			Winter steelhead	modeled presence	Yes	
			Sockeye	documented spawning		Yes
Tributary to Bear Creek	5.72	Perennial	Fall Chinook salmon	modeled presence	Yes	Yes
			Coho	modeled presence		Yes
			Winter steelhead	modeled presence	Yes	
			Sockeye	modeled presence		Yes
Tambark Creek	6.83	Perennial	Fall Chinook salmon	modeled presence	Yes	Yes
			Coho	modeled presence		Yes
			Winter steelhead	modeled presence	Yes	
			Sockeye	modeled presence		Yes
Silver Creek	7.35	Perennial	Fall Chinook salmon	modeled presence	Yes	Yes
			Coho	modeled presence		Yes
			Winter steelhead	modeled presence	Yes	
			Sockeye	modeled presence		Yes
North Creek	1,585 feet west of MP 7.76	Perennial	Fall Chinook salmon	documented spawning	Yes	Yes
			Coho	documented spawning		Yes
			Winter steelhead	documented presence	Yes	
			Sockeye	documented spawning		Yes

Source: WDFW, 2016a
[1] =modeled presence 4,750 feet downstream
[2]=documented presence 1,200 feet downstream
[3]=documented spawning 4,750 feet downstream
[4]=designated critical habitat 150 feet downstream

3.0 Project Description

3.1 Purpose and Need

According to Northwest, the Project would meet PSE's request for increased delivery capacity. Growth in southern Snohomish County and northern King County has led to the need for this Project to prevent possible service disruptions to PSE's customers.

3.2 Schedule

Northwest proposes to commence construction of the Project in summer 2019 to take advantage of the dry construction season and place the new facilities in service by November 2019. The proposed schedule would minimize potential landowner and environmental effects and facilitate safe and efficient construction progress.

3.3 Location and Description of Proposed Removal and Replacement Activities

All facilities described in this BA would be designed, constructed, tested, operated and maintained to conform with or exceed the requirements of Title 49 Code of Federal Regulations (CFR), Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Safety Standards; 18 CFR, 380.15, Site and Maintenance Requirements; and other applicable federal and state regulations.

3.3.1 *Pipeline Facilities*

The Project would remove 5.85 miles of the existing 8-inch diameter pipeline from service and replace it with a larger diameter pipeline (20-inch) in the same trench. Of the 5.85 miles, 5.54 miles would be physically removed and 0.31 mile would be abandoned in place. Between MPs 2.07 and 2.21, Northwest also plans to install a new segment of 16-inch-diameter pipeline parallel to the new 20-inch-diameter pipeline around the Fritch Forest Products (Fritch Mill) mill operations to replace the capacity of the existing 16-inch-diameter segment through the Fritch Mill, which would be abandoned in place. The Project would generally utilize Northwest's existing permanent easement; however, 1.14 acres of additional permanent easement, associated with avoidance of the Fritch Mill, would be created. Table 3.3-1 summarizes the pipeline facilities.

The proposed 20-inch-diameter pipeline would have a maximum allowable operating pressure (MAOP) of 960 psig but would operate at 600 psig until such time that PSE upgrades equipment and Northwest renews the FERC Certificate through this area. The pipeline would be installed with a minimum cover of 3 feet; however, deeper cover depths may be required for road crossings, foreign line crossings, waterbody crossings and other special areas. The pipeline would be protected from corrosion by an external fusion bond epoxy coating and connection with a low voltage electrical system, referred to as a cathodic protection system, using the existing system established for the North Seattle 2428 Mainline Lateral and 2448 Loop line.

Table 3.3-1
Summary of Pipeline Facilities

Facility	Alignment Sheets	Length (miles)	Mileposts From – To
Removal			
8-inch Pipeline	2428.22-0001 - 2428.22-0007	5.54	1.94 – 2.07 2.21 – 3.72 3.75 – 3.91 4.00 – 7.52 7.54 – 7.76
Abandon In-Place			
16-inch Pipeline	2428.22-0001	0.14 (760 ft)	2.07 – 2.21
8-inch Pipeline	2428.22-0001 2428.22-0002 2428.22-0006	0.31 (1,700 ft)	2.07 – 2.21 [1] 3.72 – 3.75 [2] 3.91 – 4.00 [3] 7.52 – 7.54 [4]
Replacement			
20-Inch Pipeline	2428.22-0001 - 2428.22-0007	5.85	1.94 – 7.76

[1] Segment within Fritch Mill tract previously abandoned under Docket No. CP11-510.
[2] The proposed conventional bore across State Route 9 (SR 9) would be offset from the 8-inc-diameter pipeline and installed at the same horizontal elevation. The 8-inch-diameter pipeline would be cut, capped, filled with grout and abandoned in place.
[3] A deviation in the 8-inch-diameter mainline lateral would be cut, capped, filled with grout and abandoned in-place. The 20-inch-diameter replacement pipeline would be installed within Northwest's existing permanent easement with a standard 20-foot off-set from the 16-inch-diameter 2448 loop line.
[4] The proposed conventional bore across Bothell Everett Hwy (SR 527) would be offset from the 8-inch-diameter pipeline and installed at the same horizontal elevation. The 8-inch-diameter pipeline would be cut, capped, filled with grout and abandoned in place.

The construction right-of-way would typically be 100 feet wide to facilitate construction activities necessary to excavate and remove the 8-inch-diameter mainline lateral and to install the proposed 20-inch-diameter pipeline in the same trench. The construction right-of-way has been narrowed or necked down to 75 feet wide or less in wetlands and waterbody crossings, where feasible, and various neckdown widths have been incorporated into the construction right-of-way to minimize residential impacts based on site-specific conditions. The construction right-of-way configurations incorporate Northwest's existing permanent easement, which varies across the Project between 35 and 75 feet wide.

The Project starts at MP 1.94 at the existing interconnection between the 20-inch-diameter 2428 mainline and 16-inch-diameter 2448 lateral loop line where the North Seattle Delivery Lateral Expansion Project ended in 2012. From this point, the Project heads west open cutting Yew Way (MP 2.04) and Snohomish County Department of Parks and Recreation railroad (MP 2.06). If the railroad is not allowed to be open cut, Northwest would utilize a conventional bore. At MP 2.07, the alignment moves north, deviating from the existing pipeline to avoid the Fritch Mill, and reconnects with the existing pipeline at MP 2.21. Immediately west of the mill at MP 2.2, Northwest's existing pig launcher/receiver and block valve facility would be removed and relocated to the end of the Project at MP 7.76. All aboveground appurtenances would be removed, however, the gravel and existing fence (0.23 acre) would remain in place after construction.

The Project continues westerly within the existing easement, crossing James Street at MP 4.66 and a manmade pond at MP 4.86. The pond would be drained and crossed in the dry. At MP 4.9 the Project intersects with 59th Ave SE then crosses through a day-care facility playground and parking lot. Northwest would negotiate construction schedules, temporary fencing and other measures to minimize the Project's effects to this business. Continuing west the Project would cross 184th St SE at MP 5.03, then is co-located between about MPs 5.25 and 5.41 with a private substation drive. At MP 5.41 the alignment crosses 51st Ave SE. At MP 5.45 the existing 8-inch mainline valve (MLV) 39-2 would be replaced with a 20-inch-diameter valve assembly and two 12-inch-diameter crossovers installed up and downstream of valve 39-2L. At this location, a new 4-inch tap for PSE's Jewel Road take-off facility would also be installed. No new easement or enlargement to the existing facility footprint is required for this modification.

Continuing west from MLV 39-2, Little Bear Creek is crossed at MP 5.52. A transmission corridor is crossed at MP 5.67 where two transmission lines and two Olympic pipelines are co-located. A tributary to Little Bear Creek is crossed at MP 5.72. At MP 5.8 the Project enters a residential subdivision (Tambark Creek), co-located with 184th Street SE to MP 6.42. West of the subdivision, the Project would cross 35th Avenue SE at MP 6.42, then proceed in a southwest direction and parallel Tambark Creek between about MPs 6.52 to 6.64. Then the alignment crosses 31st Ave SE at MP 6.69 and turns west where it is co-located with a powerline easement to about MP 6.98. In this area Tambark Creek is also paralleled between MPs 6.71 to its crossing at MP 6.83.

Continuing west between MPs 7.0 and 7.35, the alignment is confined within residential lots, within the Reinstedt Farms subdivision. West of this residential development, Silver Creek is crossed at MP 7.35 and 186th PL SE at MP 7.37. The alignment then crosses through an apartment complex (Waterstone at Silver Creek) between MPs 7.4 and 7.5.

At MP 7.54 Bothell Everett Highway (SR 527) would be crossed by conventional bore. West of SR 527, the construction right-of-way would be co-located with 186th St SE and the commercial RV storage facility between MPs 7.58 and 7.7. As the alignment continues west, co-located with186th Street SE from MPs 7.75 to MP 7.76, it is adjacent to another residential subdivision.

3.3.2 *Aboveground Facilities*

This section describes the meter station upgrade and the launchers, receivers and crossovers that would be modified or installed for the Project. Temporary extra work areas (TEWAs) required to modify or install the aboveground facilities are also required for pipeline construction. The aboveground facilities are summarized in Table 3.3-2.

North Seattle/Everett Meter Station Upgrade (Milepost 0.61)

The existing North Seattle/Everett Meter Station at milepost 0.61 would be modified by replacing the inlet filter/strainer, all yard piping, meters and regulators. Temporary extra work areas (TEWAs) 0.61 and 0.62 would be located adjacent to this facility to stage construction activities for upgrading the meter station. These TEWAs, previously used in 2012 to complete the 2.2-mile North Seattle Delivery Lateral Expansion Project (CP11-520-000), would be

returned to their prior condition following completion of construction. No additional permanent disturbance would be required to operate the meter station.

2428 Mainline Lateral and 2448 Loop Line Interconnection (Milepost 1.94)

At milepost 1.94, the existing aboveground interconnect facility between the 2428 Lateral and 2448 Loop would be modified (<0.01 acre) to interconnect the new 20-inch line.

Existing Launcher/Receiver/Block Valve and Crossover (Milepost 2.20)

At milepost 2.20, the existing 8-inch-diameter pig launcher, 20-inch-diameter pig receiver and block valve would be removed and relocated to milepost 7.76. The existing 0.23-acre graveled and fenced facility would remain.

Existing Clearview Tap (Milepost 3.91)

At milepost 3.91, a new 2-inch tap would be installed on the 20-inch-diameter 2428 Lateral for PSE's Clearview tap and tied into the 2-inch-diameter feed line from the 16-inch-diameter 2448 Loop line.

Existing Mainline Block Valve 39-2 (Milepost 5.45)

At milepost 5.45, the existing 8-inch-diameter mainline valve 39-2 would be replaced with a 20-inch-diameter valve assembly; two 12-inch-diameter crossovers installed to tie the 20-inch-diameter lateral pipeline to the 16-inch-diameter loop line; and a new 4-inch-diameter tap for PSE's Jewel Road take-off facility would be constructed.

New Launcher/Receiver, Block Valve and Crossover (MP 7.76)

The 8-inch-diameter launcher, 20-inch-diameter receiver and block valve removed from milepost 2.2 would be reinstalled at a new, 0.15-acre aboveground facility at milepost 7.76. A 16-inch-diameter crossover, to tie the 20-inch-diameter line to the 16-inch-diameter line, would also be installed. The new aboveground facility would be graveled and fenced and enclosed within a 6 to 8-foot high pre-cast fence. The total permanent footprint of this facility would be 0.15 acre, located entirely within Northwest's existing permanent easement.

Table 3.3-2
Aboveground Facility Modifications

Facility	MP	Modification/Installation	New Permanent Disturbance (Acres)	New Permanent Easement (Acres)
Existing North Seattle/Everett Meter Station Upgrade	0.61	Replace inlet filter/strainer, all yard piping, meters and regulators at the existing 0.58-acre meter station.	0.00	0.00
Existing interconnection of the 20-inch North Seattle 2428 mainline lateral and 16-inch 2448 loop line	1.94	The existing 16-inch crossover (39L-1X) would be utilized by installing a 20x20x16-inch barred tee on the 2428 mainline lateral.	0.00	0.00

Facility	MP	Modification/Installation	New Permanent Disturbance (Acres)	New Permanent Easement (Acres)
Existing North Seattle Lateral Launcher, Receiver and Block Valve	2.20	Remove the 8-inch launcher, 20-inch receiver and block valve and relocate to the end of the Project at MP 7.76. Cap and abandon (or possibly remove) the 16-inch crossover (39-1X). Existing fence and gravel would remain and aboveground appurtenances would be removed.	0.00	0.00
Existing North Seattle Lateral Clearview Tap	3.91	A new 2-inch tap would be installed on the 2428 mainline lateral for PSE's Clearview tap and tie-in the 2-inch feed line from the 16-inch 2448 loop line.	0.00	0.00
Mainline Block Valve 39-2	5.45	The 8-inch mainline block valve would be replaced with a 20-inch valve assembly; two 12-inch crossovers would be installed to tie the 2428 line in to the 2448 line up and downstream of the block valve (39-2 and 39-2L). Install a new 4" tap for PSE's Jewel Road take-off facility	0.00	0.00
New Aboveground Launcher/Receiver/Block Valve and Crossover	7.76	Reinstall the 8-inch launcher, 20-inch receiver and block valve removed from MP 2.2 and install a 16-inch crossover to tie the 2428 line in to the 2448 line.	0.30	0.00

3.3.3 *Access Roads*

Northwest would utilize the same roads currently used to operate and maintain the existing 8-inch-diameter and 16-inch-diameter pipelines to provide ingress and egress points to and from the construction right-of-way. The roads primarily include the paved county roads that are crossed by the Project. Existing private roads and driveways would also be utilized to facilitate construction. These private roads are either graveled or paved and would not require widening; however, minor improvements within the existing gravel road footprints (blading, grading or graveling) may be necessary to return the roads to their original or better condition after construction. Northwest would obtain landowner permission prior to using private roads.

3.3.4 *Pipe Storage and Contractor Yard*

Northwest has identified four potential contractor yards in Snohomish County in the vicinity of the Project. Northwest would lease one of the yards, or other potential yard, based on availability prior to construction. The yard would be used to off-load and store pipe, stage contractor equipment, store construction materials (e.g., construction mats, fencing materials, fuel and lubricants, and stormwater control materials – straw bales, erosion control fabric, silt fence materials, etc.). The yard would also be used for contractor office trailers and employee parking facilities. Two of the yards are existing commercial facilities and two have been previously graded and are vacant lots. Northwest would complete appropriate surveys, if required, on the selected yard and would file the survey results with FERC prior to use.

3.4 Construction Procedures

The Project would be designed, constructed, operated and maintained in accordance with U.S. Department of Transportation (DOT) regulations in 49 CFR Part 192, "*Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards;*" FERC regulations in 18 CFR Part 380.15, "*Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights-of-Way and the Construction of Aboveground Facilities;*" and other applicable federal, state and local regulations. In addition to the federal requirements listed above, Northwest would construct and reclaim the Project in accordance with FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and FERC's Wetland and Waterbody Procedures (Procedures).

In addition, Northwest has prepared a project-specific Erosion Control and Revegetation Plan (ECRP), incorporating the provisions of the Plan and Procedures (see attachment A) and a Spill Plan for Oil and Hazardous Substances (Spill Plan – see attachment B). A Stormwater Pollution Prevention Plan (SWPPP) would be prepared to authorize stormwater discharge under the Washington Department of Ecology's (WDOE) Construction Stormwater General Permit. The measures specified in these documents represent Best Management Practices (BMPs) that would avoid, minimize and restore Project-related effects to ESA-listed species and EFH.

Waterbody Crossings. The Project would affect 16 waterbodies waterbodies (8 intermittent and 7 perennial streams) and 1 freshwater pond. A perennial stream at MP 4.86 would not be crossed but is within the construction right-of-way. Most of the waterbodies are fish-bearing. The list of waterbodies crossed by the pipeline is based on field investigations that were conducted during fall 2016 and early 2017.

Northwest proposes to cross waterbodies, to remove the 8-inch-diameter pipe and install the 20-inch-diameter pipe, using a dry-ditch technique (flume or dam-and-pump, which are described below), if water is flowing at the time of construction. If there is no water flowing in any of the waterbodies, Northwest would cross the stream bed using a standard open-cut crossing technique. The freshwater pond at MP 4.86 would be temporarily drained to remove the existing 8-inch-diameter pipe and install the new 20-inch-diameter pipe. No blasting is anticipated because the trench that was originally excavated to install the 8- inch mainline would be re-excavated to remove the 8-inch-diameter pipeline and install the proposed 20-inch-diameter replacement pipeline. Construction is anticipated to take 4 to 5 months during the summer and fall months.

Where feasible, based on engineering and site-specific conditions, TEWAs have been located 50 feet or more from waterbody boundaries, consistent with Section V.B.2.a of FERC's Procedures.

<u>Major Waterbodies</u>

No major waterbodies (i.e., greater than 100 feet in width) would be crossed by the Project.

<u>Minor and Intermediate Waterbodies</u>

If water is present in the streambed at the time of construction, Northwest would utilize a dry-ditch crossing method (flume or dam & pump) to cross all minor and intermediate waterbodies consistent with the requirements of Section V.B.6 in FERC's Wetland and Waterbody Procedures. Northwest's fluming and dam and pump procedures are provided in attachment C.

Hazardous materials, chemicals, fuels and lubricating oils would be stored in upland areas at least 100 feet from waterbodies and wetlands or in accordance with FERC's Procedures. Restricted areas for storage of these materials would be clearly marked in the field. Concrete coating, refueling and equipment maintenance activities would be conducted according to FERC's Procedures. Concrete trucks would not be washed on the construction right-of-way. All hazardous materials would be handled in accordance with the Spill Plan. If any unanticipated spill occurs during construction, Northwest would implement the procedures outlined in the Spill Plan (see attachment B).

If water is present in any streambed at the time of construction, Northwest would utilize temporary construction bridges to cross waterbodies. FERC's Procedures (Section V.B.5.a) allow clearing equipment and equipment necessary for installation of the temporary bridges to cross waterbodies prior to bridge installation (see attachment A). Northwest may allow clearing equipment to cross waterbodies prior to bridge placement, if necessary, during construction of the Project.

The temporary equipment bridges would be constructed to maintain unrestricted flow and to prevent soil from entering the waterbody. Soil would not be used to stabilize equipment bridges. Bridges would be designed according to FERC's Procedures (Section V.B.5.B, attachment A) and would be maintained to withstand and pass the highest flow expected to occur while the bridge is in place. To provide equipment and material access up and down the construction right-of-way, it may be necessary to install and leave equipment bridges in place outside the WDFW-recommended in-water work period. Bridges would be designed to span the entire ordinary high water mark and would be properly maintained throughout construction.

Sediment barriers would be installed immediately after initial disturbance of the waterbody or adjacent upland areas. 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 until restoration of adjacent upland areas is complete.

All waterbodies supporting coldwater fisheries would be backfilled with clean gravel or the native material removed from the trench consistent with Section V.C.1 of FERC's Procedures. Northwest would return stream bottoms and banks to preconstruction contours; banks would be stabilized; and temporary sediment barriers would be installed before returning flow to the waterbody channel.

Maintenance

During operation of the 20-inch-diameter pipeline after construction is complete, vegetation maintenance adjacent to waterbodies may be required. Where existing riparian vegetation (trees/shrubs) is present, a 25 foot-wide riparian strip would be allowed to establish using native trees and shrubs to the same extent as any existing riparian vegetation adjacent to the permanent

easement. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide would be maintained in an herbaceous state. Trees that are located within 15 feet of the pipeline may be cut and removed from the permanent easement consistent with Section V.D.1 of FERC's Procedures (see attachment A). Herbicides would not be used in or within 100 feet of a waterbody.

Hydrostatic Testing. The pipeline would be hydrostatically tested in accordance with DOT regulations to ensure that the system is capable of operating at the MAOP. Once started, Northwest plans to continue hydro-testing and drying activities until complete which could require 24-hour operation. Should a leak or break occur during testing, the pipeline would be repaired and retested until the test specifications are achieved. A total of approximately 464,360 gallons (1.43 acre feet) of water would be required to test the 20-inch pipeline in two test sections: the first section runs from MP 1.94 to the fill point at MP 2.22, and the second runs from the fill point (MP 2.22) to MP 7.76. Water would be obtained from a municipal source – a hydrant located at MP 2.22 on the east side of Waverly Drive within TEWA 2.17-N.

Once the hydrostatic test is complete, the test water would be discharged to the open field in TEWA 2.17-N north of the Fritch Mill. The hydrostatic test water discharge would occur to the surface for infiltration in an upland area and would occur through an appropriately sized discharge structure as described in Section 5.3 of the ECRP (see attachment A). Hydrostatic test water would be discharged at a rate to prevent scour, erosion and sediment migration to sensitive resources such as wetlands and waterbodies.

Permission to discharge the hydrostatic test water would be applied for through WDOE and would be authorized through a National Pollutant Discharge Elimination System (NPDES) permit. Prior to discharge, the hydrostatic test water would be tested according to requirements stipulated in WDOE's NPDES permit and Northwest's SWPPP.

4.0 Action Area

The Action Area includes all areas that would be affected directly or indirectly by the Project and not just the immediate area involved.

4.1 Aquatic Action Area

Sediment suspended in the water column during construction would adversely affect salmonids (Newcombe and Jensen, 1996) downstream and proximate to the in-stream construction site but would eventually settle out of suspension. The Aquatic Action Area is defined as the point downstream where there would be no effects to salmonids or other fish species. Northwest has estimated that the maximum distance downstream for a very fine silt particle to travel is 9,783 feet in Little Bear Creek (derived, below and Table 4.1-2).

Estimation of that downstream distance over which sediment particles would be transported (**L**, distance in feet or meters) is based on: 1) the particle size and settling velocity (**V_S**, - inches per second, micrometers per second – in water at 20°C; see for example the Wentworth Grain Size Chart, USGS, 2003); 2) the average streamflow velocity, **V_A** (feet or meters per second); and 3) the average depth of flow (**D**, feet or meters) downstream, using the following equation:

$$\mathbf{L = (D\ V_A) / V_S}$$

To compute **L**, stream velocities ($\mathbf{V_A}$) and depths (**D**) during the months of proposed construction were estimated for Little Bear Creek by applying Manning's Formula (Limerinos, 1970; Arcement and Schneider 1989) to estimate **Q**, the stream discharge rate (cfs) at different depths of flow. Manning's Formula is:

$$\mathbf{Q = A\ (\mathit{k}/n)\ (R^{2/3})\ (S^{1/2})}$$

where **A** is the estimated cross-section area of the channel, **R** is the hydraulic radius (in feet, where **R** = **A/P**, and **P** is the wetted perimeter in feet), **S** is the slope of channel (vertical feet per horizontal feet), the constant ***k*** equals 1.486 if English units are used but ***k*** equals 1 with metric units, and **n** is Manning's roughness coefficient (Manning's **n**). Bankfull widths and depths were compiled and averaged for Little Bear Creek (data in Northwest Hydraulic Consultants, 2016) to estimate **A** and **R** in Manning's formula and compute **Q** under bankfull conditions. The bankfull channel shape in Little Bear Creek is assumed to be a trapezoid with banks sloped at 1:1. The following are hydrologic parameters estimated and derived for Little Bear Creek from information provided by Northwest Hydraulic Consultants (2016):

- Median bankfull width = 21.0 feet;
- Median bankfull depth = 2.4 feet;
- Cross section area (A) = 45.1 square feet;
- Wetted perimeter (P) = 23.0 feet;
- Hydraulic radius (R) = 1.96 feet.

The overall channel gradient for Little Bear Creek (**S**) is estimated at 0.80 percent or 0.008 (Fevold et al., 2001) and Manning's roughness coefficient (**n**) is estimated as 0.070, a value for streams with sluggish reaches, weedy, and deep pools (Chow, 1959). With these values, the stream discharge rate (**Q**) = 132.28 cubic feet per second (cfs). Stream velocity ($\mathbf{V_A}$) is computed as **Q / A** so that V_A = 2.93 feet / second. Since discharge, **Q**, is related to stream channel width and depth (assuming Manning's n and slope remain constant), stream depths and stream velocities can be estimated through relationships of stream depths to **Q** and of depths to **A** when flows are less than at bankfull conditions. Table 4.1-1 summarizes known average and maximum discharges in Little Bear Creek during July, August and September, the months when in-stream construction would occur. Also provided in Table 4.1-1 are estimates for stream depths and velocities corresponding to the average and maximum discharge values during each month.

Table 4.1-1
Monthly Discharge Measured in Little Bear Creek
with Estimates for Stream Depths and Velocities Derived from Modeled Bankfull Conditions [1]

Month [1]	Average Discharge (cfs) [1]	Maximum Discharge (cfs) [1]	Average Depth (feet) [2]	Maximum Depth (feet) [2]	Average Velocity (feet/second)	Maximum Velocity (feet/second)
July	1.5	3.9	0.17	0.30	0.55	0.78
August	1.8	8.5	0.19	0.48	0.58	1.04
September	1.9	7.5	0.19	0.44	0.59	0.99

Notes:
[1] Bankfull conditions provided in text (bullets), above.
[2] Average and Maximum monthly discharge rates compiled for Little Bear Creek during 2015 for July, August and September (data from Snohomish County, 2017)

The range of transport even among fine particles (medium pebbles to very fine silt laden clay) can be highly variable depending on channel velocity, channel depth and particle size. Estimates for particle transport distances in Little Bear Creek, based on reported maximum discharge rates, estimated maximum stream depths and maximum stream velocities during July, August and September (from Table 4.1-1) are provided in Table 4.1-2 and represent a worst-case estimate for the Aquatic Action Area.

For most particles (medium pebbles to coarse silt), settling from suspension would occur within 300 to 700 feet but very fine silt could remain in suspension for up to 1.86 miles in Little Bear Creek (during August) downstream from where it became suspended in the water column during construction (Table 4.1-2). The worst-case downstream distances define the Aquatic Action Area based on the assumption that the parameters in Table 4.1-1, above, are constant over the distances downstream in each waterbody during a given month.

Table 4.1-2
Estimated Downstream Transport Distances for Particles in Little Bear Creek
Using Maximum Estimates for Stream Velocities and Stream Depths

Particle Description	Diameter (in)	Settling Velocity, V_S (in/sec)	Estimated Particle Transport Distance L (in feet) Downstream [1]		
			Max. July	Max. August	Max. Sept.
Medium Pebbles	0.63	35.44	0	0	0
Very Coarse Sand	0.039	5.91	0	1	1
Coarse Sand	0.02	3.15	1	2	2
Medium Sand	0.01	1.18	2	5	4
Fine Sand	0.005	0.49	6	12	11
Very Fine Sand	0.002	0.13	21	46	40
Coarse Silt	0.001	0.033	84	179	159
Medium Silt	0.0006	0.009	309	658	583
Very Fine Silt	0.0002	0.0006	4,642	9,873	8,745

[1] Parameter values used to estimate **L**, where $\mathbf{L = (D\ V_A) / V_S}$

Little Bear Creek: July: $\mathbf{V_A}$ = 0.78 ft/s, **D** = 0.30 ft; August: $\mathbf{V_A}$ =1.04 ft/s), **D** = 0.48 ft: September: $\mathbf{V_A}$ = 0.99 ft/s, **D** = 0.44 ft

The Aquatic Action Area also includes an undetermined portion of Evans Creek downstream from where the existing pipeline easement crosses the creek.

4.2 Terrestrial Action Area

Noise from chain saws, dump trucks, excavators, dozers and loaders would exceed ambient noise in the Project vicinity. Noise levels 50 feet away from typical construction equipment used to construct a pipeline or road, including upgrading an existing road, are provided in Table 4.2-1, based on measurements made by WSDOT. Assuming that noise due to construction equipment would be classified as point sources, the standard sound reduction is 7.5 dB per doubling of distance (with soft surface conditions such as vegetative cover) from the source (WSDOT, 2011). Also, tree cover can reduce noise by 5 dB for every 100 feet of intervening vegetation, up to a maximum reduction of 10 dB (WSDOT, 2011). The maximum distance of the Terrestrial Action Area from Project construction due to noise would be 1,528 feet (0.29 mile) from construction activities, based on chain saw use in areas with minimal tree cover (see Table 4.2-1).

Table 4.2-1
Average Maximum Noise at 50 feet from Construction

Equipment	Noise dBA (Lmax measured at 50 feet)	Distance (feet) to Attenuate to Assumed Ambient Noise Level of 40 dBA	
		Soft Site Reduction At 7.5 dB per double of distance (No Intervening Trees)	Soft Site Reduction At 7.5 dB per double of distance (With 200 feet of Trees)
Chain Saw	84	1,528	606
Warning Horn	83	1,393	553
Dozer	82	1,270	504
Excavator	81	1,158	459
Front End Loader	79	962	382
Backhoe	78	877	348
Dump Truck	76	729	289
Pickup Truck	75	665	264

5.0 Species' Accounts, Critical Habitat, Project Effects and Determinations of Effect

There are five ESA-listed species and one species proposed for listing that were included in the USFWS IPaC system output. Five of those species would not be affected by the Project: marbled murrelet, streaked horned lark, yellow-billed cuckoo, Oregon spotted frog and North American wolverine. Brief synopses of the rationales to exclude these species from consideration in this BA are provided below.

5.1 Determinations of No Effect

5.1.1 *Marbled Murrelet*

Marbled murrelets in Washington, Oregon and California were listed as threatened under the ESA on October 1, 1992 (USFWS, 1992). Critical habitat for the marbled murrelet was designated for Washington, Oregon and California in 1996 (USFWS, 1996). The 1996 Final Rule designating critical habitat for the marbled murrelet in California and Oregon was revised in a final rule published in 2011 (USFWS, 2011a). However, critical habitat in Washington is currently the same as the critical habitat designated in the 1996 final rule. The closest designated

critical habitat for marbled murrelets to the Project is Critical Habitat Unit WA-09-c in eastern Snohomish County, approximately 12 miles northeast of the Project (TEWA 0.61).

There are two components of marbled murrelet habitat that are biologically important: 1) terrestrial nesting habitat and associated stands, and 2) marine foraging habitat, including prey spawning and concentration areas. Threats to marbled murrelet are apparent in both the terrestrial nesting environment and the marine foraging environment. Extensive harvest of late-successional and old-growth forest was the primary reason for listing the marbled murrelet as threatened in 1992 (USFWS 1992). Predation is expected to be the principal factor limiting marbled murrelet reproductive success and nest site selection (Ralph et al., 1995; Nelson and Hamer, 1995). Common ravens (*Corvus corax*) account for the majority of egg depredation (Nelson and Hamer, 1995). In marine foraging habitat, coastal oil spills and gill-net fishing off the Washington coast were identified as primary threats to marbled murrelets (USFWS, 1992).

In Washington, marbled murrelets nest within mature coniferous forests with old-growth characteristics, and nest sites/occupied stands are located as far as 30 and 40 miles from salt water depending on habitat (Mack et al., 2003), although most often sites are found within 12 miles of the ocean (USFWS, 1996). Suitable nest trees must have large branches or deformities, such as high, moss-covered branches or branches with growths of dwarf mistletoe, which serve as nest platforms (USFWS, 1997). In Washington, murrelets usually nest in older forests dominated by western hemlock, Sitka spruce, Douglas-fir and western redcedar from April through mid-September during which murrelets make daily flights to/from inland nest sites and marine foraging areas (WDFW, 2016b; Hamer and Nelson, 1998). Research indicates that marbled murrelets tend to nest in stands that are generally located away from high-contrast edge created from timber stand harvests and adjacent immature forests (Ripple et al., 2013; Meyer et al., 2002). Nesting murrelets have been found in Snohomish County (Hamer and Nelson, 1995) and there have been several observations of murrelets made in the 1990s in the vicinity of Lake Chaplain, more than 14 miles east of the Project (WDFW, 2010a).

There are no mature coniferous forests with old-growth characteristics in the Project area that might provide suitable nesting habitat. No marbled murrelets occur within the Terrestrial Action Area; no suitable habitat would be affected; and there is no critical habitat present.

The Project would have **no effect** on marbled murrelets or on designated critical habitat.

5.1.2 Streaked Horned Lark

The streaked horned lark was listed as threatened with critical habitat under the ESA in a final rule published October 3, 2013 (USFWS, 2013a). Critical habitat has been designated at several sites in Oregon's Willamette Valley and along the Washington southwest coast and lower Columbia River.

Loss of nesting habitat in native prairies has led to streaked horned larks nesting on artificially maintained short grass areas adjacent to several airports in Washington and Oregon (USFWS, 2013a). Maintenance mowing during the nesting period affects the species. Industrial development in open areas has altered breeding and wintering habitat. Native grasslands have become isolated and intermingled with residential, municipal and farm lands. In coastal areas, exotic beach grasses have invaded dune habitats that were used for nesting by horned larks and

have reduced nesting habitats in some areas. In addition, predation of streaked horned lark nests has been a primary source of nest failure (USFWS, 2017a).

The streaked horned lark migrates between Oregon and Washington with breeding populations found in the Puget Sound lowlands, Columbia River/coastal Washington and the Willamette Valley in Oregon from late March to early August. In Washington, nesting habitats include open grasslands, beaches and dredge spoils islands with sparse vegetation and agricultural fields, with individuals showing preference to bare ground compared to vegetation several inches tall (Stinson, 2005).

One Breeding Bird Survey (BBS) route, number 89072 (Mukileteo), passes within 1 mile of the Project area and has been surveyed almost annually for the past 20 years; however, no horned larks of any subspecies have been reported (Pardieck et al., 2016). The Edmonds Audubon Christmas Bird Count (CBC) circle is within 3.0 miles northwest of the Project (National Audubon Society, 2017). In 2003, 80 horned larks were observed in December (though the subspecies was not reported) but no other observations of horned larks have been recorded on that CBC count circle in the past 20 years. Additionally, no currently occupied breeding locations have been reported in Snohomish County (Stinson, 2016). There are no native prairies or agricultural areas with mostly bare ground in the Project area that might provide suitable habitats for streaked horned larks. Presence of a streaked horned lark in the Terrestrial Action Area during Project implementation is highly unlikely. That conclusion is based on available information about the historical species' occurrence in Snohomish County.

The Project would have **no effect** on streaked horned larks or on designated critical habitat.

5.1.3 *Yellow-billed Cuckoo*

USFWS (2014a) listed the western DPS of yellow-billed cuckoo as threatened under the ESA in 2014. The western DPS closely aligns with the defined range of the western yellow-billed cuckoo subspecies as partially described in the 12-month finding (2001a) which determined that listing the species as threatened was warranted but precluded by higher priorities (USFWS, 2001a). Critical habitat for yellow-billed cuckoos was proposed in 2014 (USFWS, 2014b) to include sites in all western states except in Oregon and Washington.

The western DPS includes suitable habitat within low- to moderate-elevation areas west of the crest of the Rocky Mountains in Canada, Mexico and the western United States. Yellow-billed cuckoos are considered a riparian obligate species and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies, but may also be found in urban areas with tall trees (USFWS, 2007). Conversions of native riparian woodland habitat decrease amounts of vegetation that supply the western yellow-billed cuckoos with essential food and adequate thermal cover (USFWS, 2014b). Cuckoos may be affected by applications of chlorinated hydrocarbon pesticides that are toxic and reduce insect prey species (especially caterpillars) which can reduce nesting success (USFWS, 2014b).

BBS route number 89072 (Mukileteo) passes within 1 mile of the Project area and includes floodplains and riparian habitats associated with the Snohomish River and its tributaries. Except for two years, the route has been surveyed each year from 1993 through 2015. No yellow-billed

cuckoos have been reported. Likewise, no yellow-billed cuckoos have been reported from the Edmonds CBC circle from 1996 through 2015.

Historic accounts of yellow-billed cuckoos include reports from Washington, with occurrences in the Puget Sound lowlands and lower Columbia River although last confirmed breeding records in the State are from the 1930s (USFWS, 2011b). More recent surveys were conducted in Okanogan and Yakima counties to check locations where the species had been sighted but no cuckoos were detected. USFWS (2011b) suggests that yellow-billed cuckoos may be extirpated from Washington. Presence of a yellow-billed cuckoo in the Terrestrial Action Area during Project implementation is highly unlikely. That conclusion is based on available information about the historical species' occurrence in Snohomish County.

The Project would have **no effect** on yellow-billed cuckoos or on proposed critical habitat.

5.1.4 *Oregon Spotted Frog*

The Oregon spotted frog was listed as threatened under the ESA in August 2014 (USFWS, 2014c). The current range of Oregon spotted frogs extends from the Fraser River Sub-basin in southern British Columbia (Haycock, 2000) and adjacent areas in Whatcom County, Washington, south through the Puget Trough lowlands, through the Willamette Valley, to southeast Oregon and adjacent areas in the Pit River Sub-basin of northern California (USFWS, 2011c). Critical habitat for the Oregon spotted frog was finalized in May 2016 (USFWS, 2016b); no critical habitat was designated in Snohomish County, Washington.

Thirty to eighty-five percent of the species' wetland habitats have been lost across its range. Sources of loss include draining wetlands, water diversions, conversion of wetlands to agriculture and livestock grazing, developments adjacent to occupied habitats that alter seasonal hydrology (through creation of impervious surfaces), and occurrence of droughts which have become more frequent in parts of the species' range. Also, riverine functions that promote early successional wetland habitats have been altered including connectivity with floodplains. Beaver activities have contributed to a historical mosaic of aquatic habitats and fires burning in summer have influenced shallow water breeding habitats the following spring (USFWS, 2013b). Introductions of exotic species, including reed canarygrass that degrades native wetland vegetation, and nonnative predators, including bullfrogs and warm water fish species, have been and continue to threaten the species. Chytrid fungus infections have been documented in Oregon spotted frog populations and infections were found to be widespread among populations (Pearl et al., 2009).

Oregon spotted frogs inhabit emergent wetland habitats in forests, and were historically associated with prairie lakes in the Puget lowlands. They breed in shallow pools with grasses, sedges and rushes that are not dominated by reed canarygrass near or connected with flowing water (USFWS, 2011c). In lower elevations of Washington and Oregon, breeding occurs during February and March, and at higher elevations breeding occurs in late May or early June (Leonard et al., 1993). In Washington, the Oregon spotted frog is known to occur in Whatcom, Skagit, Thurston, Klickitat and Skamania counties, although historically they were also found in Snohomish, King, Pierce and Clark counties (USFWS, 2016c). The closest known population to the Project area is 51 miles north in the Samish River, Skagit County. Another extant population at Black River, Thurston County is 70 miles south.

Oregon spotted frogs are not expected to occur within the Project area. No suitable Oregon spotted frog breeding habitat occurs in the Project area and there are no records of their occurrence in the vicinity of the Project area. Presence of an Oregon spotted frog in the Aquatic Action Area during Project implementation is highly unlikely. That conclusion is based on available information about the historical species' occurrence in Snohomish County.

The Project would have **no effect** on Oregon spotted frogs or on designated critical habitat.

5.1.5 *North American Wolverine*

Wolverines were proposed for listing as threatened under ESA (USFWS, 2013c) but the proposed action was withdrawn in 2014 because the threats cited were not sufficient to cause listing under the ESA (USFWS, 2014d). However on April 4, 2016, the U.S. District Court for the District of Montana vacated the USFWS' August 13, 2014 withdrawal of its proposed rule to list the distinct population segment of the North American wolverine as threatened under the ESA. The wolverine is currently considered a species proposed for threatened ESA status (USFWS, 2016d).

USFWS (2013c) summarized threats to wolverines within the contiguous United States. Climate change may have already reduced and may continue to limit the distribution of wolverine suitable habitat. Despite the lack of detectable population-level impacts, it is still likely that habitat is already reduced from historic levels due to climate warming because deep snow that persists into May is essential for wolverine reproduction (USFWS, 2013c). Demographic stochasticity and loss of genetic diversity due to small effective population sizes, with concomitant habitat loss resulting from climate change may contribute to population declines (USFWS, 2013c).

Wolverines occur within a wide variety of alpine, boreal and arctic habitats, including boreal forests, tundra and western mountains in the United States and Canada (USFWS, 2011d). Wolverines primarily scavenge carrion, but also consume small animals, birds, fruits, berries and insects. Wolverines travel long distances over rough terrain and deep snow, and adult males generally cover greater distances than females. Persistent, stable snow greater than 5 feet deep appears to be a requirement for natal denning as it provides security for offspring and buffers cold winter temperatures. At the southern limits of the species' range, wolverines' distribution is limited to higher elevations where temperatures are colder and sufficient snow cover persists (USFWS, 2011d).

WDFW (2012) notes that wolverines historically occurred in alpine and subalpine habitats of the Cascades and animals had been photographically detected near Mt. Adams in 2009 and 2010. Since then, several wolverines have been trapped and fitted with radio collars; three wolverines were found in the vicinity of Stevens Pass in 2012 and another animal detected during August 2012 west of the Cascades Crest near Glacier Peak Wilderness (WDFW, 2012). Recently, Conservation Northwest (2016) reported wolverines present in the upper Cle Elum River drainage northeast of Snoqualmie Pass in 2014 and in the Teanaway Valley in 2015. All locations are far from the Project area, outside of Snohomish County.

Presence of a wolverine in the Terrestrial Action Area during Project implementation is highly unlikely. That conclusion is based on available information about the current distribution

of wolverines in Washington, as well as lack of suitable habitats in the region surrounding the Project to support wolverines except possibly during dispersal.

The Project would have **no effect** on wolverines.

5.2 Determinations of Effect

There are three ESA-listed species with designated critical habitat that were either included in the USFWS IPaC system output (bull trout) or are listed under NMFS jurisdiction (Chinook salmon and steelhead) that could be affected by the Project. Each species is discussed, below.

5.2.1 *Chinook Salmon*

5.2.1.1 Species Account and Critical Habitat

Status. Chinook salmon in the Puget Sound ESU is listed as threatened (NMFS, 1999). The Puget Sound ESU includes naturally produced Chinook salmon that inhabit streams below impassable natural barriers. In 2011, NMFS re-evaluated the listed ESU and re-affirmed that short-term and long-term trends in abundance for Puget Sound Chinook salmon were declining and that fish in the ESU remained at a moderate risk of extinction (NMFS, 2011a).

Threats. In 2005, threats included extensive blockage and degradation of habitat within the Puget Sound ESU. Blockages include dams, water diversions, shifts in flows from hydroelectric projects and flood control developments (Ruckelshaus and Sands, 2005). Habitat degradation included high temperatures, sedimentation, streambed instability, estuarine loss, loss of large woody debris and loss of pool habitats; all of these threats are present (Ruckelshaus and Sands, 2005). In addition, ocean harvest of Chinook salmon has been very high with harvest rates on some of the stocks in the Puget Sound ESU at more than 90 percent. There is an extensive hatchery system within the ESU that has utilized Green River hatchery stocks extensively over time so that the genetic diversity and fitness of naturally spawning populations has been reduced (Ruckelshaus and Sands, 2005).

Species Recovery. A recovery plan for Puget Sound Salmon was developed by the Shared Strategy for Puget Sound Development Committee (2007) and adopted by NMFS in 2007. To achieve recovery of salmon, the plan identified the following focal points: 1) estuaries, 2) floodplains, 3) riparian areas, 4) water quantity, 5) water quality/pollution, 6) fish access, 7) Puget Sound shoreline and marine areas (nearshore), 8) harvest management, 9) hatchery management, and 10) integration of factors (harvest, hatcheries, habitat) with the ultimate goal of self-sustaining salmon populations that can be harvested to the benefit of the region's economic vitality and prosperity. The second volume of the Shared Strategy Plan provided strategies and actions for Chinook salmon populations in specific watersheds. NMFS (2006) included a supplement to the Shared Strategy Plan in which they provided criteria to determine when the ESU would be covered in terms of the listing factor criteria.

Life History, Habitat Requirements and Distribution. Chinook salmon are known to have one of the most diverse life cycles of the Pacific salmon (Healey, 1991; Raleigh et al., 1986). Times of the year for various stages of their life cycles vary considerably, as do the habitat requirements in the various phases of their lives. Two distinct types of life cycles can occur after fry emergence, the freshwater stream-type and ocean-type Chinook salmon. The stream-type

remains in freshwater for one or more years before migrating to saltwater. Some of the stream-type Chinook salmon have been documented to become sexually mature without ever entering the saltwater environment. This type of Chinook salmon travels to sea during their first year of life, lives most of the time in coastal waters, and returns to natal streams within a few weeks of spawning (Healey, 1991).

Spawning bed characteristics utilized by Chinook salmon vary considerably. Depths can range from a few centimeters to several meters, and can be located in streams from a couple of meters wide to sections of larger rivers like the Columbia River in Oregon. Little agreement exists on the minimum and maximum depths and velocities for spawning, as well as how those differences may be differentially limited by stream and ocean type Chinook salmon (Healey, 1991).

Recommended temperatures for Chinook salmon spawning range from 5.6° to 13.9°C (42°F to 57°F). For successful incubation, temperatures can range from just above freezing to 10.0°C (50°F) However, recommended incubation temperatures are from 5.0° to 14.4°C (41°F to 58°F), and optimum temperature for egg development is 11.0°C (52°F). For fingerlings, the optimum temperature is listed at 17.0°C (63°F). The upper lethal limit for Chinook salmon is 25.1°C (77°F) (Beauchamp et al., 1983). Other reports list a temperature range for eggs of 16°C (61°F) before 50 percent mortality is reached. Time to attain 50 percent hatch related to temperature was 159 days at 3°C and 32 days at 16°C (Healey, 1991).

Preferred water depth ranges vary widely for Chinook salmon during different phases of their life cycle and depending upon their race. They spawn in rivers ranging from 0.10 m to 10 m with spring and fall Chinook salmon preferring depths greater than or equal to 0.24 m and summer Chinook salmon preferring depths greater than or equal to 0.30 m. Juvenile Chinook salmon utilize surface water early in their saltwater stage before using water depths as great as 60 m (Beauchamp et al., 1983).

Chinook eggs require a minimum of dissolved oxygen concentrations at 5.0 mg/L, while juveniles avoid concentrations less than 4.5 mg/L with a temperature of 20.0°C (Beauchamp et al., 1983). Mortality increases rapidly at dissolved oxygen concentrations below 13 ppm (Healey, 1991).

Spawning substrate research has noted several sizes of substrate being selected for at various sites. One study found substrate size to range from 6 cm to 14 cm, and another study found substrate size to range from 1.3 cm to 10.2 cm. Juvenile Chinook salmon of the freshwater stream type select for large boulder habitat, while estuary juveniles select for a wide range of substrate including mud, sand, gravel, and eelgrass (Beauchamp et al., 1983).

Freshwater rearing Chinook salmon tend to prey mostly on larval and adult insects. One study in the Columbia River system found the most abundant prey items to include dipteran larvae, beetle larvae, stonefly nymphs and leaf hoppers. The prey items are similar to that of other salmonids in freshwater systems, but competition is reduced due to the different habitat types primarily occupied by the different species (Healey, 1991).

Population Status. Chinook salmon in the Skykomish stock (includes Chinook salmon in the Snohomish River) were evaluated by WDFW in 1992 and in 2002. The stock was not rated

in 1992. In 2002 the stock status was rated as depressed primarily due to the relatively few spawners and low productivity (WDFW, 2002). The goal for the Skykomish stock is 8,700 spawners (WDFW, 2002), which has not been attained since 1986.

Within the Lake Washington Sub-basin, Sammamish River Chinook salmon are one of two independent populations (Water Resource Inventory Area [WRIA] 8 Steering Committee, 2005); the other being the Cedar River population. The Sammamish River population includes fish in North Lake Washington tributaries and Issaquah sub-populations that have been found to be distinct from the second (Cedar River) population by multiple characteristics, indicating the two populations are reproductively isolated from each other. The Issaquah and North Lake Washington populations are closely linked, with the Issaquah Hatchery population influencing the North Lake Washington population. Hatchery-origin salmon are differentiated from natural-origin salmon by a clipped adipose fin. Figure 5.2-1 shows estimates of spawner abundances for hatchery fish, based on inspection of adipose fin clips on Chinook salmon carcasses, counted in the lower Issaquah Creek drainage (index of hatchery spawner abundance) and live Chinook salmon counted in Bear Creek and Cottage Creek (index of natural spawner abundance) (WDFW, 2011b). Small numbers of Chinook salmon are observed spawning in other tributaries (including North Creek and Little Bear Creek) but are not included in the abundance estimates shown in Figure 5.2-1 (WDFW, 2011b).

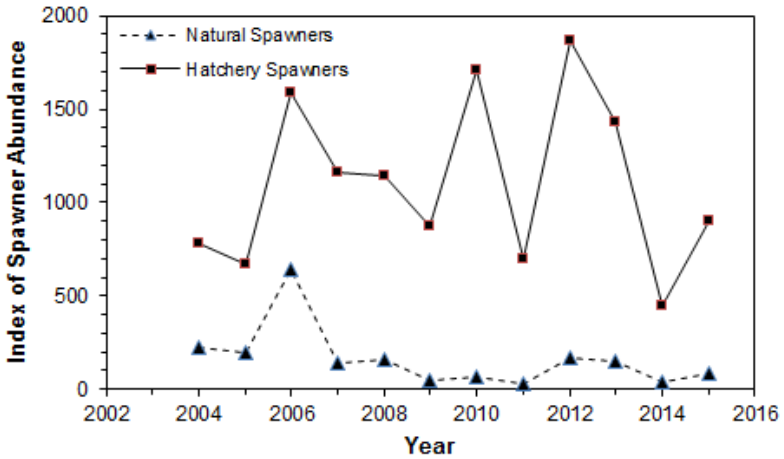


Figure 5.2-1
Abundance Estimates of Natural and Hatchery Chinook Spawners for the Sammamish Stock since 2004

Approximate timing of Chinook salmon life stage use in the Snohomish Sub-basin and in the Lake Washington Sub-basin is shown in Figure 5.2-2. Sammamish Chinook, formerly North Lake Washington Tributaries Chinook, were identified as a stock based on their distinct spawning distribution.

Chinook Salmon Use in the Snohomish Sub-basin												
Life Stage/Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Upstream Adult Migration							■	■	■	■		
Adult Spawning									■	■		
Intragravel Development	■	■								■	■	■
Juvenile Rearing		■	■	■	■	■						
Juvenile Out-Migration					■	■						
Chinook Salmon Use in the Lake Washington Sub-basin												
Upstream Adult Migration						■	■	■	■	■	■	
Adult Spawning										■	■	
Intragravel Development	■	■	■							■	■	■
Juvenile Rearing	■	■	■	■	■	■						■
Juvenile Out-Migration			■	■	■	■						
■ Indicates period of activity.												
Source: Williams et al., 1975												

Figure 5.2-2
Approximate Timing of Summer-Fall Chinook
Salmon Use in the Snohomish and Lake Washington Sub-basins

Critical Habitat. In 2005, critical habitat was designated for the Puget Sound ESU and included all marine, estuarine and river reaches accessible to listed Chinook salmon, as well as the adjacent riparian vegetation. Critical habitat includes accessible reaches in the Snohomish River Sub-basin (NMFS, 2005a) and the Snohomish River, approximately 2.4 miles downstream from the existing easement crossing of Evans Creek. Critical habitat was also designated in the Lake Washington Sub-basin including Little Bear Creek 150 feet downstream from the pipeline route and in North Creek, but does not include any of the tributaries crossed by the pipeline. NMFS (2000) defined riparian zones 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 wood debris or organic matter." Within the Project area, critical habitat has been designated for Chinook salmon freshwater spawning, rearing and migration, including substrate to support spawning, incubation and larval development (NMFS, 2005b).

Included in critical habitat designation are riverine habitats supporting the following Primary Constituent Elements (PCEs):

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, logjams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; and

3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions, and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival (NMFS, 2005b).

PCEs for Chinook salmon within estuarine habitats, nearshore marine areas and offshore marine areas were also identified but are not included here since none of those habitats occurs within the Aquatic Action Area.

5.2.1.2 Environmental Baseline

Species Presence. SalmonScape, WDFW's interactive computer mapping system (WDFW, 2016a), shows that fall Chinook salmon are present within streams crossed or proximate to the Project (see Table 2.1-1). SalmonScape includes fall Chinook salmon documented spawning in Little Bear Creek and North Creek and modeled or presumed presence in most of the other perennial streams crossed by the Project.

It is not possible to estimate numbers of Chinook salmon in Little Bear Creek that could be present at the time of Project implementation. StreamNet (2012) provides lengths of streams occupied by species utilizing various stream segments as functional habitat: 1) migration only, 2) rearing and migration and 3) spawning and rearing. Table 5.2-1 provides the total linear distances, in stream miles, of those habitats for salmonid species within the Lake Washington Sub-basin (HUC 17110012) and the relative importance of those habitats in Little Bear Creek. Little Bear Creek primarily provides spawning and rearing habitats for fall-run Chinook salmon.

Table 5.2-1
The Extent of Habitats Utilized by Fall-run Chinook in the Lake Washington Sub-basin, the Middle Sammamish 5th Field Watershed and Little Bear Creek

Habitat Function	Miles of Stream Habitat		
	Lake Washington Sub-Basin	Middle Sammamish Watershed	Little Bear Creek
Migration Only	93.31	8.50	0
Rearing and Migration	3.85	0.54	0
Spawning and Rearing	105.45	50.78	6.74
Total	**202.61**	**54.64**	**6.74**
Source: StreamNet, 2012			

Habitat. The Sammamish River has undergone some of the most dramatic alterations in the WRIA 8 system. Prior to settlement, the river was highly sinuous with many swamps, marsh, and forested wetland areas that were influenced by backwater effects from Lake Washington up past the confluence with Little Bear Creek (Kerwin, 2001; WRIA 8 Steering Committee, 2005). North Creek and Little Bear Creek watersheds and their tributaries contain a variety of land uses from undeveloped to rural residential and agriculture, to roads and rights-of-way, to commercial and industrial activities (WRIA 8 Steering Committee, 2005). Both creeks are used for adult Chinook salmon spawning and juveniles spend limited time in the creeks before migrating downstream.

Increased flow in the creeks has been related to urbanization in upland areas (e.g., vegetation clearing, soil compaction, road and building construction) increases the amount of impervious surface within watersheds which influences the infiltration of precipitation and increases the amount and rate at which surface water runoff water courses. Increased flows have caused modification of channel morphologies with channel widening and incision (WRIA 8 Steering Committee, 2005). Poor riparian conditions, limited flood connectivity, have contributed to

channel incision, lack of channel habitat complexity and has affected sediment characteristics. These issues, in turn, have reduced the amount of spawning substrates that are available for salmonids and the habitat complexity of the stream to benefit rearing juveniles (WRIA 8 Steering Committee, 2005).

Specific characteristics of Little Bear Creek and the North Creek tributaries are provided in Section 1.3. Kerwin (2001) described Little Bear Creek as the least developed of the three main north tributaries to the Sammamish River at that time, having the least degraded salmon habitat. However, there were numerous culverts in the stream basin, many of which were impassable to fish during low flow conditions. LWD was generally lacking as well as forested riparian vegetation cover along much of the stream course. The presence of pesticides and other toxicants indicated violations of the State water quality standards (Kerwin, 2001). Currently, water quality in portions of the creek is impaired for bacteria, temperature, dissolved oxygen and bioassessment (Northwest Hydraulic Consultants, 2016).

North Creek is a perennial stream that originates in highly urbanized south Everett in the Everett Mall area and flows southward through Mill Creek and Bothell (Kerwin, 2001). Developments within riparian areas of North Creek and its tributaries have led to modifications and reductions in channel complexity and connectivity with the floodplain and adjacent stream reaches caused by road crossings/culverts, streambank hydromodification, channel incision and instability, and historical and on-going clearing (Kerwin, 2001). Total riparian forest cover is estimated to be less than 30 percent of historical levels, which has led to degraded riparian vegetation and the lack of LWD recruitment (Kerwin, 2001).

Evans Creek is within the Quilceda Creek-Frontal Possession Sound Watershed (Hydrologic Unit Code 1711001102), which is within the Snohomish Sub-basin (HUC 17110011). Habitat limiting factors in Evans Creek, a perennial waterbody, were evaluated in 2002 (Harring, 2002). Floodplain wetlands and riparian zones of Evans creek are actively drained and farmed, with a proliferation of roads (Haring, 2002). Water quality in Evans Creek had been evaluated as at risk because of dairy cows' unrestricted access upstream from the Snohomish River floodplain. Riparian vegetation has been mostly removed where Evans Creek crosses the Snohomish River floodplain, which has been converted to agricultural lands. Riparian conditions improve upstream from the floodplain in the vicinity of the existing pipeline easement crossing of Evans Creek, 300 feet east of MP 1.94 and 63 feet east of the eastern end of the current Project's construction right-of-way.

Critical Habitat. Critical habitat has been designated within North Creek but does not include the tributaries crossed by the Project. Critical habitat has also been designated in Little Bear Creek, though not in the reach crossed by the Project but downstream about 150 feet from the Project crossing. Although critical habitat has been designated for Puget Sound Chinook salmon in the Snohomish River, it has not been designated in Evans Creek.

5.2.1.3 Environmental Effects

Direct and Indirect Effects

Construction of the Project could directly and/or indirectly affect Chinook salmon present in the Aquatic Action Area through one or more of the following pathways:

- Interference with key life history functions for fall Chinook salmon.
- Turbidity generated during dry open-cut construction to cross streams can adversely affect resident and anadromous salmonids.
- Accidental release of fuels and entry of other petroleum products into surface waters can adversely affect all fish species and other aquatic organisms.
- Removal of riparian vegetation can reduce shade, which could increase water temperatures.
- Application of herbicides to control noxious weeds may adversely affect fish.
- Fish salvage would occur within isolated construction sites. Some fish species are considered vulnerable to electrofishing, subject to injury and/or mortality. If fish remaining in isolated construction sites are not salvaged, they may be killed by stranding, entrainment and impingement during dewatering.

Interference with Life History Functions. To minimize impacts to spawning fish species, their eggs and aquatic habitats, Northwest would schedule the dry-open cut crossings (i.e., flume or dam and pump) of the waterbodies within the in-water work periods recommended by WDFW (Lakey, 2017): July 1 to September 15 for Little Bear and Great Dane creeks and July 1 to September 30 for Silver and Tambark creeks. There would be no in-water work conducted in Evans Creek but effects to that waterbody are included in effects analyses due to its proximity to Project surface disturbance (interconnect facility at MP 1.94, approximately 270 feet uphill from Evans Creek, and construction right-of-way, approximately 63 feet west of Evans Creek).

Fall Chinook salmon in tributaries to northern Lake Washington and the Sammamish River (including North Creek and Little Bear Creek) spawn between September and November. Juveniles migrate into the Sammamish River or Lake Washington either as fry or fingerlings between February and June; juveniles rear as they migrate towards Lake Washington (WRIA 8 Steering Committee, 2005). Consequently, in-water work would potentially coincide with adult upstream migration but would not coincide with the spawning period or most of the time when juveniles migrate from the natal creeks to the Sammamish River.

Turbidity and Suspended Sediment. Construction of the Project across each waterbody would occur during the in-water construction window using dry open-cut construction (fluming or dam and pump) if water is present. Both techniques reduce turbidity and adverse effects to fish. Nevertheless, at high and prolonged levels, turbidity directly affects growth of salmonids and other species, interferes with gill function and adversely affects substrate for egg development (Bash et al., 2001). Turbidity can also reduce macrophyte cover by limiting photosynthesis and can affect food resources as well as reduce cover from predators (Berger et al., 2004; Goldsborough and Kemp, 1988). Turbidity also adversely affects fish vision, which is a requisite for social interactions (Berg and Northcote, 1985), feeding (Vogel and Beauchamp, 1999; Gregory and Northcote, 1993), and predator avoidance (Meager et al., 2006; Miner and Stein, 1996). Growth and survival (individual fitness) could be reduced if turbidity caused one or more of these effects.

Concentrations of suspended sediment (SS) are directly related to levels of turbidity. Newcombe and Jensen (1996) compiled research from many sources that demonstrate effects to anadromous and resident salmonids, including Chinook salmon, by various levels of SS and exposures over time. The developed models that approximate the level of effect are based on known levels of SS concentration and duration of exposure to that concentration in a stream and observed responses by fish, whether in the field or the laboratory. Output from each model is severity-of-ill-effects (SEV) score ranging from 0 to 14 where SEV of 0 indicates no effects, SEV between 1 and 3 indicates behavioral effects, SEV from 4 to 8 indicates sublethal effects, and SEV from 9 through 14 indicate lethal and paralethal effects (see Table 1 in Newcombe and Jensen, 1996).

1. Behavioral Effects SEV scores: 1 = Alarm reaction; 2 = Abandonment of cover; 3 = Avoidance response.

2. Sublethal Effects SEV scores: 4 = Short-term reduction in feeding rates and/or feeding success; 5 = Minor physiological stress (increase coughing rate and/or increased respiration rate); 6 = Moderate physiological stress; 7 = Moderate habitat degradation and/or impaired homing; 8 = Indications of major physiological stress (long-term reduction in feeding rate and/or feeding success, poor condition).

3. Lethal and Paralethal Effects SEV scores: 9 = Reduced growth rate and/or delayed hatching and/or reduced fish density; 10 = 0 to 20% mortality and/or increased predation and/or moderate to severe habitat degradation. 11= >20 – 40% mortality (SEV scores exceeding 11 predict increased mortality rates).

Pipeline construction across waterbodies may increase SS (see Reid et al., 2004) levels in the short-term and may be detrimental to all fish, including ESA-listed salmonids, designated critical habitats and EFH Estimation of effects due to Project-caused turbidity and SS downstream from the Project site requires consideration of construction techniques (fluming or dam and pump) stream velocities, stream depths, sediment particle size and settling velocities, stream particle concentrations, and background or ambient concentrations of SS at the time of construction.

Ritter (1984) provided two models (minor stream crossings and major stream crossings) for estimating concentrations of suspended sediments (**C**x, as mg/L) some distance (**x**, in meters) downstream from a pipeline trench being constructed across a waterbody. The model for minor crossings was based on average stream depth of 15.2 cm (6 inches) and mostly applies to depths in Little Bear Creek during the three months of construction (see Table 4.1-1).

Ritter's model for downstream suspended sediment concentration at some distance **x** from construction across minor streams, with complete mixing of sediment particles, estimates the concentration downstream $\mathbf{C_X}$ by the equation:

$$\mathbf{C_X = C_O\, e^{-(vs\,/\,d)\,(x\,/\,u)}}$$

Where $\mathbf{C_O}$ (mg/L) is the initial concentration of suspended solids in the water column at the trenching site, **vs** = the settling velocity (m/second) of sediment particles, **d** = stream depth (m), **x** = distance (m) downstream, and **u** = stream current velocity (m/second).

Particles of different sizes settle from suspension at different distances downstream from where they become suspended (see Table 4.1-2), contributing to local turbidity and SS concentrations over varying distances while still in suspension. Particle contributions to SS concentrations downstream depend on their proportional composition in the total streambed substrate. Northwest Hydraulic Consultants (2016) provided substrate composition in Little Bear Creek as proportions of boulders, cobble, gravel, sand, fines (silt and sand), and organic materials (see Appendix Table B3 in Northwest Hydraulic Consultants, 2016). Overall, fines averaged four percent and organics averaged 28 percent of the substrate components in Little Bear Creek. The proportions of these particles in the SS concentrations generated by fluming (99 mg/L) and dam and pump (23 mg/L) construction were applied in the equation to estimate downstream distances where concentrations would equal ambient TSS concentrations in both streams during July, August and September.

Monthly ambient total SS (TSS) concentrations were averaged from data collected from 1992 through 2009 in Little Bear Creek at 180th Street, approximately 900 feet upstream from the pipeline crossing location (data downloaded and compiled from Snohomish County, 2017). These values are included in Table 5.2-2 along with monthly values for stream velocity (**u**) and stream depth (**d**) in metric terms. All downstream distances that equal ambient TSS are based on the proportions of all particles and their respective settling velocities in Table 4.1-2. For example, the very fine silt component (**vs** = 0.0000152 m/second) is 28 percent of the total $\mathbf{C_O}$ produced during fluming ($\mathbf{C_O}$ = 99 mg/L x 0.28 = 27.7 mg/L at 50m downstream) and for dam & pump ($\mathbf{C_O}$ = 23 mg/L x 0.28 = 6.4 mg/L at 50m downstream).

Table 5.2-2
Estimates of Distances Downstream for Very Fine Silt Suspended during Fluming and Dam and Pump Pipeline Construction to Equal Average Ambient TSS Concentrations in Little Bear Creek during Months of Construction

Stream	Month [1]	Average Ambient TSS (mg/L) [2]	Stream Velocity (m/sec)	Stream Depth (m)	Downstream Distance to Equal Ambient TSS (meters / feet) [3]	
					Fluming	Dam & Pump
Little Bear Creek	July	3.5	0.17	0.05	1,261 m 4,137 ft	372 m 1,220 ft
	August	3.0	0.18	0.06	1,622 m 5,322 ft	557 m 1,827 ft
	September	14.4	0.18	0.06	486 m 1,594 ft	0 m 0 ft

Notes:
[1] Months for construction based on in-water work periods recommended by WDFW (Lakey, 2017)
[2] Ambient TSS concentrations are from Snohomish County, 2017.
[3] Ambient TSS concentrations are $\mathbf{C_x}$ values in Ritter's equation: $\mathbf{C_X} = \mathbf{C_O}\ \mathbf{e}^{-(vs/d)(x/u)}$ (see text),
Where
vs = 0.0000152 m/second for very fine silt;
u = stream current velocity (m/second);
d = stream depth (m);
x = downstream distance (m) to where $\mathbf{C_x}$ equals ambient TSS;
$\mathbf{C_O}$ (mg/L) is the initial concentration of suspended solids;
For fluming, $\mathbf{C_O}$ = 99 mg/L x 0.28 = 27.7 mg/L at 50m downstream;
For dam and pump, $\mathbf{C_O}$ = 23 mg/L x 0.28 = 6.4 mg/L at 50m downstream.

Reid et al., (2004) reported that flumed crossings averaged 64 hours of in-stream work (with standard error of 14.1 hours) and dam and pump crossings averaged 37.8 hours of in-stream work (with standard error of 8.4 hours). Based on these data, the assumed range of time required

for flumed crossings and dam and pump crossings is the mean ± 2 standard errors reported for each technique by Reid et al. (2004). Consequently, estimated durations for fluming range from 36 to 92 hours and for dam and pump the range is from 21 to 55 hours. If the initial concentration of TSS is 99 mg/L at 164 feet (50 meters) downstream of a flumed crossing of Little Bear Creek, and the duration of exposure for fish at that location is 92 hours, for example, the SEV computed with Newcombe and Jensen's (1996) Model 1 for juvenile and adult salmonids is SEV=7; the same SEV would be computed if fish were exposed to the same concentration for only 36 hours. However, If the initial concentration of TSS is 23 mg/L at 164 feet (50 meters) downstream of a dam and pump crossing of Little Bear Creek for 55 hours, the SEV=6; if the exposure time to that concentration is 21 hours, SEV=5. All three SEV scores indicate sub-lethal effects of sediment on salmon at 50 meters downstream.

The estimated distances downstream required for suspended sediment concentrations generated during fluming or dam and pump construction to dissipate and equal ambient or background TSS concentrations define the portions Little Bear Creek in which ESA-listed salmonids and EFH could be affected by the Project and are within the Aquatic Action Area defined in Section 4.1 (see Table 4.1-2). Those distances would likely vary over time as stream velocities and stream depths change, particularly during the months of July, August and September, when in-stream construction is planned within WDFW recommended in-water work windows. For Little Bear Creek, the largest distance is estimated to be 5,322 feet during fluming in August (see Table 5.2-2). At the full downstream distance, the SEV level is expected to be 0 (no effect, Newcombe and Jensen, 1996), while at 164 feet (50 meters) downstream of the construction site, the SEV level is expected to be SEV=7 (sublethal effect) during flumed crossings and SEV=5 (sublethal effect) during dam & pump crossings. SEV scores would be intermediate at distances between 164 feet and the extremes.

It is not possible to estimate numbers of fall Chinook salmon in Little Bear Creek that could be present and adversely affected by turbidity within the distances provided in Table 5.2-2. StreamNet (2012) provides lengths of streams occupied by species utilizing various stream segments as functional habitat: 1) migration only, 2) rearing and migration, and 3) spawning and rearing. Table 5.2-3 provides the total linear distances, in stream miles, of those habitats for salmonid species within the Lake Washington Sub-basin (HUC 17110012) and the relative importance of those habitats in Little Bear Creek.

Table 5.2-3
Extent (stream miles) of Fall Chinook Migration, Rearing and Spawning Habitats in Little Bear Creek Relative to the Species' Habitats the Lake Washington Sub-basin (HUC 17110012)

Habitat	Drainage Area	Stream Miles of Habitat [1]	Percent of Habitat in Sub-Basin
Migration Only	Lake Washington Sub-basin	93.3 mi	N/A
	Little Bear Creek	0	-
Rearing and Migration	Lake Washington Sub-basin	3.8 mi	N/A
	Little Bear Creek	0	-
Spawning and Rearing	Lake Washington Sub-basin	105.5 mi	N/A
	Little Bear Creek	6.74 mi	6.4%

[1] Values from Table 5.2-1
Source: StreamNet, 2012.

This analysis suggests that numbers of Chinook salmon potentially affected by turbidity generated during construction across Little Bear Creek would be a very small fraction of total numbers expected within the remaining Lake Washington Sub-basin during the time of construction. Information summarized in Table 5.2-4 provides estimates of the amount of in-stream habitat affected in July, August and September over that distance that would be utilized as spawning and rearing habitat by fall Chinook salmon; 15 percent of the available habitat in Little Bear Creek could be affected during August. Alternatively, using dam and pump technology to cross Little Bear Creek in August would affect 0.35 mile (1,827 feet) of spawning and rearing habitat used by fall Chinook salmon (about 5 percent of the available habitat in Little Bear Creek).

Table 5.2-4
Percentages of Fall Chinook Rearing and Spawning Habitats in the Lake Washington Sub-basin and Streams[1] Impacted by Turbidity Generated during In-stream Construction in Little Bear Creek

Month	Stream Crossing Method	Impact Distance	Percent of Habitat Affected	
			Sub-Basin Habitat Extent	Stream Habitat Extent
July	Flume	4,137 ft	0.74%	11.69%
	Dam and Pump	1,220 ft	0.22%	3.43%
August	Flume	5,322 ft	0.95%	15.04%
	Dam and Pump	1,827 ft	0.33%	5.14%
September	Flume	1,594 ft	0.29%	4.48%
	Dam and Pump	0	0	0

[1] Sub-basin habitat extent = 105.5 miles; Stream habitat extent = 6.7 miles (StreamNet, 2012).
[2] Impact distances from Table 5.2-2
[3] Sub-basin and stream habitat extents from Table 5.2-3.

Other scenarios for adverse effects by in-stream construction from fluming and dam and pump crossing methods during July, August and September in Little Bear Creek are provided in Table 5.2-4. However, these estimates do not consider that water temperatures in the waterbodies in the Project area would likely be too warm for adult Chinook salmon migrating upstream and possibly unsuitable for juveniles at the time of construction.

The analysis provided in Table 5.2-4 shows that constructing the pipeline across Little Bear Creek in September would minimize effects on Chinook salmon due to TSS concentrations if fluming is used. Likewise, constructing using dam and pump technology would minimize effects from crossing Little Bear Creek in July and September.

There are no comparable data for any of the tributaries to North Creek or to Little Bear Creek that would allow similar levels of analysis for effects to fish in those waterbodies. Since Evans Creek would not be affected by in-stream construction, any effects due to turbidity and TSS would be a result of sediment runoff during precipitation events. Northwest has prepared a project-specific ECRP (see attachment A) to avoid such events.

USFWS developed a procedure to determine levels of effects by of instream project-generated TSS on an ESA-listed species, bull trout (Muck, 2010). USFWS' procedure requires 1) evaluation of background TSS at the time of project impact, 2) estimation of TSS concentrations produced by the project, 3) duration of exposure to the TSS concentration, 4) life stage of salmonids present in the affected stream that would be exposed to the TSS concentration over time, and 4) application of the appropriate SEV model developed by Newcombe and Jensen (1996) to estimate the level of adverse effects to the life stage present in the stream for some estimated distance downstream from the impact source. USFWS determined that SEV scores above 5 (e.g., 6 to 14) would justify a "Likely to Adversely Affect" conclusion of ESA effects to subadult and adult bull trout while SEV scores of 5 and below would justify a "Not Likely to Adversely Affect" conclusion (that is, effects that are discountable - extremely unlikely to occur, or insignificant, meaning the impact would never reach a scale where take occurs) for effects to subadult and adult bull trout (Muck, 2010). USFWS also determined that SEV scores above 6 (e.g., 7 to 14) would justify a "Likely to Adversely Affect" bull trout habitat while SEV scores of 6 and below would justify a "Not Likely to Adversely Affect" bull trout habitat, based on criteria in Anderson (1996).

SEV scores are complex interactions of SS concentrations and time of exposure to those concentrations so that higher concentrations and longer exposures result in higher SEV scores and greater impact to fish. Effects of high concentrations may be ameliorated by brief exposures and conversely effects of low concentrations may be exasperated by prolonged exposures. As applied by USFWS, effects of project-generated SS concentrations above ambient levels are used to derive SEV scores. Although no bull trout occur within streams crossed by the Project, USFWS' procedure was used to evaluate effects on subadult and adult Chinook, steelhead and habitats.

Concentrations of project-generated sediment diminish with increasing distances downstream from the construction site. Given initial TSS concentrations of 99 mg/L at 50 meters downstream from the construction site if fluming was used or 23 mg/L if dam-and-pump was used, computations for TSS concentrations downstream were used to interact with average times of exposure for the two types of construction (64 hours vs. 37.8 hours) to determine SEV levels and impact significance to salmonids during construction in Little Bear Creek during months of July, August, or September. If fluming is used and lasts for 64 hours and the TSS concentration is 13 mg/L, application in Model 1 (for subadults and adults of Newcombe and Jensen, 1996) would produce SEV = 5. The distance downstream for project-generated TSS concentration to equal 13 mg/L above ambient TSS (3.5 mg/L during July) is estimated to be 462 m (1,516 feet) in July. If constructed during August, the distance downstream for project-generated TSS concentration to equal 13 mg/L above ambient TSS (3.0 mg/L during August) is 553 m (1,814 feet). Likewise, if constructed in September, the distance downstream for project-generated TSS concentration to equal 13 mg/L above ambient TSS (14.4 mg/L during August) is 561 m (1,841 feet). Those downstream distances represent the limits of insignificant effects due to TSS concentrations produced during fluming. Downstream distances for SEV to equal 7 would be within 50 meters from the pipeline crossing with an exposure time of 64 hours.

Accidental Releases. Aquatic habitats in the Project area could be adversely affected if petroleum products were accidentally discharged into surface waters. Such materials are toxic to algae, invertebrates and fish. During 96-hour tests of acute toxicity, the LC50 (lethal

concentration for 50 percent of the exposed population) for juvenile coho salmon exposed to diesel fuel ranged between 2,186 and 3,017 mg/L (World Health Organization, 1996); similar toxicities are assumed for Chinook salmon. Water accommodated fractions (standardized preparation of water systems with dissolved oil components for toxicity studies) prepared from oils higher in aromatics (e.g., the middle distillates, including Fuel Oil No. 2, kerosene and diesel) are generally more toxic than those prepared from crude oils and gasoline (e.g., Anderson et al., 1974; Rice et al., 1976; Markarian et al., 1994). Consequently, LC50's for crude oil would most likely be higher and less toxic than those values, above, for diesel fuel. Generally, diesel fuels and lubricating oils are considerably more toxic to aquatic organisms than other, more volatile products (gasoline) on the one hand, or heavier crude oils on the other (Markarian et al., 1994). Impacts to aquatic habitats that primarily affect aquatic substrates used for fish spawning, incubating and rearing habitats can affect fish for much longer periods (Markarian et al., 1994).

Consistent with FERC's Procedures (Section IV.A.1.d and e); 1) no equipment would be parked overnight or fueled within 100 feet from a waterbody or wetlands boundary; and 2) no hazardous materials, including chemicals, fuels and lubricating oils would be stored within 100 feet of a wetland or waterbody, unless the location is designated for such use by the Environmental Inspector. Adhering to the Procedures would minimize any risk of accidental discharge of hazardous compounds, including petroleum products.

Water Temperature Effects. Water temperature can be affected by removal of riparian forested vegetation. Increased water temperatures can affect survival of fry and juvenile salmon due to direct lethality, increased susceptibility to sediment toxicity (Richter and Kolmes, 2005) and to infectious disease and parasite loads (McCullough, 1999), although susceptibility to temperature changes may depend on water temperatures to which juveniles have been acclimated (McCullough, 1999).

Water temperatures in Evans Creek were measured from June through September, 2000 (Snohomish County, 2017). During that period the warmest water temperatures occurred between late June and early August (see Figure 1.3-1). Maximum daily water temperatures exceeded recommended temperatures for spawning Chinook salmon and would likely be too warm for other life stages. Water temperatures exceeded 60°F in Little Bear Creek during July 2016, in Tambark Creek during July and August 2000, and in Silver Creek in July 2000 (data compiled from Snohomish County, 2017a). Water temperatures in waterbodies in the Project area would likely be too warm for adult Chinook salmon migrating upstream and possibly unsuitable for juveniles or subadults at the time of construction.

Shade vegetation would be removed within the riparian zones of streams crossed that could potentially temporarily increase water temperatures until replanted vegetation becomes established; an estimated 0.61 acre of riparian wetland vegetation would be removed during construction. Areas of surface water exposed to increased solar loading would depend on heights of trees that would be removed and their shadows. The effect, if measurable, would be greatest when the sun's altitude from the horizon is highest, which is during the summer solstice. Shadow lengths and shading would increase before and after the summer solstice and daily, before and after noon. The greatest potential for water temperature increases due to riparian vegetation removal would coincide with the period of maximum water temperatures expected in the waterbodies crossed in the Little Bear Creek drainage. As discussed previously, high water

temperatures have the possibility of limiting or preventing the presence of anadromous salmonids locally, including Chinook, in the Project area during summer.

However, there is no evidence that increased water temperatures result from clearing small amounts of riparian vegetation during pipeline construction. For example, water temperatures measured at four coldwater streams in New York before and during pipeline construction and three years following construction showed no short-term or long-term effect on water quality parameters, including water temperature, even though such effects were expected because streambank vegetation had to be cleared with reduced shading (Blais and Simpson, 1997). Similarly, pipeline construction across two coldwater, fish-bearing streams in Alberta required removing forested riparian vegetation. Water temperatures at the construction sites and downstream did not increase above temperatures upstream from the construction site (Brown et al., 2002). Clearing riparian vegetation is not expected to affect Chinook salmon if present in the Project area.

Herbicides. No herbicides would be used to control vegetation (i.e., brush and trees) on the permanent pipeline easement unless approved or required by the landowner. Vegetation would be periodically maintained using mowing, cutting, trimming and herbicides (selectively).

Selective use of herbicides could be used to control noxious weed infestations along the construction right-of-way and permanent easement. All use of herbicides would be in accordance with state and local regulations and landowner approval, and would be consistent with FERC Plan and Procedures. The potential for adverse effects to native resident and/or anadromous fish by use of herbicides to treat noxious weeds would be remote (e.g., Tu et al, 2001; WSDOT, 2011b).

Fish Handling. Various life stages of listed anadromous salmonids, non-listed special status salmonids and non-salmonids may be present in affected waterbodies during construction. Fish would require salvaging to avoid mortality through stranding, entrainment, and/or impingement during dewatering of the isolated in-water construction area. Northwest's Fish Salvage Plan is provided in attachment D. Seining would be the primary method utilized for fish salvage rather than electrofishing because salmonids in fresh water are especially susceptible to deleterious effects of electrofishing with high mortality in the short term but also high long-term mortality after release, possibly due to high incidence of spinal injuries and internal hemorrhage (Snyder, 2003 and 2004).

The Fish Salvage Plan details how Northwest would attempt to remove all fish from within the work area that would be isolated prior to being pumped dry for dry open-cut construction. During seining, care would be taken to run the seine along the bottom, along the bank, and under the bank if it is undercut to prevent fish from escaping under the net. Fish inadvertently left within the dammed-off construction zone could be killed by impingement on pump intakes used to dewater the construction zone or would likely die once all water was removed. Once the seine is out of the water, all captured fish would be immediately transferred to water-filled containers and/or released either upstream or downstream from the construction site. A variety of physiological stress responses to extreme capture and holding conditions have been related to exhaustive exercise, which can adversely affect survival once fish are released (Gallaugher and Farrel, 1999). Restricting fish salvage to the shortest amount of time possible would diminish risk of adverse effects.

It is not possible to estimate numbers of Chinook salmon in the Little Bear Creek drainages that may be present at the time of construction and which would require salvaging. However, the extent of Chinook salmon habitats in Little Bear Creek relative to the amounts of habitats in the Lake Washington Sub-basin were identified in Table 5.2-4, and numbers of fish present and requiring salvage would be a small fraction of total numbers expected within the Lake Washington Sub-basin during the time of construction.

Interrelated and Interdependent Effects. No interrelated or interdependent actions are associated with the Project.

Cumulative Effects. USFWS and NMFS describe cumulative effects (50 CFR 402.02) as the result of future actions by state or private entities, not involving federal actions, but reasonably certain to occur in the Action Area considered in this BA. Future federal actions that are unrelated to the Project are not considered here because they require separate consultation pursuant to Section 7 of the ESA. The only action by state or private entities known or reasonably certain to occur within the Aquatic Action Area that would cumulatively affect Chinook salmon would be the planned replacement of the Great Dane Creek box culvert on State Route 524 by WSDOT. According to WSDOT, this project, scheduled for the summer of 2018, is designed to enhance fish passage in Great Dane Creek. If constructed as scheduled, this project would be completed in 2018, one year in advance of the Project's activities affecting Great Dane Creek.

Critical Habitat. The same approach utilizing TSS concentration and exposure to evaluate levels of risk to fish (Newcombe and Jensen, 1996) was applied to quantifying effects of sediment on fish habitat, termed HADD due to the harmful alteration, disturbance or destruction of habitat by sediment (Anderson et al., 1996). HADD risk includes concentration and exposure to sediment along with sensitivity of the habitat affected. Most likely, suspended sediment would increase embeddedness of spawning gravels with increasing habitat effects closer to the construction location. Anderson et al. (1996) described five severity ranks to habitat:

SEV 3: Measured change in habitat preference.

SEV 7: Moderate habitat degradation measured by a change in the invertebrate community.

SEV 10: Moderately severe habitat degradation as defined by measureable reductions in the productivity of habitat for extended periods (months) or over a large area (kilometers).

SEV 12: Severe habitat degradation as measured by long-term (years) alterations in the ability of existing habitats to support fish or invertebrates.

SEV 14: Catastrophic or total destruction of habitat in the receiving environment.

USFWS (Muck 2010) considers SEV = 7 to define the threshold for significant effects to bull trout habitat. The same threshold is used here to define significant effects to Chinook salmon habitat. If TSS concentration = 51 mg/L for 64 hours, SEV = 7. However, that concentration of very fine silt and other substrate particles would be expected if the total TSS concentration is 99 mg/L at for a very short distance (50.1 to 50.15 meters - 164 to 165 feet) downstream from the

pipeline crossing. Significant effects to Chinook habitat in Little Bear Creek due to project-generated sediment are expect to occur within that distance for the duration of construction, estimated to last for 64 hours.

Chinook salmon critical habitat PCE 2 could be affected (water quality and forage supporting juvenile development). In addition, the Project would affect Chinook salmon critical habitat PCE 3 during dry open-cut construction. Specifically, construction would generate turbidity plumes, and require temporary installation of temporary dams (structures to isolate the site for construction in-the-dry) and potentially a block net across Little Bear Creek upstream from the construction site (see the Fish Salvage Plan) that would affect the freshwater migration corridor and water quality conditions. Effects to the migration corridor would be temporary but could coincide with late juvenile Chinook salmon rearing and out-migration to the Sammamish River.

5.2.1.4 Conservation Measures

Northwest would adhere to conditions in FERC's Wetland and Waterbody Procedures and Upland Plan that are specifically designed to avoid or minimize effects to waterbodies and fisheries habitats. In addition, Northwest has prepared a Project-specific ECRP (see attachment A). These documents provide BMPs that would avoid, minimize and restore project-related effects to fisheries resources and are not reiterated here.

Removal of trees within riparian zones would be a long-term impact, although riparian shrubs removed during construction are expected to be readily replaced by cuttings and sprigs of locally available species and through natural revegetation. As a general practice in riparian areas, shrubs and trees that must be removed during construction would be cut at ground level with the roots left in place, except where located within the pipeline trench. The cut tree and shrub roots would enhance revegetation efforts through root sprouting and regeneration. Although roots may decay overtime, streambank stability would be retained by their presence and some of the roots may even regenerate, adding to streambank stability. By revegetating streambanks with riparian species, limited to shrubs on the ground directly over the pipeline, streambank stability would be enhanced over the long-term and would provide for stream shading, sediment intercept and input of detrital nutrients to the stream, all of which are key functions of riparian zones (Washington Department of Natural Resources [WDNR], 2005). Where existing riparian vegetation (trees/shrubs) is present, a 25-foot wide riparian buffer on either side of the waterbody would be allowed to establish using native trees and shrubs to the same extent as any existing riparian vegetation adjacent to the permanent easement. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide would be maintained in an herbaceous state. Trees that are located within 15 feet of the pipeline would be cut and removed from the permanent easement consistent with Section V.D.1 of FERC's Wetland and Waterbody Procedures. Herbicides would not be used in or within 100 feet of a waterbody.

To comply with WDNR's Forest Practices, Northwest would develop an Alternate Plan.

In addition, project design components including timing, fish salvage (see attachment D) with relatively low risk to salmonids, and use of dry open-cut construction would minimize effects to all fisheries, including listed salmonids and EFH.

Effects to salmonids in Little Bear Creek would be reduced by use of a turbidity curtain/silt fence installed downstream from the pipeline crossing to intercept and precipitate silt and other suspended sediment particulates. Turbidity curtains/silt fence are a recommended BMP for application in watercourses where intrusion into the watercourse by construction activities and subsequent sediment movement is unavoidable (BMP-27 in USACE, 1997). Downstream extent of TSS would be considerably shorter and significant impacts to fish would be limited to much shorter distances downstream from the instream construction site than described above because TSS concentrations would diminish and durations of salmon exposures to elevated TSS concentrations would be brief.

5.2.1.5 Determination of Effects

Species. The Project **may affect** Puget Sound Chinook salmon because:

- Chinook salmon may be present in Little Bear Creek and tributaries to North Creek during Project construction.

The Project **is likely to adversely affect** Puget Sound Chinook salmon for the following reasons:

- Juvenile Chinook salmon may be present within the Aquatic Action Area during in-stream construction across Little Bear Creek.
- Juvenile Chinook salmon may be salvaged from surface water in the Aquatic Action Area with some risk of mortality or injury during capture and/or in storage containers or when released.
- Mortality or injury of juvenile Chinook salmon from either source would affect a very small portion of the population present within the Lake Washington Sub-basin.

Critical Habitat. The Project **may affect** designated critical habitat for Chinook salmon within the Puget Sound ESU because:

- The Project crosses tributaries to North Creek in which there is critical habitat; and
- The Project crosses Little Bear Creek 150 feet upstream from designated critical habitat.

Project components are **likely to adversely affect** designated critical habitat for Chinook salmon within the Puget Sound ESU because:

- The Project would generate short-term turbidity (increased TSS concentrations) during in-stream construction across Little Bear Creek, its tributaries, and tributaries to North Creek. The increased concentration is not expected to cause a measured change in habitat preference (avoidance) or cause moderate habitat degradation measured by a change in the invertebrate community (siltation of benthic invertebrates) affecting PCE 2 (water quality and forage supporting juvenile development).

5.2.2 *Steelhead*

5.2.2.1 Species Account and Critical Habitat

Status. The DPS of Puget Sound steelhead was listed in 2007 as threatened in a final rule by NMFS (2007). The listed DPS includes all naturally spawned anadromous steelhead populations originating below natural and manmade impassable barriers from rivers flowing into Puget Sound (NMFS, 2014); hatchery origin fish are excluded from this listing. The five-year review by NMFS (2011) identified that spawner and redd counts in the Puget Sound DPS were declining and therefore the DPS remained at a moderate risk of extinction.

Threats. NMFS published a status review in 2005 (NMFS, 2005c). In 2005, marked declines in sizes of runs for naturally produced steelhead were observed throughout the Puget Sound DPS, reflecting widespread reduced productivity (NMFS, 2005c), even while reduced harvests have been in place since the 1990s.

The principal factor contributing to decline of Puget Sound steelhead is the destruction, modification or curtailment of habitat. Barriers to otherwise suitable habitat and adverse effects to water quantity and quality due to dams, loss of wetland and riparian habitats, coupled with urban and agricultural developments have caused loss and degradation of habitats (NMFS, 2007). Steelhead harvests have been curtailed sufficiently; predation by marine mammals and birds are likely localized effects; and diseases are of unknown effect. Continued threats by habitat loss and degradation to nearshore, estuarine and lowland habitats required additional regulation and protection (NMFS, 2007b).

Species Recovery. No recovery plan has been finalized for the Puget Sound steelhead DPS. Steelhead were not specifically included in the recovery plan for Puget Sound Salmon that was developed by the Shared Strategy for Puget Sound Development Committee and adopted by NMFS in 2007. NMFS (2006) noted that the geographic area encompassed by the Shared Strategy Plan included the entire range of the Puget Sound steelhead DPS, but the DPS had not been listed as threatened at the time of the Plan's publication.

Life History, Habitat Requirements and Distribution. Steelhead are anadromous rainbow trout that utilize coastal streams and tributaries to the Columbia River. Winter-run steelhead migrate to natal streams in late fall and winter while summer-run steelhead migrate upstream during spring and summer. Winter-run steelhead are at various stages of maturity during upstream migration and spawn within a few months of entering freshwater. Alternatively summer-run steelhead are immature and require in-stream maturation prior to spawning in the spring following entry to natal streams (Pauley et al., 1986).

Steelhead require cool, clear, well-oxygenated streams for spawning with suitable gravels and water flows (Pauley et al., 1986). Females select and excavate redd sites in spawning gravel to depths of 7 to 30 cm. Substrate gravels ranging for 1.3 to 11.4 cm diameter with aerated water flowing at 76 cm/second appear to be suitable for spawning. Some steelhead are iteroparous – they have several reproductive cycles over their lifetimes unlike semelparous salmon that die after reproducing once (NMFS, 1998). Repeat spawners are generally female but incidence of repeat spawning decreases from south to north along the Pacific Coast (Pauley et al., 1986).

Preferred water temperatures during steelhead spawning range between 3.9ºC and 9.4ºC (39ºF to 49ºF) (Pauley et al., 1986). Incubation temperatures for salmonid embryos, in general range from 4.0ºC and 14ºC (39ºF to 57ºF) and preferred rearing temperatures for steelhead are 7.2ºC and 14.5ºC (45ºF to 58ºF) with an optimum temperature of 10.0ºC (50ºF) and upper lethal temperature of 23.9ºC (75ºF) (Pauley et al., 1986). Along with water temperatures, dissolved oxygen concentrations are critical for steelhead development and survival and dissolved oxygen physiological requirements increase directly with increasing water temperature. Generally, low dissolved oxygen affects metabolic rates, swimming speed, growth rates, food consumption rates, efficiency of food utilization, behavior and survival of all salmonids including steelhead (Pauley et al., 1986).

Alevins hatch in four to seven weeks and, after adsorbing their yolk sac, they are free swimming in three to seven days after hatching. Juvenile fry gradually move into deeper portions of streams and, similar to juvenile coho, are territorial. They primarily feed on benthic invertebrates including isopods, amphipods and insects (Pauley et al., 1986). Noted by numerous investigators is the importance of streamside vegetation and submerged cover (rocks, large wood) that provides food, temperature stability and protection from predators (Pauley et al., 1986). Juvenile steelhead remain in freshwater from 1 to 4 years before downstream migration and smoltification in estuarine and marine environments. They remain in marine water for 2 to 3 years before returning to spawn in their natal stream. Some fish are sexually mature ("ocean maturing") at the time they enter freshwater to spawn but others ("stream maturing") enter freshwater as sexually immature fish and require several months in freshwater for gonads to fully develop and to spawn. These two types are related to the winter-run ("ocean maturing") and summer-run ("stream maturing") steelhead stock (NMFS, 1998), as referenced above.

Population Status. Steelhead in the Snohomish River winter-run populations are among the most abundant within the Puget Sound DPS, averaging over 3,000 natural spawners per year between 2000 and 2004 (NMFS, 2005c). Escapement of winter steelhead in the Snohomish River had been significantly increasing from 1995 through 2004 (NMFS, 2005c), although the population growth rate for the 10-year period indicates the population was declining, primarily due to declining natural recruitment rates (NMFS, 2005c).

The Snohomish-Skykomish winter steelhead stock was determined to be depressed in 2002 (WDFW, 2002) after a short-term severe decline in total natural spawners after 1998 (see Figure 5.2-3). Since 2000, the estimated winter steelhead escapement had been increasing through 2006; no more recent data are available (WDFW, 2011c). Winter steelhead utilize the Snohomish River mainstem for spawning and as a migration route to spawning sites upstream in the Skykomish River and tributaries and a few larger tributaries to the Snoqualmie River (WDFW, 2010c). Spawning by winter steelhead stocks in both rivers lasts from mid-March through mid-June (WDFW, 2002).

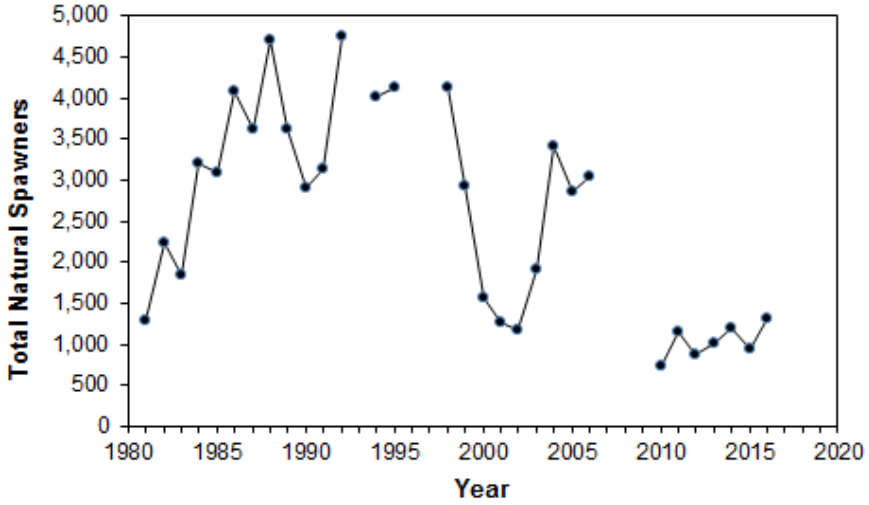


Figure 5.2-3
Estimates of Total Natural Spawners for Winter Steelhead in the Snohomish-Skykomish Rivers since 1981

In the early 1900s, water levels in Lake Washington were lowered to construct the Lake Washington ship canal which established a new outflow for Lake Washington/Cedar River watershed into Puget Sound (WDFW, 2011d). Construction of the ship canal caused dramatic changes to the Lake Washington/Green River Basin and affected North Lake Washington and Lake Sammamish winter steelhead escapement. Details on North Lake Washington and Sammamish basin steelhead surveys are limited, and survey locations and frequency are unknown, but likely included tributaries such as Swamp Creek, Bear Creek and Issaquah Creek. North Lake Washington and Sammamish tributaries have not been monitored since 2000 (see Figure 5.2-4), and due to small numbers of steelhead seen at the Chittenden Locks and estimated in the Cedar River, it is unlikely that there are currently many steelhead in these tributaries (WDFW, 2011d). WDFW determined that the Lake Washington winter steelhead stock was depressed in 1992, but by 2002 the stock was classified as critical due to severe declining escapement (WDFW, 2002).

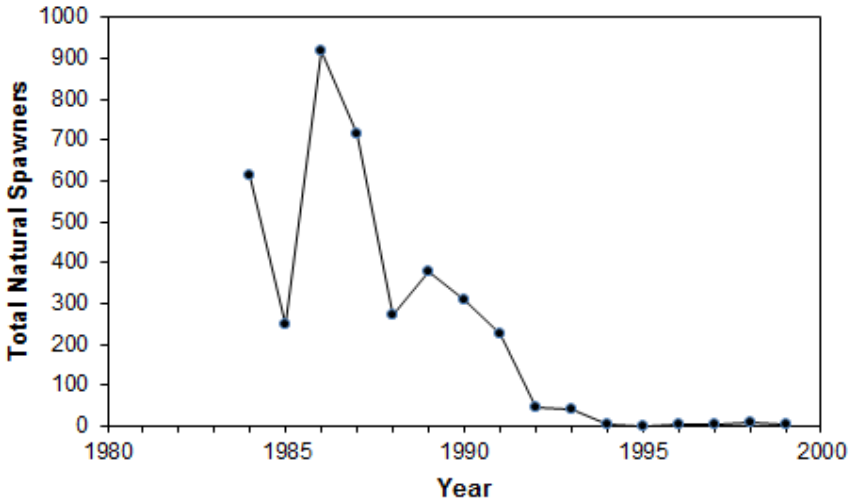


Figure 5.2-4
Estimates of Total Natural Spawners for North Lake Washington Winter Steelhead from 1984 through 1999

Critical Habitat. Critical habitat has been designated for Puget Sound steelhead in the Snohomish River and tributaries including Evans Creek (NMFS, 2016) approximately 0.8 mile downstream from where Northwest's existing permanent easement crosses the creek. No critical habitat has been designated for steelhead in the Middle Sammamish River watershed (NMFS, 2016). Critical habitat includes PCEs that support one or more life stages (i.e., freshwater sites for spawning, rearing, migration and freshwater/saltwater foraging), as well as provides biological features essential for the conservation of steelhead (NMFS, 2013). PCEs associated with designated critical habitat include the following physical or biological features in freshwater habitats (NMFS, 2016):

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.

2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.

3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

PCEs for steelhead within estuarine habitats, nearshore marine areas, and offshore marine areas were also identified but are not included here since none of those habitats occurs within the Project area (NMFS, 2016).

5.2.2.2 Environmental Baseline

Species Presence. Winter steelhead are presumed to occur in in Evans Creek downstream from the existing pipeline crossing. Likewise, winter steelhead are presumed to occur in most streams crossed by the proposed Project within the Middle Sammamish River watershed and have been documented in North Creek in the vicinity of the Project (see Table 2.2-1). SalmonScape (WDFW, 2016a) indicates that winter steelhead presence has been documented in North Creek but there is no documentation of adult spawning or juvenile rearing. WDFW (2016a) has modeled winter steelhead presence in Little Bear Creek and several tributaries to North Creek that would be crossed by the Project.

Habitat. Salmonid habitats in the Project area are limited by multiple fish passage barriers, lack of riparian vegetation, water quality impairment due to agriculture, livestock access, surface runoff and presence of non-native fish that prey on native juvenile salmonids (Kerwin, 2001; Haring, 2002). Preferred water temperatures during steelhead spawning are 39°F to 49°F (Pauley et al., 1986). Preferred juvenile rearing temperature ranges from 45°F to 58°F, with an optimum temperature of 50°F (Pauley et al., 1986). Temperatures in Evans Creek (see Figure 1.3-1), in Little Bear Creek (see Figure 1.3-3), in North Creek (see Figure 1.3-6) and presumably in other waterbodies in the Project area would likely be too warm for steelhead adults and rearing juveniles at the time of construction.

Critical Habitat. Critical habitat has been designated for Puget Sound steelhead in the Snohomish River and tributaries, including Evans Creek (NMFS, 2016) approximately 0.8 mile downstream from where Northwest's existing permanent easement crosses the creek. No critical habitat has been designated for steelhead in the Middle Sammamish River watershed.

5.2.2.3 Environmental Effects

Direct and Indirect Effects

Construction of the Project could directly and/or indirectly affect steelhead present in the Aquatic Action Area through one or more of the following pathways:

- Interference with key life history functions for winter steelhead.
- Turbidity generated during dry open-cut construction to cross streams can adversely affect resident and anadromous salmonids.
- Accidental release of fuels and entry of other petroleum products into surface waters can adversely affect all fish species and other aquatic organisms.
- Removal of riparian vegetation can reduce shade, which could increase water temperatures.
- Application of herbicides to control noxious weeds may adversely affect fish.
- Fish salvage would occur within isolated construction sites. Some fish species are considered vulnerable to electrofishing, subject to injury and/or mortality. If fish

remaining in isolated construction sites are not salvaged, they may be killed by stranding, entrainment and impingement during dewatering.

Interference with Life History Functions. To minimize impacts to spawning fish species, their eggs and aquatic habitats, Northwest would schedule the dry-open cut crossings (i.e., flume or dam and pump) of the waterbodies within the in-water work periods recommended by WDFW (Lakey, 2017): July 1 to September 15 for Little Bear and Great Dane creeks and July 1 to September 30 for Silver and Tambark creeks. There would be no in-water work conducted in Evans Creek but effects to that waterbody are included in effects analyses due to its proximity to Project surface disturbance (interconnect facility at MP 1.94, approximately 270 feet uphill from Evans Creek, and construction right-of-way, approximately 63 feet west of Evans Creek).

It is not clear to what degree steelhead utilize tributaries in the Lake Washington Sub-basin. Tributaries to North Lake Washington and Lake Sammamish/Sammamish River are not currently monitored for steelhead (WDFW, 2011d) and no information has been found describing their seasonal occurrences in North Creek or other northern tributaries to the Sammamish River and Lake Washington.

Turbidity Effects. Construction of the Project across each waterbody would occur during the in-water construction window using dry open-cut construction (fluming or dam & pump) if water is present. Both techniques reduce turbidity and adverse effects to fish. At high levels, turbidity directly affects growth of salmonids and other species and their survival by interfering with gill function and adversely affecting substrate for egg development (reviewed by Bash et al., 2001), as discussed above for Chinook salmon.

The same estimated downstream distances for Project-generated sediment in Little Bear Creek described for Chinook salmon apply to winter steelhead. For Little Bear Creek, the largest distance is estimated to be 5,322 feet during fluming in August (Table 5.2-2). At the full downstream distance, the SEV level is expected to be 0 (no effect, Newcombe and Jensen, 1996) while at 164 feet (50 meters) downstream of the construction site, the SEV level is expected to be SEV=7 (sublethal effect) during flumed crossings and SEV=5 (sublethal effect) during dam & pump crossings. SEV scores would be intermediate at distances between 164 feet and the extremes.

It is not possible to estimate numbers of winter steelhead in Little Bear Creek that could be present and adversely affected by turbidity within the distances provided in Table 5.2-2. StreamNet (2012) provides lengths of streams occupied by species utilizing various stream segments as functional habitat: 1) migration only, 2) rearing and migration, and 3) spawning and rearing. Table 5.2-5 provides the total linear distances, in stream miles, of those habitats for salmonid species within the Lake Washington Sub-basin (HUC 17110012) and the relative importance of those habitats in Little Bear Creek. There are no stream habitats in Little Bear Creek in which winter steelhead would be expected.

Table 5.2-5
Extent (stream miles) of Winter Steelhead
Rearing and Spawning Habitats in Little Bear Creek
Relative to the Species' Habitats in the Lake Washington Sub-basin (HUC 17110012)

Habitat	Drainage Area	Stream Miles of Habitat [1]	Percent of Habitat in Sub-Basin
Migration Only	Lake Washington Sub-basin	123.4 mi	N/A
	Little Bear Creek	0	-
Rearing and Migration	Lake Washington Sub-basin	9.69 mi	N/A
	Little Bear Creek	0	-
Spawning and Rearing	Lake Washington Sub-basin	35.2 mi	N/A
	Little Bear Creek	0	-
Source: StreamNet, 2012.			

This analysis suggests that turbidity generated during pipeline construction would not affect steelhead habitats in Little Bear Creek (see Table 5.2-5).

There are no comparable data for any of the tributaries to North Creek or to Little Bear Creek that would allow similar levels of analysis for effects to fish in those waterbodies. Since Evans Creek would not be affected by in-stream construction, any effects due to turbidity and TSS would be a result of sediment runoff during precipitation events. However, Northwest has prepared a project-specific ECRP (see attachment A) to avoid such events.

The same approach utilizing TSS concentration and exposure to evaluate levels of risk to fish (Newcombe and Jensen, 1996) was applied to quantifying effects of sediment on fish habitat, or HADD (Anderson et al., 1996). HADD risk includes concentration and exposure to sediment along with sensitivity of the habitat affected. There are no effects to winter steelhead habitats anticipated for this Project. Likewise, there are no effects to winter steelhead due to sediment generated by this Project.

Accidental Releases. Aquatic habitats in the Project area could be adversely affected if petroleum products were accidentally discharged into groundwater and/or surface waters. Such materials are toxic to algae, invertebrates and fish, discussed above for Chinook salmon.

According to FERC's Wetland and Waterbody Procedures (Section IV.A.1.d and e) and the ECRP (see attachment A); 1) no equipment would be parked overnight or fueled within 100 feet from a waterbody or wetlands boundary; and 2) no hazardous materials, including chemicals, fuels, and lubricating oils, would be stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. Adhering to these procedures would minimize any risk of accidental discharge of hazardous compounds, including petroleum products, into waterbodies and associated wetlands potentially utilized by steelhead.

Water Temperature Effects. As discussed above for Chinook salmon, water temperature can be affected by removal of riparian forested vegetation. Increased water temperatures can affect survival of fry and juvenile salmon due to direct lethality, increased susceptibility to sediment toxicity (Richter and Kolmes, 2005), and to infectious disease and parasite loads (McCullough, 1999) although susceptibility to temperature changes may depend on water temperatures to which juveniles have been acclimated (McCullough, 1999). Preferred water temperatures during steelhead spawning range between 3.9^{o}C and 9.4^{o}C (39°F to 49°F) (Pauley

et al., 1986). Preferred rearing temperatures for steelhead are 7.2ºC and 14.5ºC (45ºF to 58ºF) with an optimum temperature of 10.0ºC (50ºF) and upper lethal temperature of 23.9ºC (75ºF) (Pauley et al., 1986).

Water temperatures in the streams that the Project crosses would likely be too warm for steelhead. Water temperatures exceeded 60ºF in Little Bear Creek in July 2016, in Tambark Creek during July and August 2000, and in Silver Creek in July 2000 (data compiled from Snohomish County, 2017a). Water temperatures in Evans Creek were measured from June through September, 2000 (Snohomish County, 2017a). Summer water temperatures in Evans Creek and other waterbodies crossed would likely be higher than temperatures preferred by steelhead. Clearing riparian vegetation is not expected to affect winter steelhead.

Herbicides. Herbicides have the potential to cause toxic effects to different salmonid life stages and to other aquatic species, causing direct impacts, if used improperly. When herbicides are properly used according to label restrictions and BMPs to control noxious weeds, there is little to no chance of causing injury or mortality to fish or other aquatic organisms.

No herbicides would be used to control vegetation (i.e., brush and trees) on the permanent easement unless approved or required by the landowner. Vegetation would be periodically maintained using mowing, cutting, trimming and herbicides (selectively). Selective use of herbicides could be used to control noxious weed infestations along the permanent easement. All use of herbicides would be in accordance with state and local regulations and landowner approval and would be consistent with FERC's Plan and Procedures. Considering the potential for limited use of herbicides within the Project area and precautions that would be in place to prevent entry into waters, meaningful negative effects to steelhead from herbicides would be unlikely to occur (e.g., Tu et al, 2001; WSDOT, 2011b).

Fish Handling. The Fish Salvage Plan (see attachment D) details how Northwest would attempt to remove all fish from within the work area that would be isolated prior to being pumped dry for dry open-cut construction. During seining, care would be taken to run the seine along the bottom, along the bank, and under the bank if it is undercut to prevent fish from escaping under the net. Fish inadvertently left within the dammed-off construction zone could be killed by impingement on pump intakes used to dewater the construction zone or would likely die once all water was removed. Once the seine is out of the water, all captured fish would be immediately transferred to water-filled containers and/or released either upstream or downstream from the construction site. A variety of physiological stress responses to extreme capture and holding conditions have been related to exhaustive exercise, which can adversely affect survival once fish are released (Gallaugher and Farrel, 1999). Restricting fish salvage to the shortest amount of time possible would diminish risk of adverse effects.

It is not possible to estimate numbers of steelhead in the Little Bear Creek drainage that may be present at the time of construction and which would require salvaging. The available information indicates that winter steelhead would not be present.

Interrelated and Interdependent Effects. No interrelated or interdependent actions are associated with the Project.

Cumulative Effects. USFWS and NMFS describe cumulative effects (50 CFR 402.02) as the result of future actions by state or private entities, not involving federal actions, but reasonably certain to occur in the Action Area considered in this BA. Future federal actions that are unrelated to the Project are not considered here because they require separate consultation pursuant to Section 7 of the ESA. The only action by state or private entities known or reasonably certain to occur within the Aquatic Action Area that would cumulatively affect steelhead would be the planned replacement of the Great Dane Creek box culvert on State Route 524 by WSDOT. According to WSDOT, this project, scheduled for the summer of 2018, is designed to enhance fish passage in Great Dane Creek. If constructed as scheduled, this project would be completed in 2018, one year in advance of the Project's activities affecting Great Dane Creek.

Critical Habitat. There is no designated critical habitat for Puget Sound steelhead in the Middle Sammamish River watershed (NMFS, 2016), including Little Bear Creek. Critical habitat has been designated for Puget Sound steelhead in the Snohomish River and tributaries including Evans Creek (NMFS, 2016) approximately 0.8 mile downstream from where Northwest's existing permanent easement crosses the creek. No effects to critical habitat in Evans Creek are expected. Since Evans Creek would not be affected by in-stream construction, any effects due to turbidity and TSS would be a result of sediment runoff during precipitation events. However, Northwest has prepared a project-specific ECRP (see attachment A) to avoid such events.

5.2.2.4 Conservation Measures

Northwest would adhere to conditions in FERC's Plan and Procedures that are specifically designed to avoid or minimize effects to waterbodies and fisheries habitats. In addition, Northwest has prepared a Project-specific ECRP (see attachment A). These documents provide BMPs that would avoid, minimize and restore project-related effects to fisheries resources and are not reiterated here.

Removal of trees within riparian zones would be a long-term impact, although riparian shrubs removed during construction are expected to be readily replaced by cuttings and sprigs of locally available species and through natural revegetation. As a general practice in riparian areas, shrubs and trees that must be removed during construction would be cut at ground level with the roots left in place, except where located within the pipeline trench. The cut tree and shrub roots would enhance revegetation efforts through root sprouting and regeneration. Although roots may decay overtime, streambank stability would be retained by their presence and some of the roots may even regenerate, adding to streambank stability. By revegetating streambanks with riparian species, limited to shrubs on the ground directly over the pipeline, streambank stability would be enhanced over the long-term and would provide for stream shading, sediment intercept and input of detrital nutrients to the stream, all of which are key functions of riparian zones (WDNR, 2005). Where existing riparian vegetation (trees/shrubs) is present, a 25-foot wide riparian buffer on either side of the waterbody would be allowed to establish using native trees and shrubs to the same extent as any existing riparian vegetation adjacent to the permanent easement. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide would be maintained in an herbaceous state. Trees that are located within 15 feet of the pipeline would be cut and removed

from the permanent easement consistent with Section V.D.1 of FERC's Procedures. Herbicides would not be used in or within 100 feet of a waterbody.

To comply with WDNR's Forest Practices, Northwest would develop an Alternate Plan.

In addition, project design components including timing, fish salvage (see attachment D) with relatively low risk to salmonids, and use of dry open-cut construction would minimize effects to all fisheries including listed salmonids and EFH.

Effects to salmonids in Little Bear Creek would be reduced by use of a turbidity curtain/silt fence installed downstream from the pipeline crossing to intercept and precipitate silt and other suspended sediment particulates. Turbidity curtains/silt fence are a recommended BMP for application in watercourses where intrusion into the watercourse by construction activities and subsequent sediment movement is unavoidable (BMP-27 in ACOE, 1997). Downstream extent of TSS would be considerably shorter and significant impacts to fish would be limited to much shorter distances downstream from the instream construction site than described above because TSS concentrations would diminish and durations of salmon exposures to elevated TSS concentrations would be brief.

5.2.2.5 Determination of Effects

Species. The Project **may affect** Puget Sound DPS steelhead because:

- Steelhead may be present in Little Bear Creek during Project construction, based on WDFW modeling of species' presence.

The Project **is not likely to adversely affect** Puget Sound DPS steelhead for the following reasons:

- Juvenile or adult winter steelhead are not expected within the Aquatic Action Area during in-stream construction across Little Bear Creek or tributaries.

- Juvenile or adult steelhead are not likely to be salvaged from surface water in the Aquatic Action Area; risk of mortality or injury during capture is discountable and insignificant.

Critical Habitat. The Project would have **no effect** on designated critical habitat for steelhead within the Puget Sound DPS because:

- The Project does not affected designated critical habitat associated with Evans Creek, which is 0.8 mile downstream from where Northwest's permanent easement crosses the creek.

5.2.3 ***Bull Trout***

5.2.3.1 Species Account and Critical Habitat

Status. The Coastal-Puget Sound DPS of bull trout was listed as a threatened species in 1999 (USFWS, 1999). With that final rule, all bull trout populations within the coterminous United States were listed as threatened, including three other DPSs that had been listed as threatened in

earlier actions. The Project is within the Coastal Recovery Unit, one of six such units within a single U.S. DPS (USFWS, 2015a) (previously five DPS when bull trout was listed as threatened in 1999, which included the Coastal-Puget Sound DPS).

Threats. At the time they were listed in 1999, abundance of bull trout in the Coastal-Puget Sound DPS had declined in many of the inhabited river basins. Bull trout were threatened by multiple effects including habitat degradation and fragmentation, blockage of migration routes, degraded water quality, harvest and introduction of non-native species (USFWS, 1999 and 2004).

Species Recovery. A recovery plan for bull trout in the coterminous United States was published in 2015 (USFWS, 2015a). The Coastal-Puget Sound DPS is one of five DPSs for which USFWS has identified Core Recovery Areas, including the Snohomish-Skykomish core area. A draft recovery plan for bull trout in the Puget Sound Management Unit was published in 2004 (USFWS, 2004). The Puget Sound Management Unit includes all watersheds within the Puget Sound basin and the marine nearshore areas of Puget Sound. The management unit coincides with 57 local populations and five potential local populations which have been divided into eight core areas.

USFWS (2015b) provides a specific recovery implementation plan for the Coastal Recovery Unit that includes the Coastal-Puget Sound DPS and bull trout in Snohomish-Skykomish core area (see USFWS, 2015a and 2015b). Primary threats in the Snohomish-Skykomish Core Area include: 1) impacts associated with flood and erosion control associated with agricultural practices, residential development and urbanization that have led to channelization and habitat degradation in the lower river which adversely affects bull trout anadromy; 2) impacts associated with recreational mining that affect spawning and rearing tributary habitats; 3) impacts to water quality by residential developments and urbanization that increase seasonal high water temperature in the lower mainstem river, a migration corridor key to the persistence of the anadromous life history form; and 4) connectivity impairment due to fish passage in the South Fork Skykomish River.

Recovery in the Snohomish-Skykomish Core Area is focused on actions that 1) reduce stream channel degradation and increase channel complexity; 2) practice non-intrusive flood control and flood repair activities; 3) prevent or reduce impacts from recreational mining activities; and 4) implement restoration and protection activities in development areas to reduce water temperatures. Recovery is also directed to continue ongoing population monitoring efforts within the basin to periodically assess abundance and distribution of bull trout (USFWS, 2015b).

Life History, Habitat Requirements and Distribution. Bull trout exhibit one of four life history strategies (WDFW, 2000):

- Anadromous form; spawning and early rearing occur in freshwater streams with major growth and maturation occurring in salt water.

- Adfluvial form; spawning and early rearing occur in freshwater streams and most growth and maturation occurs in lakes or reservoirs.

- Fluvial form; spawning and early rearing occur in smaller tributaries with major growth and maturation occurring in mainstem rivers.

- Resident form; all life stages (spawning, rearing, growth, maturation) occur in small headwater streams, often upstream of impassable barriers.

Bull trout require complex forms of cover including LWD, under cut banks, boulders and pools (WDFW, 2000). Population densities of bull trout are directly related to the amounts of in-stream woody debris which provides protection from predators and increases over winter survival (WDNR, 1997). Spawning generally occurs during late summer and early fall when water temperatures range from 5°C to 9°C (41°F to 48°F), utilizing loose, clean gravel substrates in low gradient streams. Eggs, alevins and fry require clear water and are susceptible to sediment filling spaces between cobbles. Optimum water temperatures for egg incubation range from 2°C to 4°C (35°F to 39°F) and for juvenile rearing temperatures range from 7°C to 8°C (44°F to 46°F) (USFWS, 1999). Depending on the life history form, rearing and overwintering habitat vary but bull trout still require cool clean water with insects, macro-zooplankton, and small fish for larger adults to consume. Removing riparian vegetation contributes to higher water temperatures, increased sediment loads, decreased presence and recruitment of LWD, and decreased habitat suitability for bull trout.

In Washington State, bull trout may live for twelve years or more, may weigh over 20 pounds where adequate forage is available, and mature at age five after a relatively prolonged juvenile maturation period (WDFW, 2000). Adults begin to move upstream in April and most reach tributary streams in August, seeking cover in pools, with LWD, and with undercut banks until spawning which occurs during September and October (WDNR, 1997). Unlike salmon, bull trout are iteroparous; males may spawn multiple times and both sexes may spawn in successive or alternate years. After spawning, bull trout return to larger waterbodies (ocean, lake or mainstem river) depending on their life history (WDNR, 1997).

Bull trout express resident or migratory (fluvial, adfluvial or anadromous) life history strategies. Resident forms spend their entire life cycle in the tributary streams in which they spawn and rear, whereas migratory bull trout spawn in tributary streams where juvenile fish rear for 1 to 4 years before migrating to a lake, river or salt water (USFWS, 2015a). Resident and migratory forms may be found together and either form may give rise to offspring exhibiting either resident or migratory behavior.

Bull trout are believed to be glacial relicts. Spawning sites are often associated with the coldest streams in a watershed and may be located at cold water spring outflows (USFWS, 1999), with loose, clean gravel (USFWS, 2015a).

Population Status. WDFW (2004) evaluated population data for the Snohomish-Skykomish bull trout stock that inhabit the upper North Fork Skykomish River mainstem and tributaries. Based on redd counts, peak escapement counts of adults and fish trap counts at Sunset Falls on the South Fork Skykomish River from 1988 to 1997, WDFW classified the bull trout stock as healthy. Redd counts increased substantially between 1997 and 2002, but the recent trend (WDFW, 2011e) has been one of a declining population (see Figure 5.2-5). The decreasing trend (dashed line) in the figure is significant.

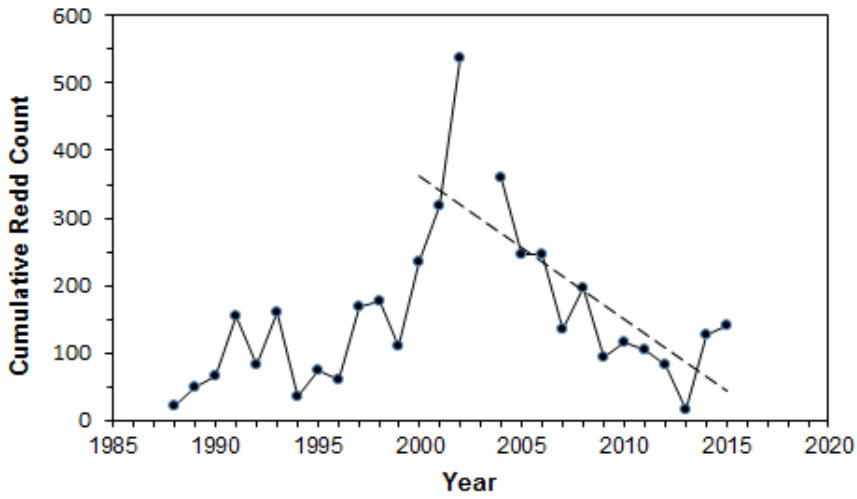


Figure 5.2-5
Estimates of Bull Trout Abundance in the Skykomish River since 1988 and Trend from 2000 to 2015.

Critical Habitat. USFWS (2005) designated critical habitat for bull trout, including those in the Coastal-Puget Sound DPS. A revision of critical habitat was finalized in 2010 (USFWS, 2010b), designating critical habitat in most of the same portions of the Snohomish River Basin as the 2005 designation. Critical habitat for bull trout has been designated in the Snohomish River but not in Evans Creek. No critical habitat was designated within the Middle Sammamish River Watershed. The USFWS (2010) identified nine PCEs with physical and biological features essential to bull trout conservation that consider water quality, migration corridors, food availability, in-stream habitat, water temperature, substrate characteristics, stream flow, water quantity and nonnative species. The nine PCEs are listed in further detail below.

1. Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a cold water source and provide thermal refugia.

2. Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.

3. An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.

4. Complex river, stream, lake, reservoir, and marine shoreline environments with multiple features including large woody debris, side channels, pools, and undercut banks that provide a variety of depths, gradients, velocities and structures.

5. Water temperatures ranging from 2 to 15°C (36 to 59°F), with adequate thermal refugia available if temperatures are at the upper end of the range.

6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size

from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions.

7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.

8. Sufficient water quantity and quality such that normal reproduction, growth, and survival are not inhibited.

9. Sufficiently low levels of occurrence of non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (brook trout); or competing (brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

5.2.3.2 Environmental Baseline

Species Presence. Bull trout do not occur in any of the North Lake Washington tributaries crossed by the Project. Bull trout utilize the Snohomish River mainstem as a migratory pathway by anadromous forms and for juvenile rearing by resident and anadromous fish (WDFW, 2016). Bull trout are presumed to occur in Evans Creek in the vicinity of the existing pipeline easement crossing (Haring, 2002). Salmonid habitats in the Project area are limited by multiple fish passage barriers, lack of riparian vegetation, water quality impairment due to agriculture, livestock access, surface runoff and presence of non-native fish that prey on native juvenile salmonids (Haring, 2002). Water temperatures in Evans Creek (see Figure 1.3-1) would likely be too warm for adult bull trout and juveniles at the time of construction.

Habitat. None of the North Lake Washington tributaries crossed by the Project provides habitat for bull trout. WDFW's SalmonScape (WDFW, 2016a) indicates that bull trout are presumed to be present in Evans Creek in the vicinity of the existing permanent easement. Habitat limiting factors in Evans Creek, a perennial waterbody, were evaluated in 2002 (Harring, 2002). Floodplain wetlands and riparian zones of Evans Creek are actively drained and farmed, with a proliferation of roads (Haring, 2002). Water quality in Evans Creek has been evaluated as at risk because of dairy cows' unrestricted access upstream from the Snohomish River floodplain. Riparian vegetation has been mostly removed where Evans Creek crosses the Snohomish River floodplain, which has been converted to agricultural lands. Riparian conditions improve upstream from the floodplain in the vicinity of the existing pipeline easement crossing of Evans Creek, 300 feet east of MP 1.94 and 63 feet east of the eastern end of the current Project's construction right-of-way.

Critical Habitat. Critical habitat for bull trout has been designated in the Snohomish River about 2.4 miles downstream from the existing pipeline easement crossing of Evans Creek but not in Evans Creek. No critical habitat is designated within the Middle Sammamish River Watershed.

5.2.3.3 Environmental Effects

Direct and Indirect Effects

There is a slight chance that construction of the Project could indirectly affect bull trout if present in the Action Area portion in Evans Creek.

Water for hydrostatically testing the 20-inch pipeline would be obtained from a municipal source that would be acquired from a hydrant located at MP 2.22 on the east side of Waverly Drive within TEWA 2.17-N. Once the hydrostatic test is complete, the test water would be discharged to the open field in TEWA 2.17-N north of the Fritch Forest Products Mill. The hydrostatic test water discharge would occur to the surface for infiltration in an upland area and would occur through an appropriately sized discharge structure. The discharge site is approximately 1,500 feet uphill from Evans Creek. However, Yew Way and Snohomish County Department of Parks and Recreation Rails to Trails intervene between the discharge site and Evans Creek so there would be little or no risk of hydrostatic water entering the creek. Hydrostatic test water would be discharged at a rate to prevent scour, erosion and sediment migration to sensitive resources such as wetlands and waterbodies.

Since Evans Creek would not be affected by in-stream construction, any effects due to turbidity and TSS would be a result of sediment runoff during precipitation events from construction activities on the eastern end of the current Project's construction right-of-way, located 63 feet from Evans Creek. However, Northwest has prepared an ECRP (see attachment A) to avoid such events.

Interrelated and Interdependent Effects. No interrelated or interdependent actions are associated with the Project.

Cumulative Effects. There are no actions by state or private entities known or reasonably certain to occur within the Action Area that would cumulatively affect bull trout.

Critical Habitat. There is no designated critical habitat for bull trout in the Aquatic Action Area.

5.2.3.4 Conservation Measures

Northwest would adhere to conditions in FERC's Plan and Procedures that are specifically designed to avoid or minimize effects to waterbodies and fisheries habitats. In addition, Northwest has prepared a Project-specific ECRP (see attachment A). These documents provide BMPs that would avoid, minimize and restore Project-related effects to fisheries resources and are not reiterated here.

Removal of trees within riparian zones would be a long-term impact, although riparian shrubs removed during construction are expected to be readily replaced by cuttings and sprigs of locally available species and through natural revegetation. As a general practice in riparian areas, shrubs and trees that must be removed during construction would be cut at ground level with the roots left in place, except where located within the pipeline trench. The cut tree and shrub roots would enhance revegetation efforts through root sprouting and regeneration. Although roots may decay overtime, streambank stability would be retained by their presence

and some of the roots may even regenerate, adding to streambank stability. By revegetating streambanks with riparian species, limited to shrubs on the ground directly over the pipeline, streambank stability would be enhanced over the long-term and would provide for stream shading, sediment intercept and input of detrital nutrients to the stream, all of which are key functions of riparian zones (WDNR, 2005). Where existing riparian vegetation (trees/shrubs) is present, a 25-foot wide riparian buffer on either side of the waterbody would be allowed to establish using native trees and shrubs to the same extent as any existing riparian vegetation adjacent to the permanent easement. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide would be maintained in an herbaceous state. Trees that are located within 15 feet of the pipeline would be cut and removed from the permanent easement consistent with Section V.D.1 of FERC's Procedures. Herbicides would not be used in or within 100 feet of a waterbody.

To comply with WDNR's Forest Practices, Northwest would develop an Alternate Plan.

In addition, project design components including timing, fish salvage (see attachment D) with relatively low risk to salmonids, and use of dry open-cut construction would minimize effects to all fisheries including listed salmonids and EFH.

5.2.3.5 Determination of Effects

Species. The Project **may affect** Coastal-Puget Sound DPS bull trout because:

- Bull trout may be present in Evans Creek during Project implementation.

The Project **is not likely to adversely affect** Coastal-Puget Sound DPS bull trout for the following reasons:

- Juvenile bull trout may be present within the Evans Creek portion of the Aquatic Action Area.
- Evans Creek would not be affected by in-stream construction and any effects due to turbidity and TSS would be a result of sediment runoff during precipitation events on construction sites proximate to Evans Creek. However, Northwest has prepared a project-specific ECRP (see attachment A) to avoid such events.
- Construction during July, August and September would coincide with expected high water temperatures which would likely preclude bull trout presence within the Aquatic Action Area.
- Based on the available information presented above, bull trout presence in the Aquatic Action Area is judged to be discountable (extremely unlikely to occur) or insignificant (the impact would never reach a scale where take occurs).

Critical Habitat. The Project would have **no effect** on designated critical habitat for Coastal-Puget Sound DPS bull trout because:

- The Project does not affect critical habitat associated with the Snohomish River, 2.4 miles downstream from the existing pipeline easement crossing of Evans Creek.

6.0 Essential Fish Habitat

The PFMC amended the Pacific Coast Salmon Plan to identify and describe EFH and adverse impacts and recommended conservation measures for Chinook salmon, coho salmon and Puget Sound pink salmon which are present in the Snohomish Hydrologic Unit 17110011 (PFMC, 1999). Likewise, the Pacific Coast Salmon Plan identified and described EFH and adverse impacts and recommended conservation measures for Chinook salmon, coho salmon and sockeye salmon which are present in the Lake Washington Hydrologic Unit 17110012. The MSFCMA describes EFH as waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity (NMFS, 1997). In freshwater, EFH for Chinook salmon, coho, sockeye and pink salmon includes habitats for spawning and incubation, juvenile rearing, juvenile migration corridors and adult migration corridors (and adult holding habitat for Chinook salmon; PFMC, 1999).

The Sustainable Fisheries Act of 1996 amended the MSFCMA and requires federal agencies, in part, to consult with NMFS about activities that may adversely affect EFH (NMFS, 1997). The MSFCMA established guidelines for Regional Fishery Management Councils to identify and describe EFH in FMPs to responsibly manage exploited fish and invertebrate species in federal waters. The PFMC developed a FMP that addresses EFH for Pacific salmon. The PFMC has amended the Pacific Coast Salmon Plan (PFMC, 1997) to identify and describe EFH and adverse impacts and recommended conservation measures for Chinook salmon, coho salmon and pink salmon (odd-year), which are present in the Snohomish Sub-basin and Chinook salmon, coho salmon, and sockeye salmon which are present in the Lake Washington Sub-basin (PFMC, 2016). Chinook salmon in both sub-basins were addressed above, and only EFH for coho, sockeye and pink salmon are discussed below.

6.1 Other Species with EFH

Coho Salmon. Coho within the Puget Sound/Strait of Georgia ESU were designated as a species of concern (SOC) in 2004. Washington State includes coho salmon as a priority species under the WDFW Priority Habitats and Species Project (WDFW, 2017). Coho utilize Evans Creek and Little Bear Creek for spawning (see Table 2.1-1). Coho spawning occurs in small, accessible tributaries to the Sammamish River in areas of mid-velocity water with small- to medium-sized gravel (WDFW, 2016a ; Sandercock, 1991).

Typically coho salmon begin their spawning migration as 3-year olds in late summer and fall and spawn by mid-winter. Adult coho salmon rarely migrate farther up freshwater streams greater than 150 miles and generally return to spawn at sites where they hatched. Returning to parental spawning grounds ensures repeated use of suitable redd sites (Sandercock, 1991). Eggs incubate for 1.5 to 4 months and then hatch and emerge from the gravel in the spring. Juveniles rear for about a year in freshwater before migrating in the spring to the ocean. Coho generally spend two growing seasons within the ocean before migrating back to their natal stream to spawn (Good et al., 2005). Approximate timing of life stages for coho in the Snohomish and Lake Washington sub-basins is summarized in Figure 6.1-1.

Life Stage/Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Coho Salmon Use in the Snohomish Sub-basin												
Upstream Adult Migration												
Adult Spawning												
Intragravel Development												
Juvenile Rearing												
Juvenile Out-Migration												
Coho Salmon Use in the Lake Washington Sub-basin												
Upstream Adult Migration												
Adult Spawning												
Intragravel Development												
Juvenile Rearing												
Juvenile Out-Migration												
Indicates period of activity.												
Sources: Williams et al., 1975												

Figure 6.1-1
Approximate Timing of Coho Salmon Use
in the Snohomish and Lake Washington Sub-basins

Preferred water temperatures during adult coho salmon upstream migration range between 45°F to 60°F (Laufle et al., 1986). The preferred range for juvenile survival is between 53°F to 58°F (Laufle et al., 1986). Water temperatures in Evans Creek (see Figure 1.3-1), Little Bear Creek (see Figure 1.3-3), North Creek (see Figure 1.3-6) and presumably in other waterbodies in the Project vicinity would likely be too warm for adult coho migrating upstream and possibly unsuitable for juvenile coho at the time of construction.

In 1992, WDFW rated the Snohomish coho stock as depressed due to multiple years of declining escapement estimates between 1983 and 1991 (see Figure 6.1-2) but numbers of returning coho increased through the 1990s, and in 2002 the stock was rated as healthy (WDFW, 2002). Since peaking in 2001 at an estimated 261,500 coho salmon (WDFW, 2011f), the trend in yearly escapement estimates has been declining and the number of coho estimated in 2015 was the lowest escapement during the period of record (see Figure 6.1-2). The decreasing trend (dashed line) iin the figure is significant. There are no data available for coho in the Lake Washington/Sammamish River tributaries.

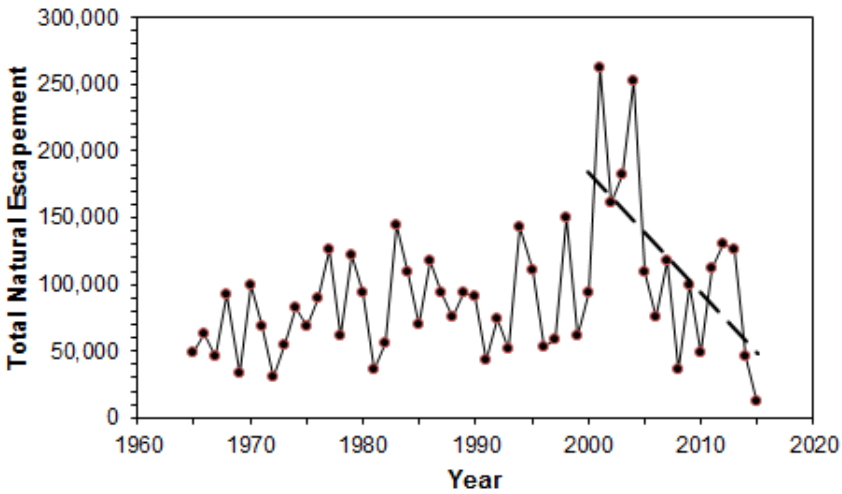


Figure 6.1-2
Estimates of Total Natural Coho Escapement for the Entire Snohomish River Basin since 1965 and Trend from 2000 to 2015.

It is not possible to estimate numbers of coho in Little Bear Creek that could be present and adversely affected by turbidity within the distances provided in Table 5.2-2. StreamNet (2012) provides lengths of streams occupied by species utilizing various stream segments as functional habitat: 1) migration only, 2) rearing and migration, and 3) spawning and rearing. Table 6.1-1 provides the total linear distances, in stream miles, of those habitats for coho salmon within the Lake Washington Sub-basin (HUC 17110012) and the relative importance of those habitats in Little Bear Creek.

Table 6.1-1
Extent (stream miles) of Coho Salmon Rearing and Spawning Habitats in Little Bear Creek Relative to the Species' Habitats in the Lake Washington Sub-basin (HUC 17110012)

Habitat	Drainage Area	Stream Miles of Habitat [1]	Percent of Habitat in Sub-Basin
Migration Only	Lake Washington Sub-basin	93.3 mi	N/A
	Little Bear Creek	0.44 mi	0.4%
Rearing and Migration	Lake Washington Sub-basin	51.8 mi	N/A
	Little Bear Creek	0.40 mi	0.8%
Spawning and Rearing	Lake Washington Sub-basin	155.1 mi	N/A
	Little Bear Creek	7.20 mi	4.6%
Source: StreamNet, 2012.			

This analysis suggests that numbers of coho potentially affected by turbidity generated during pipeline construction across Little Bear Creek would be a very small fraction of total numbers expected within the remaining Lake Washington Sub-basin during the time of construction. For example, from Table 6.1-2, the greatest in-stream distance for TSS concentrations above ambient levels in Little Bear Creek is 1.01 miles (5,322 feet, a worst-case estimate) generated by flumed construction in the short-term. Information provided in Table 6.1-2 estimates of the amount of in-stream habitat affected in August over that distance that would be utilized as migration habitat by coho; 14 percent of the available coho rearing and spawning habitat in Little Bear Creek could be affected. Alternatively, using dam & pump technology to

cross Little Bear Creek in August would affect 0.34 mile (1,827 feet) of rearing and spawning habitat used by coho (about 5 percent of the available habitat in Little Bear Creek).

Table 6.1-2
Percentages of Coho Rearing and Spawning Habitats in the Lake Washington Sub-basin and Streams Impacted by Turbidity Generated during In-stream Construction in Little Bear Creek

Month	Stream Crossing Method	Impact Distance	Percent of Habitat Affected[1]	
			Sub-Basin Habitat Extent	Stream Habitat Extent
July	Flume	4,137 ft	0.50%	10.88%
	Dam & Pump	1,220 ft	0.15%	3.21%
August	Flume	5,322 ft	0.65%	14.00%
	Dam & Pump	1,827 ft	0.22%	4.81%
September	Flume	1,594 ft	0.19%	4.19%
	Dam & Pump	0	0	0

[1] Sub-basin habitat extent = 155.5 miles; Stream habitat extent = 7.2 miles (StreamNet, 2012).
[2] Impact distances from Table 5.2-2.
[3] Sub-basin and stream habitat extents from Table 6.1-1.

Other scenarios for adverse effects by in-stream construction from fluming and dam & pump crossing methods during July, August and September in Little Bear Creek are provided in Table 6.1-2. However, these estimates do not consider that water temperatures in the waterbodies in the Project area would likely be too warm for juvenile coho salmon at the time of construction.

The analysis provided in Table 6.1-2 shows that constructing the pipeline across Little Bear Creek in September would minimize effects on coho EFH due to TSS concentrations if fluming is used. Constructing using dam & pump technology would likewise minimize effects from crossing Little Bear Creek in September.

There are no comparable data for any of the tributaries to North Creek or to Little Bear Creek that would allow similar levels of analysis for effects to fish in those waterbodies. Since Evans Creek would not be affected by in-stream construction, any effects due to turbidity and TSS would be a result of sediment runoff during precipitation events. However, Northwest has prepared an ECRP (see attachment A) to avoid such events.

Sockeye Salmon. Sockeye salmon are a species with Pacific Salmon EFH in the Lake Washington Sub-basin, not in the Snohomish Sub-basin. Sockeye were introduced into the Cedar River in the 1930s. Sockeye salmon runs in the Lake Washington Sub-basin have been larger than others outside of Alaska, even though the sub-basin has been heavily altered and urbanized; the Cedar River contributes the greatest proportion of sockeye in the Sub-basin (Kerwin, 2001). Sockeye spawning streams are usually associated with lakes because adults select spawning sites in streams flowing into the lake, in upper sections of the lake's outlet river or along the lake's shore with some level of flow through gravel substrates (Pauley et al., 1989).

After adults spend a period in a lake (up to eight months), adults move to their natal spawning areas. The time for egg incubation depends on water temperature; alevins remain in gravels for several weeks before emerging. Juveniles may migrate to natal lakes, forming schools that move between the lake surface and depths during the day, generally to avoid

predation (Pauley et al., 1989). Sockeye fry may spend from one to three years in rearing lakes (see Figure 6.1-3). Water temperatures between 54°F and 59°F are considered the preferred range for young sockeye (Pauley et al., 1989). Water temperatures in Little Bear Creek (see Figure 1.3-3) and North Creek (see Figure 1.3-6) average above 59°F during summer, June through August.

Life Stage/Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Upstream Adult Migration					■	■	■	■	■	■	■	
Adult Spawning	■								■	■	■	■
Intragravel Development	■	■	■	■					■	■	■	■
Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
Juvenile Out-Migration			■	■	■	■						
■ Indicates period of activity.												
Source: Williams et al., 1975;												

Figure 6.1-3
Approximate Timing of Sockeye Salmon Use in the Lake Washington Sub-basin

WDFW (2002) evaluated the Cedar River sockeye stock as depressed, due to chronically low escapement (WDFW, 2002). Counts of adult fish returning through the Ballard Locks fish ladder, located on the Ship Canal connecting Puget Sound to Lake Union and Lake Washington, were chronically low up through 2000 and have decreased since then (see Figure 6.1-4). Sockeye spawning has been documented in Little Bear Creek and North Creek in the Project area and are presumed or modeled to be present in most of the other perennial streams crossed (see Table 2.1-1).

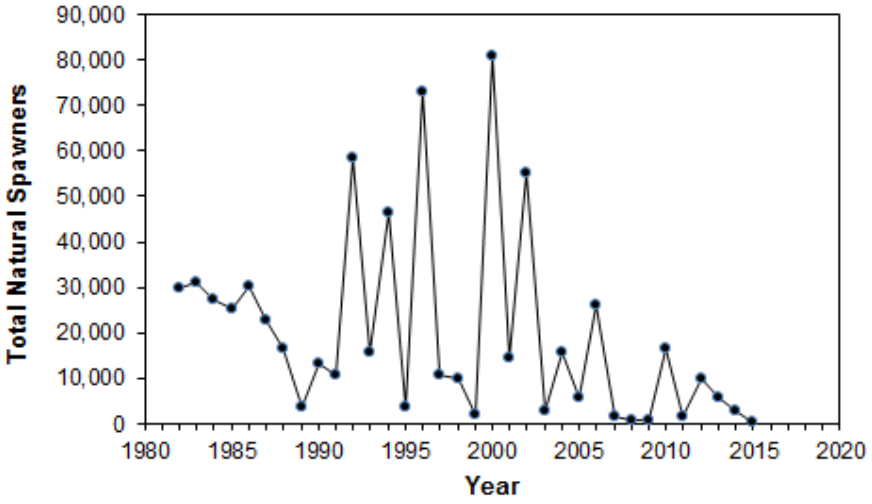


Figure 6.1-4
Estimates of Total Natural Sockeye Spawners in the Lake Washington/Sammamish Tributaries since 1982

It is not possible to estimate numbers of sockeye salmon in Little Bear Creek that could be present and adversely affected by turbidity within the distances provided in Table 5.2-2. StreamNet (2012) provides lengths of streams occupied by species utilizing various stream segments as functional habitat; 1) migration only, 2) rearing and migration, and 3) spawning and

rearing. Table 6.1-3 provides the total linear distances, in stream miles, of those habitats for sockeye salmon within the Lake Washington Sub-basin (HUC 17110012) and the relative importance of those habitats in North Creek and Little Bear Creek.

Table 6.1-3
Extent (stream miles) of Sockeye Salmon Rearing and Spawning Habitats in Little Bear Creek Relative to the Species' Habitats the Lake Washington Sub-basin (HUC 17110012)

Habitat	Drainage Area	Stream Miles of Habitat [1]	Percent of Habitat in Sub-Basin
Migration Only	Lake Washington Sub-basin	80.1 mi	N/A
	Little Bear Creek	0.80 mi	0.1%
Rearing and Migration	Lake Washington Sub-basin	0	N/A
	Little Bear Creek	0	-
Spawning and Rearing	Lake Washington Sub-basin	114.5 mi	N/A
	Little Bear Creek	8.27 mi	7.2%
Source: StreamNet, 2012.			

This analysis suggests that numbers of sockeye salmon potentially affected by turbidity generated during pipeline construction across Little Bear Creek would be a very small fraction of total numbers expected within the remaining Lake Washington Sub-basin during the time of construction. For example, from Table 6.1-4, the greatest in-stream distance for TSS concentrations above ambient levels in Little Bear Creek is 1.01 miles (5,322 feet, a worst-case estimate) generated by flumed construction in the short-term. Information provided in Table 6.1-4 provides estimates of the amount of in-stream habitat affected in August over that distance that would be utilized as migration habitat by sockeye; 12 percent of the available sockeye rearing and spawning habitat in Little Bear Creek could be affected. Alternatively, using dam and pump technology to cross Little Bear Creek in August would affect 0.35 mile (1,827 feet) of rearing and spawning habitat used by sockeye (about 4 percent of the available habitat in Little Bear Creek).

Table 6.1-4
Percentages of Sockeye Rearing and Spawning Habitats in the Lake Washington Sub-basin and Streams Impacted by Turbidity Generated during In-stream Construction in Little Bear Creek

Month	Stream Crossing Method	Impact Distance	Percent of Habitat Affected[1]	
			Sub-Basin Habitat Extent	Stream Habitat Extent
July	Flume	4,137 ft	0.68%	9.44%
	Dam & Pump	1,220 ft	0.20%	2.80%
August	Flume	5,322 ft	0.88%	12.14%
	Dam & Pump	1,827 ft	0.30%	4.19%
September	Flume	1,594 ft	0.26%	3.65%
	Dam & Pump	0	0	0

[1] Sub-basin habitat extent = 114.5 miles; Stream habitat extent = 8.3 miles (StreamNet, 2012).
[2] Impact distances from Table 5.2-2.
[3] Sub-basin and stream habitat extents from Table 6.1-3.

Other scenarios for adverse effects by in-stream construction from fluming and dam and pump crossing methods during July, August and September in Little Bear Creek are provided in

Table 6.1-4. However, these estimates do not consider that water temperatures in the waterbodies in the Project area would likely be too warm for sockeye salmon at the time of construction.

The analysis provided in Table 6.1-4 shows that constructing the pipeline across Little Bear Creek in September would minimize effects on sockeye EFH due to TSS concentrations if fluming is used. Likewise, constructing using dam and pump technology would minimize effects from crossing Little Bear Creek in September.

Pink Salmon (Odd-Year). Pink salmon are a species with Pacific Salmon EFH in the Snohomish Sub-basin, not in the Lake Washington Sub-basin. Pink salmon have a 2-year life cycle; their runs (stocks) are characterized as either odd-year or even-year, depending on when they return to natal streams, and individuals of one run do not interbreed with those of the other (Bonar et al., 1989). Pink salmon spawn in the fall when water temperatures range from 46 to 57°F. As indicated in Figure 6.1-5, juvenile rearing and juvenile out-migration to salt water occur very soon after fry emerge from incubating in spawning gravels (Bonar et al., 1989).

Life Stage/Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Upstream Adult Migration												
Adult Spawning												
Intragravel Development												
Juvenile Rearing												
Juvenile Out-Migration												
Indicates period of activity.												
Source: Williams et al., 1975												

Figure 6.1-5
Approximate Timing of Odd-Year Pink Salmon Use in the Snohomish Basin

Odd-year and even-year runs of pink salmon spawn in the mainstem of the Snohomish, Skykomish and Snoqualmie rivers. Odd-year pink salmon also spawn in larger tributaries to the Skykomish and Snoqualmie rivers (WDFW, 2002 and 2010b). WDFW has modeled Evans Creek for potential pink salmon presence (see Table 2.1-1). Pink salmon are not present in the Lake Washington Sub-basin.

6.2 Effects to Essential Fish Habitat

Direct and Indirect Effects. In the Aquatic Action Area, available data indicate that EFH is present in Evans Creek, North Creek and Little Bear Creek, all of which support spawning habitat for Chinook salmon and coho salmon. Sockeye spawning habitat is also present in North Creek and Little Bear Creek.

Effects to Pacific Salmon EFH include the effects to habitat required to support a species' spawning, breeding, feeding or growth to maturity during the full life cycle. As discussed above for Chinook salmon and steelhead, the Project may:

- Interfere with key life history functions for fall Chinook salmon, coho and sockeye salmon.

- Generate turbidity during dry open-cut stream crossings, which can adversely affect resident and anadromous salmonids.
- Accidentally release fuels or other petroleum products into surface waters, which can adversely affect all fish species and other aquatic organisms.
- Remove riparian vegetation which could reduce shade and increase water temperatures.
- Apply herbicides to control noxious weeds, which may adversely affect fish.
- Salvage fish from isolated construction sites. Some fish species are considered vulnerable to electrofishing, subject to injury and mortality. If fish remaining in isolated construction sites are not salvaged, they may be killed by stranding, entrainment and impingement during dewatering of construction zones.

The same conservation measures described in this BA for listed fish species apply to mitigate effects to EFH.

Cumulative Effects. Cumulative effects associated with the Project are unlikely to affect EFH. Any cumulative impacts associated with other projects planned in the vicinity of the Project would be required to comply with existing or emerging development standards required to protect habitat for fish species. These standards are intended to protect water quality, hydrologic conditions, estuarine shallow water and deepwater habitat conditions.

6.3 EFH Effects Determination

Adverse effects to Pacific Coast Salmon EFH include the direct or indirect physical, chemical or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. As determined for ESA fish species (Chinook salmon and steelhead) in this BA, the Project "**may adversely affect**" freshwater Pacific Coast Salmon EFH.

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Attachment A

Erosion Control and Revegetation Plan

Attachment B

Spill Plan for Oil and Hazardous Materials

Appendix C

Fluming and Dam and Pump Procedures

Attachment D

Fish Salvage Plan

Attachment A

Erosion Control and Revegetation Plan

Northwest Pipeline LLC

Erosion Control and Revegetation Plan (ECRP)

North Seattle Lateral Upgrade Project

May 2017

Table of Contents

1.0 Introduction ... 1
1.1 Project Summary ... 1
1.2 Schedule ... 1
2.0 Site Description ... 2
2.1 Existing Site Conditions ... 2
2.2 Proposed Construction Activities ... 2
2.2.1 Pre-Construction Survey ... 3
2.2.2 Clearing and Grading ... 3
2.2.3 Installation of Erosion Control BMPs ... 4
2.2.4 Topsoil Segregation ... 4
2.2.5 Trenching and 8-inch Mainline Lateral Removal/Backfilling ... 4
2.2.6 Retrenching and 20-inch Mainline Lateral Replacement/Backfilling ... 5
2.2.7 Hydrostatic Testing ... 5
2.2.8 Restoration ... 5
3.0 Best Management Practices ... 5
3.1 Temporary Erosion Control Procedures ... 7
3.1.1 Construction Ingress and Egress ... 7
3.1.2 Sediment Barriers ... 7
3.1.3 Temporary Slope Breakers ... 8
3.1.4 Mulch ... 8
3.1.5 Erosion Control Fabric ... 8
3.1.6 Dust Control ... 9
3.1.7 Waterbody Crossings ... 9
3.1.8 Wetland Crossings ... 10
3.1.9 Spill Prevention and Equipment Fueling and Maintenance ... 11
3.1.10 Material Delivery and Storage ... 11
3.2 Permanent Erosion Control Measures ... 12
3.2.1 Trench Breakers ... 12
3.2.2 Permanent Slope Breakers ... 12
3.2.3 Soil Compaction ... 12
3.2.4 Revegetation ... 12
4.0 Maintenance and Evaluation ... 13
5.0 Hydrostatic Test Water and Dewatering ... 13
5.1 Hydrostatic Testing ... 13
5.2 Dewatering ... 13
5.3 Hydrostatic and Trench Water Discharge ... 13
6.0 Non-Stormwater Discharges ... 14
7.0 Restoration and Revegetation ... 14
7.1 Recontouring ... 14
7.2 Construction Debris Disposal ... 15
7.3 Soil Compaction ... 15
7.4 Scarification ... 15
7.5 Soil Replacement ... 15
7.6 Rock Removal ... 16
7.7 Seedbed Preparation ... 16
7.8 Fertilization ... 16
7.9 Seed Mixtures and Supplemental Plantings ... 16
7.10 Seeding Timing ... 17
7.11 Seeding Methods ... 17
7.12 Supplemental Wetland and Riparian Plantings ... 17
7.13 Mulch ... 19
7.14 Residential Landscaping ... 19
7.15 Grazing Deferments ... 20
7.16 Noxious Weeds ... 20
7.17 Monitoring and Maintenance ... 21
8.0 References ... 22

List of Tables

Table 7.9-1 Recommended Seed Mixtures 18
Table 7.12-1 Native Shrub and Tree Plantings for Restoring Riparian Areas 19

List of Attachments

Attachment A FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
Attachment B FERC's Wetland and Waterbody Construction and Mitigation Procedures
Attachment C BMP Typicals

List of Abbreviations

BMP	best management practice
CWF	certified weed free
DOT	U.S. Department of Transportation
ECRP	Erosion Control and Revegetation Plan
EI	Environmental Inspector
FERC	Federal Energy Regulatory Commission
HPA	Hydraulic Project Approval
MP	milepost
Northwest	Northwest Pipeline LLC
NRCS	Natural Resource Conservation Service
OHWM	ordinary high water mark
PLS	pure live seed
Project	North Seattle Lateral Upgrade Project
SCS	Soil Conservation Service
Spill Plan	Spill Plan for Oil and Hazardous Materials
TEWA	temporary extra work area
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources

1.0 INTRODUCTION

This Erosion Control and Revegetation Plan (ECRP or Plan) outlines the erosion control and revegetation procedures that Northwest Pipeline LLC (Northwest) will utilize during construction of the North Seattle Lateral Upgrade Project (Project) in Snohomish County, Washington to minimize erosion and sedimentation and enhance revegetation success on all lands affected by the Project. The revegetation measures outlined in this ECRP have been prescribed to stabilize disturbed areas and to revegetate the construction right-of-way and temporary extra work areas (TEWAs) to a condition which supports the preconstruction land uses as quickly as possible following construction.

This Plan was developed using the Federal Energy Regulatory Commission's (FERC's) Upland Erosion Control, Revegetation, and Maintenance Plan (Upland Plan) and FERC's Wetland and Waterbody Construction and Mitigation Procedures (Wetland and Waterbody Procedures) (see Attachments A and B). FERC's Upland Plan and Wetland and Waterbody Procedures have been developed specifically for linear pipeline projects with the intent to minimize the extent and duration of project-related disturbance and to minimize erosion and enhance revegetation success. The Upland Plan and Wetland and Waterbody Procedures were developed through a public process which included input from state, federal, and local agencies, industry, and the general public. In addition, the ECRP incorporates recommendations provided by the Natural Resource Conservation Service (NRCS) to prevent, to the maximum extent practical, the transport of sediment from the Project site to drainage facilities, water resources, and adjacent properties.

1.1 Project Summary

The Project will involve construction activities associated with the removal and replacement of up to 6.85 miles of 8-inch diameter pipeline with 20-inch diameter pipeline. The Project will occur primarily within Northwest's existing right-of-way established for the North Seattle 8-inch mainline and 16-inch lateral. The Project will require a new appurtenance and existing appurtenance modifications to tie the proposed 20-inch diameter replacement pipeline into the existing 20-inch pipeline. The new appurtenance and existing appurtenance modifications will be installed within the construction right-of-way and will be permanently stabilized with gravel; therefore, these aboveground facilities are not discussed further in this Plan. The measures outlined in this plan will be used to restore/revegetate the existing aboveground facility (launcher/receiver/block valve and crossover) at milepost (MP) 2.20 that will be removed and the land reclaimed and relinquished to the landowner, unless the landowner requests the site remain graveled.

1.2 Schedule

Northwest proposes to commence construction of the Project in summer 2019 to take advantage of the dry construction season and place the new facilities in service by November 2019. The proposed schedule will minimize potential landowner and environmental effects and facilitate safe and efficient construction.

2.0 SITE DESCRIPTION

2.1 Existing Site Conditions

The Project is located within the Puget Sound Basin portion of the Puget Trough Province, a glaciated depression. The Project generally traverses gentle to moderately sloping glacial terrain, with elevations ranging from about 195 to 610 feet. Generally, the Project traverses a mix of forested and rural residential terrain from MPs 1.94 to 5.8 and densely populated residential areas from MP 5.8 to the west end at MP 8.79.

The climate of the Project area is greatly tempered by winds from the Pacific Ocean. Summers are fairly warm, but hot days are rare. Winters are cool; snow and freezing temperatures are not common. During summer, rainfall is extremely light, averaging 1-2 inches. Several weeks in summer often pass without precipitation. During the rest of the year rains are frequent, especially late in fall and in winter.

In the winter, the average temperature is approximately 40°F and the average monthly minimum temperature is about 34°F for the cities of Everett and Monroe, Washington. In the summer, the average temperature is about 60-63°F, and the average monthly maximum temperature is approximately 72-75°F. Total annual precipitation ranges from 36 inches in Everett to 47 inches in Monroe. Of the total annual precipitation, about 30 percent usually falls during April through September, which includes the growing season for most crops. The average snowfall is approximately 8 inches (Western Regional Climate Center, 2017a and 2017b and Soil Conservation Service [SCS], 1983). In most winters one or two storms in the Project area bring strong and sometimes damaging winds, and in some years the accompanying heavy rains cause serious flooding (SCS, 1983).

The Project will affect 19 waterbodies, seven of which are assumed to be perennial, although flows are very limited during the summer when construction is scheduled. Construction activities will also affect 8.68 acres of wetlands in 23 systems.

2.2 Proposed Construction Activities

The Project will be designed, constructed, operated and maintained in accordance with the U.S. Department of Transportation (DOT) regulations in 49 CFR Part 192, *"Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards;*" FERC regulations in 18 CFR Part 380.15, "*Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights-of-Way and the Construction of Aboveground Facilities;*" and other applicable federal, state and local regulations. Northwest will also construct and reclaim the pipeline and aboveground facilities in accordance with FERC's Upland Plan (see Attachment A) and FERC's Wetland and Waterbody Procedures (see Attachment B). Where exceptions to FERC's Upland Plan and Wetland and Waterbody Procedures have been identified, modifications have been requested (see Resource Report 1).

Pipeline construction will primarily occur between late spring and early fall in 2019. Northwest will prepare to receive materials and pipe at a contractor and pipe yard in the spring of 2019. Reclamation will occur during the late summer or early fall of 2019. The construction sequence is as follows with each sequence described in more detail in the following sections:

- Pre-Construction Survey;
- Clearing and Grading;
- Installation of Erosion Control Best Management Practices (BMPs);
- Topsoil Segregation;

- Trenching and 8-inch Mainline Lateral Removal/Backfilling;
- Retrenching and 20-inch Mainline Lateral Replacement/Backfilling;
- Hydrostatic Testing; and
- Restoration.

2.2.1 Pre-Construction Survey

The limits of disturbance will be clearly marked/staked prior to construction including the construction right-of-way, TEWAs, access roads, and staging/stockpile areas. Utility lines or other foreign lines and drain lines will be located and marked to prevent accidental damage during pipeline construction. Sensitive areas to be protected from disturbance will be marked with t-post and brightly colored flagging or construction fence so as to be clear to equipment operators. These areas will also be shown on the Environmental Alignment Sheets and presented during pre-construction environmental training. Equipment will only be allowed to enter and operate within the delineated limits of disturbance and access roads. Flagging, signs, and other markings identifying the limits of disturbance will be maintained through all phases of construction and routinely checked by the Environmental Inspector (EI). Construction will generally use a 100-foot wide construction right-of-way, with additional TEWAs required at designated locations such as at road or waterbody crossings and other areas where additional staging areas are required. However, a number of areas will require the construction right-of-way to be reduced to 75-feet in width, such as through wetland and waterbody crossings and in residential areas to minimize disturbance. Where feasible, based on site-specific conditions and engineering constraints, TEWAs have been located at least 50 feet away from wetland and waterbody boundaries to minimize impacts to wetland buffers and riparian areas consistent with FERC's Wetland and Waterbody Procedures.

2.2.2 Clearing and Grading

The flagged limits of disturbance will be maintained throughout all construction phases and will be monitored by Northwest's EI so activities are restricted to the certificated limits. Brush and trees within the construction right-of-way and TEWAs will be felled or sheared so as to prevent damage to adjacent trees and structures and will be felled away from wetlands and waterbodies. Any debris entering a waterbody as a result of felling and yarding of timber will be removed as soon as practical after entry into the waterbody. Any logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed, unless they prevent trenching and fluming operations. Any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody during bank restoration after the pipeline has been installed and backfilling is complete.

Logs and slash will not be yarded across Washington Department of Natural Resources (WDNR) Type F streams and, where possible, across WDNR Type N streams. Where temporary crossing of Type N streams is necessary, the direction of log movement between stream banks will be designed to minimize sediment delivery to streams. Logs and slash will not be stored in wetlands and, where feasible, logs yarded out of wetlands or riparian areas will be skidded with at least one end suspended from the ground so as to minimize soil disturbance. The logs will be transported to minimize damage to adjacent trees and vegetation, where possible. All clearing operations near waterbodies will follow conditions specified in the Project's Hydraulic Project Approval (HPA) issued by the Washington Department of Fish and Wildlife (WDFW) and the Forest Practices approvals issued by WDNR.

No vegetation will be cleared outside the certificated construction right-of-way and TEWAs. Grading of the construction right-of-way in upland areas will be limited to the minimum required to provide a safe working area necessary to construct the pipeline. Vegetation in wetlands will be cut off at ground level, leaving existing root systems in place. Pulling of tree stumps and

grading activities will be limited to directly over the trench. Northwest will not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless it is determined that safety-related construction constraints require removal of tree stumps from under the working side of the construction right-of-way. Minimizing stump and root system removal will accelerate restoration efforts by allowing sprouting species to reestablish from existing root systems.

2.2.3 Installation of Erosion Control BMPs

On recent Northwest projects, temporary erosion control measures have been installed immediately after clearing and prior to grading (initial soil disturbance). Installation of temporary erosion control measures prior to clearing is ineffective because the brush must be cleared to allow installation and because the BMPs are frequently damaged or removed by the clearing activities and must be re-installed. All erosion control devices will be routinely inspected and any damaged or temporarily removed structures will be replaced at the end of each working day. Temporary erosion control measures will be maintained until successful revegetation has been achieved. Section 3.1 describes in detail the temporary erosion control procedures that will be implemented during Project construction to minimize potential impacts from erosion and sedimentation.

2.2.4 Topsoil Segregation

The potential mixing of topsoil with subsoil from construction activities could result in a loss of fertility of the soil. To prevent mixing of the soil horizons or incorporation of excess rock into the topsoil, topsoil segregation will be performed. FERC's Upland Plan requires topsoil segregation in 1) all residential areas, 2) actively cultivated or rotated agricultural lands, 3) pastures and hayfields, and 4) other areas at the landowner’s request. In these areas, FERC's Upland Plan requires either full right-of-way or trench and subsoil storage area stripping. Segregated topsoil will be stockpiled separately from subsoil in accordance with FERC’s Upland Plan.

In wetland areas, FERC’s Wetland and Waterbody Procedures generally require the top 12 inches of topsoil over the trench to be salvaged, except in areas where standing water or saturated soils are present. Areas where topsoil segregation will occur are shown on the Environmental Alignment Sheets.

2.2.5 Trenching and 8-inch Mainline Lateral Removal/Backfilling

To remove the 8-inch mainline, the trench will be excavated with track-hoes or similar equipment. Once the 8-inch pipeline has been sufficiently exposed, at strategic locations the trench will be excavated wider to allow welders to safely enter the trench to cut the pipe for removal. After the pipe is cut, the 8-inch pipeline sections will be removed from the trench with side booms, track-hoes or similar equipment and carried to load out areas where the pipe will be hauled to an approved scrap or recycling facility. After the 8-inch pipeline has been removed, the trench will be temporarily backfilled with the trench spoil materials until re-excavation activities commence for installation of the 20-inch pipe.

Prior to removing the 6.85-mile section of the 8-inch mainline, the 8-inch will be cleaned by running foam/swab pigs through it from MPs 2.2 to 11.14. The pigs will be received at the existing pig launcher/receiver facility located at MP 11.14. Any waste material generated during the cleaning operations will be captured and disposed of according to federal and state requirements. Northwest does not expect there to be much waste material to capture from cleaning the 8-inch since it is scheduled for a hydrotest to meet Pipeline and Hazardous Materials Safety Administration requirements in the summer of 2017. The cleaning pig will remove any remaining waste material that may be in the 8-inch pipeline prior to removal and abandonment.

2.2.6 Retrenching and 20-inch Mainline Lateral Replacement/Backfilling

After the 8-inch mainline has been removed, the trench will be re-excavated in preparation for installation of the 20-inch replacement pipeline. After trenching is complete, the 20-inch pipeline sections will be strung along the trench, bent to fit the contour of the trench bottom, aligned, welded together and placed on temporary supports. All welds will be visually and radiographically inspected and repaired, if necessary. Line pipe, normally mill-coated prior to stringing, will require field-applied coating at the welded joints prior to final inspection. The entire pipeline coating will be inspected and tested to locate and repair any faults or voids. The pipe assembly will then be lowered into the trench by side-boom tractors, and the trench will be backfilled using a backfilling machine or bladed equipment. No foreign substance, including skids, welding rods, containers, brush, trees or refuse of any kind, will be permitted in the backfill.

After installation of the 20-inch pipeline and prior to backfilling, Northwest will install trench plugs (see Figure 13 Attachment C), consistent with the requirements of FERC's Upland Plan (see Section V.B.1). Trench plugs will be installed at the base of slopes adjacent to wetlands and waterbodies and where needed to avoid draining of wetlands. Trench plugs may be constructed from sandbags, foam or bentonite. Topsoil will not be used to fill the bags. Trench plugs will be installed on slopes to minimize water flow down the trench to prevent potential subsurface erosion and to maximize stability.

2.2.7 Hydrostatic Testing

The pipeline will be hydrostatically tested in accordance with DOT regulations to ensure that the system is capable of operating at the design pressure. Should a leak occur, the line would be repaired and retested until the pressure test specifications are achieved. Hydrostatic test water will be discharged in a manner to prevent erosion from scour and to prevent sedimentation of adjacent wetlands or waterbodies. The test water will be discharged into a structure to dissipate energy and to allow sheet flow (see Figure 15 Attachment C). Northwest will discharge all hydrostatic test water in an upland field in TEWA 2.17-N which is at an appropriate distance to ensure that all water infiltrates and does not flow into a wetland or waterbody.

2.2.8 Restoration

After the pipeline is backfilled and tested, disturbed areas will be restored, as closely as possible, to their original contours. Permanent erosion control measures will be installed as discussed in Section 3.2 of this Plan and revegeation will be performed as outlined in Section 7.0.

3.0 BEST MANAGEMENT PRACTICES

This Plan will be used by contractors as a primary construction reference for the Project. It provides site-specific directions for installing temporary and permanent erosion control measures (e.g., BMPs) to prevent or minimize erosion. Attachment C provides drawings of typical BMPs that may be used during construction. BMP materials will be stored onsite or at a contractor yard.

Northwest will employ one EI for the Project. The EI will be onsite during active construction and will have peer status with all other activity inspectors. The EI will have authority to stop activities that violate the measures set forth in this Plan or that fail to comply with conditions of other authorizations and will have the authority to order corrective action. At a minimum, the EI will be responsible for:

- Ensuring compliance with the measures set forth in this Plan, the requirements of FERC's Upland Plan, FERC's Wetland and Waterbody 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 right-of-way and TEWAs;
- Identifying erosion/sediment control and stabilization needs in all areas;
- Locating dewatering structures and slope breakers to ensure they will not cause erosion or direct water into sensitive resource areas;
- Verifying that trench dewatering activities are located such that water is allowed to infiltrate whenever possible, turbid water does not reach waters of the state, and dewatering does not result in the deposition of sand, silt, and/or sediment. If such deposition is occurring, the dewatering activity will be stopped and corrective action taken to prevent reoccurrence;
- Testing subsoil and topsoil in pastures 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 or soil mixing;
- Ensuring restoration of contours and topsoil;
- Approving imported soils for use in residential areas and verifying that the soil is certified free of noxious weeds and soil pests;
- Determine 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 controls prior to a predicted storm event whenever possible and installing additional measures as needed to control storm water and sediment;
- 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. Inspections will be recorded and records maintained for review upon request.
- Ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours of identification;
- Keeping records of compliance with conditions of all environmental permits and approvals (including the measures set forth in this Plan) during active construction and restoration;
- Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and
- Verify the locations of disposal of excess construction materials for beneficial reuse to ensure disposal does not result in environmental impact and is in compliance with applicable surveys, landowner approval and permit requirements.

3.1 Temporary Erosion Control Procedures

Temporary erosion controls will be installed immediately after initial disturbance (clearing) and will be properly maintained throughout construction and reinstalled as necessary until replaced by permanent erosion controls or until restoration is complete. Near waterbodies and wetlands, it will be determined in the field by the EI if it is necessary to install temporary erosion control measures (i.e., sediment barriers) prior to initial disturbance to minimize the potential for sediment to enter a wetland or waterbody.

3.1.1 Construction Ingress and Egress

Northwest has identified general locations of ingress/egress points to the construction right-of-way using existing public and private roads that are crossed by the right-of-way. These ingress/egress points are shown on the Environmental Alignment Sheets as “Access Roads.” traffic will move along the construction right-of-way within the construction right-of-way and TEWAs.

Locations of the construction entrance pads from main public roads and thoroughfares are shown on the Environmental Alignment Sheets. However, because it is difficult to determine the exact locations of construction entrance pads until the time of construction due to the construction contractors use (ingress/egress) of the construction right-of-way and TEWAs, adjustments and additions to the locations shown will likely be required. Ultimately, as determined by the EI, Northwest will install construction entrance pads at all construction right-of-way access points that intersect paved roads to reduce sediment transport onto the roadway. A typical drawing of a construction entrance access pad is provided as Figure 1 in Attachment C.

3.1.2 Sediment Barriers

Sediment barriers will be used to confine sediment to the construction right-of-way and TEWAs and will be constructed of either silt fence or certified weed free (CWF) straw bales or CWF straw wattles (see Figures 2 and 7 in Attachment C). Generally, silt fence will be used where sediment barriers are required parallel to the construction right-of-way and/or TEWAs. Straw bales will generally be used in locations where sediment barriers are required to cross the construction right-of-way along the travel lane such as at waterbody and wetland crossings. Straw wattles may be used in appropriate areas as determined by the EI to reduce run-off velocity and confine sediment to the construction right-of-way and TEWAs. These structures will generally be placed as follows:

- at the base of slopes adjacent to road, wetland and waterbody crossings where sediment could flow from the construction right-of-way and/or TEWAs onto the road surface or into the wetland or waterbody;
- adjacent to wetland and waterbody crossings, as necessary, to prevent sediment flow in the wetland consistent with the requirements of FERC's Wetland and Waterbody Procedures; and
- on the down slope side of the right-of-way and TEWAs where they traverses steep side slopes.

Figure 3 in Attachment C shows the placement of temporary sediment barriers adjacent to road crossings, including the use of drivable berms. Figures 4 and 5 in Attachment C also detail typical temporary erosion control installations at open cut and bored road crossings. An example of sediment control in ditches and swales is shown on Figure 6 in Attachment C. Straw wattles/logs (see Figure 7) may also be utilized along the construction right-of-way in

appropriate applications, as determined by the EI. Examples of sediment barrier installations during construction at wetlands and streams are shown on Figure 8.

The EI will inspect temporary erosion control structures at least on a daily basis in areas of active construction and equipment operation. In areas where active construction and equipment operation are not occurring, inspections will be made at least weekly. All structures will be inspected by the EI within 24 hours of 0.5 inch or greater of rainfall, however, state and other local jurisdictions may require more frequent inspection of erosion control structures. The EI will be responsible for ensuring that ineffective temporary erosion control measures are repaired within 24 hours of discovery, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts. Whenever possible, the EI will inspect erosion control measures in advance of predicted storm events and take preventative measures to minimize the potential for off right-of-way sedimentation.

Temporary sediment barriers will be maintained in place until permanent revegetation measures are successful or until the upland areas adjacent to wetlands, waterbodies or roads are stabilized. The structures will be removed once the area has been successfully restored.

3.1.3 Temporary Slope Breakers

Northwest will install temporary slope breakers to reduce runoff velocity and concentrated flow and to divert water off the construction right-of-way to avoid excessive erosion (see Figure 9 in Attachment C). Temporary slope breakers may be constructed of materials such as soil, silt fence, staked straw bales or sand bags. The outfall of each temporary slope breaker will be to a stable, well-vegetated area or to an energy-dissipating device at the end of the slope breaker and off the construction right-of-way. The outfall of the slope breakers will be positioned to avoid sedimentation of wetlands, waterbodies and other sensitive areas. Northwest consulted with the Natural Resources Conservation Service (NRCS, 2017) regarding spacing of temporary and permanent slope breakers; however, the NRCS did not provide spacing recommendations. Therefore, Northwest will install temporary slope breakers on all slopes greater than 5 percent based on the typical spacing provided on Figure 11 (see Attachment C) unless the EI determines that a closer spacing is necessary. On slopes between 5 and 15 percent, straw wattles/logs (Figure 7) may be utilized, as determined by the EI.

3.1.4 Mulch

Although not expected, if it becomes necessary to delay final cleanup, including final grading and installation of permanent erosion control measures, beyond 20 days (10 days in residential areas) after the trench is backfilled in a specific area, Northwest will apply mulch on all disturbed slopes before seeding. Mulch will also be applied if construction and restoration activities are interrupted for extended periods. In these areas mulch will be applied uniformly over the area to cover the ground surface at a rate of two tons/acre of CWF straw. In addition, the mulch application rate will also be increased to 3 tons/acre on steep slopes and all slopes within 100 feet of waterbodies and wetlands. The mulch will consist of CWF straw or wood fiber hydromulch.

3.1.5 Erosion Control Fabric

Northwest will install erosion control fabric (such as jute or excelsior) on stream banks at the time of recontouring (see Figure 10 in Attachment C). The fabric will be anchored using staples or other appropriate devices. The erosion control fabric to be used on stream banks and steep slopes will be designed for the proposed use and will be approved by the EI.

3.1.6 Dust Control

During the summer, fugitive dust may be a potential impact along the construction right-of-way, especially in residential areas. In general to control dust, the EI will control traffic speeds and direct watering, if necessary. Watering trucks will spray only enough water to control the dust or to reach the optimum moisture content of the soil for compaction. Run-off will not be generated during this operation. Dust will be controlled on paved roadways by sweeping (either by machine or hand). During sweeping the EI will determine if water needs to be sprayed to better control dust. Any sediment generated from sweeping will be disposed of properly. Water for dust control will be obtained from a municipal source.

As outlined in Resource Report 9 to minimize wind erosion and fugitive dust emissions during construction, Northwest will, where necessary, implement the following reasonably available control measures:

- Disturb no more earth than required for construction to occur;
- Depending on climate conditions during construction, Northwest will suppress dust on disturbed sites by spraying water from trucks. The amount of water required for dust suppression will depend on factors such as rainfall, wind, soil type and amount of exposed disturbance. The construction right-of-way, laydown areas and temporary roads may require water at least daily in areas of active construction, as determined by the EI. In areas of excessively dust-prone soils or road surfaces, the frequency of watering will be increased to prevent off-property transport of visible fugitive particulate emissions;
- Control Project-related traffic speeds on dirt access roads to no more than 20 mph;
- Speeds on the construction right-of-way will be reasonable and prudent. The speed limit will be 15 mph;
- Speed limits will decrease when excessive winds prevail and where sensitive areas such as public roads may be adjacent to access roads or the construction right-of-way;
- Speed limit signs will be maintained for the duration of the construction activities and will be placed where access roads intersect with the construction right-of-way. Signs will be designed to endure weather conditions and will be posted in a non-obscured, visible manner;
- Temporarily stockpiled soils will be watered to create a semi-hard protective layer to minimize wind erosion, if necessary and as determined by the EI. This treatment would occur once after the trench has been excavated;
- No earthwork activities will be performed when the wind speed exceeds 30 miles per hour if it results in off-property transport of visible fugitive particulate emissions; and
- Gravel access pads will be utilized to prevent mud and dirt carryout on to paved surfaces.

Northwest will ensure that wind erosion best management practices will be in place during forecasted high wind (greater than 25 mph) weather advisories.

3.1.7 Waterbody Crossings

Waterbody crossings will be completed using dry open cut procedures (dam and pump or flume) (see Figure 11 in Attachment C) consistent with the requirements of federal, state and local agencies with specific authority to regulate Project impacts. Resource Report 2 also provides detailed procedures for these crossing methods (see Appendices 2B and 2C).

Waterbody crossings will be made within the previously disturbed right-of-way and trench which was excavated to install the original 8-inch mainline; crossings are generally perpendicular to the axis of the waterbody channel. Where feasible, based on site-specific conditions (topography, engineering constraints), Northwest has designed each crossing such that TEWAs

are not closer than 50 feet from waterbody boundaries, except where the adjacent upland consists of other disturbed land consistent with FERC's Wetland and Waterbody Procedures (V.B.2.a.&b) and where site-specific conditions necessitate a closer placement. Table 1.7-1 in Resource Report 1 provides the rationales for TEWAs that have been located closer than 50 feet from waterbody boundaries. During dry open cut waterbody crossings, the 20-inch pipeline will be fabricated and installed immediately after the 8-inch pipeline has been removed.

Northwest will utilize temporary construction bridges during all phases of construction to cross waterbodies. These structures will be designed according to FERC's Wetland and Waterbody Procedures as well as according to conditions required by the U.S. Army Corps of Engineers and WDFW's HPA. The temporary equipment bridges will be constructed to maintain unrestricted flow and to prevent soil from entering the waterbody. Soil will not be used to stabilize equipment bridges. Bridges will be designed to withstand and pass the highest flow expected to occur while the bridge is in place, and, where feasible, bridges will be designed to span the entire ordinary high water mark (OHWM) of the waterbody. If it is not possible to span the OHWM with the bridge, a temporary pier may be required. The temporary bridges may include:

- equipment mats and culvert(s);
- equipment mats or railroad car bridges without culverts;
- clean rock fill and culvert(s); and
- flexi-float or portable bridges.

Northwest may utilize other alternatives for equipment bridges that achieve the same performance and objective. Figure 12 in Attachment C provides a typical drawing of a temporary crossing bridge. The bridge will be removed as soon as possible after permanent seeding. If there will be more than one month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, equipment bridges will be removed as soon as possible after final cleanup.

Sediment barriers will be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers will 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.

3.1.8 Wetland Crossings

All wetlands will be crossed in accordance with FERC's Wetland and Waterbody Procedures. Figure 8 in Attachment C shows the typical wetland crossing methods that will be utilized. Wetlands crossed by or in close proximity to the Project are shown on the Environmental Alignment Sheets.

Sediment barriers will be installed immediately after initial disturbance (clearing) of the wetland or adjacent upland. Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Where necessary, sediment barriers will be installed across the entire construction right-of-way immediately upslope of the wetland boundary to prevent sediment flow into the wetland. Where wetlands are adjacent to the construction right-of-way, sediment barriers will be installed along the edge of the construction–right-of-way and/or TEWAs, as necessary, to prevent sediment flow into the wetland. These sediment barriers will be removed after restoration is complete and revegetation has stabilized the disturbed areas.

As stated above, where feasible, based on site-specific conditions (topography, engineering constraints), Northwest has designed each crossing such that TEWAs are not closer than 50 feet from wetland boundaries, except where the adjacent upland consists of other disturbed land consistent with FERC's Wetland and Waterbody Procedures (VI.B.1.a.&b.), or where site-specific conditions/engineering constraints require a closer placement.

In wetlands, where standing water or saturated soils are present, or if construction equipment would cause ruts or mixing of the topsoil and subsoil in wetlands, Northwest will use low-ground-weight construction equipment or will operate normal equipment on timber riprap or standard prefabricated equipment mats. Equipment mats are comprised of wood and serve to distribute the weight of equipment. Rocks, soil imported from outside the wetland, tree stumps, or brush riprap will not be used to support equipment on the construction right-of-way. If trees are utilized as timber riprap or equipment mats to support equipment in saturated areas on the construction right-of-way, they will be obtained from clearing operations and will not be cut outside of the approved construction work areas. Where timber riprap is used, Northwest will attempt to use no more than two layers of riprap to support equipment on the construction right-of-way. All materials utilized to support equipment on the construction right-of-way will be removed after construction.

The duration of construction-related disturbance within wetlands will be minimized and construction equipment operating in wetland areas limited to the extent practical to that needed to clear the right-of-way, dig the trench, remove the 8-inch pipeline, fabricate and install the 20-inch pipe, backfill the trench and restore the right-of-way (as described in Section 1.6.5 in Resource Report 1). All other construction equipment will use access roads located in upland areas to the maximum extent practicable. Where access roads in upland areas do not provide reasonable access, Northwest will limit all other construction equipment to one pass through the wetland using the right-of-way in wetlands that cannot be appropriately stabilized.

3.1.9 Spill Prevention and Equipment Fueling and Maintenance

Northwest has developed a Spill Plan for Oil and Hazardous Materials (Spill Plan) that describes measures to prevent and control any inadvertent spill of hazardous materials such as fuels, lubricants and solvents that could contaminate soils and affect water quality. The Spill Plan will be updated with site-specific information prior to construction. All Project employees will receive Spill Plan training.

Equipment fueling and storage of oil, fuel, or other materials near waterbodies or wetlands could create a soil contamination and water quality impact if a spill were to occur. Leaks from equipment and vehicles could also cause impacts to surface waters. Vehicle fueling and maintenance and equipment storage will take place along the entire construction right-of-way and TEWAs. However, certain areas are restricted from these activities. Hazardous materials, chemicals, fuels and lubricating oils will be stored in upland areas at least 100 feet from waterbodies and wetlands or in accordance with FERC's Wetland and Waterbody Procedures. Restricted areas for storage of these materials will be clearly marked in the field. Concrete coating, concrete truck washing, refueling and equipment maintenance activities will also be conducted according to FERC's Wetland and Waterbody Procedures. All hazardous materials will be handled in accordance with the Spill Plan. If an unanticipated spill occurs during construction, Northwest would implement the procedures outlined in the Spill Plan.

3.1.10 Material Delivery and Storage

Northwest will use a contractor yard for material delivery and storage. Materials will be brought onto the construction right-of-way and TEWAs as they are needed and will be located away from waterbodies and wetlands. Secondary containment will be provided for liquids.

3.2 Permanent Erosion Control Measures

Permanent erosion control measures that will be used to reduce pollutants in stormwater discharges will be implemented after construction is completed. Post-construction BMPs consist of permanent features and operational practices designed to minimize pollutant discharges, including sediment, from the site.

3.2.1 Trench Breakers

Where the pipeline trench may drain a wetland, trench breakers will be installed and/or the trench bottom sealed as necessary to maintain the original wetland hydrology. A permanent slope breaker and a trench breaker will be installed at the base of slopes near the boundary between the wetland and adjacent upland area. The trench breaker will be installed immediately upslope of the slope breaker (see Figure 13 in Attachment C).

Trench breakers will generally be spaced according to the following, unless directed by the EI or authorized company representative:

Slope Percent	Spacing (feet)
10-15	500
15-20	300
20-30	150
>30	100

Trench breakers will consist of foam or approved sacks filled with a minimum 0.6 cubic feet of sand. They will be keyed into the trench sidewall where determined necessary by the EI or authorized company representative.

3.2.2 Permanent Slope Breakers

As required by FERC's Upland Plan, slope breakers (water bars) will be installed with a two to eight percent outslope, and flow will be diverted to a stable area. If a stable area is not present, a temporary energy-dissipating device will be installed at the end of the breaker. A typical design of a slope breaker is provided as Figure 9 in Attachment C.

The frequency of permanent slope breakers will be as specified on Figure 9 in Attachment C because the NRCS did not provided a spacing recommendation. The EI or Northwest's authorized representative may modify the spacing based on site-specific characteristics such as slope, surface materials, elevation, expected waterfall, and opportunity to install the slope breakers based on the construction right-of-way configuration and topography, as well as experience. The permanent slope breakers will be installed in all areas except agricultural fields, hayfields, pastures, and lawns.

3.2.3 Soil Compaction

Northwest will test for soil compaction in agricultural (e.g., pastures) and residential areas. Tests will be conducted on the same soil type under similar moisture conditions as specified in Section V.C.1 of FERC's Upland Plan. Pursuant to Section II.B.8 of FERC's Upland Plan, the EI will be responsible for conducting subsoil and topsoil compaction testing and determining corrective measures. Compaction will be relieved in residential areas based on site-specific conditions.

3.2.4 Revegetation

Revegetation will be performed as outlined in Section 7.0 of this Plan.

4.0 MAINTENANCE AND EVALUATION

Erosion control structures will be maintained in accordance with FERC's Upland Plan. The EI will inspect temporary erosion control structures at least daily in areas of active construction. In areas where active construction is not occurring, inspections will be made at least weekly. All structures will be inspected by the EI within 24 hours of 0.5 inch or greater of rainfall or as required by state and local jurisdictions. Whenever possible, the EI will evaluate erosion control measures prior to a predicted storm event and implement measures needed to prevent off right-of-way sedimentation. Inspections will be documented and available for agency review upon request.

The EI will be responsible for ensuring that ineffective temporary erosion control measures are repaired within 24 hours of discovery, or as soon as conditions allow if compliance with this timeframe would result in greater environmental impact. The EI will notify Project construction crews when poor weather conditions prevail and when to initiate adequate precautionary measures. The EI will ensure that the contractor has adequate equipment, materials and crews available to respond rapidly to storm events. It is the responsibility of the EI to advise the Chief Inspector when wet weather or other conditions make it advisable to restrict construction activities to avoid excessive rutting in sensitive areas.

5.0 HYDROSTATIC TEST WATER AND DEWATERING

5.1 Hydrostatic Testing

The pipeline will be hydrostatically tested in accordance with DOT regulations to ensure that the pipeline is capable of operating at design pressure. Should a leak occur, the pipeline would be repaired and retested until the pressure test specifications are achieved. Hydrostatic test water will be obtained from municipal sources and will not be withdrawn from surface waters, unless approvals are obtained from the Washington Department of Ecology and WDFW.

5.2 Dewatering

During construction there is the potential, in areas of high groundwater, that trench dewatering may be required. Generally, these locations are associated with low lying areas near wetland and waterbody crossings. Figure 14 in Attachment C provides typical measures to minimize potential sedimentation during trench dewatering activities. However, the construction schedule will generally coincide with the period when the soils in these areas are expected to be at their driest.

5.3 Hydrostatic and Trench Water Discharge

No hydrostatic test water or water from trench dewatering will be discharged directly to waterbodies. Water will be directed to an energy dissipation structure to prevent erosion and avoid sedimentation (see Figures 14 and 15 in Attachment C). The discharge will occur to an appropriately sized dewatering structure based on the expected quantity of water. The proposed hydrostatic test water discharge location is in the open field in TEWA 2.17-N and it is shown on the Environmental Alignment Sheets. The discharge location is located in an upland area and at an appropriate distance from wetlands and waterbodies to promote infiltration and to ensure that sedimentation of wetlands, waterbodies or other sensitive areas does not occur. Northwest’s EI will visually monitor the release of hydrostatic test water and trench dewatering activities to ensure that no erosion or sedimentation occurs. In addition, the EI will ensure that turbid water

is not discharged to waters of the State. If the EI determines that a discharge is occurring, the receiving water will be visually monitored for turbidity. If turbidity is observed, the dewatering operations would be immediately adjusted/reinstalled/maintained to ensure that the discharge to surface water is stopped and water quality standards are not exceeded.

6.0 NON-STORMWATER DISCHARGES

The main non-stormwater discharges associated with construction of the pipeline are trench dewatering and hydrostatic test water discharge. Water associated with trench dewatering will be pumped to a discharge structure similar to Figures 14 and 15 in Attachment C but will be appropriately sized for the discharge volume. Water associated with trench dewatering and hydrostatic testing will not be directly discharged to waterbodies.

7.0 RESTORATION AND REVEGETATION

Initial reclamation of the disturbed areas will begin as soon as possible after construction. Affected waterbodies will be stabilized and temporary sediment barriers will be installed within 24 hours in accordance with FERC's Wetland and Waterbody Procedures (Section V.C.2). Final grading and permanent erosion control measures will be completed within 20 days (10 days in residential areas) after the trench is backfilled, weather and soil conditions permitting. During final clean-up and initial reclamation, permanent repairs of fences, gates, drainage ditches, and other structures removed or damaged during construction will be completed. Drain tiles will be repaired before backfilling. All drain tiles crossed by the Project will be probed to check for damage. Cut or damaged drain tiles will be repaired to their original or better condition. Northwest will use a qualified specialist to test tiles for damage and to conduct any necessary repairs. Filter-covered drain tiles will not be used during repairs unless the local soil conservation authorities and the landowner approve their use.

Northwest will work with individual landowners to address restoration of pastures and residential lawns, ornamental shrubs, trees, and other landscaping features. In residential areas, Northwest will utilize contractors familiar with local horticultural and lawn establishment procedures for reclamation work or will compensate the landowner to restore these areas. Northwest has developed residential construction plans, which describe the construction procedures that will be used near residences and in neighborhoods (see Appendix 8B to Resource Report 8).

7.1 Recontouring

All graded areas associated with pipeline construction will be regraded and contoured to blend into the surrounding landscape and to reestablish natural drainage patterns. Emphasis during recontouring will be to return the construction right-of-way to its approximate original contours, to stabilize slopes, control surface drainage, and to provide an aesthetic appearance. Ruts and other scars will be filled and all drainage ditches will be returned to their preconstruction conditions. Recontouring to the original grade in disturbed wetlands is especially critical so that the wetland hydrology is not altered. Existing culverts that are damaged or removed during construction will be replaced to their original or better condition. No other culverts will be installed except those used as temporary waterbody/ditch crossings as described in Section 3.1.7 or as shown on Figure 4 in Attachment C.

7.2 Construction Debris Disposal

During final cleanup, all construction debris (e.g., timber, slash, mats, garbage, drilling fluids, excess rock, etc.) will be cleared from the construction right-of-way and TEWAs and disposed of in accordance with state and local regulations.

7.3 Soil Compaction

Northwest will test for soil compaction in residential areas and pastures. Tests will be conducted on the same soil type under similar moisture conditions as specified in Section V.C.1. in FERC's Upland Plan. Pursuant to FERC's Upland Plan, the EI will be responsible for conducting subsoil and topsoil compaction testing and determining corrective measures. Compaction will be relieved in residential areas based on site-specific conditions.

7.4 Scarification

Prior to respreading the topsoil, the construction right-of-way and TEWAs will be scarified (where necessary as determined by the EI) by ripping or chiseling to loosen compacted areas from equipment traffic. Scarifying the subsoil will also promote water infiltration and improve soil aeration, root penetration and revegetation success.

Where compaction is evident and if deemed necessary, scarification will occur in disturbed areas, including the passing lane or TEWAs, even if these areas were only scalped of vegetation or driven over. Scarification will be at least 12 inches deep with rippers spaced not more than 16 inches apart. Ripping and chisel plowing will also occur when materials are dry to promote the shattering of compacted layers.

In wetlands, scarification is not anticipated because traffic will be limited to that needed to clear the construction right-of-way, dig the trench, remove the 8-inch pipeline, fabricate and install the 20-inch pipeline, backfill the trench, and restore the right-of-way. Equipment mats will be utilized in wetlands where soils are saturated, or where standing water is present, to stabilize these areas and minimize compaction. Therefore, the need for scarification in wetland areas will be determined by the EI. Scarification will not be conducted in wetlands where it may adversely affect the wetland hydrology.

7.5 Soil Replacement

All salvaged topsoil will be uniformly spread over the portions of the construction right-of-way from where the soil was salvaged. If compaction occurs during this operation that might not be relieved during seedbed preparation, all compacted areas will be scarified. Topsoil spreading will not occur during wet periods when soils are easily compacted and all travel over retopsoiled areas will be restricted. The EI will be responsible for ensuring that topsoil imported into residential areas for replacement is free of noxious weeds or other deleterious materials.

7.6 Rock Removal

FERC's Upland Plan requires the removal of excess rock from the top 12 inches of soil to the extent practicable in all rotated and permanent croplands, hayfields, pastures, residential areas, and other areas at the landowner's request. In these areas, Northwest will clean up excess rock to a condition similar to adjacent portions of the construction right-of-way (e.g., size, density, and distribution of rock) unless the landowner and Northwest negotiate other requirements. The rock collected from these operations will either be hauled to an approved landfill or commercial quarry or will be disposed of in upland areas within the certified construction limits, with approval of the landowner. Approval for the use of alternate disposal locations would be requested from FERC.

7.7 Seedbed Preparation

Seedbed preparation will be conducted immediately prior to seeding to prepare a firm seedbed conducive to proper seed placement and moisture retention. Seedbed preparation will also be performed to break up surface crusts and to eliminate weeds which may have developed between initial reclamation and seeding.

A seedbed will be prepared in disturbed areas, where necessary, to a depth of three to four inches using appropriate equipment to provide a seedbed that is firm, yet rough. A rough seedbed is conducive to capturing or lodging seed when broadcasted or hydroseeded, and it reduces runoff and erosion potential. The rough seedbed will retain soil moisture for seedling germination and establishment.

In most areas, final construction right-of-way and TEWA cleanup procedures should be sufficient because it leaves a surface smooth enough to accommodate a drill seeder pulled by a farm tractor and rough enough to catch broadcasted seed and trap moisture and runoff. However, additional preparation, if determined necessary by the EI, such as chisel plowing or disking may be necessary to prepare an adequate seedbed. Where residential lawns or landscaped areas are disturbed, more intensive ground and seedbed preparations may be required, including rock collection, grading and soil preparation/amending.

7.8 Fertilization

Northwest will use a standard fertilization rate of 200 pounds per acre bulk triple-16 fertilizer (16:16:16 - nitrogen, potassium, and phosphorus) on all disturbed areas to be reseeded, except in wetlands. This fertilization rate will apply 32 pounds per acre of elemental nitrogen, potassium, and phosphorus. The NRCS (2017) agreed with the proposed fertilization rate, which has been used on previous Northwest projects in western Washington, including the Project area. Where fertilizer is applied by broadcast methods, the fertilizer will be incorporated into the top 2 inches of soil. Where the fertilizer is applied by hydroseeding, the fertilizer will be applied with the hydroseeding slurry. The NRCS did not recommend the addition of lime or other soil pH modifiers.

7.9 Seed Mixtures and Supplemental Plantings

As required by FERC's Upland Plan, Northwest has consulted with the NRCS (2017) regarding recommended seed mixtures for the Project area. The NRCS reviewed the proposed seed mixtures and provided recommendations which have been incorporated into Table 7.9-1. The NRCS indicated that the seeding rates should be based on a targeted number of seeds per square foot for critical area plantings and provided an Excel Seeding Rate Calculator, which

assumes a 90 percent PLS (seed germination x seed purity). The applications rates for the seed mixtures in Table 7.9-1 are based on the NRCS recommendations. All seed will be tested within 12 months of use. The seed will be free of noxious weeds and the quantity of total weed seed will be low. The EI will review all seed tags prior to use to ensure that these procedures are implemented. The seeding rates specified in Seed Mixtures 1, 2 and 3 are based on drill seeding methods. If hydroseeding occurs, the seeding rate will be used plus any adjustment the hydroseeding company recommends based on their equipment specifications. If broadcast seeding is conducted, the seeding rate will be doubled. Individual landowners may also specify specific seed mixtures for their properties. Residential landscaping is discussed in Section 7.14.

7.10 Seeding Timing

Disturbed areas will be seeded within six working days of final grading, weather and soil conditions permitting. It is expected that seeding of disturbed areas may begin as early as mid-August and will proceed until all areas have been reseeded. Seeding past October 10th will require mulching and may not germinate to provide an effective cover, unless the weather is unseasonably warm.

7.11 Seeding Methods

Seeding will be conducted using either a seed drill, broadcast or hydroseeding according to the guidelines in FERC's Upland Plan. Where broadcast seeding occurs, other than hydroseeding, the seeded area will be lightly dragged with chains or other appropriate harrows to lightly cover the seed. Fertilizer and mulch will not be used in wetlands.

7.12 Supplemental Wetland and Riparian Plantings

To mitigate impacts to riparian areas, Northwest will plant native shrubs and trees in areas where these species existed prior to construction or to enhance existing conditions where landowners allow. Table 7.12-1 provides a list of suggested native trees and shrubs that are common in the Project area in these habitats and which will be planted after final restoration and cleanup during appropriate planting periods (during the winter and early spring). To complete the restoration plantings, Northwest will select a local restoration contractor who is knowledgeable about wetland and riparian ecosystems as well as with the species' characteristics and site growth requirements (see Table 7.12-1). The shrubs and trees planted at each site will be determined at the time of planting based on the moisture regimes (wet, moist or dry) and site-specific conditions and based on the plant spacing provided in Table 7.12-1. Disturbed riparian areas will be replanted with tree and shrubs according to FERC's Wetland and Waterbody Procedures (Section V.C.6. and V.D.1). Shrubs will be planted and allowed to grow within 5 feet of the pipeline centerline and trees will not be planted within 15 feet of either side of the pipeline centerline to facilitate corrosion and leak surveys and to prevent roots from damaging pipe coatings. In riparian areas, shrubs and trees will be planted across the right-of-way for a width of 25 feet from the waterbody banks subject to the existing landuses and landowner approval.

Table 7.9-1
Recommended Seed Mixtures[1]

Seed Mixture 1 – Upland Right-of-Way Areas, Wet Pastures and Disturbed Emergent Wetlands		
Common Name	***Scientific Name***	**lbs/ac**
Perennial Grasses		
Redtop or Colonial bentgrass	*Agrostis alba or Agrostis capillaris*	4.0
Fescue, Fine or Creeping Red	*Festuca rubra*	5
Fescue, Tall	*Festuca arundinacea*	15
Orchardgrass	*Dactylis glomerata*	6
Ryegrass, Annual or Italian	*Lolium multiflorum*	12
Timothy	*Phleum pratense*	2
Legumes		
Clover, Red	*Trifolium pratense*	4
Clover, White	*Trifolium repens*	4
Trefoil, Big	*Lotus uliginosus*	1
Annual Cereal Grains		
Oats	*Avena sativa*	20
	lbs/acre	**73** [2]
Seed Mixture 2 - Pasture Mix – Upland Sites		
Common Name	***Scientific Name***	**lbs/ac**
Perennial Grasses		
Fescue, Tall	Festuca arundinacea	10
Orchardgrass	*Dactylis glomerate*	13
Ryegrass, Perennial or English [5]	*Lolium perenne*	22
Legumes		
Clover, Red	*Trifolium pratense*	5
Clover, White	*Trifolium repens*	3
	lbs/acre	**53** [3]
Seed Mixture 3 – Wetland Seed Mixture		
Grasses		
Ryegrass, Annual	*Lolium multiflorum*	25
Quick Guard [6]		45
Red Fescue [7]	*Festuca rubra*	8
Hairgrass, Tufted [7]	*Deschampsia caespitosa*	3
Bluejoint reedgrass [7]	*Calamagrostis canadensis*	3
Western Mannagrass [7]	*Glyceria occidentalis*	3
Barley, Meadow [7]	*Hordeum Brachyantherum*	10
Legumes		
Clover, Crimson	*Trifolium incarnatum*	8
	lbs/acre	**105** [4]

[1] Specified seed mixtures application rates are based on a targeted 300 to 600 seeds per square foot for critical area plantings depending on seed size, as recommended by the NRCS for critical area plantings. The rate assumes a PLS of 90 percent (seed germination x seed purity) for each species. If pure live seed (PLS) is less than 90%, either increase seeding rate by difference or use a different seed lot.

[2] The seeding rate calculates to ~500 seeds/sq ft/acre. The mixture includes both small to large seed sizes.

[3] The seeding rate calculates to ~500 seeds/sq ft/acre. The mixture includes both small to large seed sizes.

[4] Quick Guard is a sterile hybrid of wheat and rye.

[5] These species will be included in the seed mixture if they are readily available from a commercial seed supplier. The Native Seed Network (http://www.nativeseednetwork.org/index) provides a source to search for seed availability and vendors. Native seed will be from west of Cascades sources where available. Northwest will approve final seed mixture and substitutes.

Table 7.12-1
Native Shrub and Tree Plantings for Restoring Riparian Areas

Common Name	Scientific Name	Planting size [1]	Plant Spacing [2]
SHRUBS			
Wet Sites			
Red-osier dogwood	*Cornus stolonifera*	36” cuttings	3’
Willow spp	*Salix spp.*	36” cuttings [3]	3’
Moist Sites			
Indian Plum	*Oemleria cerasiformis*	1 gal or bare root	6’
Red elderberry	*Sambucus racemosa*	1 gal	8’
Vine maple	*Acer circinatum*	1 gal	8’
Salmonberry	*Rubus spectabilis*	1 gal	4’
Nootka rose	*Rosa nutkana/*	1 gal	4’
Dry Sites			
Snowberry	*Symphoricarpos albus*	1 gal	4’
Vine maple	*Acer circinatum*	1 gal	8’
Beaked hazelnut	*Corylus cornuta*	1 gal	8’
TREES			
Wet Sites			
Red alder	*Alnus rubra*	1 gal	10’
Sitka spruce	*Picea sitchensis*	2 gal or bare root	15’
Western red cedar	*Thuja plicata*	2 gal or bare root	12’
Moist Sites			
Black cottonwood	*Populus balsamifera ssp. trichocarpo*	36” cuttings or poles	10’
Cascara buckthorn	*Frangula purshiana*	1 gal	8’
Western hemlock	*Tsuga heterophylla*	1 gal	12’
Dry Sites			
Douglas’ fir	*Pseudotsuga menziesii*	1 gal or bare root	12’
Big-leaf maple	*Acer macrophyllum*	2 gal	15’

[1] Planting stock sizes may include bare root equivalents.
[2] Shrubs will be installed in clusters of 5 to 10, while trees will be individual specimens.
[3] The NRCS (2017) noted in areas of reed canarygrass infestations longer whips can be used, up to 8-feet in length, to outcompete the grass. Willow stakes will be planted/driven in to be in contact with groundwater. The NRCS also noted if the cuttings are from older planting stock, the thicker bark of this planting stock will aid in minimizing rodent damage/girdling.

7.13 Mulch

Mulch will be applied where necessary to stabilize the soil. The mulch will be uniformly applied at a rate of 2 tons/acre to cover at least 75 percent of the ground surface. If seeding occurs shortly before the beginning of the wet season (after mid-September), all disturbed areas will be mulched. Mulching will occur during seeding (where hydroseeded) or immediately after seeding where broadcast or drill seeding occurs. All straw utilized for mulch will be CWF. Anchoring straw mulch by crimping the mulch in is not expected to be necessary because strong winds, which could dislodge the mulch, typically occur during the winter rainy season when the moist conditions will bind the straw to the soils; however, the EI will determine if straw crimping is appropriate. Liquid mulch binders are not expected to be utilized unless hydromulch is applied. Liquid binders will not be used within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

7.14 Residential Landscaping

In residential areas (see Resource Report 8), Northwest will initiate cleanup operations immediately following backfill operations in all lawn and landscaped areas within 10 days after backfilling the trench, weather permitting consistent with FERC's Upland Plan (Section V.A.1). This includes final grading, topsoil replacement and installation of permanent erosion control structures. Residential landscaping will be restored by a local landscaping contactor familiar with local conditions. Landscaping may include lawns, shrubs, trees, fences, irrigation systems, and other landscape features as negotiated during Northwest's easement acquisition process.

7.15 Grazing Deferments

Northwest will develop grazing deferment plans, where necessary, based on negotiations with individual landowners. Grazing deferment plans may include temporary fencing to keep horses or livestock off of the restored construction right-of-way and TEWAs, boarding animals at alternate locations, purchasing supplemental feed, or other similar methods to minimize potential livestock disturbance to construction right-of-way and TEWA revegetation efforts.

7.16 Noxious Weeds

The NRCS (2017) was consulted for recommendations to prevent the introduction or spread of noxious weeds and soil pests. The NRCS recommended that the best way to control the establishment of invasive species is to plant desirable vegetation at relatively high rates so they provide vigorous completion. In addition, Northwest will include the following measures to ensure that the potential spread of noxious weeds is minimized.

- Prior to transporting to the construction right-of-way and TEWAs, all equipment will be inspected to ensure it is clean and free of potential weed seed or sources (i.e., soil roots, or rhizomes). All equipment hauled into Snohomish County will be cleaned before entering the County. Inspection of all equipment and trucks used on the Project to ensure they are clean will be the responsibility of the EI or Northwest's authorized representative.
- CWF straw will be used for mulch and sediment barriers, dewatering structures, or other uses along the construction right-of-way or TEWAs. The EI will be responsible to ensure that all straw hauled to authorized work areas is CWF. The State of Washington Noxious Weed Control Board [1] has a Weed Free Hay and Mulch Program, which is run by the Washington State Department of Agriculture Plant Services Program; producers of certified hay and mulch are listed at the following web site http://www.nwcb.wa.gov/washington-weed-free-hay-and-mulch-program or http://agr.wa.gov/PlantsInsects/WWHAM/WWHAM.aspx.
- Prior to clearing, the Project will be surveyed for areas that may be infested with priority noxious weeds that are listed on the County's priority noxious weed list. These are weeds listed on the County's current noxious weed list as Class A weeds[2]. Class A weeds are non-native species that have limited distribution in Washington. Preventing new infestations and eradicating existing infestations are the highest priority for the state and eradication is required by law (17.10 RCW). Class B Weeds are those noxious weeds not native to the state that are of limited distribution or are unrecorded in a region of the state and that pose a serious threat to that region and require control in the county.

[1] http://www.nwcb.wa.gov/washington-weed-free-hay-and-mulch-program
[2] http://snohomishcountywa.gov/750/Noxious-Weeds-List

- Surveys will be conducted by Northwest's EI or authorized representative prior to construction. Infested areas will be cleared in a manner to minimize transport of weed seed, roots and rhizomes, or other vegetative materials and soil from the site down the construction right-of-way or within TEWAs.
- In areas where infestations have been identified or noted in the field, the Contractor will stockpile cleared vegetation and salvage topsoil adjacent to the area from which they are stripped to eliminate the transport of soil-born noxious weed seeds, roots, or rhizomes. During reclamation, the Contractor will return topsoil and vegetative material from infestation sites to the areas from which they were stripped. Any clearing equipment used in areas of Class A and B weeds will be cleaned by hand or blown down with air prior to leaving the site. Infested areas will be mapped to ensure that these areas would be monitored during operations so that the weeds would be controlled and would not spread.
- During restoration, where weed control is necessary, Northwest will employ mechanical methods (mowing, etc.) to prevent flowering and the spread of weeds or will employ a licensed contractor to ensure that the appropriate herbicides are utilized for the targeted weed species during the proper phenological period at the specified rate. The contractor will ensure that the herbicides are used according to the labeling restrictions and according to all applicable laws and restrictions. The contractor will confirm that the herbicides are used under the proper seasonal and weather conditions to ensure effectiveness and to minimize drift to non-targeted areas. Herbicides will not be applied during precipitation events or when precipitation is expected within 24 hours or as specified on the label. Herbicides will not be used within 100 feet of a wetland or waterbody, unless allowed by the appropriate agency. Prior to herbicide application, Northwest and/or their contractor will obtain all required permits from the local jurisdictions/authorities.

7.17 Monitoring and Maintenance

Northwest will conduct follow-up inspections of all disturbed areas after the first and second growing seasons, or as required by Project permits, to determine the success of revegetation. Revegetation will be considered successful in upland areas if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. If vegetative cover and density are not similar or there are excessive weeds after two full growing seasons, Northwest will continue revegetation efforts until revegetation is successful. Repair of erosion control structures will occur until the construction right-of-way and TEWAs have successfully revegetated and has stabilized. Once the site is stabilized, temporary erosion control measures will be removed.

In wetland areas, revegetation will be considered successful if the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation); vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction; and invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction. If revegetation is not successful at the end of 3 years, Northwest will develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate the wetland and will continue revegetation efforts until wetland revegetation is successful.

Routine vegetation maintenance clearing will not be done more frequently than every 3 years. Vegetation maintenance adjacent to waterbodies will allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way (if the landowner is in

agreement). However, to facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipelines (20-inch mainline and 16-inch loop line) may be maintained annually in an herbaceous state. Routine vegetation maintenance mowing or clearing will not occur during the migratory bird nesting season between April 15 and August 1 of any year.

Northwest will test, operate and maintain the proposed Project facilities in accordance with 49 CFR Part 192 and other applicable federal and state regulations. The pipeline right-of-way will be clearly marked where it crosses public roads, railroads, rivers, fenced property lines, and other locations as necessary in accordance with applicable regulations to avoid accidental excavation.

8.0 REFERENCES

National Resource Conservation Service. 2017. Personal Communication with Edge Environmental, Inc. March

Soil Conservation Service. 1983. Soil Survey of Snohomish County Area, Washington. U.S. Department of Agriculture.

Western Regional Climate Center. 2017a. Monthly Climate Summary for Everett, Washington (452675). http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa2675. Accessed in February.

Western Regional Climate Center. 2017b. Monthly Climate Summary for Monroe, Washington (455525). http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa2675. Accessed in February.

Attachment B

Spill Plan for Oil and Hazardous Materials

Spill Plan for Oil and Hazardous Materials

North Seattle Lateral Upgrade Project
Snohomish County, Washington

May 2017

TABLE OF CONTENTS

SECTION 1 - GENERAL INFORMATION 3

1.1 Project Location & Description 3

SECTION 2 - FACILITY DRAINAGE & SPILL PREVENTION PRACTICES 4

2.1 Drainage Patterns 4

2.2 Spill Prevention Practices..... 4

SECTION 3 - EMERGENCY SPILL RESPONSE PROCEDURES..... 5

3.1 Contractor Responsibilities..... 5

3.2 Company Responsibilities 6

3.3 Emergency Contacts 6

3.4 Duties of Chief Inspector (or Assistant District Manager) 6

SECTION 4 - EMERGENCY SPILL RESPONSE AND PERSONNEL PROTECTION EQUIPMENT6

SECTION 5 - SPILL NOTIFICATION PROCEDURES 7

5.1 Internal Notifications..... 7

5.2 External Notifications..... 7

5.3 Emergency Spill Response Contractors..... 8

5.4 Local Emergency Response Teams..... 8

SECTION 6 – CLEAN-UP PROCEDURES..... 9

6.1 Spills…. 9

6.2 Equipment Cleaning/Storage 9

6.3 Waste Disposal……..…9

APPENDIX A

List of Emergency Contacts

APPENDIX B

Emergency Spill Response and Personnel Protection Equipment

SPILL PLAN FOR OIL & HAZARDOUS MATERIALS

SECTION 1 - GENERAL INFORMATION

1.1 Project Location & Description

This Spill Plan for Oil & Hazardous Materials was developed for the following construction project:

North Seattle Lateral Upgrade Project
Snohomish County, WA

The North Seattle Lateral Upgrade Project (Project) will include removing up to 6.5 miles of Northwest Pipeline LLC's (Northwest's), a Williams company, existing 8-inch diameter pipeline, replacing it with a 20-inch diameter pipeline, upgrading the existing North Seattle delivery meter station and installing a new pig launcher/receiver site at the terminus of the 20-inch pipeline.

Prior to conducting any remote work along the right-of-way, the Contractor shall be familiar with this Spill Plan For Oil & Hazardous Materials (Spill Plan) and its contents.

This Spill Plan will be followed to prevent any spills that may occur during the project from entering any waterway and to mitigate any spills that do occur.

Company representatives assigned to this project include:

Chief Inspector (CI):	*(to be completed by Williams)*
District Manager (DM):	Randy Tarter
Assistant District Manager (ADM):	Francis Roemer
Environmental Inspector (EI):	*(to be completed by Williams)*
Environmental Compliance:	Derek Forsberg
Environmental Permitting:	Toby Schwalbe

SECTION 2 - DRAINAGE PATTERNS AND SPILL PREVENTION PRACTICES

2.1 Drainage Patterns

The numerous drainage patterns along the construction right-of-way corridor vary due to site-specific terrain conditions. As a result, the Contractor shall always implement Best Management Practices based on site-specific observations that are continuously made during construction. These measures shall minimize off-site impacts should a spill and/or release occur.

2.2 Spill Prevention Practices

The Contractor shall take the following precautions to ensure that an oil or hazardous materials spill does not occur or if one does, it does not enter any waterway:

a) Containers

(1) Any containers shall be stored on level ground at least 100 feet from the nearest waterway. Additionally, all containers should be located within temporary containment.

(2) Temporary containment will include, but not be limited to, temporary hay bale berms with plastic sheets underlining the entire contained area.

(3) Containment areas shall be capable of containing 110% of the volume of hazardous materials being stored.

(4) All container storage areas shall be routinely inspected for integrity purposes.

(5) Leaking and/or deteriorated containers shall be replaced as soon as the condition is first detected with clean-up measures immediately taking place.

(6) No incompatible materials shall be stored in the same containment area.

(7) No container storage areas shall be left unattended during non-work hours.

b) Tanks

(1) The Contractor shall operate only those tanks that meet the requirements and specifications of applicable regulations and that are surrounded with temporary containment as described above.

(2) Self-supporting tanks shall be constructed materials compatible with its contents.

(3) All tanks shall be routinely inspected for integrity purposes.

(4) Vehicle mounted tanks shall be equipped with flame/spark arrestors on vents to ensure that self-ignition does not occur.

(5) Tanks will not be used to store incompatible materials in sequence unless first thoroughly decontaminated.

(6) Any tank utilized for storing different products between construction locations will be thoroughly decontaminated prior to refilling.

c) Unloading/Loading Areas

(1) Re-fueling and transferring of any liquids shall only occur in pre-designated locations that are on level ground and at least 100 feet from any waterway. Where conditions require construction equipment (e.g., backhoes, trench dewatering pumps or hydrostatic test water discharge pumps) be re-fueled within 100 feet of any waterway, this activity must be continuously manned to ensure that overfilling, leaks or spills do not occur. In addition, all this equipment must be surrounded by temporary containment as described above.

(2) All service vehicles used to transport fuel must be equipped with an appropriate number of fire extinguishers and an oil spill response kit. At a minimum, this kit must include:

- Ten, 48”x 3” oil socks
- Five, 18” x 18” oil pillows
- One, 10’x 3” oil booms
- Twenty-five, 24” x 24”oil mats/pads
- 1 box garden-size, 6-mil, disposable polyethylene bags (w/ ties)
- 4 pair of oil-proof gloves
- One, 55-gallon PE open-head drum
- Blank drum labels
- 2 shovels

SECTION 3 - EMERGENCY RESPONSE PROCEDURES

This section provides a generic description of emergency response procedures to be performed to address oil and hazardous materials spills during construction of the Project. Each response will vary depending upon the nature and extent of the incident. However, the general procedures outlined below will be followed.

3.1 Contractor Responsibilities

(1) The Contractor must designate both an Emergency Coordinator (EC) and an Alternate EC for the Project.

(2) The Contractor is responsible for appropriately addressing all spills that occur directly as a result of construction-related activities.

(3) For de minimus spills (spills that take less than a shovel-full of dirt to clean-up), no internal notification requirements of this Plan need to be

followed. However, this does not relieve the Contractor from appropriately cleaning up the area.

(4) The Contractor shall supply the necessary manpower, personal protective equipment (PPE), and spill response equipment to appropriately address all spills that directly occur as a result of construction-related activities.

(5) Ensure that all emergency spill response equipment and PPE is well-stocked and kept in good condition. Replace any materials when necessary.

(6) If the situation warrants it, the Contractor shall immediately notify any local emergency responders for assistance.

(7) The Contractor shall be responsible for contracting an outside emergency spill response team if the nature of the emergency incident requires it.

(8) The Contractor is responsible for immediately notifying the CI (or DM) of any non-de minimus spills.

3.2 Company Responsibilities

(1) Company shall be responsible for ensuring that the Contractor adequately follows the procedures outlined in this Spill Plan at all times.

(2) Company shall be responsible for all verbal and written external notifications made to any regulatory agency or any local emergency responders.

3.3 Emergency Contacts

Appendix A provides a list of Company and Contractor emergency contacts.

3.4 Duties of Chief Inspector (or District Manager)

The duties of the CI (or DM) include the following:

(1) Determine the source, character, amount, and extent of the spill.

(2) Assess the potential hazards to the job site, environment, and surrounding community.

(3) Evacuate the area if necessary.

(4) Report the spill in accordance with the Internal Notification Procedures outlined in Section 5.1 and the External Notification Procedures outlined in Section 5.2.

(5) Commit manpower and equipment for minor incidents that can be reasonably remediated by the Contractor.

(6) Oversee Contractor’s spill response efforts to contain and control all spills to ensure they adequately follow the procedures outlined in this Plan.

(7) Document the Contractor’s response efforts, including taking photographs whenever possible.

(8) Generate an Emergency Incident Report (WGP Form 0187).

SECTION 4 - EMERGENCY SPILL RESPONSE AND PERSONNEL PROTECTION EQUIPMENT

Appendix B provides a list of the minimally-required Emergency Spill Response Equipment and PPE for this project. This is in addition to the minimally-required spill response equipment previously specified in Section 2.2(c)(2).

SECTION 5 - SPILL NOTIFICATION PROCEDURES

5.1 Internal Notifications

All non-de minimus spills are to be immediately reported to the CI (or DM) who will contact Gas Control and/or Environmental Compliance. Appendix A includes a list of emergency contacts.

An Emergency Incident Report (WGP Form 0187) must be forwarded to Environmental Compliance as soon as technically feasible by the CI (or DM). Environmental Compliance will determine if the spill constitutes a:

(1) Reportable Quantity under CERCLA,

(2) Reportable release under the Clean Water Act or RCRA, or

(3) Reportable Threshold Quantity under SARA Title III

If any reporting is necessary, Environmental Compliance shall be responsible for immediately contacting the appropriate federal and state regulatory authorities and following-up in writing, if required.

5.2 External Notifications

Any non-de minimus spills that may pose a threat to human health or the environment shall be immediately reported to the CI (or DM) who will contact the Local Emergency Planning Committee (LEPC) if necessary. When determining if the LEPC should be contacted or not, any gas release to the atmosphere must be taken into consideration.

The appropriate LEPC is:

Name:	Mark Murphy
Organization:	Snohomish County Emergency Management
Phone Number:	425/388-5077

Environmental Compliance is responsible for submitting any required written follow-up notifications to the LEPC or any local emergency responders.

5.3 Emergency Spill Response Contractors

Company has arrangements with several emergency spill response contractors to address emergency responses beyond the capabilities of the Contractor.

If necessary, the following firms could be utilized for this project:

Company: PSC Emergency Spill Response

Name: Jeff Kacirek – Emergency Response Division

Location: 24-hour nation-wide response

Phone Number: 877/577-2669

Company: CCS – Emergency Response Division

Name: Todd Partridge

Location: Longview, WA

Phone Number: 360/423-6316 888/423-6316

5.4 Local Emergency Response Teams

The Contractor or the CI (or DM) may call the following local emergency responders should their assistance be required:

Service	Organization Name	Telephone Number
Emergency Medical Services	Ambulance	911
Hospital	Valley General Hospital	360/794-7497
Fire Department	Snohomish County – All Districts	911
Police Department	Snohomish County Sheriff	425/388-3393

SECTION 6 – CLEAN-UP PROCEDURES

The following section outlines specific procedures to be followed when addressing spills:

6.1 Spills

(1) Small spills and leaks must be remediated as soon as feasible. Use adsorbent pads wherever possible.

(2) Restrict spills to the containment area if possible by stopping or diverting flow.

(3) If the spill exceeds the containment structure's capacity, immediately construct additional containment using sandbags or fill material. Every effort must be made to prevent the spill from entering any waterway.

(4) If a spill does reach a waterway, immediately place oil booms downstream in order to contain the material. As soon as possible, remove the floating layer with absorbent pads.

(5) After all recoverable oil has been collected and drummed, place all contaminated PPE, spill clean-up equipment, and any impacted soil into appropriate drums.

(6) For significant quantities of impacted soils, construct temporary waste piles using plastic sheets. This material should subsequently be transferred into lined roll-off boxes as soon as feasible.

(7) Environmental Compliance will coordinate all waste characterization and disposal activities.

6.2 Equipment Cleaning/Storage

(1) Upon completion of remedial activities, the Contractor shall be responsible for decontaminating the used emergency response equipment as well as the PPE.

(2) The Contractor shall be responsible for replacing any spent emergency response equipment and PPE prior to resuming construction-related activities.

(3) Decontamination rinse fluids shall be collected and containerized. Environmental Compliance will coordinate waste characterization and disposal activities.

(4) Reusable PPE will be tested and inventoried prior to being placed back into service.

6.3 Waste Disposal

The Contractor is responsible for waste management and waste disposal; however, Environmental Compliance will coordinate all waste characterization, profiling, and disposal activities.

APPENDIX A

LIST OF EMERGENCY CONTACTS

Company:	Job Description	Phone Number
GAS CONTROL	**Salt Lake City**	**801/584-6574 (24-hrs)**
(to be completed by Williams)	**Chief Inspector**	*(to be completed by Williams)*
Randy Tarter	**District Manager**	**206/915-6554 (m)** **425/868-1010 x2051 (o)**
Francis Roemer	**Assistant District Manager**	**425/214-2760 (m)** **425/868-1010 (o)**
(to be completed by Williams	**Environmental Inspector**	*(to be completed by Williams*
Derek Forsberg	**Environmental Compliance**	**801/673-1334 (m)** **801/584-6736 (o)**
Toby Schwalbe	**Environmental Permitting**	**801/209-6047 (m)** **801/584-6751 (o)**

Contractor:	JOB DESCRIPTION	Phone Number
(to be completed by Contractor)	**EMERGENCY COORDINATOR**	*(to be completed by Contractor)*
(to be completed by Contractor)	**Alternate EMERGENCY COORDINATOR**	*(to be completed by Contractor)*

Regulatory Agencies:	Name	Phone Number
	National Response Center	**800/424-8802**
	Environmental Management Dept. (EMD)	**800/258-5990**

APPENDIX B

EMERGENCY SPILL RESPONSE AND PERSONNEL PROTECTION EQUIPMENT

Equipment	Quantity	Location
(1) chemical spill kit	**	Strategically located along the right-of-way and adjacent to work space/waterbodies
(2) oil spill kit	**	Strategically located along the right-of-way and adjacent to work space/waterbodies

EMERGENCY SPILL RESPONSE EQUIPMENT:

(1)	1 bag loose chemical pulp	3 chemical pillows (18” x 18”)
	3 chemical socks (48” x 3”)	10 chemical mats/pads (24” x 24”)
	1 box garden-sized, 6-mil, disposable, polyethylene bags (w/ ties)	
	Blank waste labels	one 30-gallon PE open-head drum
	2 shovels	

(2)	1 oil boom (100’ x 3”)	10 oil pillows (18” x 18”)
	10 oil socks (48” x 3”)	25 oil mats/pads (24” x 24”)
	1 box garden-sized, 6-mil, disposable, polyethylene bags (w/ ties)	
	Blank waste labels	three, 55-gallon PE open-head drums
	4 shovels	

**** The appropriate quantity of spill kits for the project shall be determined and based on site-specific observations that are continuously made during construction. This emergency spill response equipment, in addition to the BMPs implemented in Section 2.1 of this Spill Plan, shall minimize off-site impacts should a spill and/or release occur.**

PERSONNEL PROTECTION EQUIPMENT:

The inventory of PPE should include enough for at least 4 responders reacting to a spill.

Splash goggles, half-face respirators (w/ cartridges for benzene),
Tyvek suits, nitrile gloves, waterproof/ chemical resistant hip-waders

Attachment C

Fluming and Dam and Pump Procedures

Northwest Pipeline LLC

Stream Fluming Procedures

North Seattle Lateral Upgrade Project

May 2017

STREAM FLUMING PROCEDURES

During construction various local, state and federal permits will require that flowing streams with coldwater fisheries be crossed utilizing a "dry crossing" technique. Fluming is one of the methods which may be utilized to achieve a dry crossing of a flowing stream. The purpose of this plan is to outline the techniques that will be utilized to flume stream crossings during construction of the North Seattle Lateral Upgrade Project (Project). These guidelines are subject to change based on permits issued by regulatory agencies.

1.0 Purpose of Flumed Stream Crossings

The primary purpose of fluming a stream is to ensure that in-stream construction activities comply with water quality standards for turbidity that have been established by the state to protect aquatic life and other beneficial uses. Overall, a properly installed and maintained flume can be very effective in reducing turbidity during in-stream construction. In most cases, detectable increases in turbidity are limited to short durations when the flume is installed and when the flume is removed from the streambed.

However, installation of a flume does not guarantee that compliance with water quality standards will occur. Flumes require monitoring and occasional repair during the crossing period to ensure the integrity of the structure(s). Adequate pumps play an integral role in a successful flumed crossing.

2.0 Where Flumes Will Be Installed

Any minor or intermediate waterbody with water flowing in the streambed at the time of construction, which has a coldwater fishery as defined by the Washington Department of Fish and Wildlife (WDFW), may be flumed. A list of streams where dry open cut crossing methods (fluming or dam and pump) may be utilized is provided in Resource Report 2.

3.0 General Layout of a Typical Flumed Stream Crossing

Figure 1 shows a plan view of a typical flumed stream crossing. The primary components of a flumed crossing include:

- flume pipe or multiple flume pipes;
- sandbag/plastic dams;
- spoil storage and staging areas;
- pumps and pump containment structure(s);
- dewater structure(s);
- erosion control structures; and
- spill containment and cleanup materials.

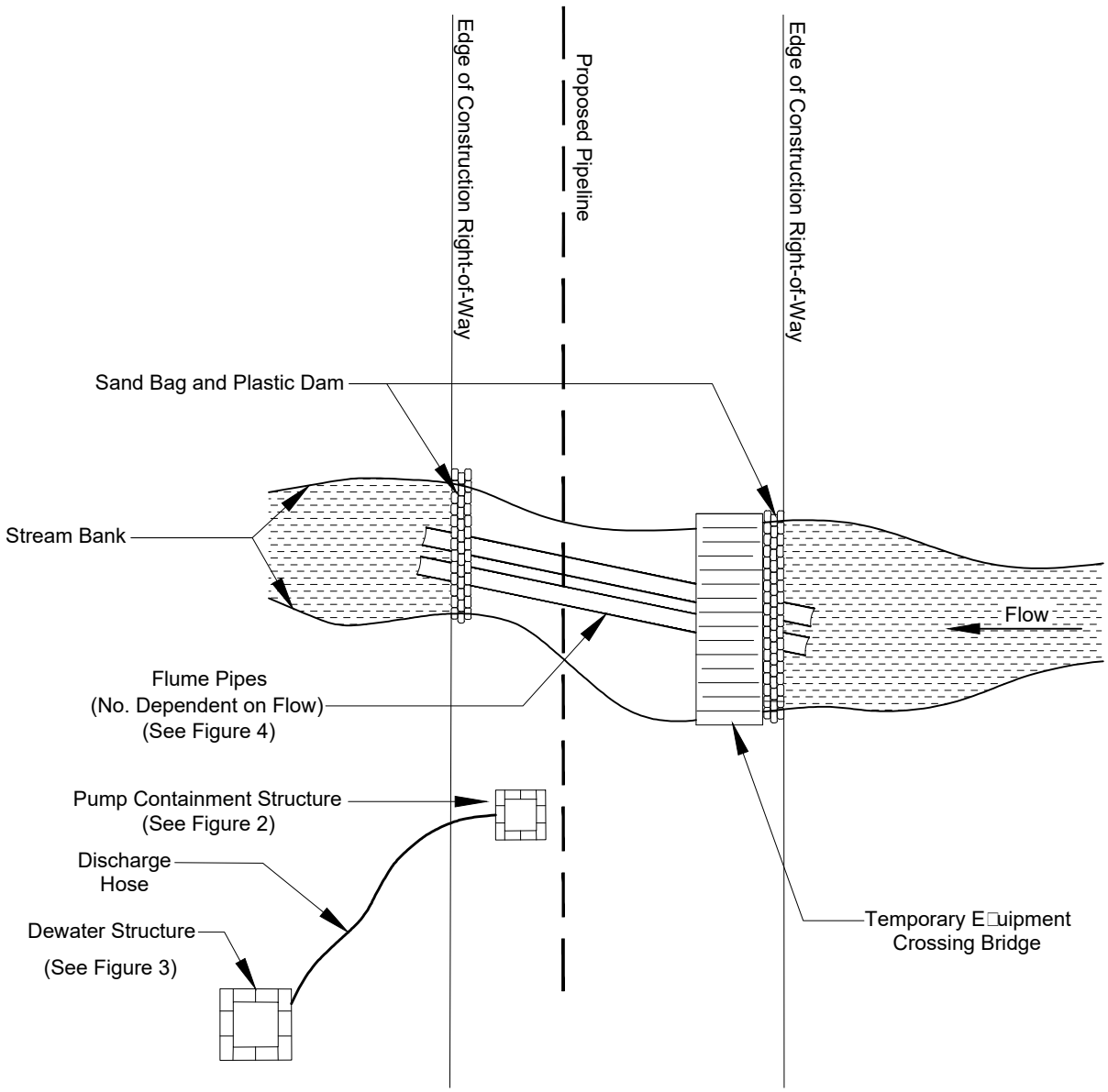


FIGURE 1
PLAN VIEW OF TYPICAL FLUMED STREAM CROSSING

A single or multiple flume pipe(s) are used to temporarily convey the stream flow over the construction area, thereby reducing the introduction of sediments into the water column during trenching and backfilling. The sandbag/plastic dams are used to support and seal the ends of the flume pipe(s) and to direct stream flow into the flume pipe and over the construction area. These structures are also utilized to prevent downstream water from flowing upstream into the construction area. They also serve to contain water that infiltrates into the construction area before it can be removed by the pumps and discharged to an upland area. Finally, the downstream structure serves to contain turbid water, which rises quickly in the construction area during backfilling of the trench.

All waterbodies with water in the streambed at the time of construction must have an equipment crossing bridge.

The temporary spoil storage area is where spoil trenched from the streambed will be stored until backfilling is completed. These temporary extra work areas are identified on the Environmental Alignment Sheets. The Federal Energy Regulatory Commission's (FERC) Wetland and Waterbody Construction and Mitigation Procedures (Wetland and Waterbody Procedures) prohibit the location of staging areas or additional right-of-way within 50 feet of the stream banks or edge of adjacent wetlands unless site-specific conditions such as topography prevent the setback and a modification is approved (see Resource Report 1). Trench spoil must be placed at least 10 feet away from stream banks at all flowing stream crossings. In addition, these areas must be enclosed with silt fence and/or straw bales to prevent runoff of the spoil into the stream.

Adequate pumps are essential for the successful completion of flumed stream crossings. During several phases of the crossing period, it will be necessary to quickly remove large quantities of water from the construction area to prevent overflow or leakage of the sandbag/plastic dams or the temporary equipment crossing bridge. The most effective means of quickly removing water from the construction area is by utilizing well-maintained pumps with adequate pumping rates. In addition, backup pumps will be located on-site, hooked up and maintained as fully operational during the entire crossing period. Backup pumps will be tested prior to the start of construction. Pumps will be located in a spill containment structure that is designed to fully contain any spills of fuel or oil (see Figure 2).

Dewater structures (see Figure 3) will be utilized to reduce the velocity of pump discharge water and subsequent erosion of upland areas. These structures are essential in preventing erosion and the flow of turbid water overland and back into the stream - such overflow effectively defeats the purpose of the flumed crossing by introducing turbid water into the stream.

Runoff control structures are utilized to prevent runoff from the spoil piles or from drainage of water from the trackhoe bucket from flowing around the sandbag/plastic dams or temporary equipment crossing bridges and adding sediment to the stream. Containment and control materials are necessary to respond to any spills of fuel or lubricating oils from operating equipment. A Spill Plan for Oil and Hazardous Materials (Spill Plan) will be implemented by the contractor in accordance with the provisions of that plan. Erosion control structures prevent sedimentation and surface water runoff from the right-of-way into the stream during and after construction is complete.

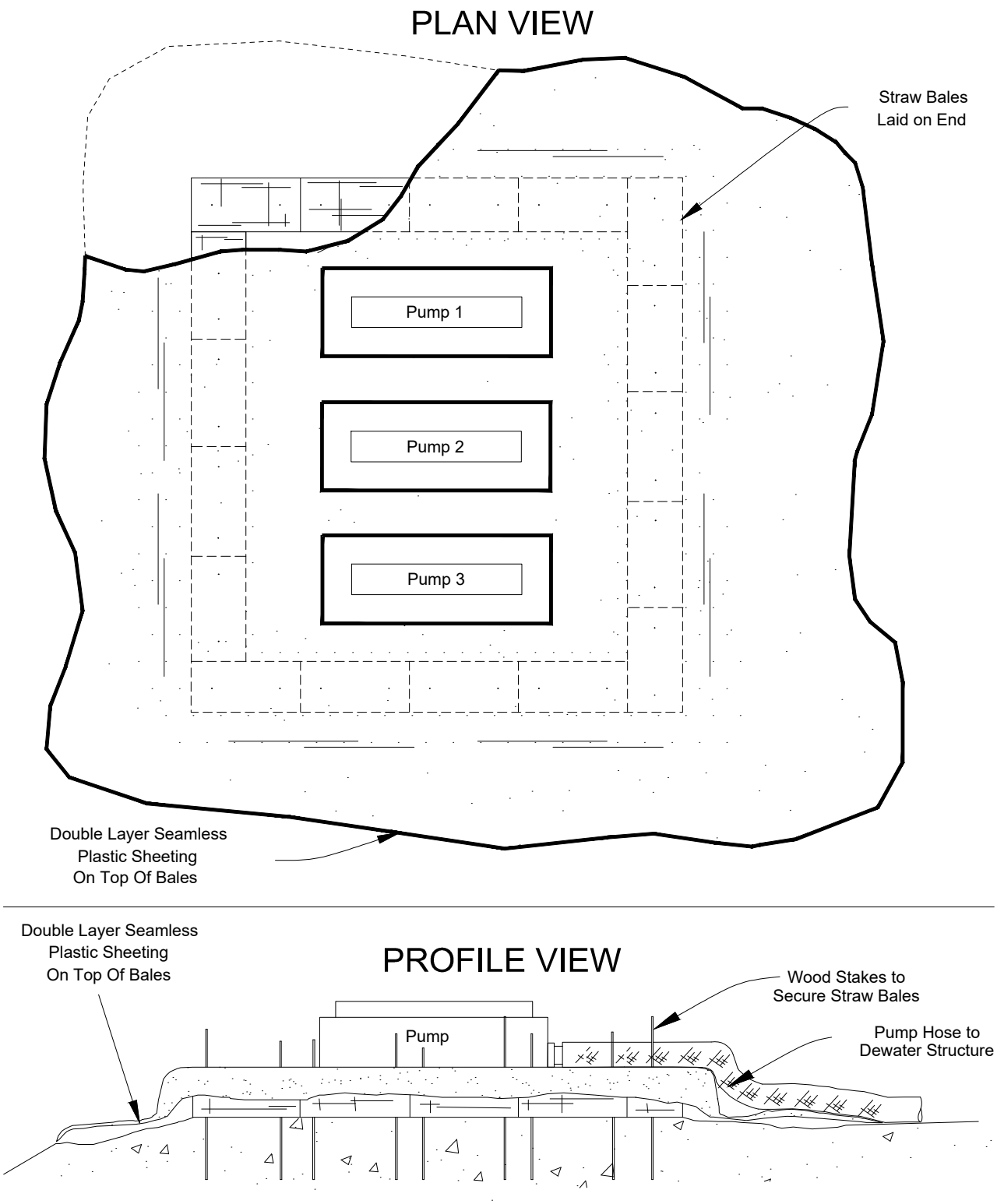


FIGURE 2
TYPICAL PUMP CONTAINMENT
STRUCTURE

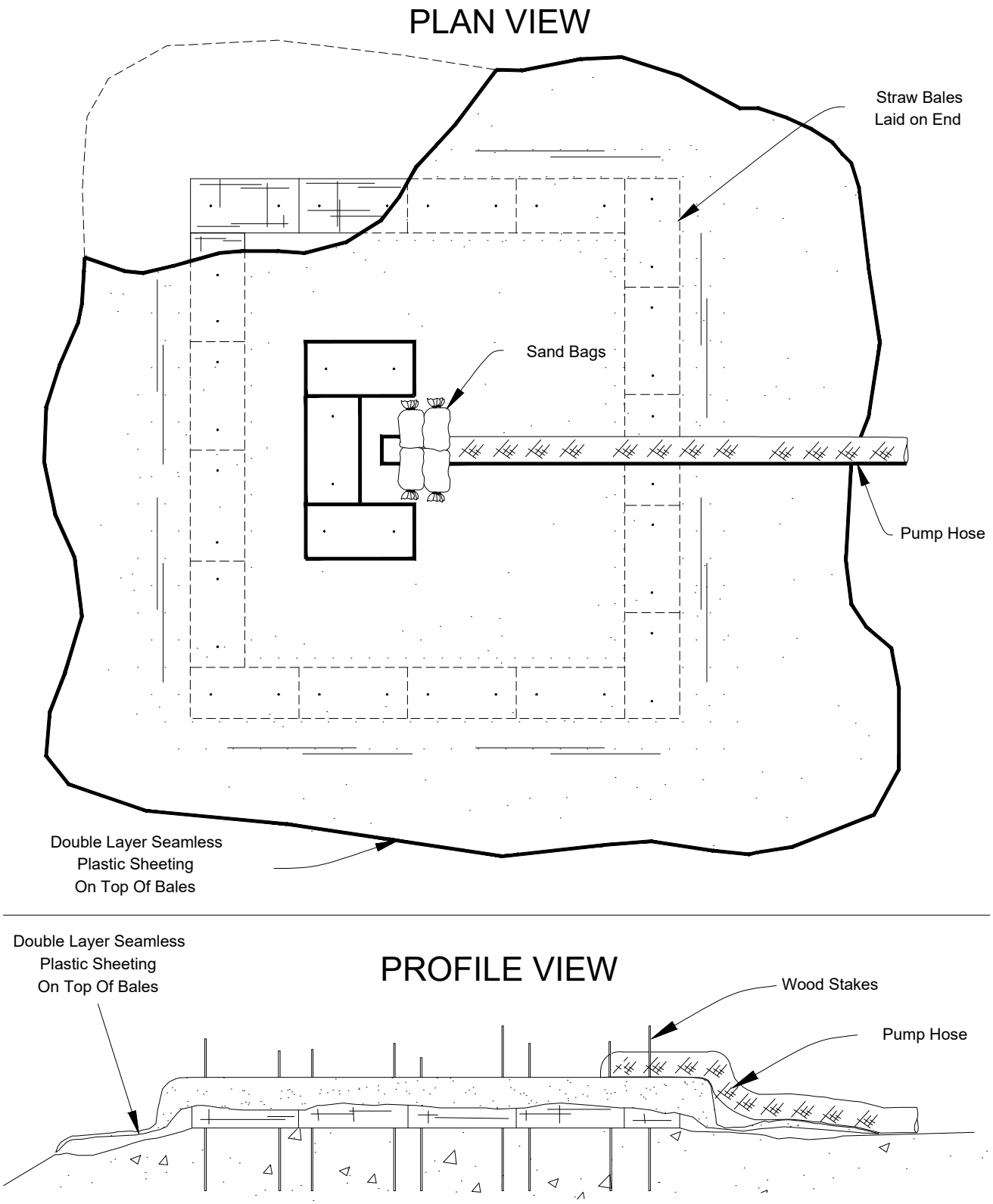


FIGURE 3
TYPICAL DEWATER
STRUCTURE

4.0 Materials Required to Install and Maintain a Flumed Stream Crossing

The materials discussed below will accommodate most stream crossings. However, certain situations will arise where additional materials are required. Those streams that require additional materials will be addressed on a case-by-case basis.

Typically, scrap steel pipe will be utilized to construct the flume. Before the flume pipe is installed in the stream, it will be inspected to ensure that it is free of grease, oil or other pollutants. In addition, excessive dirt will be removed from the flume pipe. If oil or grease is present on the flume pipe, it will be steam-cleaned before the flume pipe is placed in the stream.

Both the inlet and outlet of the flume pipe will be sandbagged and lined with plastic to create a proper seal (see Figure 4). The reason for sandbagging the downstream end of the flume is to create a contained area where turbid water is trapped and to prevent downstream water from flowing up the streambed and flooding the trench.

Sandbags will be filled with a non-leachable material such as clean, pre-washed sand. Sandbags are most effective if they are only filled to approximately 2/3 their capacity. Bags filled to capacity conform poorly to the adjacent bags and make creation of a seal more difficult. The bags must be tied securely before they are installed. If the bags are left un-tied, they tend to spill upon removal from the streambed and are nearly impossible to remove with a trackhoe. It is preferable to utilize burlap sandbags to construct the upstream and downstream dams. Plastic bags tend to rip when removed from the stream and are often too porous to adequately contain small grain sand.

Sandbags alone are often not sufficient to completely seal the upstream and downstream ends of the flume pipes. The dams are typically more effective when sheets of thick plastic are interwoven within the sandbags (see Figure 5). The plastic, when applied as shown on Figure 5, will effectively seal the dams and will greatly reduce the amount of water leaking into the construction area from behind the upstream and downstream sandbag dam.

5.0 Flume Pipe Design

A number of flume pipe designs have been used with varying degrees of success. To improve success, flume pipes with wings welded to the front end of the pipe provide for better conveyance of stream flow into the mouth of the flume (see Figure 6). The most effective wings extend to each stream bank and are angled slightly upstream. Where the bottom of the stream is other than rock, the wings extend approximately 12 inches below the bottom of the flume pipe and are pushed into the stream substrate utilizing a trackhoe during installation. The upstream and downstream portions of the wings are then sandbagged and overlain with plastic as needed to prevent leaks as shown in Figure 7.

The flume pipe(s) installed at the crossing will be of sufficient length so that the integrity of the upstream and downstream sandbag dams are not jeopardized by excessive top of ditch widths within the stream or adjacent stream banks. It is tempting to restrict the flumed width to an area smaller than the actual construction right-of-way. However, experience has shown that the contractor often needs to utilize the majority of the construction right-of-way to complete the crossing. Therefore, the flume pipes must be long enough to span the entire construction right-of-way through the stream (see Figure 4).

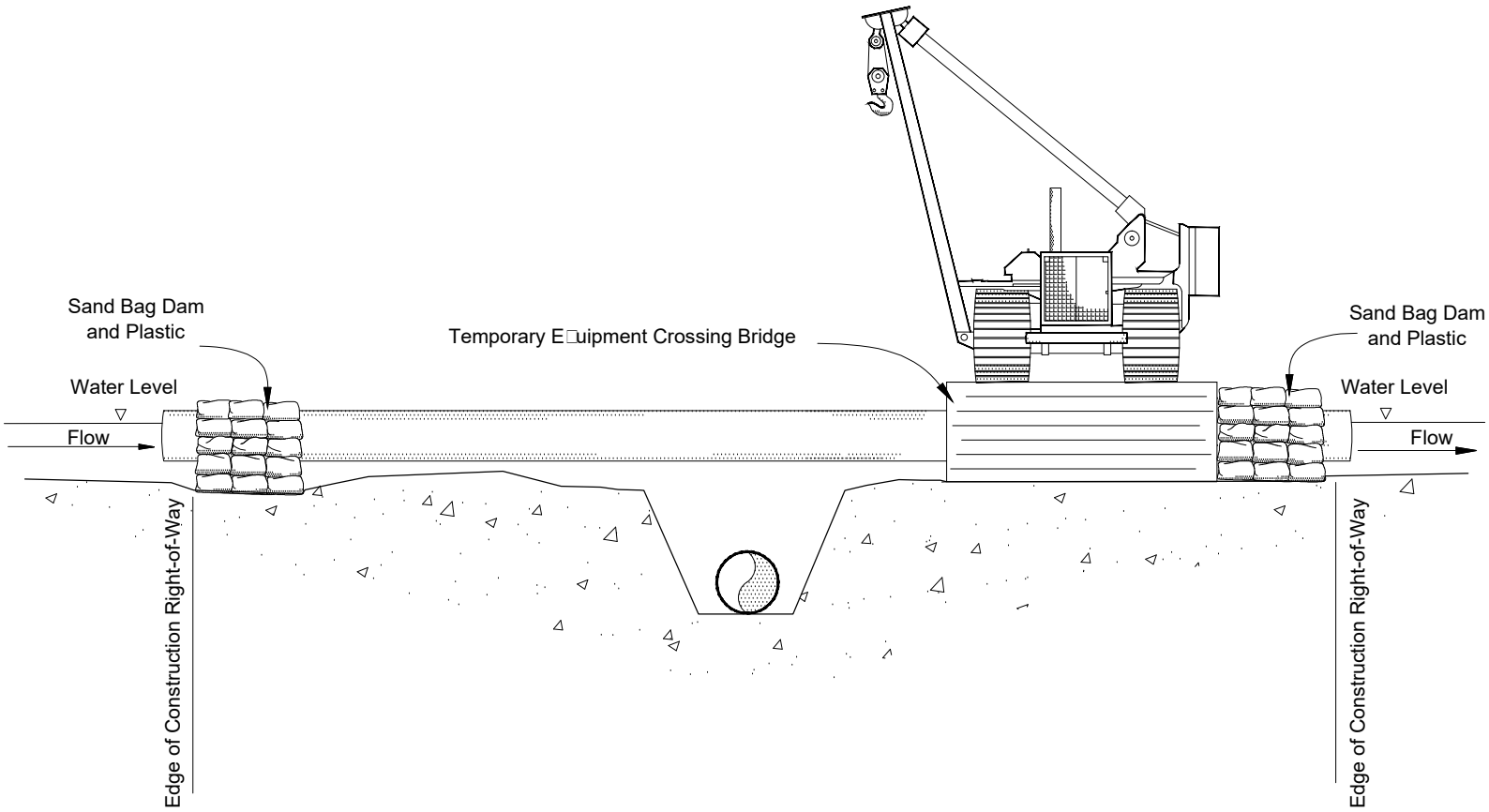


FIGURE 4
FLUME PIPE PLACEMENT ACROSS
RIGHT-OF-WAY

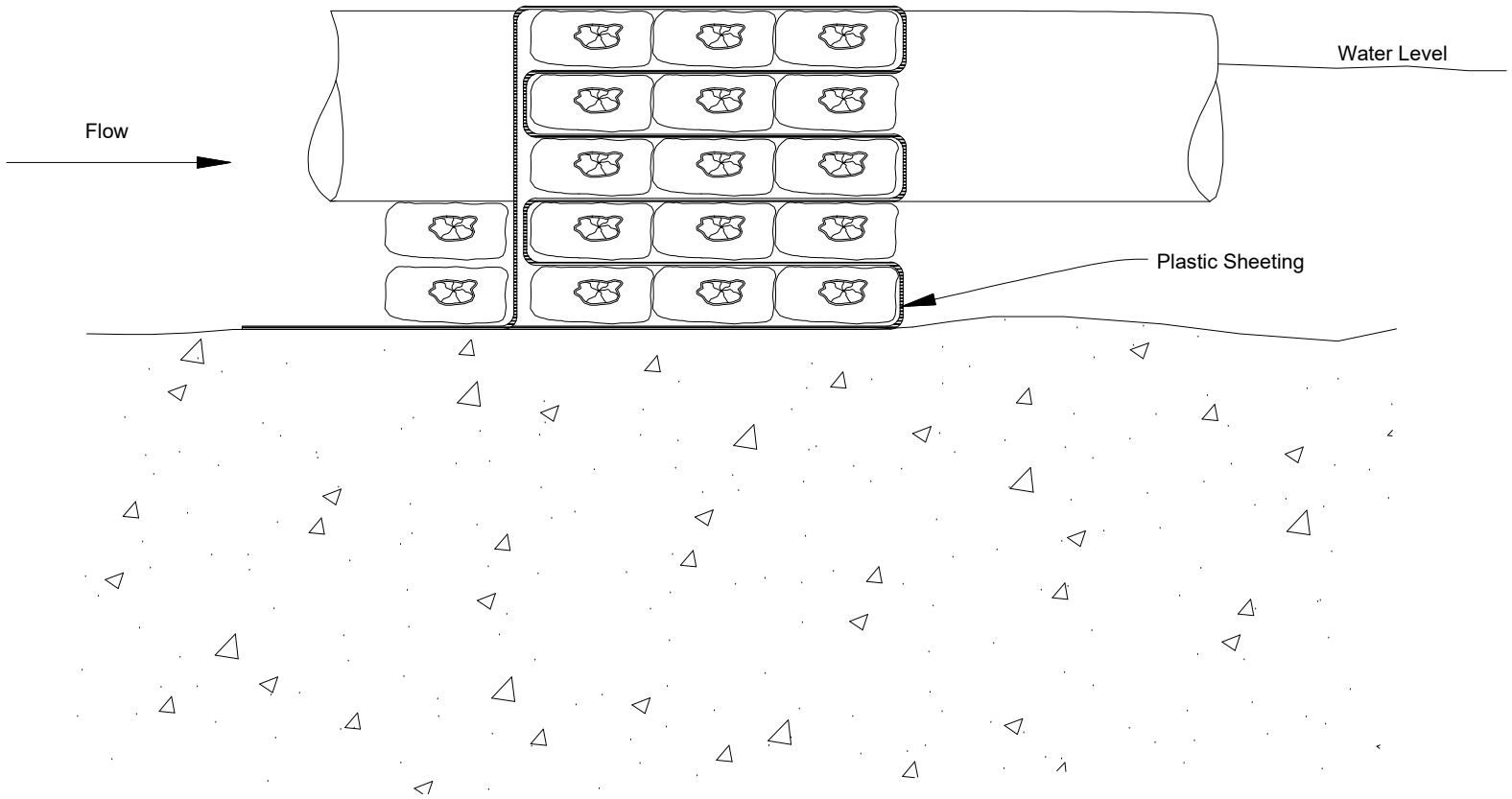
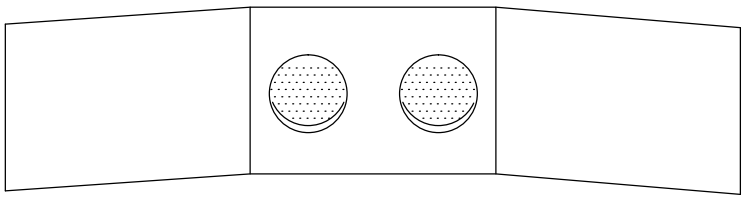


FIGURE 5
PLASTIC SHEETING INTERWOVEN INTO A SAND BAG DAM

FRONT VIEW



TOP VIEW

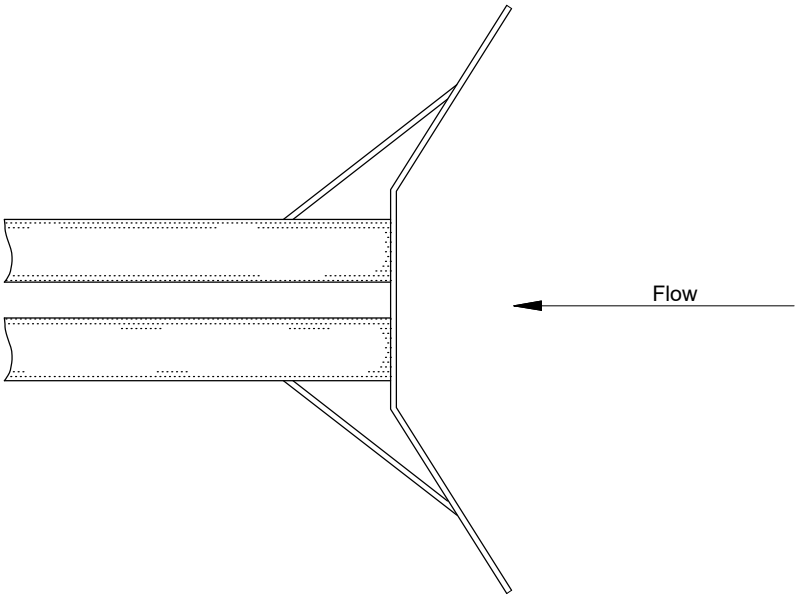
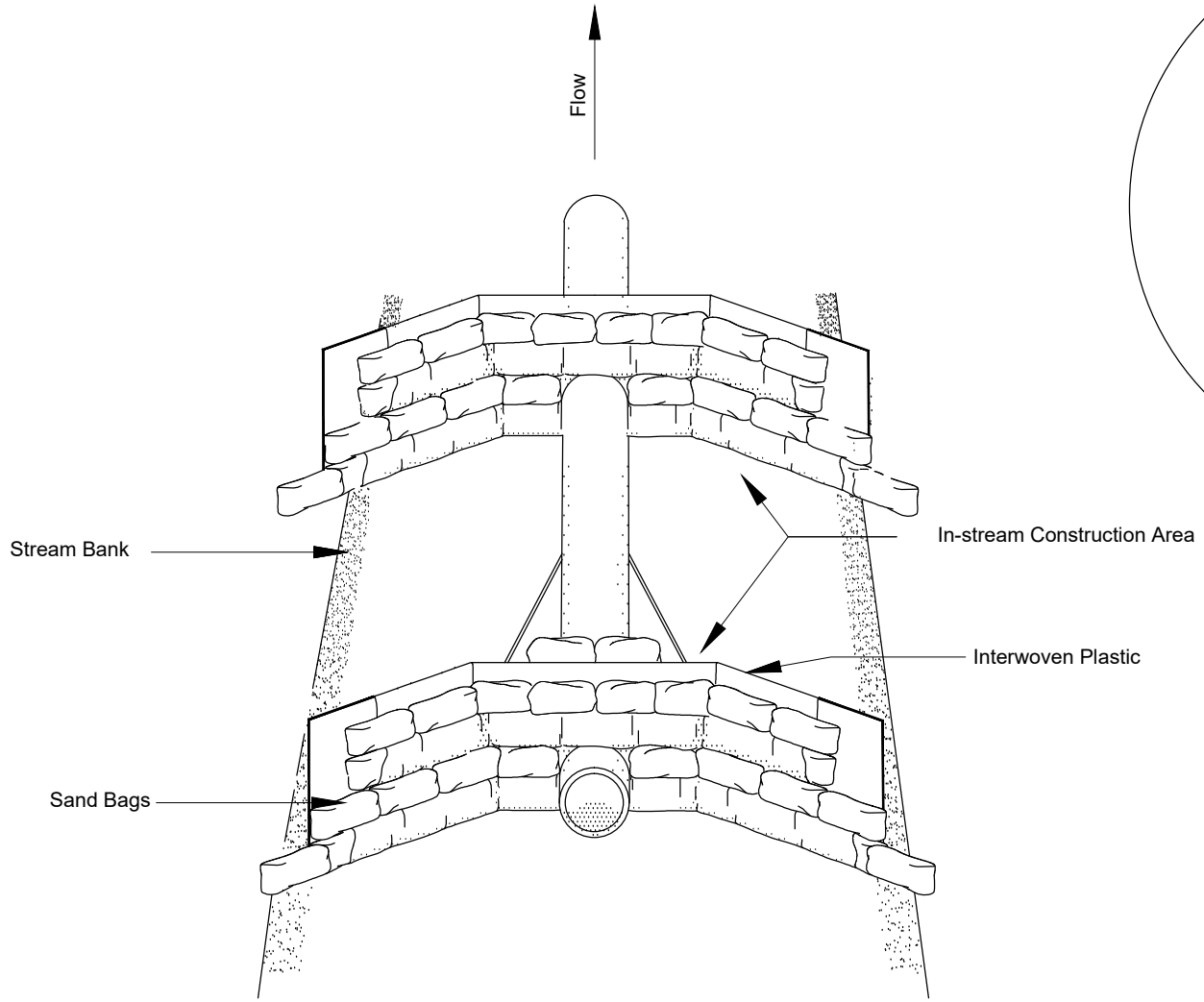


FIGURE 6
UPSTREAM FLUME WINGS



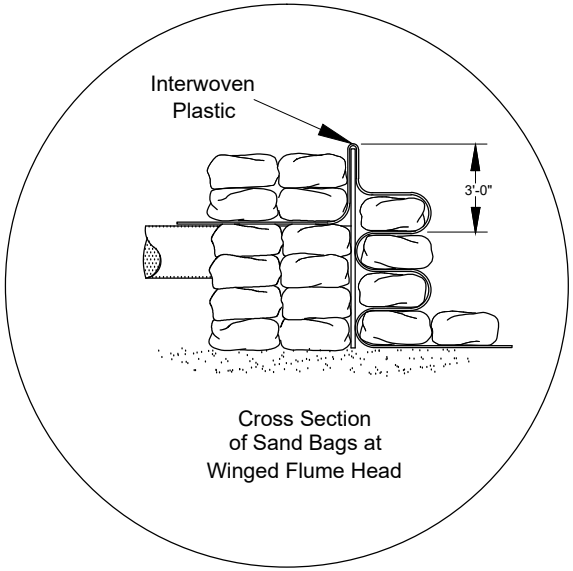


FIGURE 7
SAND BAG AND PLASTIC DAM

As a general rule, a flume pipe of at least 80 feet in length will be utilized for crossings but will depend on the authorized construction right-of-way width at each stream crossing. The diameter of the flume pipe (s) will depend on the stream discharge at the time of the crossing. However, in all cases the flume pipe diameter will be oversized to accommodate any storm events that might occur during the crossing period.

6.0 Installation of the Flume Pipe

Short-term elevated levels of turbidity are expected to occur during installation of the flume pipe. However, several measures can be taken to minimize the increased turbidity. Before the contractor attempts to install the flume pipe, all materials necessary to complete the installation process will be located on-site. Installation of the flume cannot begin until all of the precautions outlined in the Spill Plan have been undertaken. Turbidity sampling will be conducted during all flumed crossings in accordance with the Stormwater Pollution Prevention Plan.

The first step in installing the flume pipe is to clear away any large rocks and boulders from the sandbag/plastic dam area and under the flume pipe that will prohibit placement of the flume pipe or affect the integrity of the sandbag/plastic dam. It may be necessary to utilize a trackhoe to assist in removing these rocks. However, under no circumstances will the bucket be allowed to dig into the streambed to remove rocks. Rather, the edge of the bucket should be utilized to roll the rocks to the side or a thumb on the bucket will be used to pick up and move rock obstacles.

Before the flume pipe is installed, the contractor will lay at least three rows of sandbags on the streambed (at least two sandbag layers tall) to support the upstream and downstream portions of the flume pipe (see Figure 5). The sandbags may be laid on top of the plastic sheeting that will be used to help seal the sandbag dam. The plastic will be laid such that when it is wrapped around the sandbag dam, the plastic sheeting lays on the upstream face of the dam so that water pressure holds the plastic firmly against the sandbag dam face. The sandbags will be properly seated over the plastic and onto the stream bottom and packed as tightly together as possible.

Once the first rows of sandbags are in place, the flume pipe can be lowered into position. The flume pipe will be lifted over the stream and carefully aligned before it is lowered onto the sandbags over the streambed. The contractor will not push or pull the flume pipe over the stream banks and into the water. Rather, the flume pipe will be suspended over the crossing and lowered into place.

After the flume pipe is laid on the sandbags, the contractor will begin to construct the upstream sandbag/plastic dam. First, the winged upstream portion of the flume pipe will be pushed into the streambed substrate, where possible. Sandbags will be installed upstream and downstream of the wings and interwoven with plastic sheeting to form a tight seal. Typically, the sandbag/plastic dam will extend at least three feet above the water level of the stream to accommodate increased stream discharge during the crossing period (see Figure 7).

After the upstream sandbag/plastic dam is complete, the contractor will immediately begin installation of the downstream dam. The downstream sandbag/plastic dam will be constructed to a height at least three feet above the downstream water level.

7.0 Maintenance of the Flume During Construction

Flumed crossings require constant monitoring and occasional repair during the crossing period. The longer the flume remains in the water, the greater the probability that the dams will begin to leak and that water will invade the construction area in significant quantities. Therefore, it is imperative that once trenching within the stream begins that the construction process is carried non-stop to completion. Typically, this involves installing the flume on the day immediately proceeding construction of the crossing. Ditching of the stream channel should begin early the following morning and the pipe pulled under the flume pipe immediately following completion of the trench. Backfilling should commence immediately following the stringing of the drag section. For most streams it typically requires 3 to 7 days to install the flume, dig the trench, install the pipe drag section under the flume, backfill the trench and restore and stabilize the stream banks. Smaller streams (less than 10 feet in width) generally require less time to cross using fluming procedures.

While the flume is in place, the contractor will provide a sufficient crew that will be responsible for maintaining the flumed crossing. The crew will apply additional plastic to the dams and add additional sandbags as necessary. In addition, the crew will be responsible for operating the pumps and maintaining the discharge structures. When the crossing is complete, the crew will immediately install the erosion control structures pursuant to FERC's Wetland and Waterbody Procedures.

To be adequately prepared to repair the flume, the contractor must have on-site rolls of thick plastic sheeting and extra filled and tied sandbags. These materials need to be stored directly adjacent to the stream crossing so that they are readily accessible should the need to repair the flume arise.

8.0 Length of the Drag Section

One of the biggest problems encountered during construction of flumed stream crossings is the installation of extremely long drag sections across the stream in a single drag section. The extra length requires that the flume be in place longer than necessary which increases the probability of issues with the integrity of the sandbag/plastic dams. In addition, the extra time required to dig additional ditch to accommodate long drag sections can result in integrity problems with the flume dams.

Segments must be kept short and extend only the distance necessary to allow for later tie-ins to the upland portions of the pipeline. On most streams the drag section to be pulled under the flume should only be long enough to incorporate the sag bends. In other locations, it may be necessary to install additional pipe to complete the crossing.

The entire drag section must be made up prior to the start of in-stream trenching. Once the drag section is complete (welds x-rayed and joints coated), the drag section can be installed immediately following trenching.

9.0 Trenching Under the Flume Pipes

At some point prior to initiating trenching, chains should be hung from the flume pipe over the ditch line. These chains will be utilized to hang the pump heads or intake pipe into the ditch.

Digging the ditch under the flume requires careful preparation and execution. Two trackhoes will begin trenching from each stream bank at the same time. The trackhoes will begin by trenching under the flume pipe(s) and dig back to the stream banks. Finally, the trackhoes will dig the upland portion of the ditch necessary to install the drag section.

Generally, pumping water from the construction area is not necessary during trenching as the amount of spoil removed from the streambed generally exceeds the volume of water that infiltrates the construction area. However, if the water flow into the construction area becomes excessive, pumping would be necessary to avoid overflow or leakage from the downstream dam.

10.0 Spoil Storage During Trenching

Spoil must be stored in a manner such that runoff from the spoil does not flow into the stream or off the right-of-way. For streams in flat topography, runoff from the spoil storage pile is not typically a problem. However, on steep sloping stream banks water can run back down the right-of-way and enter the stream upstream or downstream of the dams and potentially create a water quality problem. The problem can be compounded as the trackhoes working on the stream banks lift water-saturated spoil from the stream and lay it on the right-of-way adjacent to the stream bank before it can be conveyed uphill by additional equipment. To accomplish runoff control during trenching, diversion structures or trenches will be dug within the right-of-way to direct the runoff back into the construction area as shown on Figure 8.

11.0 Spoil Transfer During Construction

Some of the stream crossings may occur adjacent to steep upland areas. In these cases, it will be necessary to utilize additional equipment (trackhoes, dozers, loaders) to transfer spoil dug by the trackhoes at each stream bank to the temporary spoil storage area.

In most cases, the contractor will utilize dozers to push the spoil to the temporary storage area. In other areas, trackhoes will be required to transfer spoil dug by the trackhoe working on the stream bank uphill to a flatter area where it can be moved by dozers. When two trackhoes are utilized to transfer spoil uphill, the trackhoe working on the stream bank places the spoil into a pit (see Figure 9). The spoil from the pit is then picked up by the second trackhoe and lifted further uphill. The pit will significantly reduce the amount of water from the spoil that runs downhill. The pit can be maintained and dug by the trackhoe working uphill from the crossing.

12.0 Installing the Pipe

While trenching is being conducted, the contractor will hook up the drag section to the sideboom tractors so that the pipe may be installed as soon as trenching is completed. It will be necessary at many crossings to float the pipe across the trench (i.e., it may not be feasible to completely dewater the ditch). While the drag section is being slid under the flume pipe, it is essential that pumps be operated to assure that turbid water does not leak through or flow over the dams. The contractor will operate the pumps at a rate so that water displaced by the pipe is immediately removed and discharged to the dewater site.

13.0 Dewatering the Construction Area

Proper operation of pumps is essential to the successful completion of a flumed stream crossing. Pumps will be utilized by the contractor as necessary to control the level of water in the construction area. The purpose of the pumps is not to completely dewater the trench.

If the water level in the construction area exceeds the upstream or downstream level of the dams, the environmental inspectors will notice small amounts of turbid water escaping into the stream either upstream or downstream of the dams. This is known as "bleeding" and the problem can be quickly resolved by increasing the pumping rate and reducing the water level within the construction area. Although bleeding will not typically result in a violation of water quality standards downstream, if left unchecked it can quickly result in erosion of the dams and serious downstream water quality problems.

The contractor will utilize pumps at each crossing to control the water level in the construction area. The contractor will also install backup pumps that will be tested and fully functional prior to the start of the crossing period. Pumps will be installed and tested and the dewater sites constructed the day prior to any in-stream construction. For most crossings, the contractor will setup three pumps. Additional pumps may be required at a few of the stream crossings. Two of the pumps will serve to remove water from the construction area and the third pump will serve as a backup should one of the primary pumps fail.

The pumps will be set in a containment area as shown on Figure 2. The primary purpose of the containment area is to fully contain any fuel or lubricating oil spills. If hydraulic pumps are used, the hose couplings on the side of the pump body will be oriented in the containment area such that they point perpendicularly away from the stream banks. The purpose of orienting the couplings away from the stream is to protect the stream should one of these couples fail and hydraulic fluid escape.

The contractor will carefully inspect each pump prior to its delivery to the crossing site. In particular, any frayed hoses or apparent leaks will be repaired before the pumps are delivered to the crossing site. Pump heads and the hoses will be cleaned of any free hydraulic oil prior to placing the pump heads into the stream.

All pumps will be installed with individual intake hoses or hydraulic heads, trash filters and discharge hoses. All three hydraulic heads will remain in the water during the entire construction process including backfill. In this manner, the backup pump can be immediately employed should one of the primary pumps fail.

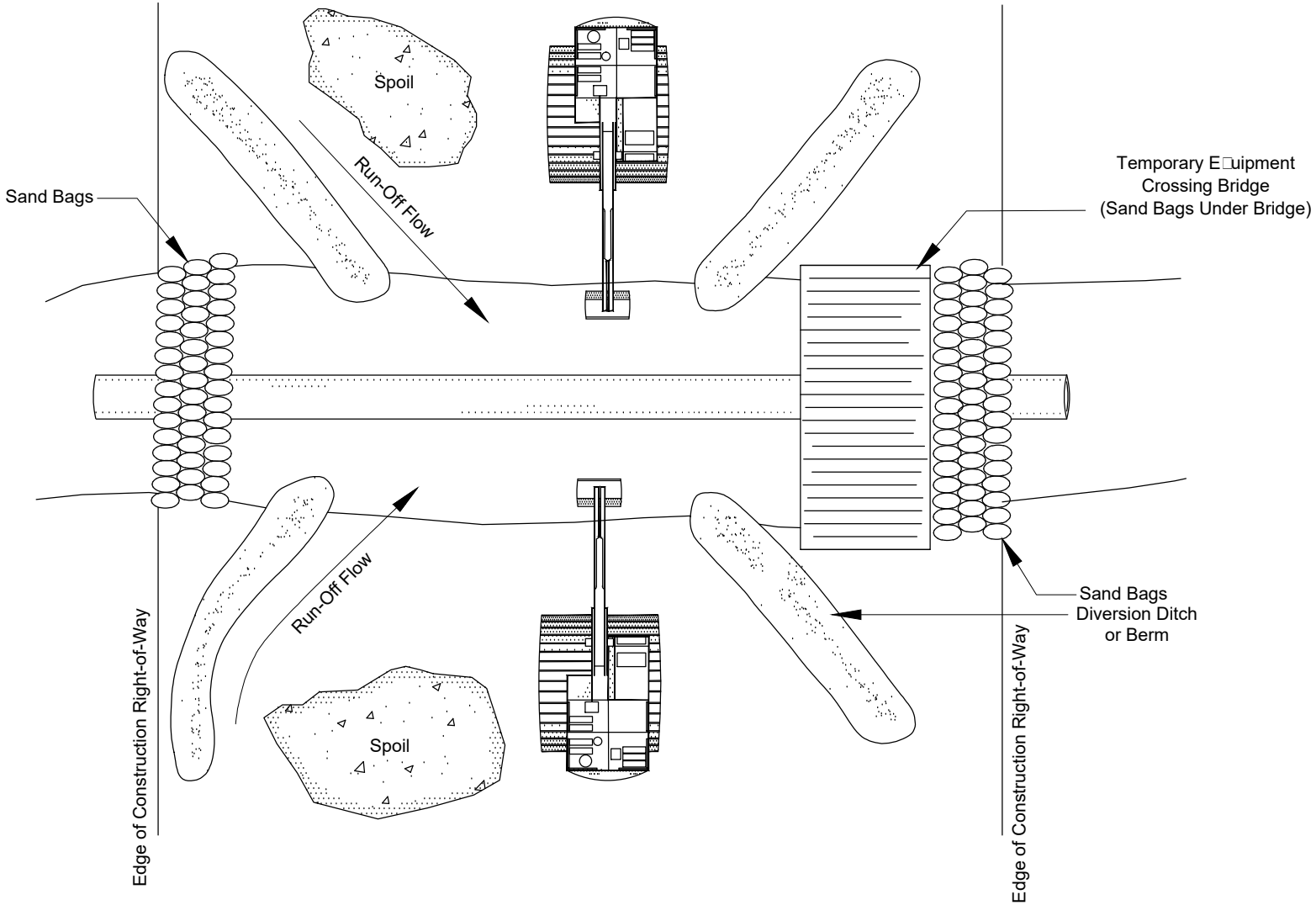


FIGURE 8
DIVERSION DITCH OR BERMS

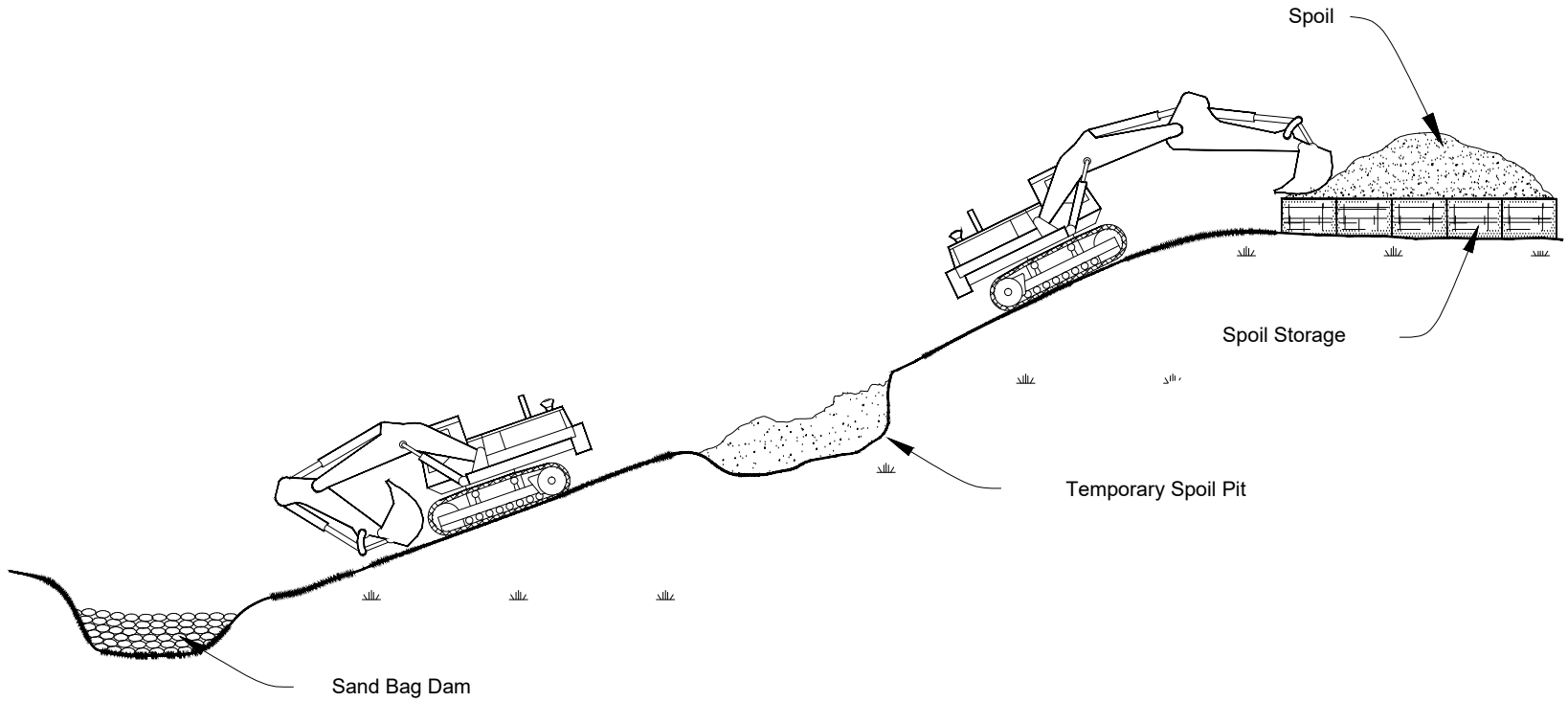


FIGURE □
UPHILL SPOIL
TRANSFER

Each of the pumps (including the backup pump) will be equipped with a minimum of 300 feet of discharge hose. It is important to stretch the hose on the backup pump and install a dewater structure for that pump at the same time the primary pumps are installed. Hoses should be free of leaks and in good operating condition.

In many cases, it is difficult to locate dewater sites where water will flow away from wetlands or streams. In these cases, careful attention will be paid to the dewater sites and alternative sites (which require additional discharge hose) selected prior to the start of in-stream construction. Often it is necessary to move the location of the dewater site several times during construction of the stream crossing to avoid dewatering activities from reaching sensitive areas.

Dewater structures will be constructed of straw bales and plastic and wooden stakes as shown on Figure 3. The intent of the design provided on Figure 3 is to allow the water to fill the dewater structure and flow evenly over the tops of the bales. Straw bales will be securely staked to the ground utilizing wooden stakes. Alternative dewater structures/devices are also provided in the Erosion Control and Revegetation Plan appended to Resource Report 1.

14.0 Backfilling the Ditch

The highest potential for water quality problems during a flumed crossing is during backfilling of the ditch. Quick backfilling into the ditch by the contractor can cause the water level in the construction area to overflow or leak through the downstream dam. Pumps must be carefully managed during backfilling to control the water level in the construction area. The contractor must carefully monitor the effectiveness of the pumps and control the rate of backfill to preclude bleeding through the downstream dam. If backfilling occurs too quickly, the pumps will not be capable of removing the water from the construction area quick enough to prevent the escape of turbid water.

To prevent turbidity, backfilling of the ditch will be conducted in a slow, well-planned manner. Backfilling will begin in the center of the stream directly under the flume pipes and proceed toward each bank simultaneously. In this manner, much of the water in the ditch will be pushed to the ditch outside of the stream channel. If upland portions of the trench are backfilled first, the water in the ditch is pushed into the stream channel and will inevitably leak through or overflow the downstream dam.

Once backfilling of the entire stream channel is complete, the contractor will compact the streambed and construct solid plugs on both banks. Water will remain trapped in the ditch outside of the stream channel. This water will be pumped from the ditch at a later time in the manner described for dewatering the construction area (see Section 13).

15.0 Flume Removal

After the ditch is backfilled, clean gravel fill is placed on the top one foot of the ditch (where necessary). Plugs will be installed at each stream bank and the stream banks stabilized and the flume will be removed from the crossing. To prevent excessive increases in turbidity during flume removal, the contractor will remove all of the sandbags from the downstream dam. A trackhoe can be utilized to remove the top layers of the sandbags as long as the operator takes great care not to dig into the streambed or to increase turbidity.

After the downstream sandbags are completely removed from the streambed (except those few left directly under the flume), the contractor will begin removing the sandbags from the upstream dam. The top rows of sandbags should be removed by hand until the water begins to overflow the top of the dam and flows slowly over the construction area. For the first 10 to 30 minutes, turbidity downstream of the crossing area could increase considerably. However, the streambed portion of the construction area will be flushed clean of sediments left over from construction and the water will flow clear over the disturbed stream bed area. After the turbidity level has decreased to acceptable levels or that of upstream levels, the contractor can proceed with removing the remainder of the upstream dam sandbags.

Once the majority of the sandbags are removed, the flume pipe will be removed. The flume pipe will be raised directly from the streambed in a single movement. Under no circumstances will the contractor drag the flume pipe from the streambed. Rather, it will be lifted and then carried from the crossing area. After the flume is removed, the remaining few sandbags, which were laid directly under the flume pipe, can be removed by hand.

Northwest Pipeline LLC

Dam and Pump Procedures

North Seattle Lateral Upgrade Project

May 2017

DAM & PUMP PROCEDURES

During construction various local, state and federal permits will require that flowing streams with coldwater fisheries be crossed utilizing a "dry crossing" technique. Dam & pump is one of the methods which may be utilized to achieve a dry crossing of a flowing stream. The purpose of this plan is to outline the techniques that will be utilized to temporarily dam stream crossings and pump the flowing water around the site during construction of the North Seattle Lateral Upgrade Project (Project). These guidelines are subject to change based on permits issued by regulatory agencies.

1.0 Purpose of Dam & Pump Stream Crossings

The primary purpose of damming a stream is to ensure that in-stream construction activities comply with water quality standards for turbidity that have been established by the state to protect aquatic life and other beneficial uses. Overall, properly installed and maintained dams can be very effective in reducing turbidity during in-stream construction. In most cases, detectable increases in turbidity are limited to only the short duration when the dams are installed or removed from the streambed.

However, simply installing the dams is no guarantee that compliance with water quality standards will occur. Dams require monitoring and occasional repair during the crossing period to ensure the integrity of the structure(s). Adequate pumps play an integral role in a successful dam & pump crossing.

2.0 Where Dams & Pumps Will Be Installed

Any minor or intermediate waterbody with water flowing in the streambed at the time of construction, which has a coldwater fishery as defined by the Washington Department of Fish and Wildlife (WDFW), may be dammed & pumped. A list of streams where dry open cut crossing methods (fluming or dam and pump) may be utilized is provided as part of Resource Report 2.

3.0 General Layout of a Typical Dam & Pump Stream Crossing

Figure 1 shows a plan view of a typical dam & pump stream crossing. The primary components of a dam & pump crossing include:

- sandbag/plastic dams or other functional designs (e.g., metal plates, water bladders, etc.);
- spoil storage and staging areas;
- pumps and pump containment structure(s);
- dewater structure(s);
- erosion control structures; and
- spill containment and cleanup materials.

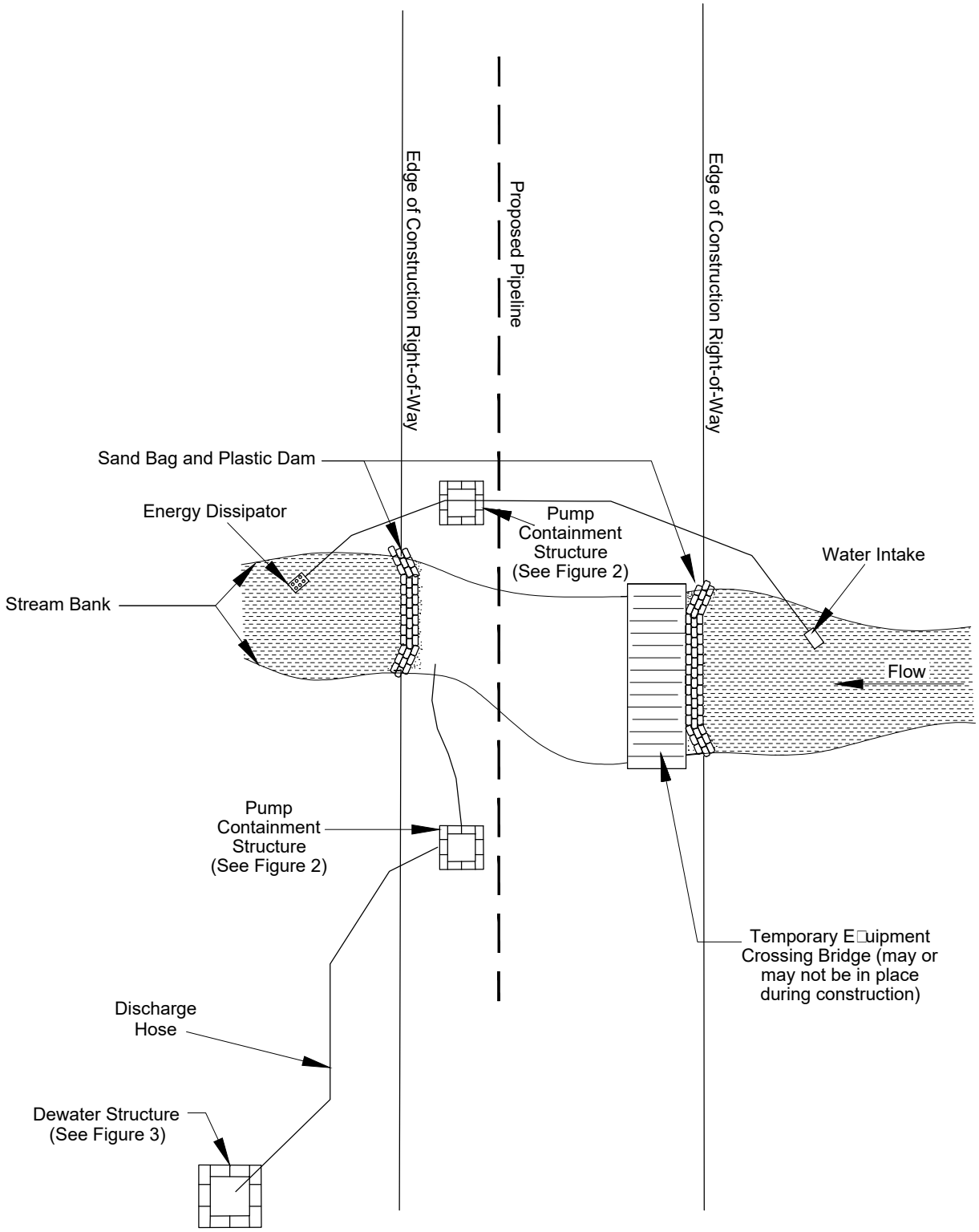


FIGURE 1
PLAN VIEW OF TYPICAL DAM & PUMP STREAM CROSSING

The sandbag/plastic dams (or other functional designs such as metal plates or water bladders) are used to isolate the stream flow from the area of construction. A single pump or multiple pumps are used to temporarily convey the stream flow around the construction area, thereby reducing the introduction of sediments into the water column during ditching and backfilling. These structures are also utilized to prevent downstream water from flowing upstream into the construction area. They also serve to contain water that infiltrates into the construction area before it can be removed by pumps and discharged to an upland area. Finally, the downstream structure serves to contain turbid water, which rises quickly in the construction area during backfilling of the trench.

All waterbodies with water in the streambed at the time of construction must have an equipment crossing bridge.

The temporary spoil storage area is where spoil trenched from the streambed will be stored until backfilling is completed. These temporary extra work areas are identified on the Environmental Alignment Sheets. The Federal Energy Regulatory Commission's (FERC) Wetland and Waterbody Construction and Mitigation Procedures (Wetland and Waterbody Procedures) prohibit the location of staging areas or additional right-of-way within 50 feet of the stream banks or edge of adjacent wetlands unless site-specific conditions such as topography prevent the setback and a modification is approved (see Resource Report 1). Trench spoil must be placed at least 10 feet away from stream banks at all flowing stream crossings. In addition, these areas must be enclosed with silt fence and/or straw bales to prevent runoff of the spoil into the stream.

Adequate pumps are essential for the successful completion of dam & pump stream crossings. During several phases of the crossing period, it will be necessary to quickly remove large quantities of water from the construction area to prevent overflow or leakage of the sandbag/plastic dams. In order to quickly and effectively remove water from the construction area, well-maintained pumps with adequate pumping rates must be utilized. In addition, backup pumps will be located on-site, hooked up and maintained as fully operational during the entire crossing period. Backup pumps will be tested prior to the start of construction. Pumps will be located in a spill containment structure that is designed to fully contain any spills of fuel or oil (see Figure 2).

Dewater structures (see Figure 3) will be utilized to reduce the velocity of pump discharge water and subsequent erosion of upland areas. These structures are essential in preventing erosion and the flow of turbid water overland and back into the stream - such overflow defeats the purpose of the dam & pump crossing by introducing turbid water into the stream.

Runoff control structures are utilized to prevent runoff from the spoil piles or from drainage of water from the trackhoe bucket from flowing around the sandbag/plastic dams or temporary equipment crossing bridges and adding sediment to the stream. Containment and control materials are necessary to respond to any spills of fuel or lubricating oils from operating equipment. A Spill Plan for Oil and Hazardous Materials (Spill Plan) will be implemented by the contractor in accordance with the provisions of that plan. Erosion control structures address the prevention of runoff from the right-of-way into the stream during and after construction is complete.

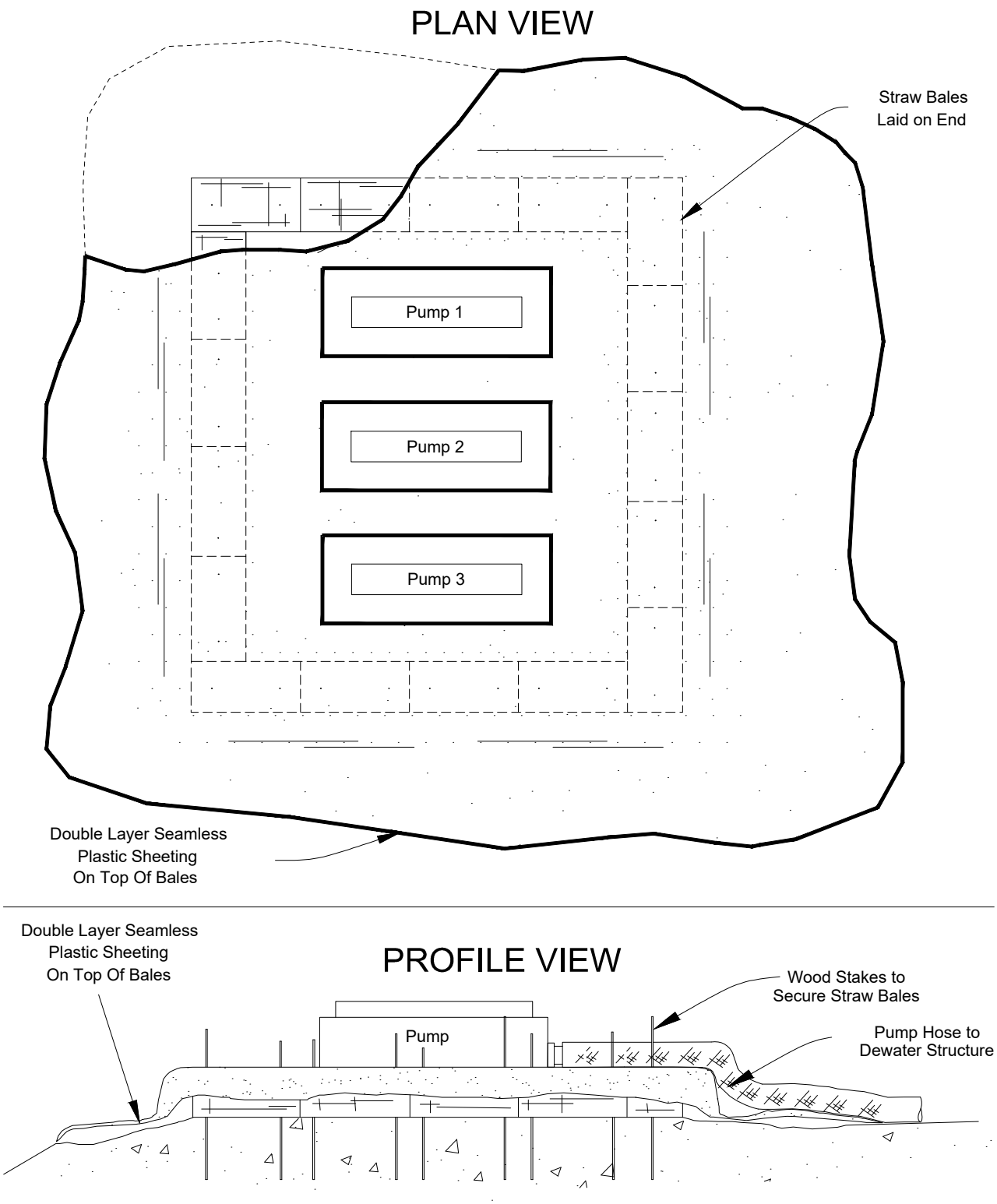


FIGURE 2
TYPICAL PUMP CONTAINMENT
STRUCTURE

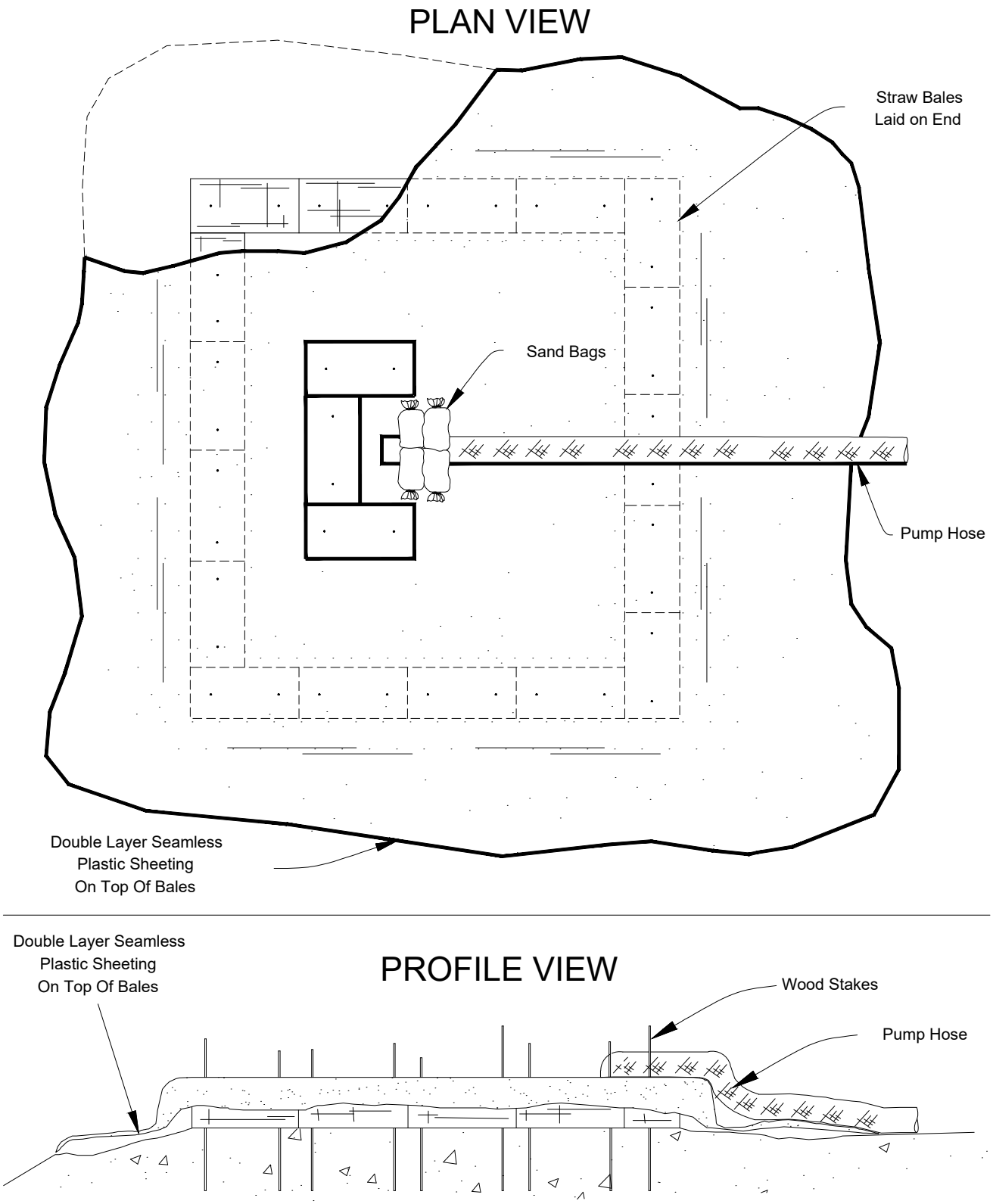


FIGURE 3
TYPICAL DEWATER
STRUCTURE

4.0 Materials Required to Install and Maintain a Dam & Pump Stream Crossing

The materials discussed below will accommodate most stream crossings. However, certain situations will arise where additional materials are required. Those streams that require additional materials are site specific and will be addressed on a case-by-case basis.

Sandbags will be filled with a non-leachable material such as clean, pre-washed sand. Sandbags are most effective if they are only filled to approximately 2/3 their capacity. Bags filled to capacity conform poorly to the adjacent bags and make creation of a seal more difficult. The bags must be tied securely before they are installed. If the bags are left un-tied, they tend to spill upon removal from the streambed and are nearly impossible to remove with a trackhoe. It is preferable to utilize burlap sandbags to construct the upstream and downstream dams. Plastic bags tend to rip when removed from the stream and are often too porous to adequately contain small grain sand.

Sandbags alone may not completely seal the upstream and downstream ends of the construction area. The dams are typically more effective when sheets of thick plastic are interwoven within the sandbags (see Figures 4 and 5). The plastic, when applied as shown on Figure 4, will effectively seal the dams and will greatly reduce the amount of water leaking into the construction area from behind the upstream and downstream sandbag dams.

5.0 Installation of the Dams

Short-term elevated levels of turbidity are expected to occur during installation of the dams. However, several measures can be taken to minimize the increased turbidity. Before the contractor attempts to install the dams, all materials necessary to complete the installation process will be located on-site. Installation of the dams cannot begin until all of the precautions outlined in the Spill Plan have been undertaken. Turbidity sampling will be conducted during all dam & pump crossings in accordance with the Stormwater Pollution Prevention Plan.

The first step in installing the dams is to clear away any large rocks and boulders from the sandbag/plastic dam area that may affect the integrity of the sandbag/plastic dams. It may be necessary to utilize a trackhoe to assist in removing these rocks. However, the bucket will not dig into the streambed to remove rocks. Rather, the edge of the bucket will be utilized to roll the rocks to the side or a thumb on the bucket will be used to pick up and move rock obstacles.

The sandbags may be laid on top of the plastic sheeting that will be used to help seal the sandbag dam. The plastic will be laid such that when it is wrapped around the sandbag dam, the plastic sheeting lays on the upstream face of the dam so that water pressure holds the plastic firmly against the sandbag dam face. The sandbags will be properly seated over the plastic and onto the stream bottom and packed as tightly together as possible.

Sandbags will be installed upstream and downstream and interwoven with plastic sheeting to form a tight seal. Typically, the sandbag/plastic dams will extend at least three feet above the water level of the stream to accommodate increased stream discharge during the crossing period (see Figures 4 and 5).

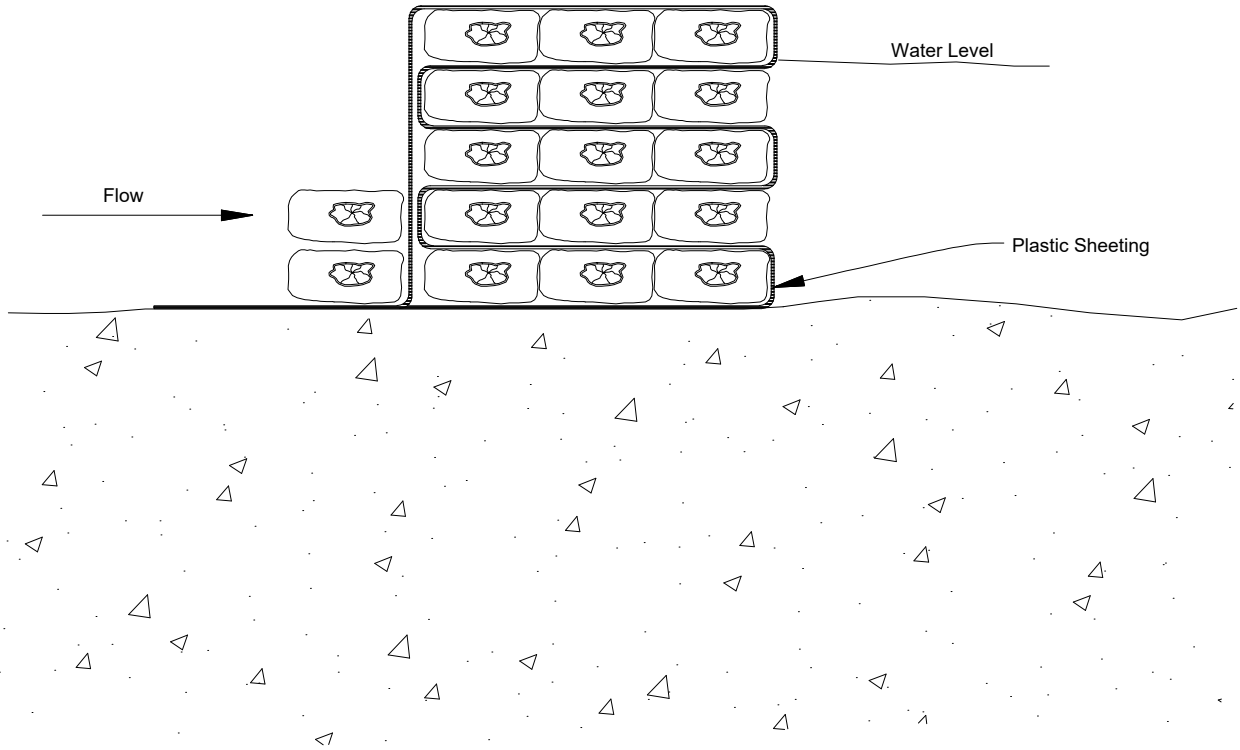
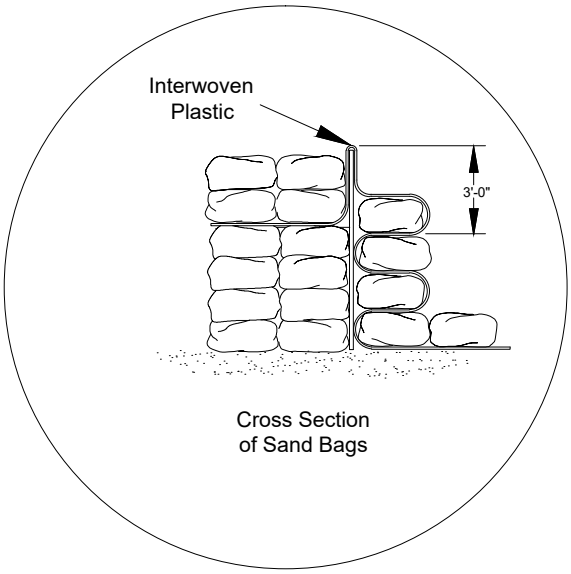


FIGURE 4
PLASTIC SHEETING INTERWOVEN INTO A SAND BAG DAM



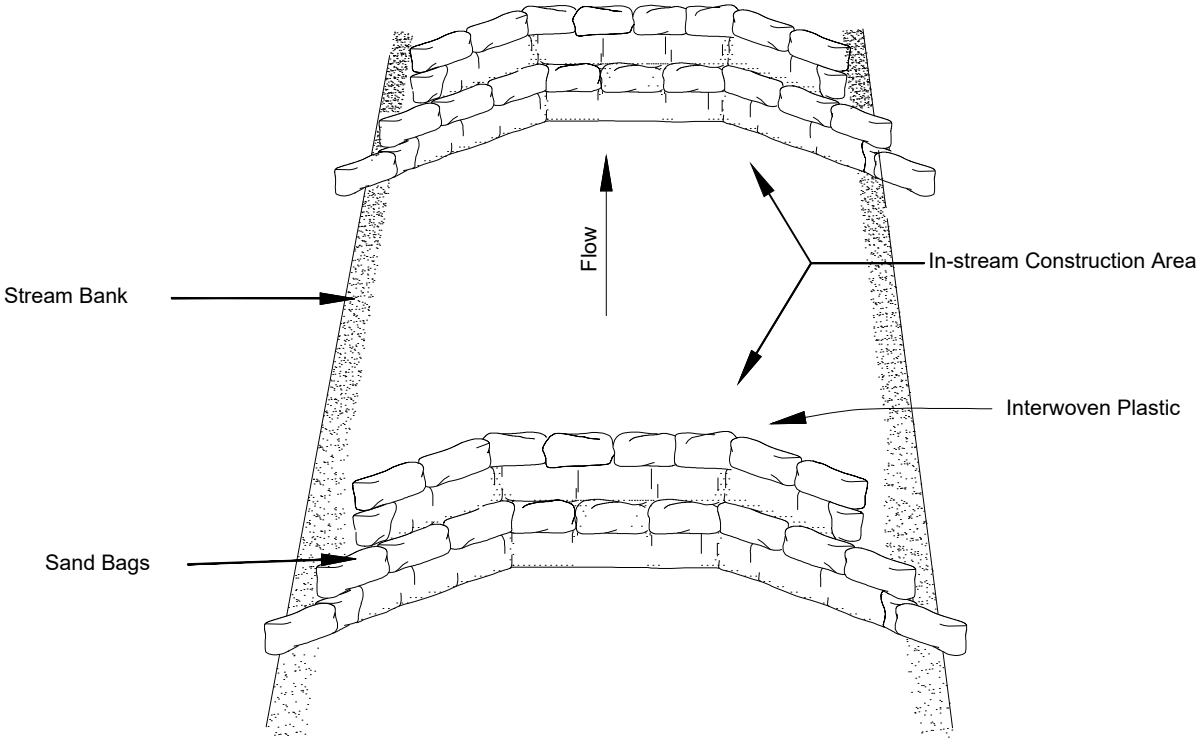


FIGURE 5
SAND BAG AND PLASTIC DAM

While the upstream dam is being installed a properly sized pump(s) will be operating to move stream flow around the dam to prevent stream erosion or bank scour. After the upstream sandbag/plastic dam is complete, the contractor will immediately begin installation of the downstream dam. The pump(s) will continue operating to divert stream flow around the dams throughout installation of the dams and completion of the crossing. The downstream sandbag/plastic dam will be constructed to a height at least three feet above the downstream water level.

6.0 Maintenance of the Dams and Pumps During Construction

Dam & pump crossings may require constant monitoring and occasional repair during the crossing period. The longer the dams remain in the water, the greater the probability they will begin to leak and that water will invade the construction area in potentially significant quantities. Therefore, it is imperative that once trenching within the stream begins that the construction process is carried to completion non-stop. Typically, this involves installing the dams on the day immediately preceding construction of the crossing. Ditching of the stream channel should begin early the following morning and the pipe pulled immediately following completion of the trench. Backfilling should commence immediately following the stringing of the drag section. Most stream crossings typically require approximately 7 - 14 days to install the dams, dig the trench, install the pipe drag section, backfill the trench and restore and stabilize the stream banks depending on site conditions. Smaller streams (less than 10 feet in width) generally require less time to cross using dam & pump procedures.

While the dams are in place, the contractor will provide a sufficient crew that will be responsible for maintaining the dam & pump crossing. That crew will apply additional plastic to the dams and add additional sandbags as necessary. In addition, this crew will be responsible for operating, maintaining and fueling the pumps and maintaining the discharge structures. When the crossing is complete, this crew will immediately install the erosion control structures pursuant to FERC's Wetland and Waterbody Procedures.

To be adequately prepared to repair the dams, the contractor will have on-site rolls of thick plastic sheeting and extra filled and tied sandbags. These materials will be stored directly adjacent to the stream crossing so that they are readily accessible should the need to repair the dams arise.

7.0 Length of the Drag Section

One of the biggest problems encountered during construction of dam & pump stream crossings is the installation of extremely long drag sections across the stream in a single drag section. The extra length requires that the dams be in place longer than necessary which increases the probability of serious issues with the integrity of the sandbag/plastic dams. In addition, the extra time required to dig additional ditch to accommodate long drag sections can result in integrity problems with the sandbag/plastic dams.

Segments must be kept short and extend only the distance necessary to allow for later tie-in to the upland portions of the pipeline. On most streams the drag section should only be long enough to incorporate the sag bends. In other locations, it may be necessary to install additional pipe to complete the crossing.

The entire drag section must be made up prior to the start of in-stream trenching. Once the drag section is complete (welds x-rayed and joints coated), the drag section can be installed immediately following trenching.

8.0 Spoil Storage During Trenching

Spoil must be stored in a manner such that runoff from the spoil does not flow into the stream or off the right-of-way. For streams in flat topography, runoff from the spoil storage pile is not typically a problem. However, on steep sloping stream banks water can run back down the right-of-way and enter the stream upstream or downstream of the dams creating a serious water quality problem. The problem can be compounded as the trackhoes working on the stream banks lift water saturated spoil from the stream and lay it on the right-of-way adjacent to the stream bank before it can be conveyed uphill by additional equipment. To accomplish runoff control during trenching, diversion structures or trenches will be dug within the right-of-way to direct the runoff back into the construction area as shown on Figure 6.

9.0 Spoil Transfer During Construction

Some of the stream crossings may occur adjacent to steep upland areas. In these cases, it will be necessary to utilize additional equipment (trackhoes, dozers, loaders) to transfer spoil by the trackhoes at each stream bank to the temporary spoil storage area.

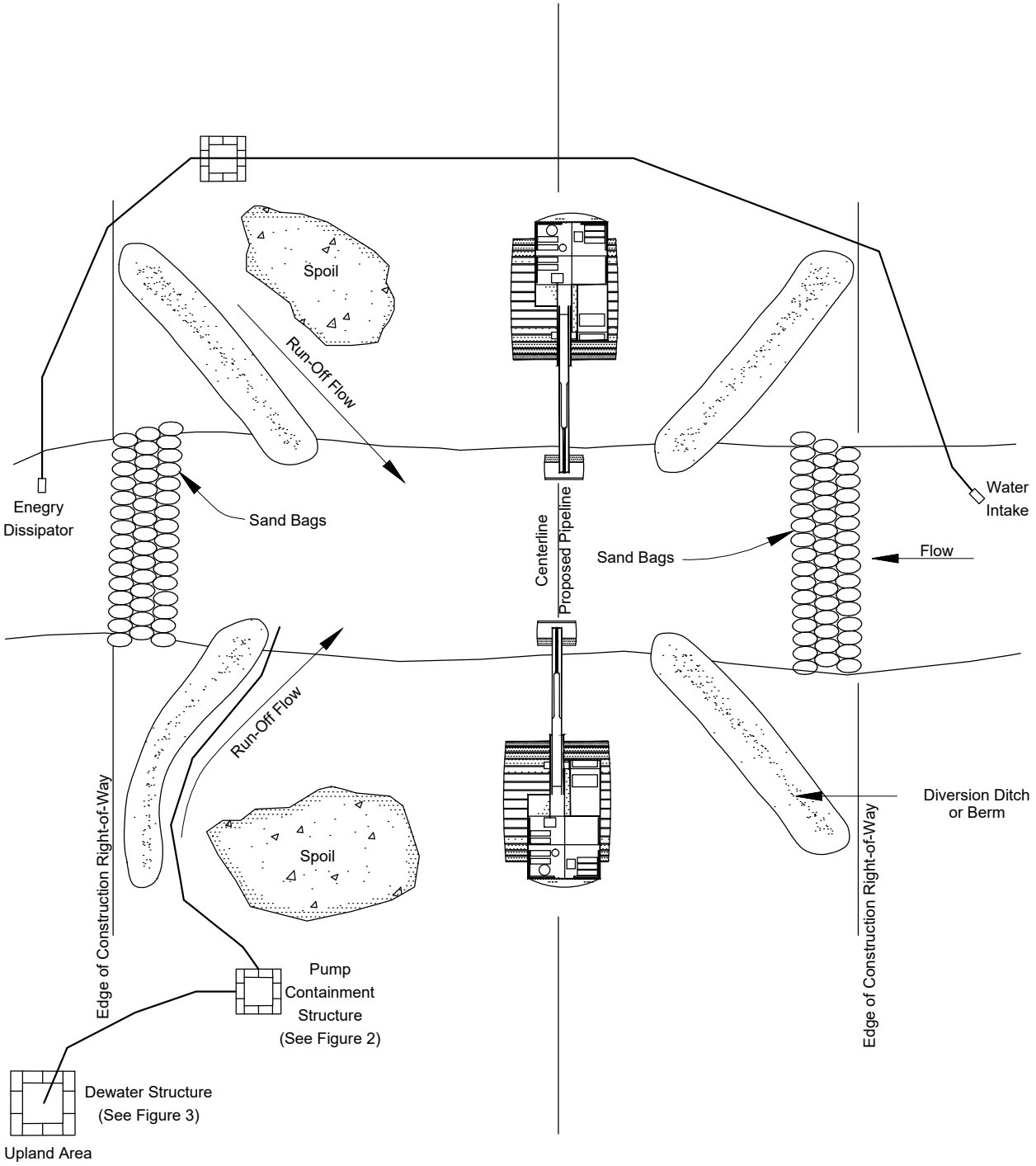
In most cases, the contractor will utilize dozers to push the spoil to the temporary storage area. In other areas, trackhoes will be required to transfer spoil dug by the trackhoe working on the stream bank uphill to a flatter area where it can be moved by dozers. Where two trackhoes are utilized to transfer spoil uphill, it is often desirable to have the trackhoe working on the stream bank place the spoil into a pit (see Figure 7). The spoil from the pit is then picked up by the second trackhoe and lifted further uphill. The pit will significantly reduce the amount of water from the spoil that runs downhill. The pit can be maintained and dug by the trackhoe working uphill from the crossing.

10.0 Installing the Pipe

While trenching is being conducted, the contractor will hook up the drag section to the sideboom tractors so that the pipe may be installed as soon as trenching is completed. It will be necessary at many crossings to float the pipe across the trench (i.e., it may not be feasible to completely dewater the ditch). While the drag section is being lowered into the trench, it is essential that pumps be operated to ensure that turbid water does not leak through or flow over the dams. The contractor will operate the pumps at a rate so that water displaced by the pipe is immediately removed and discharged to the dewater site.

11.0 Dewatering the Construction Area

Proper operation of pumps to dewater the construction area is essential to the successful completion of a dam & pump stream crossing. Pumps will be utilized by the contractor as necessary to control the level of water in the construction area. The purpose of the pumps is not to completely dewater the trench.



NOTE:

Temporary Bridge may or may not be in place during trenching operations.

FIGURE 6
DIVERSION DITCH OR BERMS

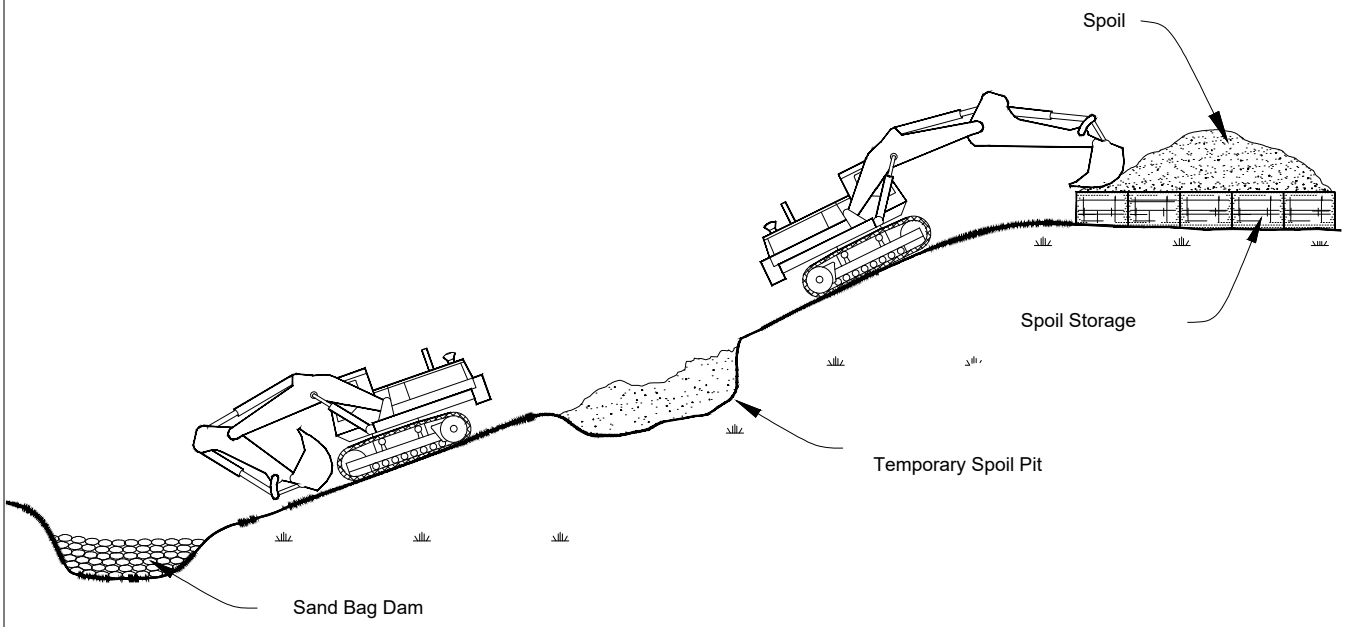


FIGURE 7
UPHILL SPOIL
TRANSFER

If the water level in the construction area exceeds the upstream or downstream level of the dams, environmental inspectors will notice small amounts of turbid water escaping into the stream either upstream or downstream of the dams. This is known as "bleeding" and the problem can be quickly resolved by increasing the pumping rate and reducing the water level within the construction area. Although bleeding will not typically result in a violation of water quality standards downstream, if left unchecked it can quickly result in erosion of the dams and serious downstream water quality problems.

The contractor will utilize pumps at each crossing to control the water level in the construction area. The contractor will also install backup pumps that will be tested and fully functional prior to the start of the crossing period. Pumps will be installed and tested and the dewater sites constructed the day prior to any in-stream construction. For most crossings, the contractor will setup three pumps. Additional pumps may be required at a few of the stream crossings. Two of the pumps will serve to remove water from the construction area and the third pump will serve as a backup should one of the primary pumps fail.

The pumps will be set in a containment area as shown on Figure 2. The primary purpose of the containment area is to fully contain any fuel or lubricating oil spills. If hydraulic pumps are used, the hose couplings on the side of the pump body will be oriented in the containment area such that they point perpendicularly away from the stream banks. The purpose of orienting the couplings away from the stream is to protect the stream should one of these couples fail and hydraulic fluid escape.

The contractor will carefully inspect each pump prior to its delivery to the crossing site. In particular, any frayed hoses or apparent leaks will be repaired before the pumps are delivered to the crossing site. Pump heads and the hoses will be cleaned of any free hydraulic oil prior to placing the pump heads into the stream.

All pumps will be installed with individual intake hoses or hydraulic heads, trash filters and discharge hoses. All hydraulic heads will remain in the water during the entire construction process including backfill. In this manner, the backup pump can be immediately employed should one of the primary pumps fail.

Each of the pumps (including the backup pump) will be equipped with a minimum of 300 feet of discharge hose. It is important to stretch the hose on the backup pump and install a dewater structure for that pump at the same time the primary pumps are installed. Hoses should be free of leaks and in good operating condition.

In many cases, it is difficult to locate dewater sites where water will flow away from wetlands or streams. In these cases, careful attention will be paid to the dewater sites and alternative sites (which require additional discharge hose) selected prior to the start of in-stream construction. Often it is necessary to move the location of the dewater site several times during construction of the stream crossing to avoid dewater from reaching sensitive areas.

Dewater structures will be constructed of straw bales and plastic and wooden stakes as shown on Figure 3. The intent of the design provided on Figure 3 is to allow the water to fill the dewater structure and flow evenly over the tops of the bales. Straw bales will be securely staked to the ground utilizing wooden stakes. Alternative structures are also provided in the Erosion Control and Revegetation Plan appended to Resource Report 1.

12.0 Backfilling the Ditch

The highest potential for water quality problems during a dam & pump crossing is during backfilling of the ditch. Quick backfilling into the ditch by the contractor can cause the water level in the construction area to overflow or leak through the downstream dam. Pumps must be carefully managed during backfilling to control the water level in the construction area. The contractor must carefully monitor the effectiveness of the pumps and control the rate of backfill to preclude bleeding through the downstream dam. If backfilling occurs too quickly, the pumps will not be capable of removing the water from the construction area quick enough to prevent the escape of turbid water.

To prevent turbidity, backfilling of the ditch will be conducted in a slow, well-planned manner. Backfilling will begin in the center of the stream and proceed toward each bank simultaneously. In this manner, much of the water in the ditch will be pushed to the ditch outside of the stream channel. If upland portions of the trench are backfilled first, the water in the ditch is pushed into the stream channel and will inevitably leak through or overflow the downstream dam.

Once backfilling of the entire stream channel is complete, the contractor will compact the streambed and construct solid plugs on both banks. Water will remain trapped in the ditch outside of the stream channel. This water will be pumped from the ditch at a later time in the manner described for dewatering the construction area (see Section 11).

13.0 Removal of Dams

After the ditch is backfilled, clean gravel fill will be placed on the top one foot of the ditch (where necessary). Plugs will be installed at each stream bank and the stream banks stabilized and the dams will be removed from the crossing. To prevent excessive increases in turbidity during dam removal, the contractor will remove all of the sandbags from the downstream dam. A trackhoe can be utilized to remove the top layers of the sandbags as long as the operator takes great care not to dig into the streambed or to increase turbidity.

After the downstream sandbags are completely removed from the streambed, the contractor will begin removing the sandbags from the upstream dam. The top rows of sandbags should be removed by hand until the water begins to overflow the top of the dam and flows slowly over the construction area. For the first 10 to 30 minutes, turbidity downstream of the crossing area could increase considerably. However, the streambed portion of the construction area will be flushed clean of sediments left over from construction and the water will flow clear over the disturbed stream bed area. After the turbidity level has decreased to acceptable levels or that of upstream levels, the contractor can proceed with removing the remainder of the upstream dam sandbags.

Attachment D

Fish Salvage Plan

Attachment D

Fish Salvage Plan

The Salvage Plan details how Northwest Pipeline LLC (Northwest) would attempt to remove all fish from within the North Seattle Lateral Upgrade Project (Project) work area that will be isolated prior to being pumped dry for dry open-cut construction.

The Project will affect 19 waterbodies, and 18 will be crossed by the pipeline. One perennial stream at MP 4.86 is not crossed but is within the right-of-way. Seven streams are assumed to be perennial although flows are very limited during the summer when construction is scheduled. One manmade freshwater pond at MP 4.86 will be drained to remove the existing 8-inch pipeline and install the new 20-inch pipeline. The remaining 11 intermittent and ephemeral streams are expected to be dry during construction. Various life stages of listed anadromous salmonids, non-listed special status salmonids and non-salmonids may be present in affected waterbodies during construction. Fish will require salvaging to avoid mortality through stranding, entrainment, and/or impingement during dewatering of the isolated in-water construction area. Seining would be the primary method utilized for fish salvage rather than electrofishing.

Prior to constructing the upstream dam necessary for dam-and-pump construction across the six waterbodies, one or more block nets will be installed upstream from the instream work zone, farther upstream than the location of the upstream diversion dam. The block net material is typically a 9.5 millimeter stretched mesh (WSDOT, 2008) that will prevent fish and other organisms from moving into the work area from upstream locations. Sites will be selected based on desirable attributes such as slower flows and without heavy vegetation, undercut banks, or deep pools so that the block net seals off the work area to the maximum extent possible. The block net(s) will have to be frequently inspected for sealing capacity and leaf/debris collected will be frequently removed. Block nets need to be secured on both banks and within the stream channel to prevent failure during rain events or debris collection (WSDOT, 2008).

Once the upstream block net is in place, one or more seining crews will proceed from that site to the downstream block net site. The objective of seining is not to capture fish but to maneuver them downstream and out of the construction zone. Small two-stick seines will be operated by at least two people although a third person may be required to move the seine over bottom debris and/or to seal the bottom of the net along the streambed. Similar to the block net, seines would be made of a 9.5 millimeter stretched mesh (WSDOT, 2008) that will prevent fish and other organisms from escaping.

In some situations where heavy instream and/or stream bank vegetation is present, or with undercut banks or deep pools, a haul seine or two-stick seine may not completely seal the water column from bank to bank or from water surface to streambed. In those situations, compressed air will be used to generate underwater bubbles, either from a perforated hose, wand or nozzle, to drive fish away from vegetation debris, out from undercut banks, or from deep pools in advance of the seining crew. Whether one or more air compressors are required to generate bubbles through more than one hose will depend on site conditions and the distances over which the bubble generator (air compressor) must operate. The use of bubble scare tactics will be site-dependent and may require one or more people in addition to the seining crew(s) to dislodge fish from difficult instream situations, to increase the efficiency of the seine, and to exclude as many fish as possible from the construction area.

Once the seining crew(s) reaches the downstream block net site, the downstream block net will be installed behind (upstream from) the seining crew(s). Similar precautions to ensure an adequate seal as those employed at the upstream site will be necessary. The downstream block

net will also be monitored for accumulated litter and debris will be removed during the entire construction operation. These actions to exclude fish from the construction right-of-way should reduce or eliminate the risk of death or injury to fish by construction and by dewatering the isolated work area that will require other fish removal methods.

After the upstream and downstream block nets are in place, construction crews will begin building the sand bag and plastic sheeting dams on the edges of the construction right-of-way to completely isolate the construction zone. When the dams are functional with dam-and-pump diversion installed and working, water contained between the dams will be pumped out and discharged within dewatering structures on the streambank. All pumped water intakes, whether for dewatering or for dam-and-pump diversion, will be screened according to National Marine Fisheries Service standards (NMFS, 1997) to prevent entrainment of aquatic species. The screens will also prevent aquatic life from entering the intake hose if a block net should fail. Screens shall be placed approximately 2 to 4 feet from ~~the end~~ of the intake hose to ensure fish are not pinned upon the screen (WSDOT, 2008). Dewatering will be slow enough to allow for additional removal of fish if any remain after the fish exclusion procedures, described above. During dewatering, the construction site will be monitored to prevent stranding organisms. Additional fish removal from within the isolated construction site may include additional seining with two-stick seines, using dip nets, or removing fish and other organisms by hand.

The following has been adapted from procedures and conditions developed by Washington State Department of Transportation (2008) to minimize risks to Endangered Species Act (ESA)-listed species during their removal from construction zones and release:

1. Fish handling will be kept to the minimum necessary to remove fish from the work site.
2. Fish will not be sampled or anesthetized during removal activities as this protocol is intended to address fish removal, not research. Fish species, number, age class estimate, and release location will be documented.
3. Individuals handling fish will ensure that their hands are free of sunscreen, lotion, or insect repellent and bare skin will be wetted to avoid drying out fish skin at points of contact and increasing potential for fungal or other skin lesions.
4. Fish or other aquatic life captured will immediately be put into dark colored containers filled with clean stream water. Fish removal personnel shall provide a healthy environment for fish with minimum holding periods and low fish densities in holding containers to avoid effects of overcrowding. Large fish shall be kept separate from smaller fish to avoid predation during containment. Water-to-water transfers will occur whenever possible.
5. ESA listed fish should not be transferred out of water to prevent added stress. Holding container temperature and well being of specimens will be frequently monitored to ensure that all specimens will be released unharmed. Potential shade areas and supplemental oxygen for fish holding shall be considered in designing fish handling operations.
6. Unless site conditions require alternative release locations, all fish captured by any means will be released upstream from the upstream block net. Release at an upstream site will ensure that the captured fish will be held for very short durations. Also, release upstream will minimize effects of turbidity generated when the sand bag dams are removed and water flows over the dry open-cut construction site.
7. Each released fish shall be capable of remaining upright and have the ability to actively swim upon release. ESA-listed or proposed fish will have priority over other species for release. One person shall be designated to transport specimens in a timely manner to the site selected for release.
8. All dead ESA-listed fish will be preserved and delivered to the pertinent regulatory agency as outlined in the appropriate permit conditions.

9. If authorized level of take is exceeded, the pertinent regulatory agency shall be notified as soon as possible.

References:

National Marine Fisheries Service. 1997. Fish Screening Criteria for Anadromous Salmonids. National Marine Fisheries Service. Southwest Region, Santa Rosa, CA.

Washington State Department of Transportation. 2008. Chapter 14.0 In-Water Work. Pages 14.1 – 14.10 *in* Biological Assessment Preparation for Transportation Projects, Advanced Training Manual Version 10-08. Environmental Affairs Office, Washington State Department of Transportation, Olympia, WA.

APPENDIX F

RESIDENTIAL CONSTRUCTION PLANS

APPENDIX F – List of Residences within 50 Feet of Construction Work Space or Temporary Extra Work Areas

Milepost	Distance from Edge of Construction Right-of-Way or TEWA (feet)
1.96	12
2.25-2.31	12
	9
	13
	6
2.34-2.39	13
	9
2.45-2.51	13
	3
	0
2.57	3
2.70	1
2.82	12
	25
2.96-3.0	1
	6
3.16-3.19	14
	16
	39
4.05-4.08	34
	48
4.11-4.17	44
	0
	50
4.20-4.27	2
	16
	40
4.42	35/ROW & 24/TEWA
4.68	12
	10
4.84	6
4.92	15
	44
5.0	50
5.27	8
5.36	29
5.82-5.90	43
5.91-5.94	14
	12
	13
	13
	14
	14
	15
	16
	45
	43
	46
	43
	45
	44
	49
	47

Milepost	Distance from Edge of Construction Right-of-Way or TEWA (feet)
5.91-5.94	15
	16
	32
	43
5.94-5.98	28
	30
	22
	29
	30
5.98-60.2	28
	31
	22
	29
	29
6.02-6.05	31
	29
	28
	29
6.07-6.11	6
	17
	11
	11/ROW & 10/TEWA
	37
6.12-6.16	7
	2
	39
	2
	39
	2
	40
6.17-6.21	40
	2
	39
	1
	42
	2
	18
6.21-6.24	2/ROW & 9/TEWA
	2/ROW & 6/TEWA
	6
6.30	28
6.32-6.37	19
	19
	19
	6
	6
	8/ROW & 10/TEWA
	44
	29
6.37-6.40	17/ROW & 8/TEWA
	11
	12
	4
	12
	31

APPENDIX F – List of Residences within 50 Feet of Construction Work Space or Temporary Extra Work Areas

Milepost	Distance from Edge of Construction Right-of-Way or TEWA (feet)
6.43-6.45	19/ROW & 17/TEWA
	29
	29
	31
	44
6.47	11
	30
6.66	46
6.79	23
6.88-6.93	22
	17
	7
7.0	6
	0/ROW & 45/TEWA
	25
7.04-7.12	0
	0
	0
	0
	22
	31
	40
	43
7.12-7.18	0
	14
	15
	36
	29
	32
	22
	42
7.18-7.25	18
	0
	27
	32/ROW & 13/TEWA
	34
	37
	0
	0
	43
	23
7.25-7.32	44
	42
	27
	27
	20
	20
	26
	27
	24
	23
	46
	39
	32
	7
	0
	0
	0

Milepost	Distance from Edge of Construction Right-of-Way or TEWA (feet)
7.32-7.34	24
	24/ROW & 3 TEWA
	0
	12
	48
7.39	43 – Apt.
7.39-7.46	8 – Apt.
	4 – Apt.
	22 – Apt.
7.46-7.52	41 – Apt.
	6 – Apt.
7.75-7.80	16
	18
	18
	20
	17
7.80-7.86	18
	19
	21
	29
11.1	25 – Apt.

Northwest Pipeline LLC

Neighborhood Residential Construction Plan
(MPs 2.25 to 7.34, 7.75 to 8.00)

North Seattle Lateral Upgrade Project

Updated
October 2017

Scope of Residential Construction Plan

The scope of this Residential Construction Plan (Plan) is to describe how Northwest Pipeline LLC (Northwest) will perform construction and coordinate with landowners in densely populated single or multifamily residences located within 25-feet of the construction right-of-way or temporary extra work areas (TEWA).

General Description of Work

Work to be performed as part of the North Seattle Lateral Upgrade Project (Project) includes the removal and replacement of 5.85 miles of 8-inch diameter pipeline with 20-inch diameter x 0.375-inch wall thickness, Grade X-52 pipe. The replacement pipe will meet the requirements of U.S. Department of Transportation's (DOT) Class 3 location designation. The replacement pipe will be installed at a minimum three-foot depth of cover from the top of the pipe within the same trench alignment and easement as the existing 8-inch pipeline that will be removed. Environmental Alignment Sheets provided under separate cover and site-specific Residential Drawings (see Attachment 1) show the alignment of the existing 8- and 16-inch pipelines and the location of the construction right-of-way and TEWA limits in relation to the residences in the neighborhood.

Northwest will work closely with landowners to minimize potential construction-related impacts. The goal is to minimize the construction timeframe for removal, excavation, replacement, and backfill in residential areas.

Schedule

Work will be scheduled to comply with local noise ordinances. Assuming a 10-hour work day (7:00 AM to 6:00 PM), 6 days per week, the work is expected to last for four to five months. No residential area should be impacted for more than 30-days (not including final clean up and restoration activities). Work is not presently scheduled after 6:00 PM, or on Sundays, but if required to meet the schedule, or complete critical activities (e.g. strength testing, drying), construction activities would be extended and will be conducted in accordance with Snohomish County noise exemptions [SCC 10.01.050 (2) and (6)].

Safety and Security

Where necessary, landowners' fencing will be taken down if located within the construction right-of-way and/or TEWAs. Chain link fence panels will serve as the safety fencing and will be installed on the edges of the construction work limits as indicated on the Residential Drawings provided in Attachment 1. The chain link fence panels will be a minimum of 6 feet high and will create a continuous boundary separating the construction work limits from the homes. The chain link fence will also serve as a temporary barrier for any fences that have been removed for construction. The fence panels will be secured to keep children and pets out of the work limits, and contained within the previously fenced areas. All construction activities will be contained within the fencing boundary. Once the work is completed the permanent property fences will be restored. A security guard will patrol the work area during non-working hours.

Equipment and Personnel

The following is a preliminary list of equipment that may be used during the Project:

- Pipe Trucks
- Backhoes
- Side Booms
- Welding Trucks
- Bulldozers
- Front End Loaders (to shuttle dirt)
- Motorgraders
- Dump Trucks
- Mulcher
- Pipe Bending Machine
- Track Hoe
- Water Trucks
- Pickup Trucks
- Air Compressors
- Dewatering pumps

It is expected that approximately 20 - 30 people will be at any particular site during any given time for the Project construction period.

Noise & Vibration

Northwest will comply with the Snohomish County Noise ordinance.

To minimize noise impact in residential areas, construction activities will be undertaken during daytime hours when most residents are not home and will avoid disturbance during the evening and nighttime hours. For residences within 25 feet of the construction right-of-way, Northwest will offer temporary housing arrangements (hotel) for those that are impacted by noise during the daytime hours at the landowner's request.

Northwest is not anticipating any blasting or rock trenching equipment for the Project because excavation will occur along a previously disturbed pipeline trench. Additionally, geotechnical studies have been completed in the Project area which have not identified any consolidated rock that would require blasting or rock trenching equipment. The Project vibrations should be limited to typical tracked-type construction equipment.

Project Access

Primary access within the neighborhoods for heavy equipment, pipe, and materials will be along public roads and the construction right-of-way. Public roads, which have been identified for access to the construction right-of-way, will be utilized for light duty vehicles. Traffic control will be utilized for congested construction areas with signage and flaggers as required. Roads will be kept clean to minimized dirt buildup and fugitive dust.

Landowner Access

If the work corridor crosses a road or driveway, access will be maintained so residents will have ingress/egress to their homes. If the road is proposed to be open cut, one lane will remain open during construction. There may be short periods of time where the entire road or driveway will be closed to install a joint of pipe. Alternate points of access to neighborhoods will be maintained during temporary road closures. A traffic plan, appropriate signage, and flaggers will facilitate these occurrences. Generally, at night, steel plates will be placed over the road ditch so traffic can flow on all lanes. Road work will be scheduled during non-peak travel hours (outside of 6:00 – 8:00 a.m. and 4:00 – 6:00 p.m.) to minimize construction impacts to landowners.

Summary of Launcher/Receiver Facility Construction Activities (MP 7.75 – 8.00)

Construction activities of the launcher/receiver facility at MP 7.76 will occur over a three month period, which may not coincide with the pipeline construction timing. The activities are anticipated to occur during the summer months, but not all activities can be completed until the pipeline is installed (i.e. strength testing, drying, etc.). Northwest will work with the local residences and local school districts on bus stop locations if the construction activities extend into the school year. A temporary relocation of the school bus stop may be required, though the need cannot be determined until the construction contractor has been selected and the contractor's schedule is provided.

Parking on the north and south sides of 186th Street SE will not be available within the construction work space while construction actives are occurring. Northwest will coordinate parking and access with the landowners as part of the Project notification process. Ingress and egress will be maintained for 12th and 13th Drives along 186th Street SE.

Construction activities for the launcher/receiver facility will be similar to those described in the pipeline construction activities below with the exception of pipe support foundations and the pre-cast fencing that will be installed around the launcher/receiver facility. Options on the style of pre-cast fencing will be provided to the Copper Creek Home Owners Association for consideration prior to construction.

Summary of Pipeline Construction Activities and Sequence

General pipeline construction activities and their sequence are described below and are as follows:

- Pre-construction Activities
- Notification
- Survey and Staking
- Pipeline Cleaning and De-pressurization
- Clearing and Grading
- Erosion Control Measures
- Safety Fencing
- Trenching
- 8-inch Pipe Removal/Backfilling
- Stringing, Bending, and Welding of 20-inch pipe
- X-Ray, Weld Repair, and Coating

- Trench Re-excavation, Lowering, Padding, and Backfill
- Pipeline Hydrostatic Testing
- Pipeline Drying
- Final Clean-up and Restoration

The construction activities (e.g., 8-inch pipe removal and 20-inch replacement activities) will follow a rolling sequential schedule. Within some of the densely populated neighborhoods having more residences, the construction activity is anticipated to take approximately one to-two-rolling weeks per property once grading has started. Final cleanup will be conducted following backfilling operations, as indicated in the FERC's Upland Erosion Control, Revegetation and Maintenance Plan (V.A.1.) Final restoration including restoring lawns and landscaping will follow cleanup operations, weather and soil conditions permitting according to the FERC Plan (H).

Pre-construction Activities

Prior to construction Northwest will determine if the external coating on the 8-inch pipeline contains asbestos or polycarbonated biphenyls (PCBs). If asbestos or PCBs are present, Northwest would handle the pipe in accordance with applicable asbestos regulations during pipe removal from the ground, transport, storage and separating the coating from the pipe prior to its ultimate reuse or sale.

Notification

Forty-five days prior to the start of the construction activities, Northwest will make written notification to each landowner. Northwest will complete any additional follow up with individual landowners per their requests as stated in the landowner stipulations.

Survey and Staking

Prior to mobilization of any equipment, the centerline of the pipelines, limits of disturbance (construction right-of-way, TEWAs, unpaved access roads and all underground utilities) will be staked and clearly flagged. Access points will also be marked with signage.

Pipeline Cleaning and De-pressurization

An in-line cleaning tool called a "pig" will be pushed through the existing 8-inch pipeline to remove any liquids from the line. Depending on the contractor's sequencing of the work, the pig could be run prior to, or after de-pressurization. There are two possible de-pressurization options depending on local requirements. One option is to vent the gas to atmosphere and the second is to flare (burn) the remaining contents. Northwest will make notifications to nearby residences and emergency responders at the venting/flaring location. The depressurization will occur at one of the existing Northwest above ground facilities.

Clearing and Grading

Clearing will occur as necessary within each neighborhood using appropriate labor crews and equipment. The typical construction right-of-way will be 100 feet wide, except in areas where the right-of way has been reduced or TEWAs have been designated to

facilitate the Project's removal/replacement activities. Trees and brush within the construction limits will be removed, as will any temporary structures that have not previously been removed by the landowners. Northwest will coordinate with the affected landowners regarding the disposal/handling of removed trees, brush, and solid waste. Any waste removed from the construction work limits will be hauled to an approved disposal area. Care will be taken to save as many mature trees and landscaping as possible within the construction work limits. Trees contained within the permanent easement will not be retained. Trees to be removed will be flagged. The construction right-of-way will be graded as necessary to create a reasonably level working surface to allow safe equipment passage.

Erosion Control Measures

Erosion control measures will be installed on the construction right-of-way, as shown on the construction drawings and as deemed necessary by Northwest's Environmental Inspector (EI) to prevent sediment from being carried off the construction right-of-way.

Throughout construction, excess dust will be controlled by limiting traffic speeds and using water trucks. As conditions require, and as determined by Northwest's EI or authorized personnel, water trucks will wet appropriate surfaces along the construction right-of-way, including TEWAs and stockpile surfaces. The EI will also post traffic speed signs to limit traffic to 15 mph or less on unpaved surfaces. Speed limits on paved surfaces will be in accordance with posted speed limits.

Safety Fencing

Chain link fence panels will serve as the safety fencing and will be installed as described above under "Safety and Security."

Trenching

The trench will be excavated to expose and remove the 8-inch pipeline. The trench will be approximately 5 to 8 feet deep and the trench width will vary depending on soil materials. During trenching, the trench spoil storage will be located along the north side of the pipeline trench, (on the non-working side), away from the construction traffic and pipe assembly area. The non-working side of the trench centerline will be 30-35 feet wide.

Consistent with FERC's Upland Plan (Section IV. B. 2.), where topsoil segregation is not feasible due to the limited construction right-of-way spacing, Northwest will import topsoil during restoration and not segregate the topsoil from the trench spoil. Soil imported for residential use will be free of noxious weeds and soil pests in accordance with the FERC procedures and will be verified by the EI.

The State of Washington One-Call service will be contacted prior to any excavation to mark utility locations. Every effort will be made to identify utilities in the construction right-of-way, however, during excavation there may be some utility lines that may not be identified and consequently cut. These lines will be repaired as soon as practical. Whenever possible, cut lines will be temporarily repaired that day. Final repairs will be done before backfilling the trench. The contractor will have materials on hand to make temporary repairs.

8-Inch Pipeline Removal/ Trench Cleanup

After the 8-inch pipeline is exposed, it will be pulled out of the trench using backhoes or side booms and cut into sections. These sections will be loaded onto trucks and hauled off the construction right-of-way to an approved off-site pipe storage yard. After the 8-inch pipeline has been removed, the trench will be temporarily backfilled with the trench spoil materials until re-excavation activities commence for installation of the 20-inch pipe.

Stringing, Bending, and Welding

The 20-inch pipe will be transported to the construction right-of-way using trucks and trailers. The joints of pipe will be laid along the trench in a single, continuous line on the working side of the trench. The joints will be lined up and welded together. In highly congested areas the pipe will be installed in 40-80 foot sections referred to as stove piping. Some bending may be required to follow any turns or elevation changes in the pipe alignment. The hydraulic bending machine will bend the pipe prior to welding. Bending may occur on-site or at an approved location off the construction right-of-way.

X-Ray, Weld Repair, and Coating

To ensure that the 20-inch pipe meets or exceeds the design strength requirements, the welds are visually inspected and X-rayed in accordance with American Petroleum Institute (API) standards. During the X-ray of the weld, the X-ray area will have a tape barrier contained within the existing construction fenced area isolating the equipment from the workers and nearby residences. The tape barrier will not extend past the safety panel fence. Any welds with defects will be repaired or cut out, re-welded, and X-rayed again. The welded uncoated sections of the pipe will then be cleaned and epoxy coated to prevent corrosion.

Trench Re-excavation, Lowering, Padding, and Backfill

Once the 20-inch pipe has been welded, coated, and X-rayed, the pipeline alignment will be re-surveyed and the trench re-excavated. The completed section of pipe will then be lowered into the trench using side booms or backhoes. Prior to lowering in, the trench will 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 will be placed in the trench bottom to protect the pipe. Padding will be rock-free soil on which the pipe will be set. After the pipe is lowered into the trench, the trench spoil will be pushed back into the trench to cover the pipe. During backfilling, the trench spoil will be compacted to minimize the potential for trench settlement. Prior to final backfill, safety tape will be installed over the pipeline approximately 12-18” above the pipe. This tape will read “Caution Buried Natural Gas Pipeline.” This tape will be installed over the length of the line in trenched areas.

Pipeline Testing

Once all the Project’s 6.85 miles of replacement 20-inch pipeline has been installed, the pipeline will be tested per Northwest procedures and DOT regulations to ensure that the

system is capable of operating at the maximum allowable operating pressure (MAOP). These tests are described below.

Geometry Tool Inspection. An electronic device called a geometry pig will be run through the new pipeline. This device checks the pipe to make sure there are no dents or ovalities. If any anomalies are found that exceed Federal Department of Transportation or Northwest's tolerance specifications, they will be dug up and visually inspected. If necessary, the piece of pipe containing the anomaly will be replaced.

Strength Test. To comply with 49 CFR 192 regulations, the replacement pipeline segment will be filled with water and pressure tested. Once the pipe is filled, the pressure is allowed to stabilize for several hours. Then the actual test will begin and will last for a minimum of 8 hours. Upon successful testing, the hydrotest water will be drained through a filtration device and discharged in an upland area at the beginning and/or end of the hydrostatic test section in an open field. There will be no discharge of hydrotest water in the neighborhood. Two test segments are currently planned for the Project. During testing, there will be limited access to the construction right-of-way. Northwest will work with landowners on restrictions to residences during the test. At a minimum, any exposed section of pipe during the test will have a 100-foot minimum buffer from the public.

Drying. After a successful hydrostatic test, the pipeline will be dried to remove any residual water. This will be completed using squeegee pigs and air compressors. Multiple passes of the drying pigs are required to achieve the required water removal.

Final Clean-up and Restoration

Final cleanup activities will begin immediately after backfilling operations. All contours will be restored to the original elevations and drainage patterns. Final grading and topsoil replacement activities will be completed within 10 days of backfilling operations as required by FERC's Upland Plan (Section V. A. 1.). After the final cleanup and topsoil redistribution, the restoration sequence will generally follow with:

- Repairs or replacement of sprinkler systems and other utilities
- Removal of any damaged sod
- Fine grading of the topsoil and placement of new imported sod, where affected
- Reseeding
- Restoration of landscaping
- Removal of safety devices
- Removal of erosion control devices
- Restoration of landowners' fences.

New sod and landscaping materials will be reserved through a local sod company to make sure there are sufficient quantities to complete all restoration activities. Northwest will work closely with residents to make sure all restoration is done in accordance with easement agreements and landowner stipulations. Restoration of all landowner parcels within the neighborhood is expected to take approximately 45-60 working days.

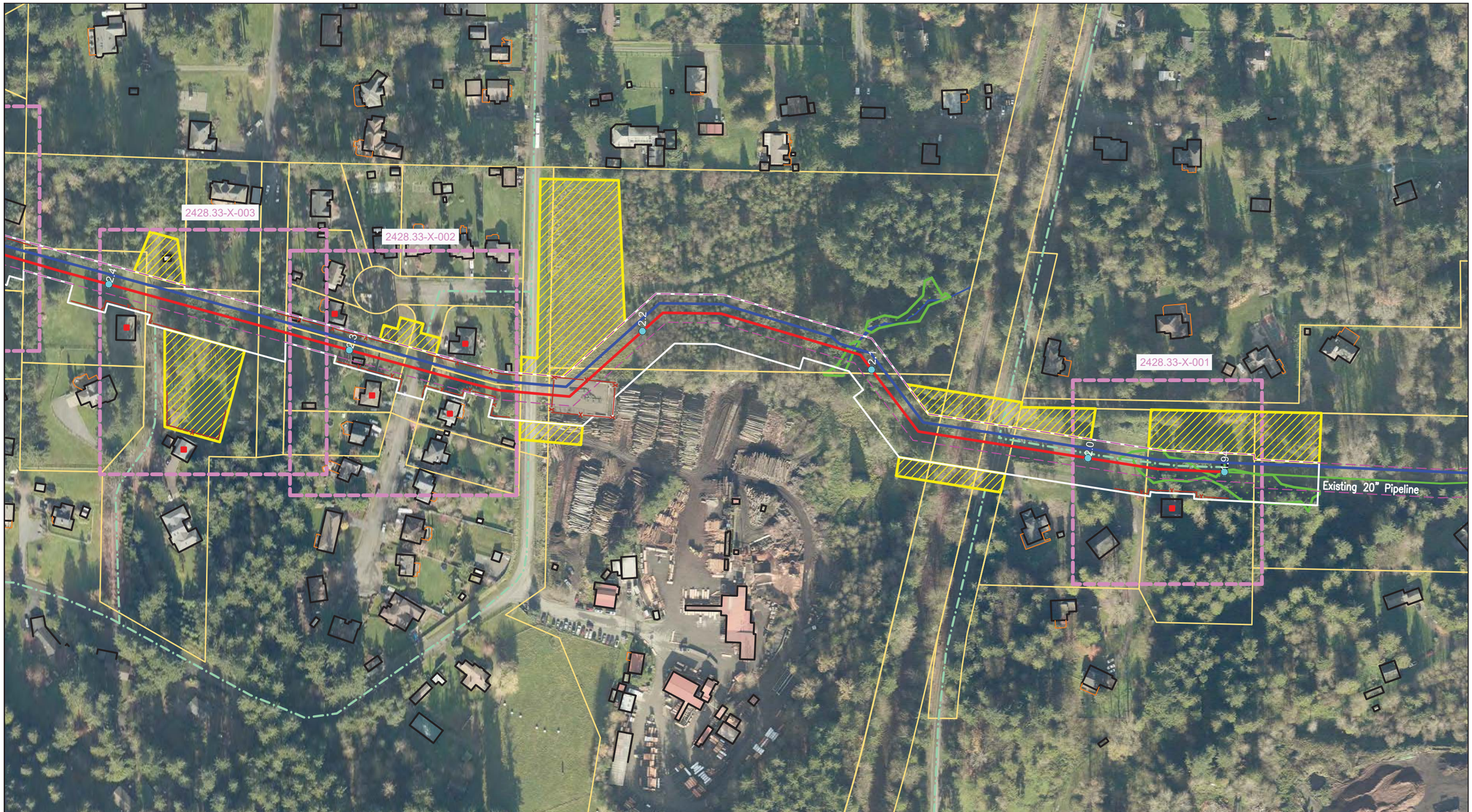
Northwest will continue to monitor the progress and quality of the restoration and work with landowners after final work is complete until restoration is successful.

Key Personnel

Personnel	Responsibility	Phone Number
Contractor		
Superintendent	TBD	TBD
Northwest Pipeline LLC		
Kevin Self	NWP Area Chief	1-509-727-2551
Les Price	NWP Project Manager	1-801-584-6133
Randy Hamburger	NWP Design Engineer	1-801-584-6756
Randy Tarter	NWP Redmond District Manager	1-425-868-1010
Rodney Gregory	Land Representative	1-425-471-1300

Attachment 1

Residential Drawings



LEGEND

- Prop. 20" Pipeline Centerline
- Exist. 16" Pipeline Centerline
- Construction Right-of-Way
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- Property Line
- Construction Access
- Safety Panel/Fence
- Temporary Extra Work Area
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- Wetland
- Residential Site Map Index

NOTE:
House within 25' =
House within 50' =

N

Public

REFERENCE DRAWINGS	
DRAWING NO.	TITLE

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 1.94 TO 2.4
SNOHOMISH COUNTY, WASHINGTON

Williams

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 3/13/2017	ISSUED FOR BID:	SCALE: 1" = 200'
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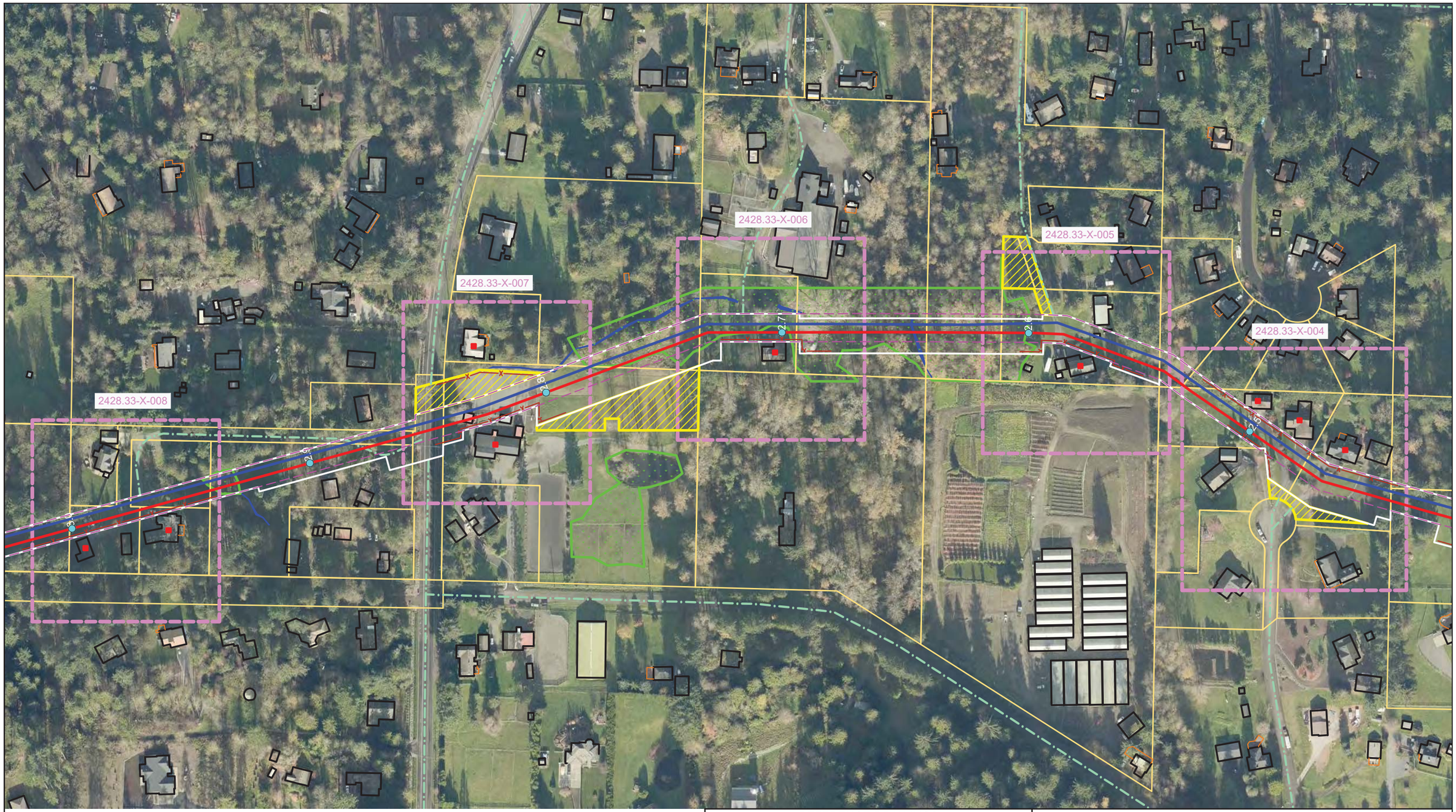
APPROVED BY:	DATE:	DRAWING NUMBER: RES-OVERVIEW	SHEET 1 OF 13



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NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 2.5 TO 3.0
SNOHOMISH COUNTY, WASHINGTON

Williams

REVISIONS

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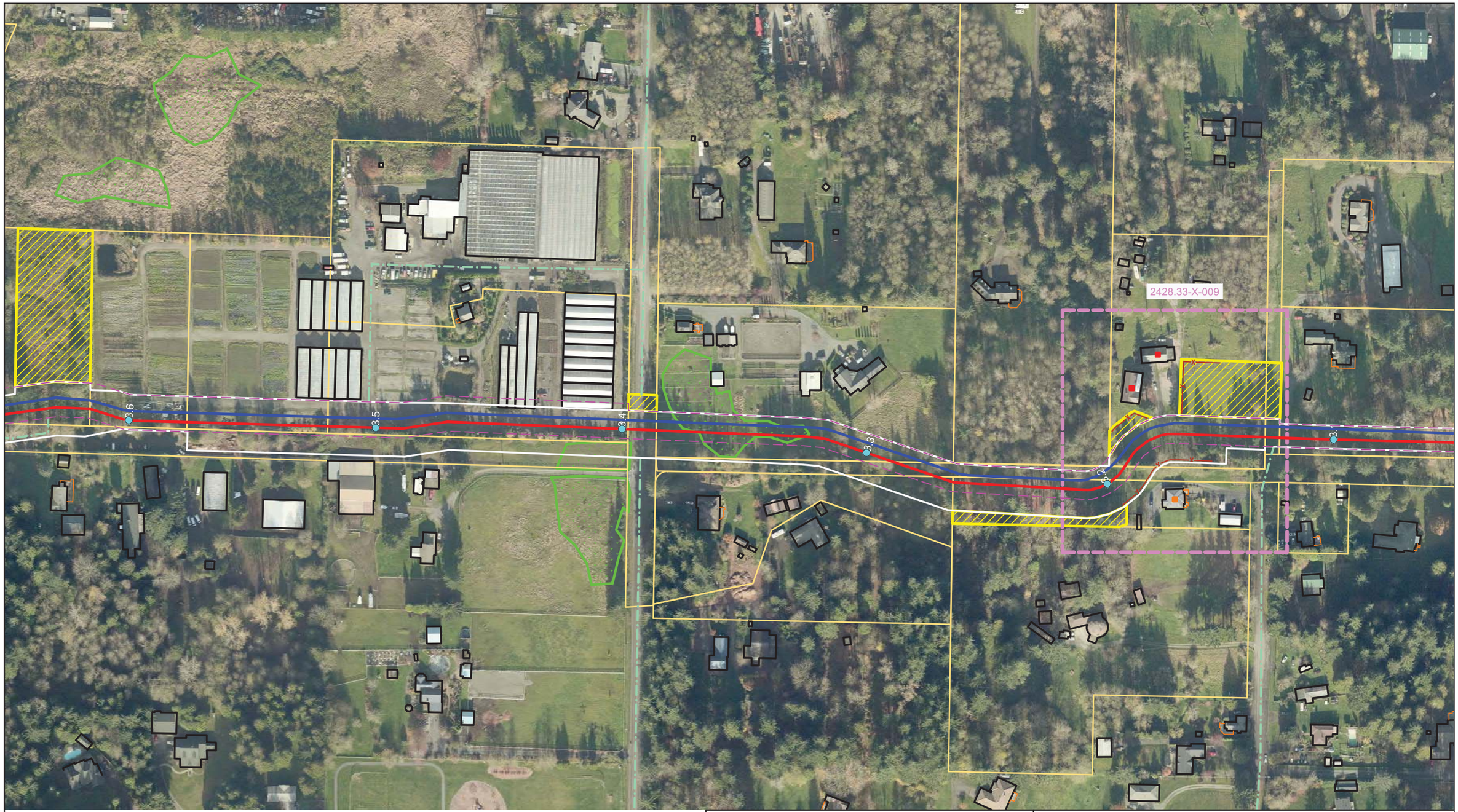

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NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 3.1 TO 3.2
SNOHOMISH COUNTY, WASHINGTON

Williams

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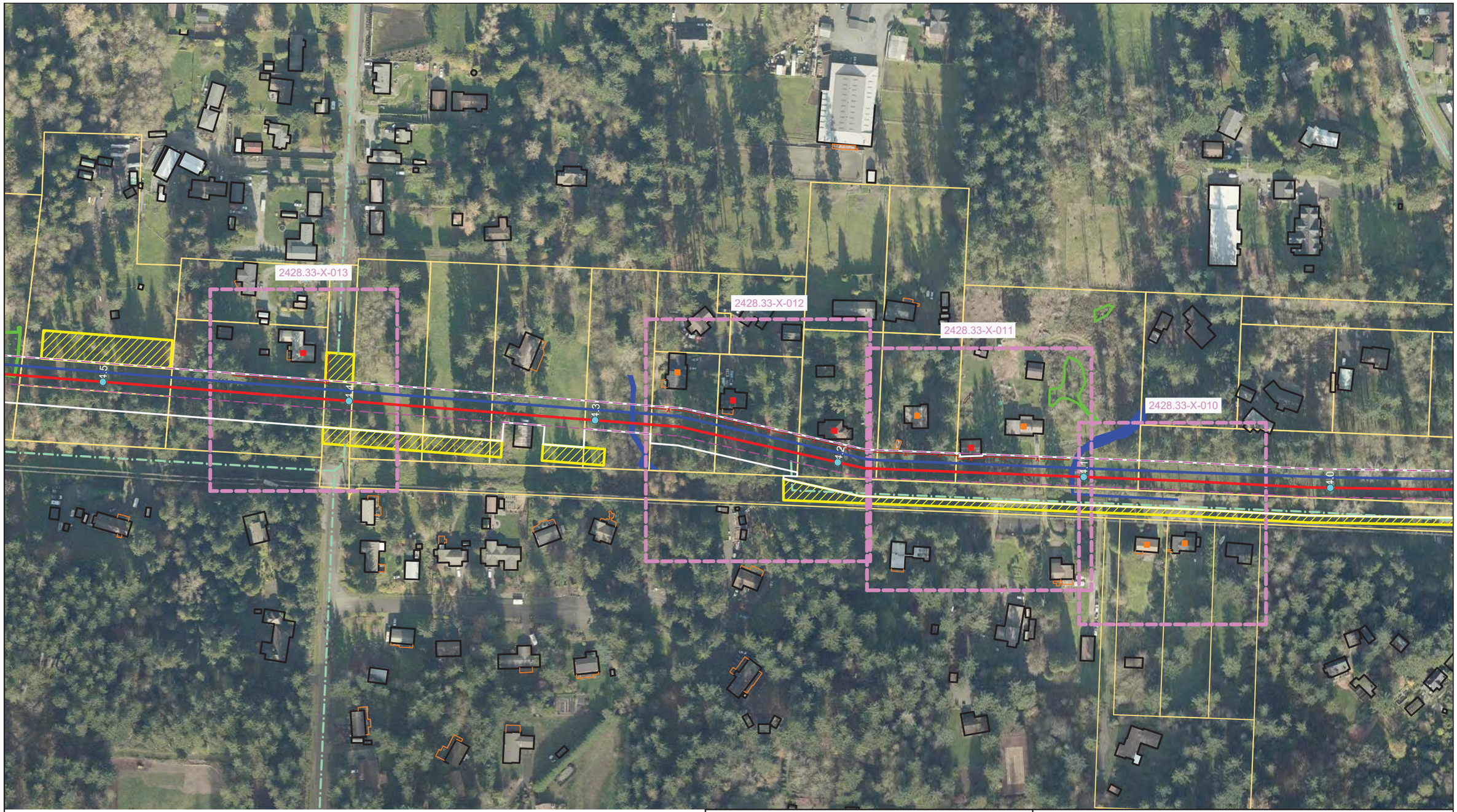

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NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 4.0 TO 4.4
SNOHOMISH COUNTY, WASHINGTON

Williams

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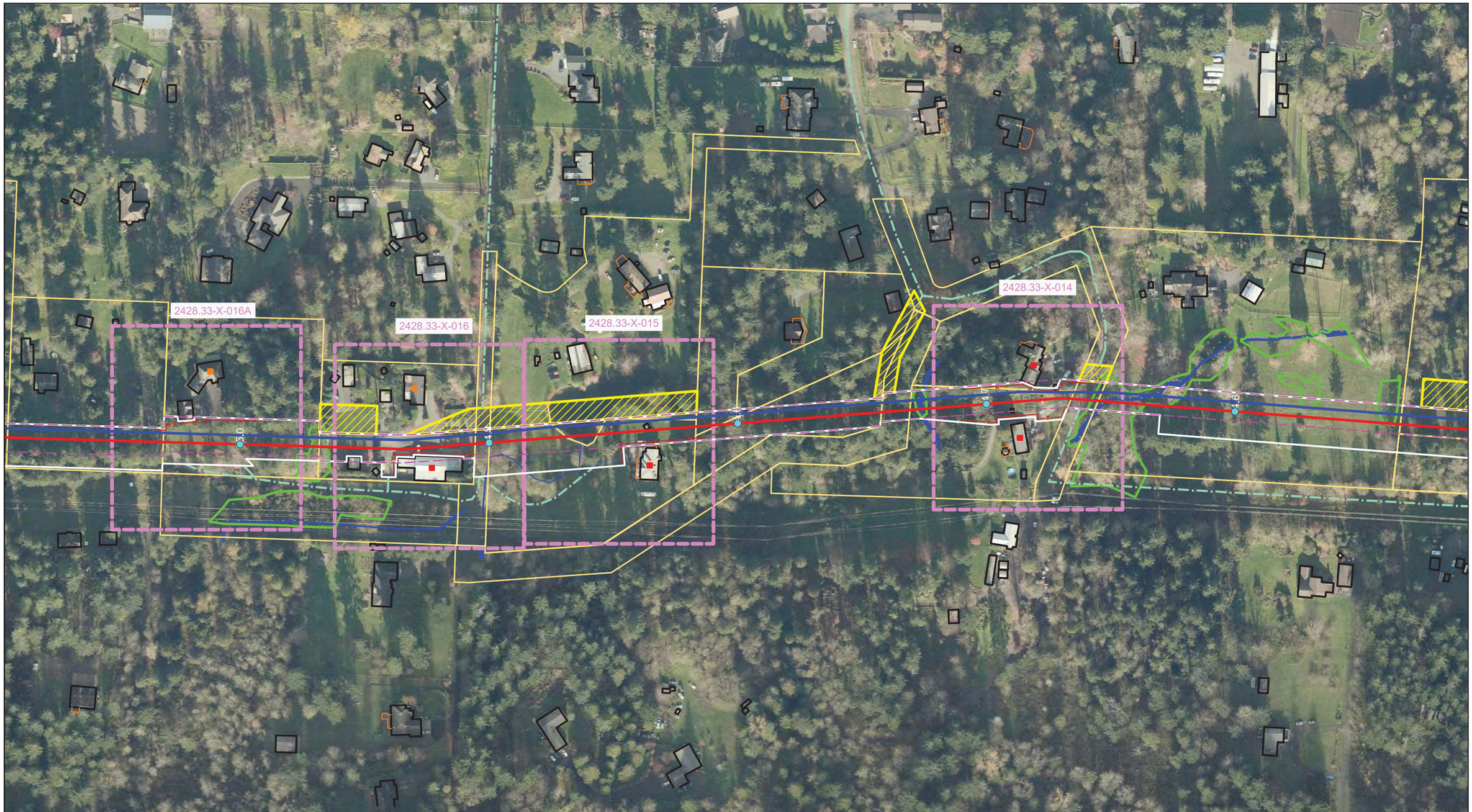

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NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 4.7 TO 5.0
SNOHOMISH COUNTY, WASHINGTON

Williams

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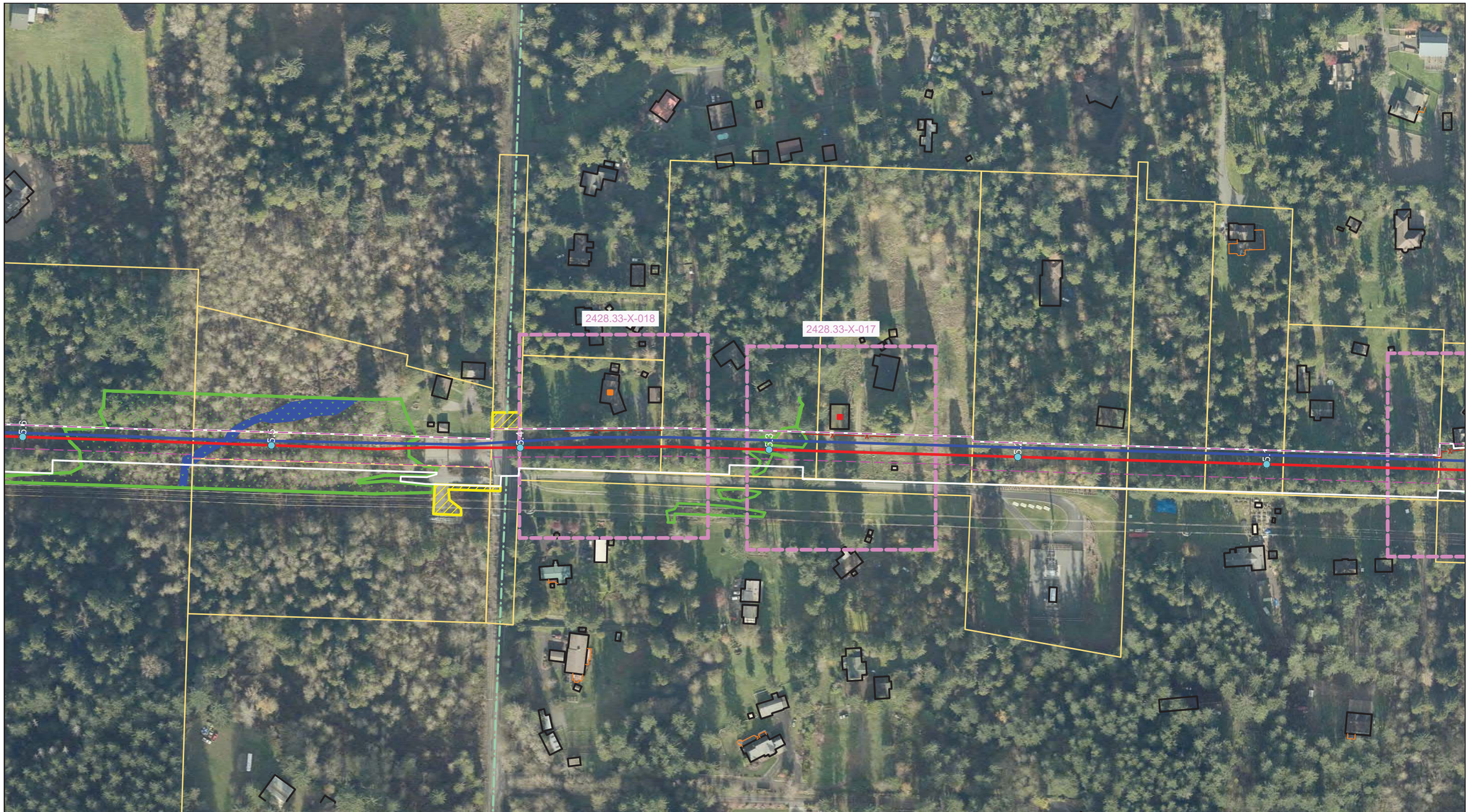

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20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 5.3 TO 5.4
SNOHOMISH COUNTY, WASHINGTON

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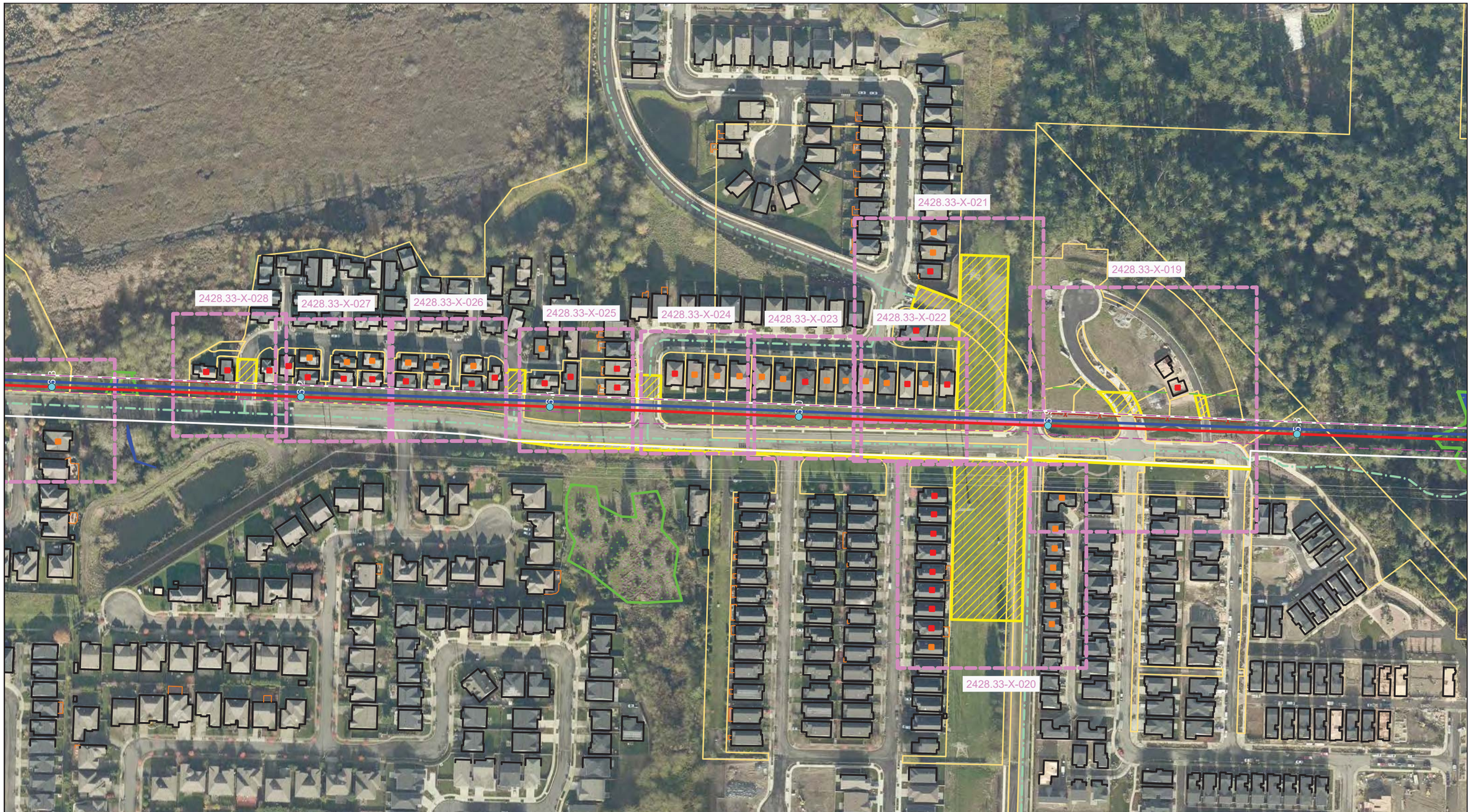

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NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 5.8 TO 6.3
SNOHOMISH COUNTY, WASHINGTON

REVISIONS

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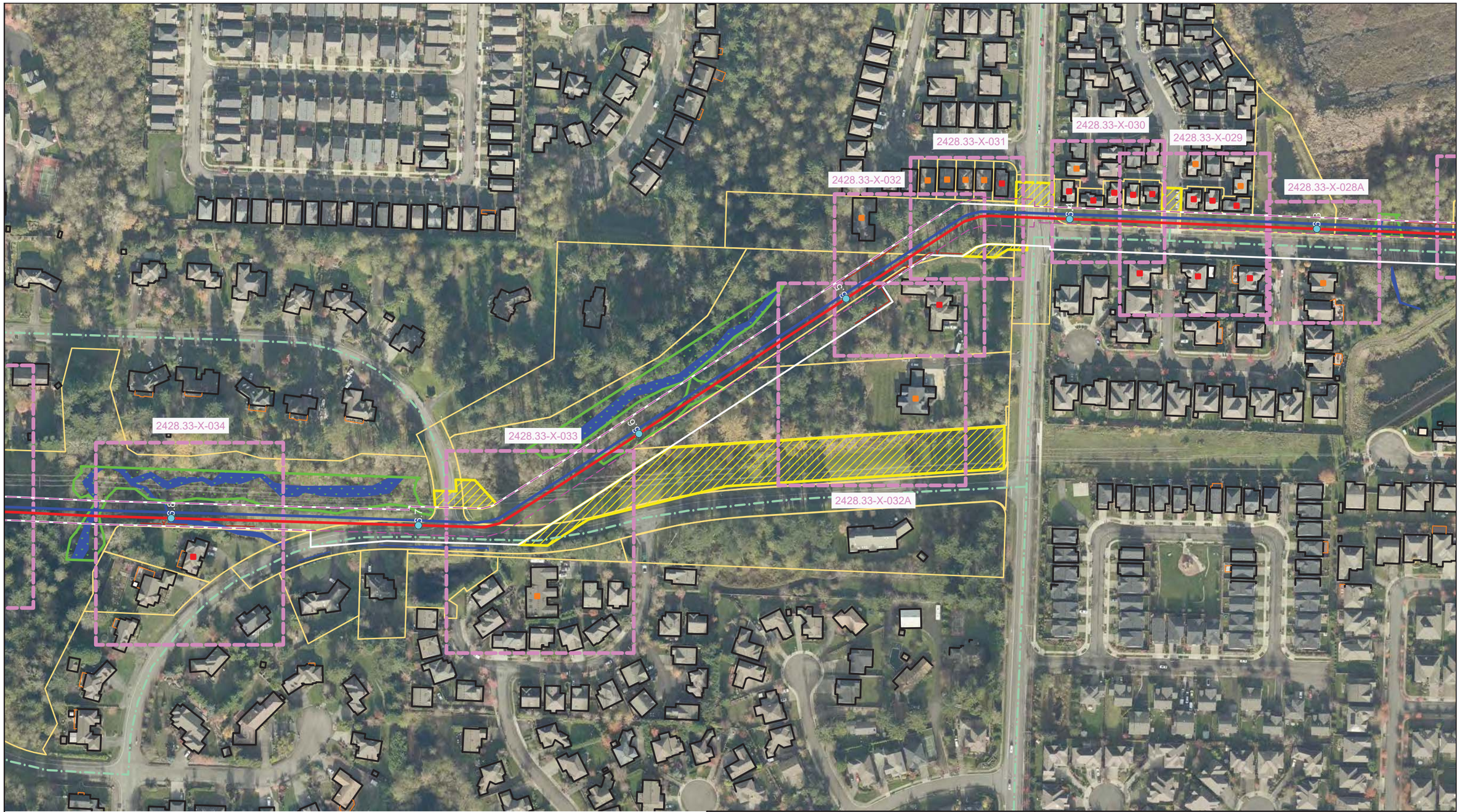

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NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 6.3 TO 6.8
SNOHOMISH COUNTY, WASHINGTON

Williams

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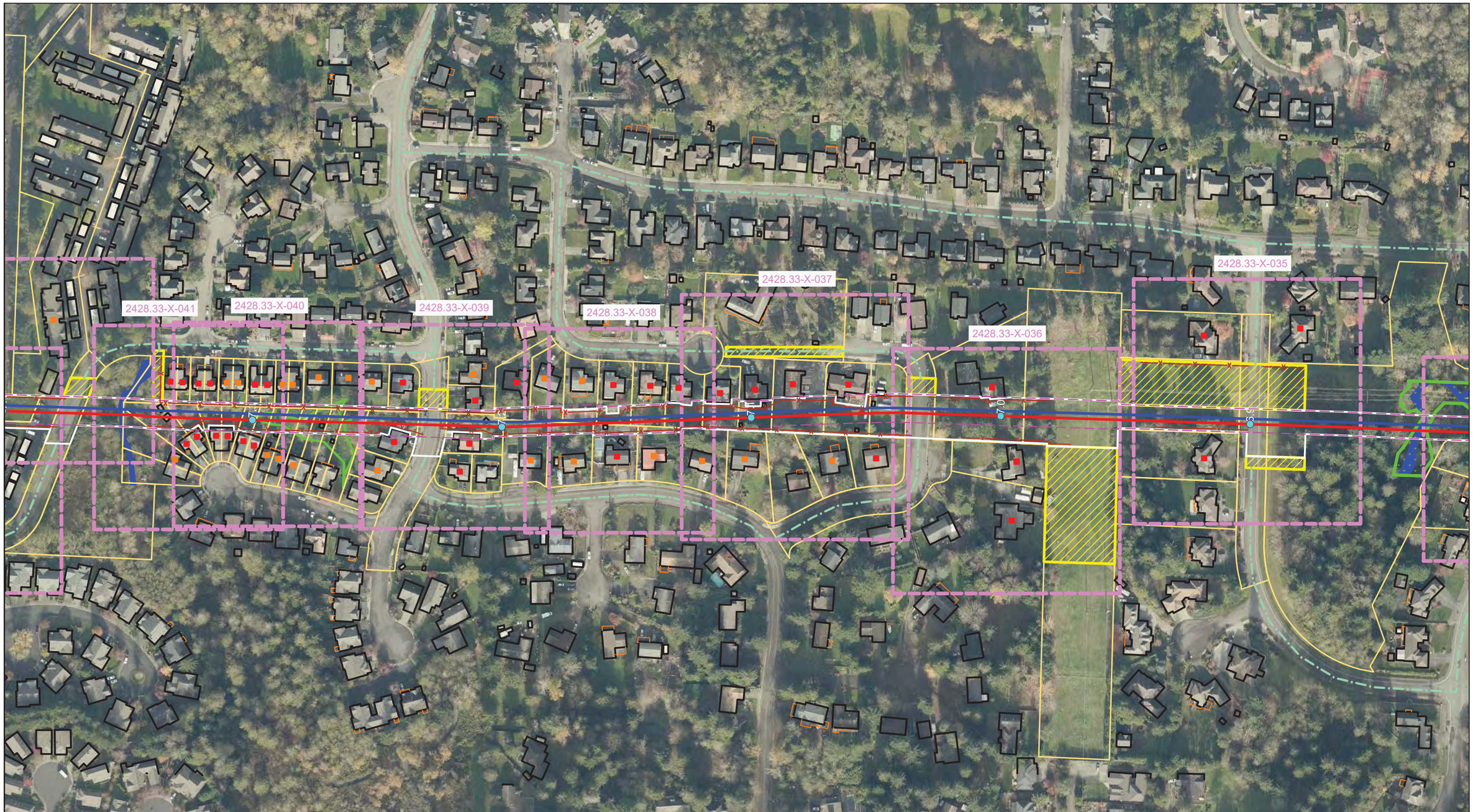

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NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 6.9 TO 7.3
SNOHOMISH COUNTY, WASHINGTON

Williams

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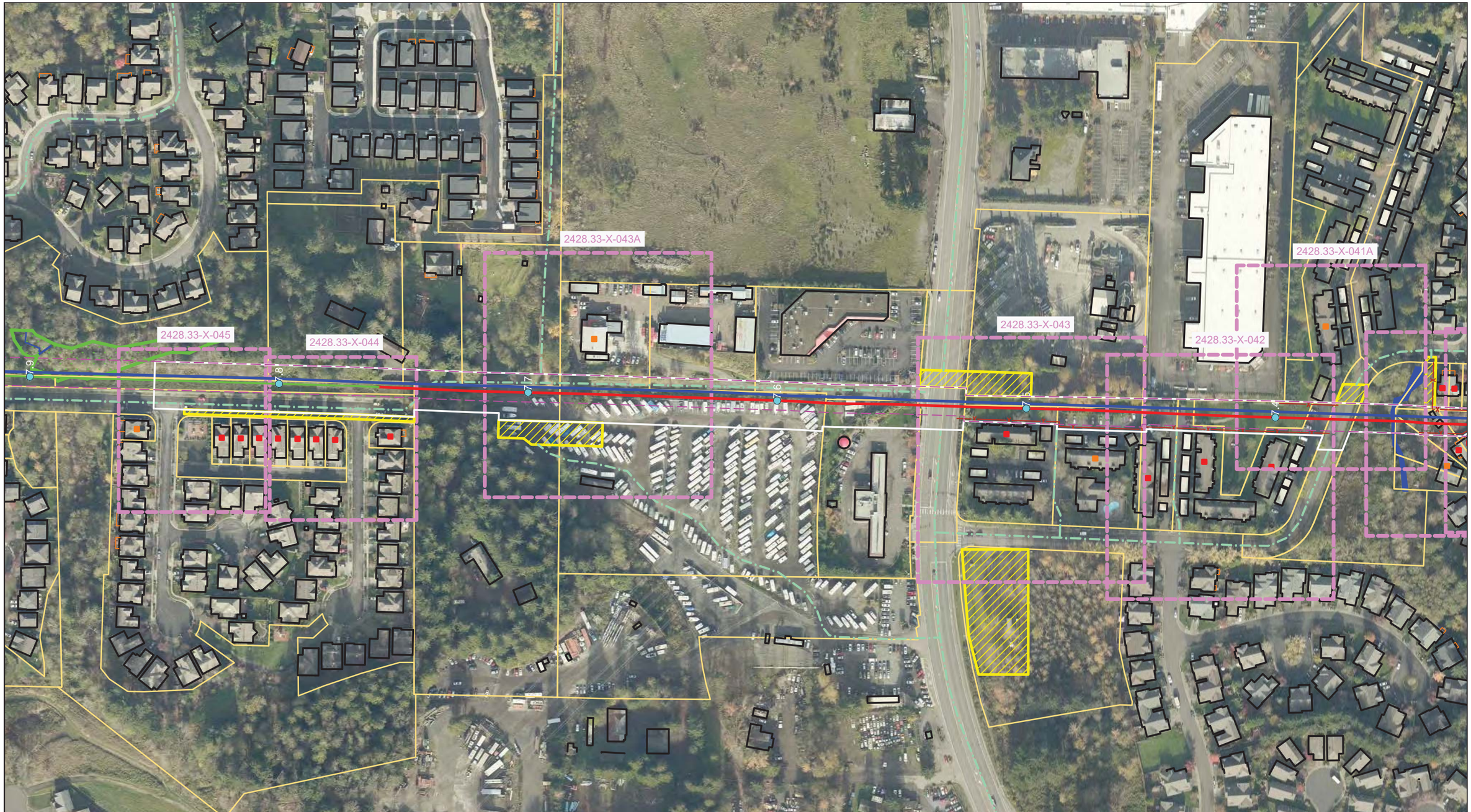
APPROVED BY:	DATE:	DRAWING NUMBER: RES-OVERVIEW	SHEET 9 OF 13



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NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 7.4 TO 7.9
SNOHOMISH COUNTY, WASHINGTON

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

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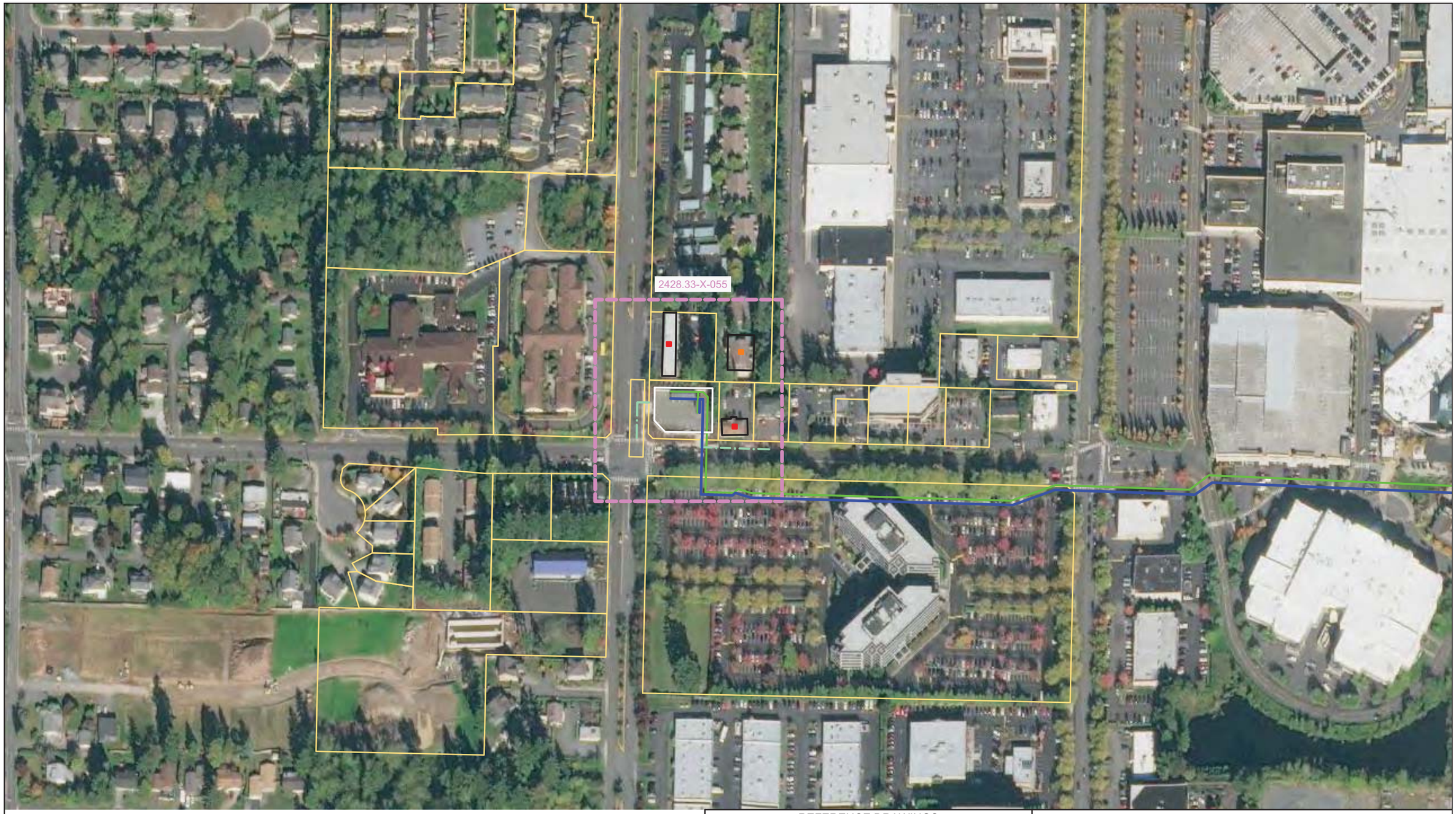
APPROVED BY:	DATE:	DRAWING NUMBER: RES-OVERVIEW	SHEET 10 OF 13



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NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL OVERVIEW MAP
M.P. 11.1
SNOHOMISH COUNTY, WASHINGTON

Williams

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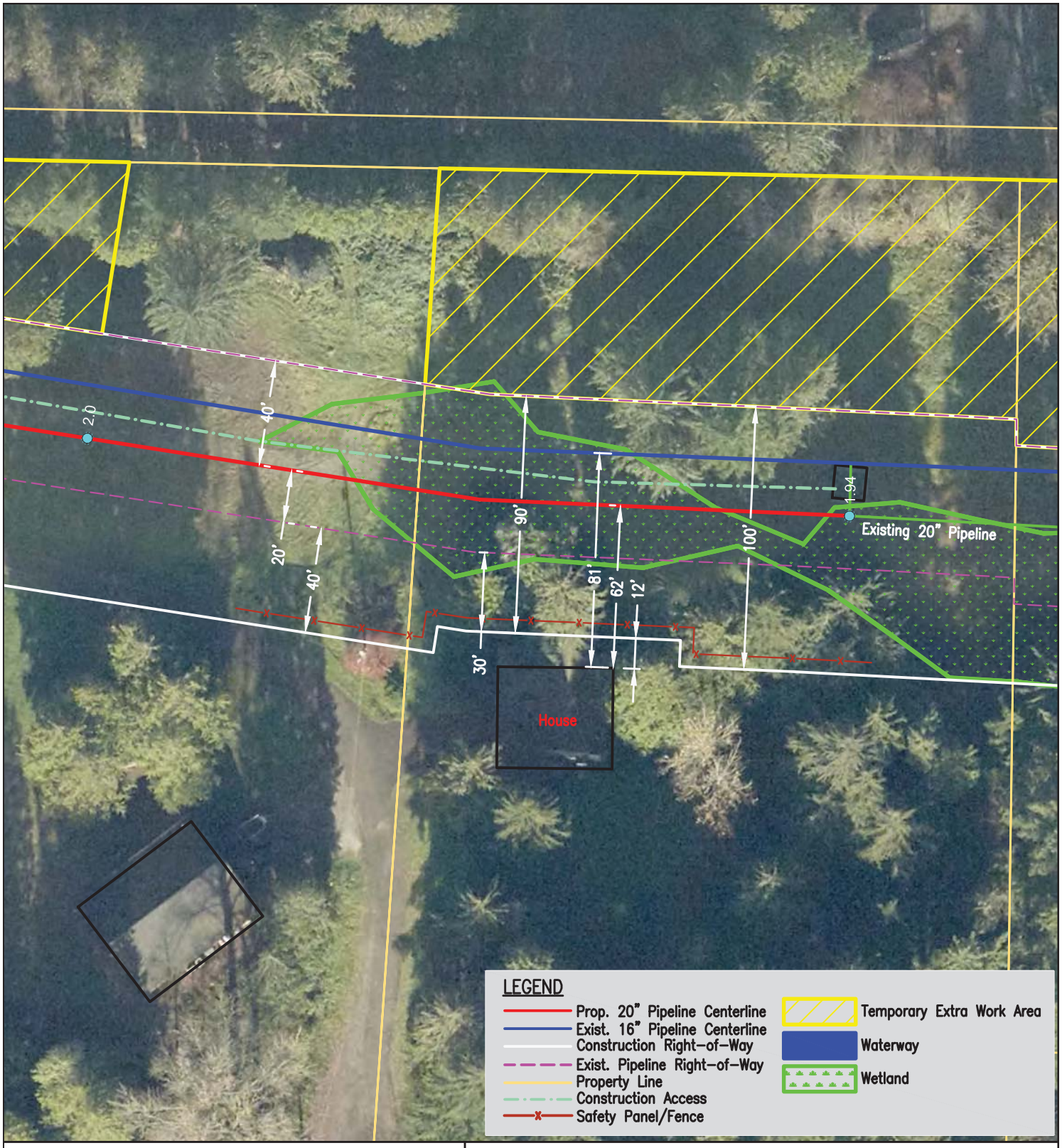

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N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 1.96
SEC 18, T-27-N, R-6-E
SNOHOMISH COUNTY, WASHINGTON

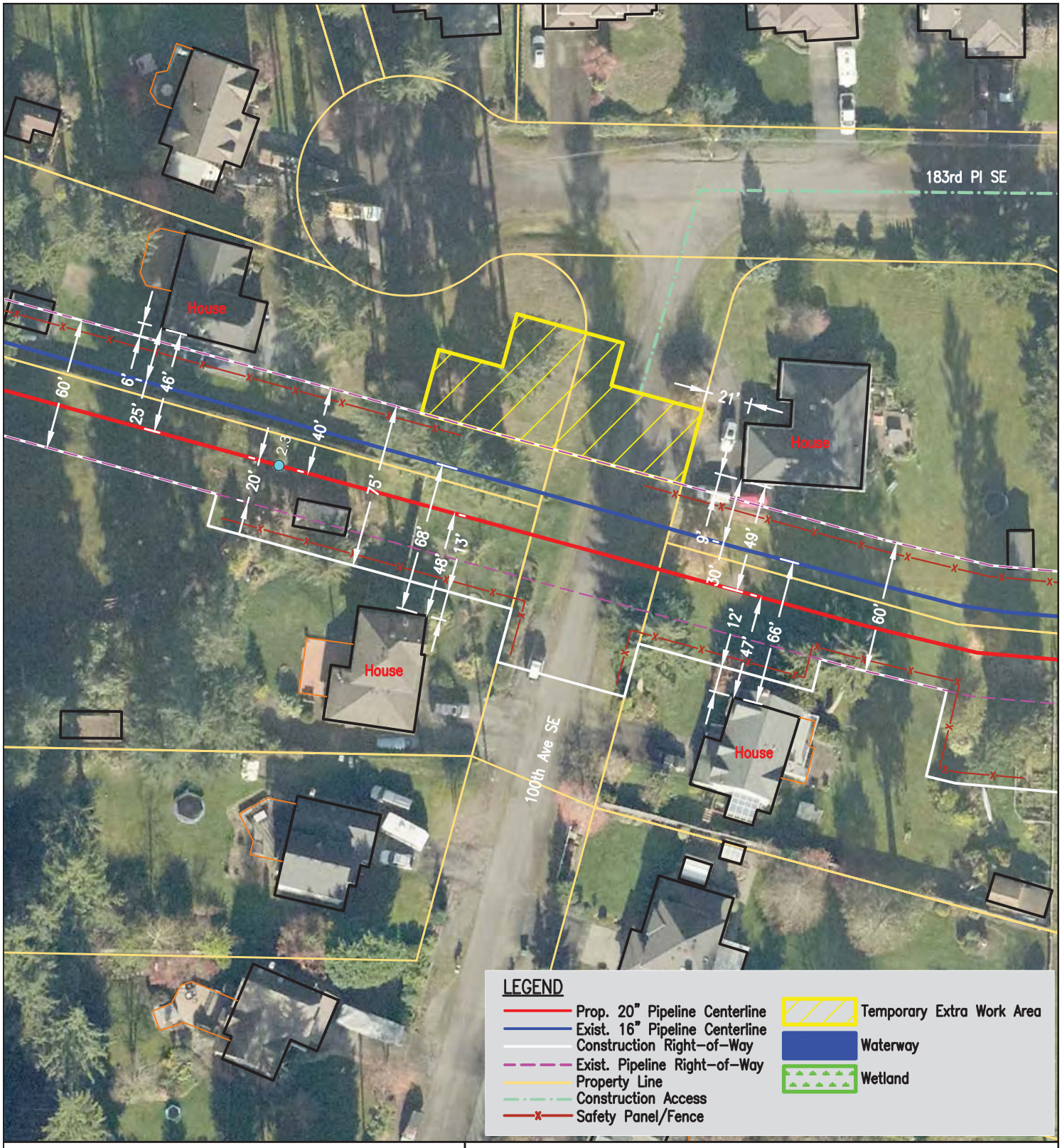
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-001	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 2.25 - 2.31
SEC 18, T-27-N, R-6-E
SNOHOMISH COUNTY, WASHINGTON

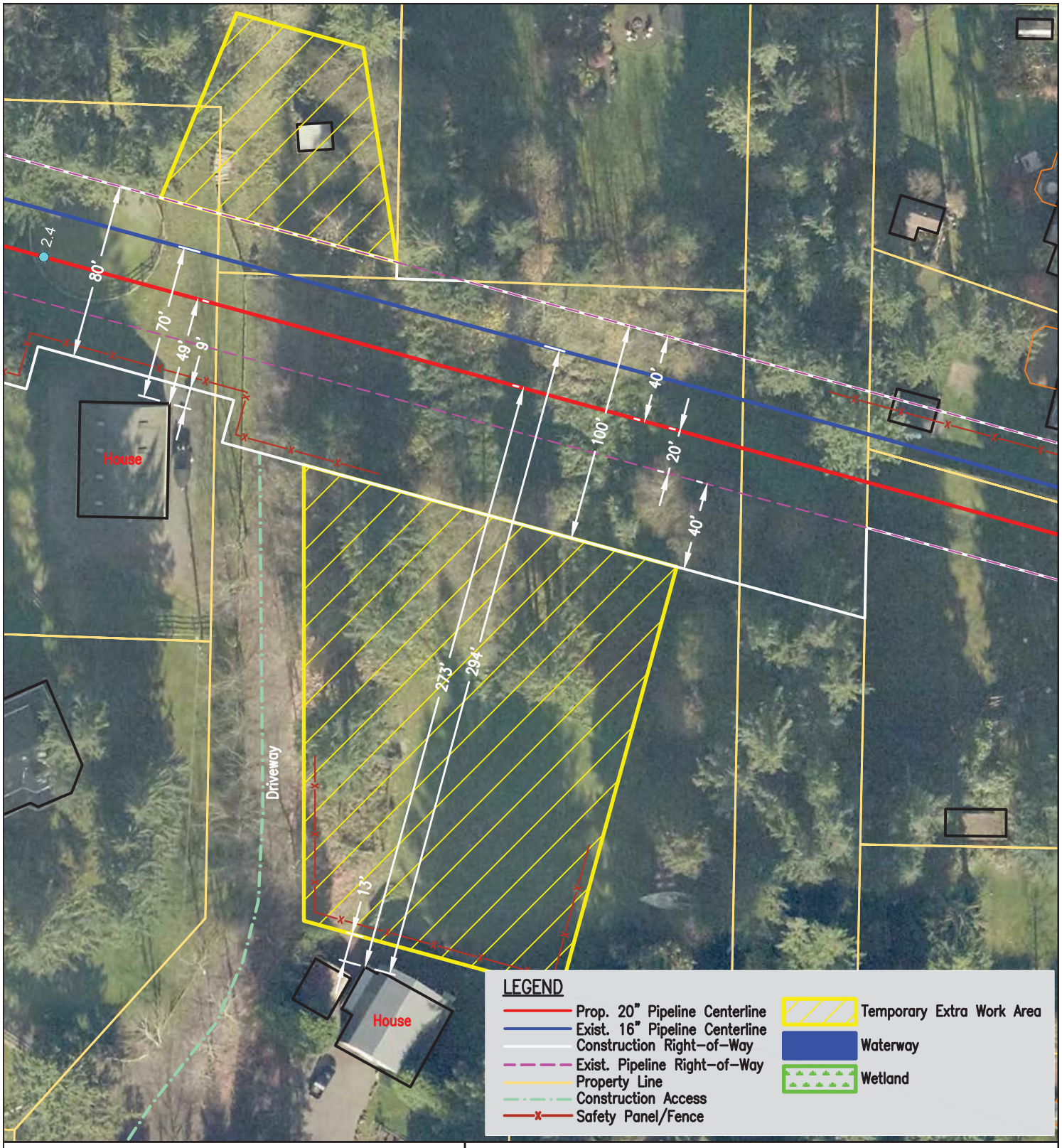
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-002	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 2.34 - 2.39
SEC 18, T-27-N, R-6-E
SNOHOMISH COUNTY, WASHINGTON

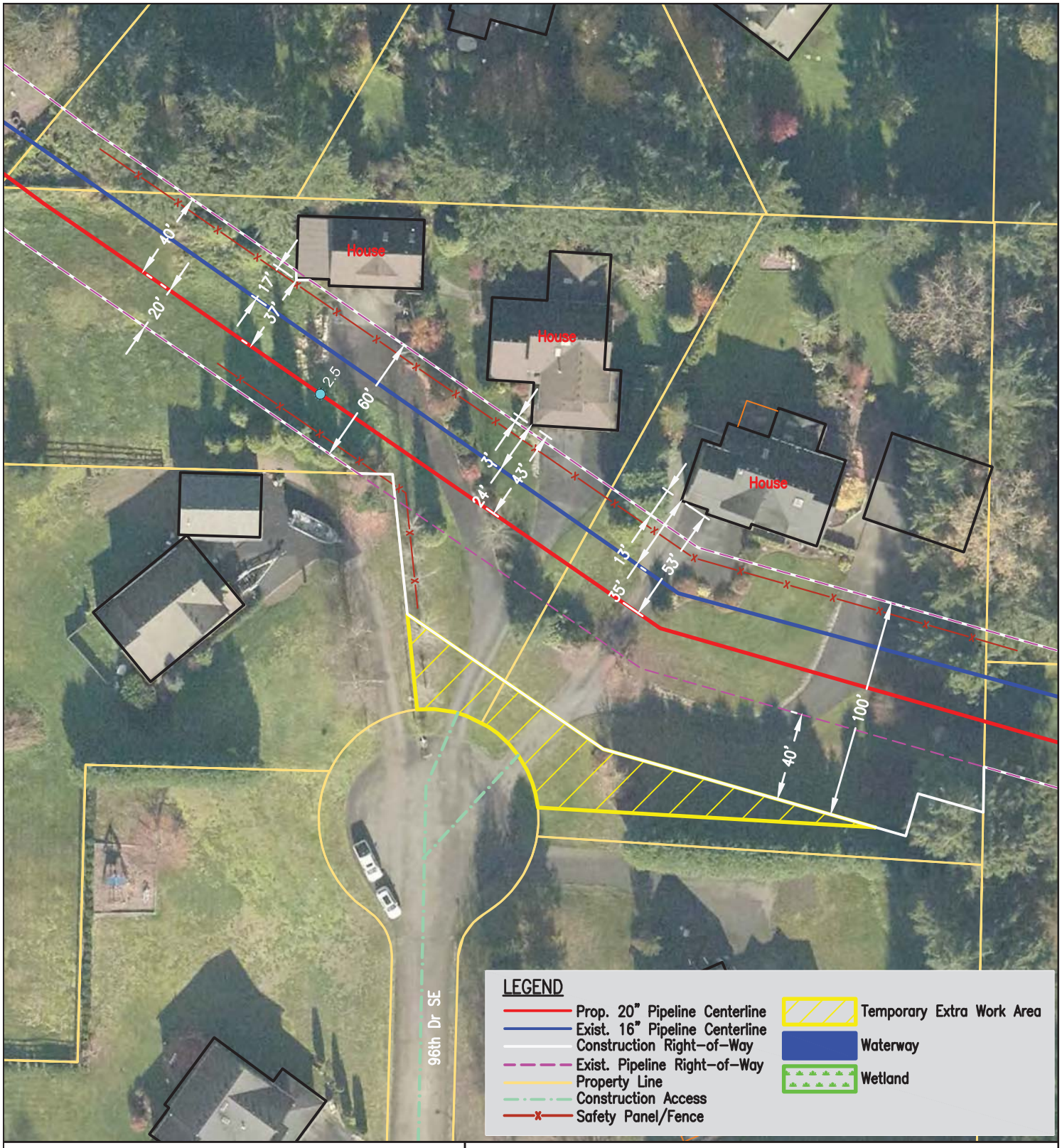
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	6/27/2017	JCP	ADDED SAFETY FENCE TO TEWA 2.34-W	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-003	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 2.45 - 2.51
SEC 13, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

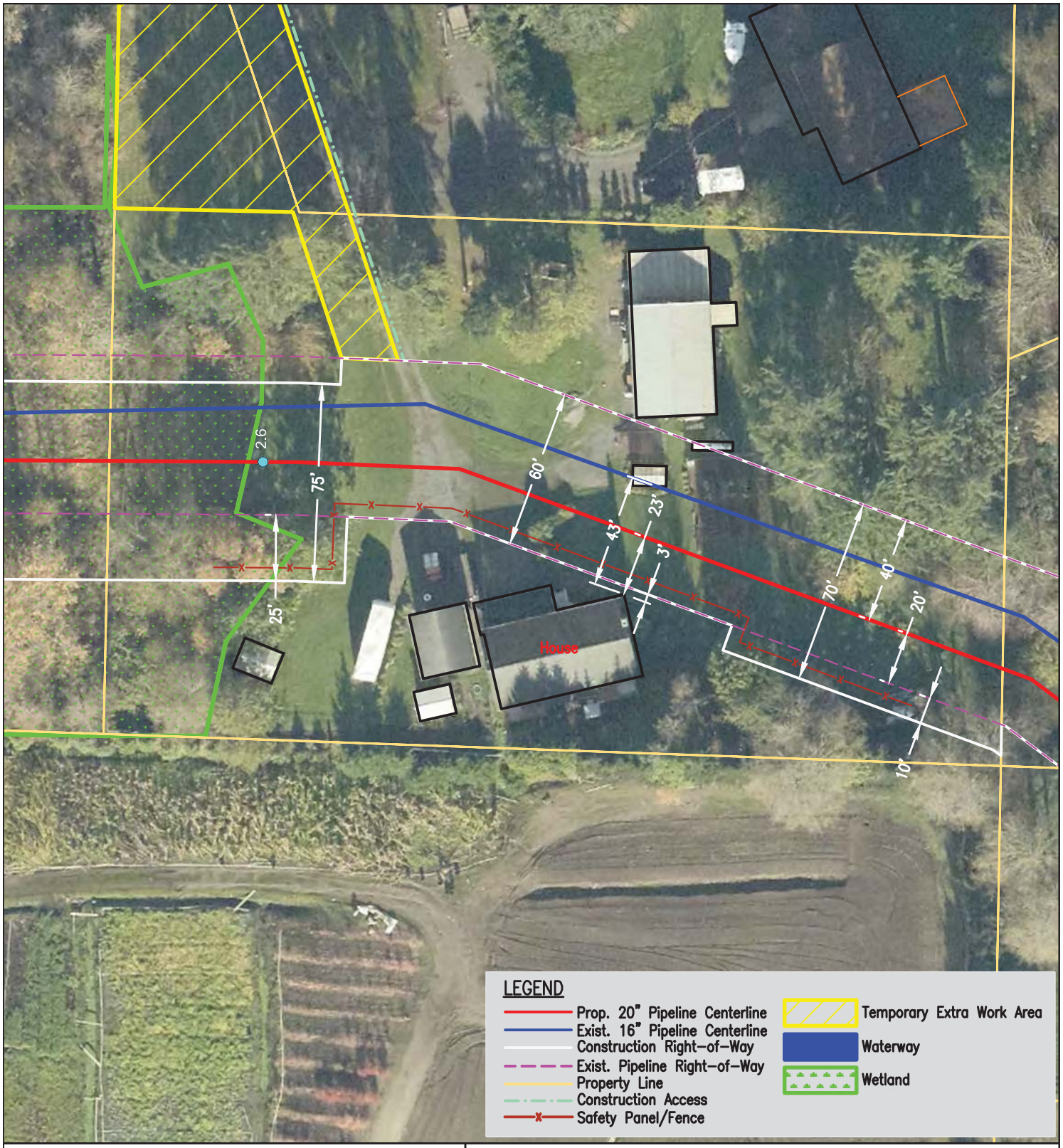
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-004	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 2.57
SEC 13, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

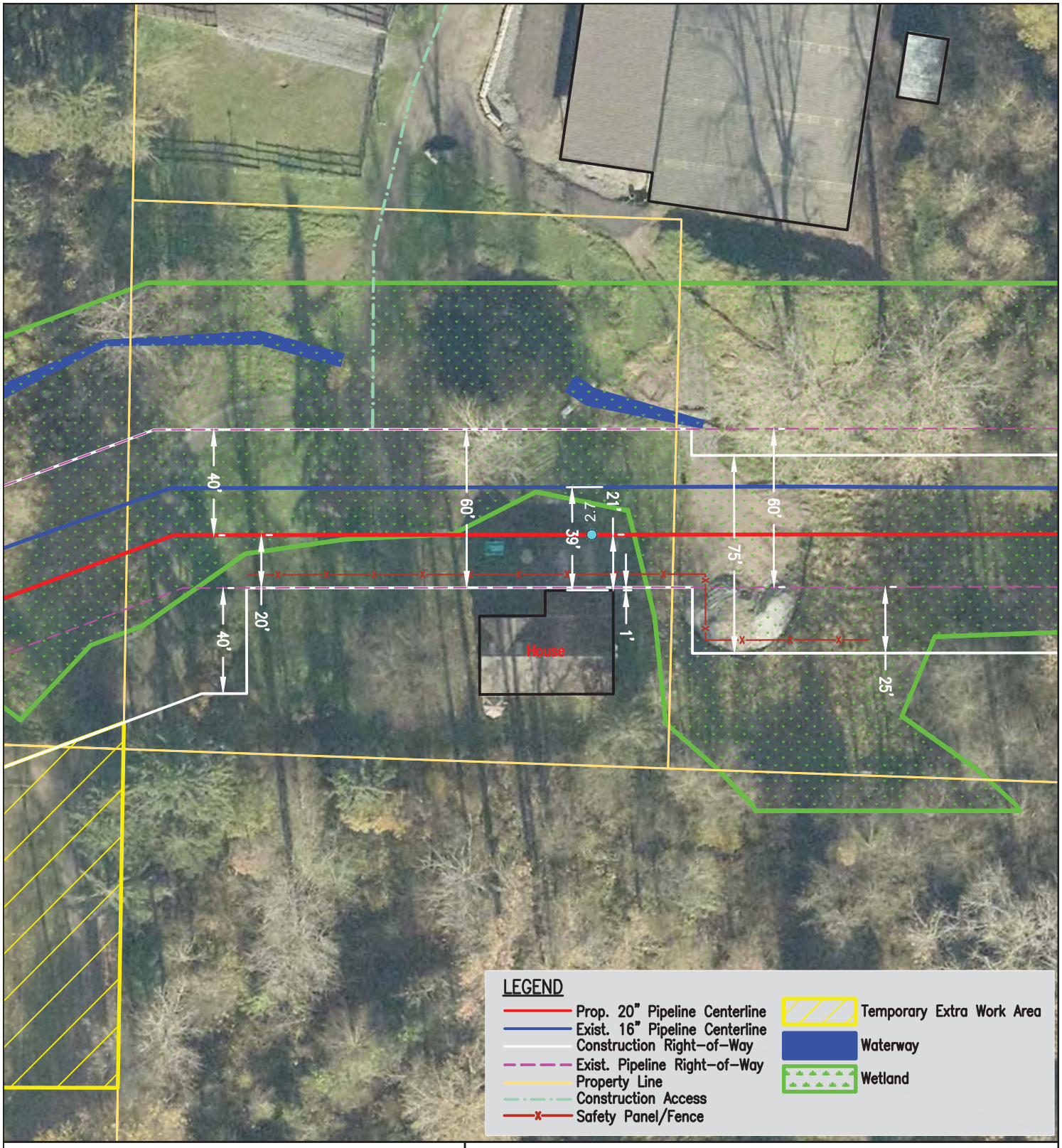
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-005	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 2.70
SEC 13, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-006	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 2.82
SEC 13, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

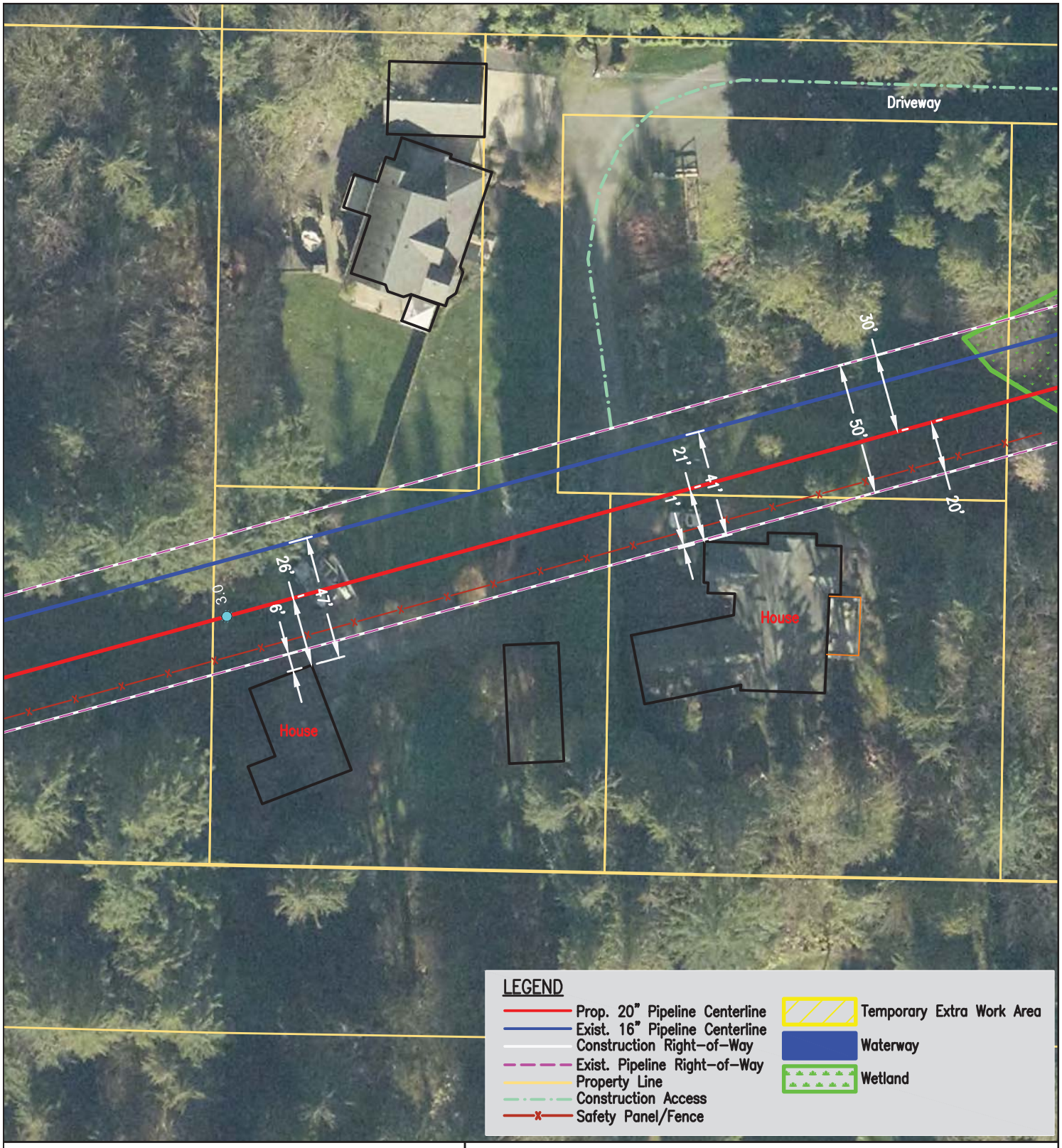
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-007	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 2.96 - 3.0
SEC 13, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

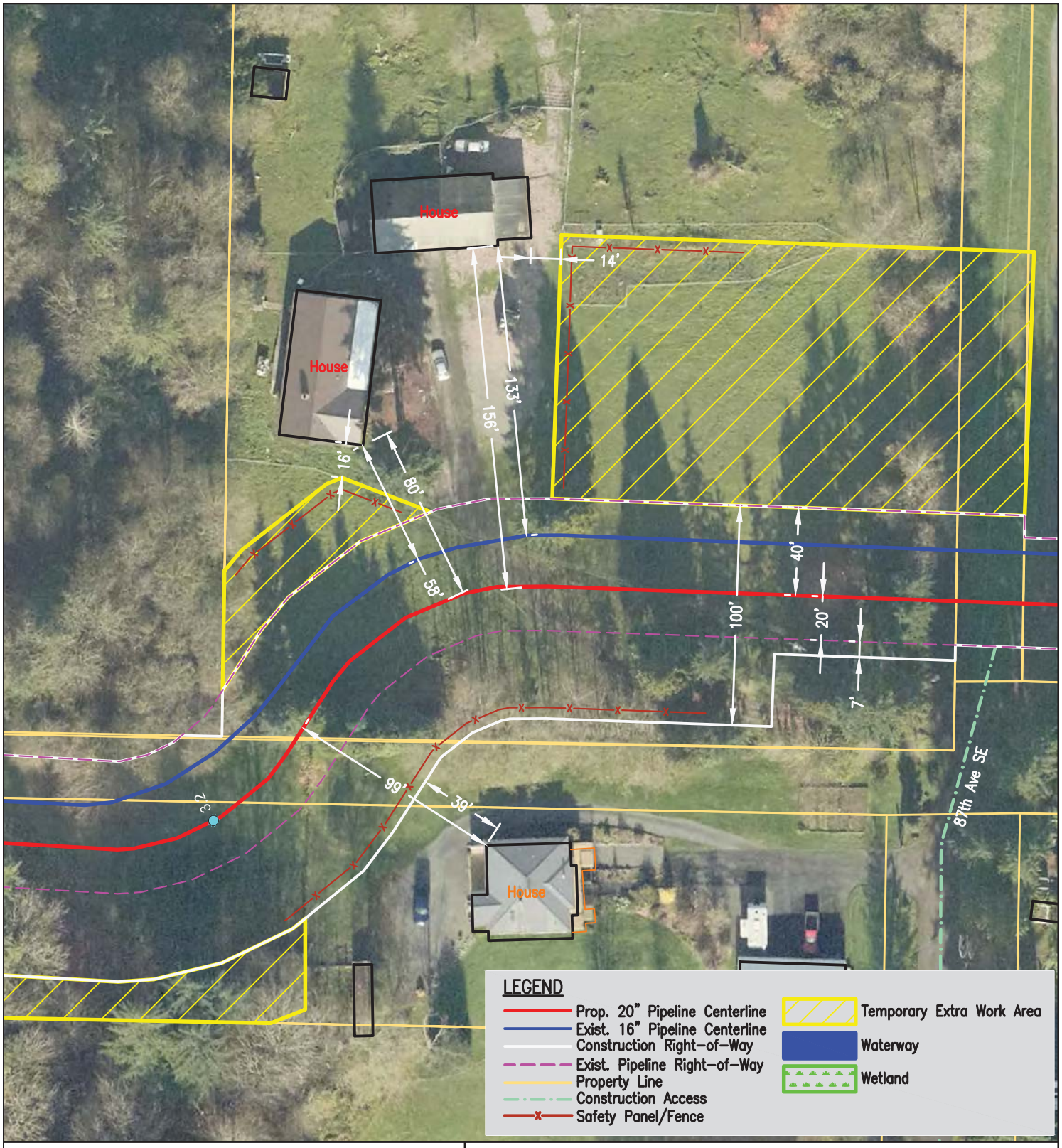
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-008	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 3.16 - 3.19
SEC 13, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

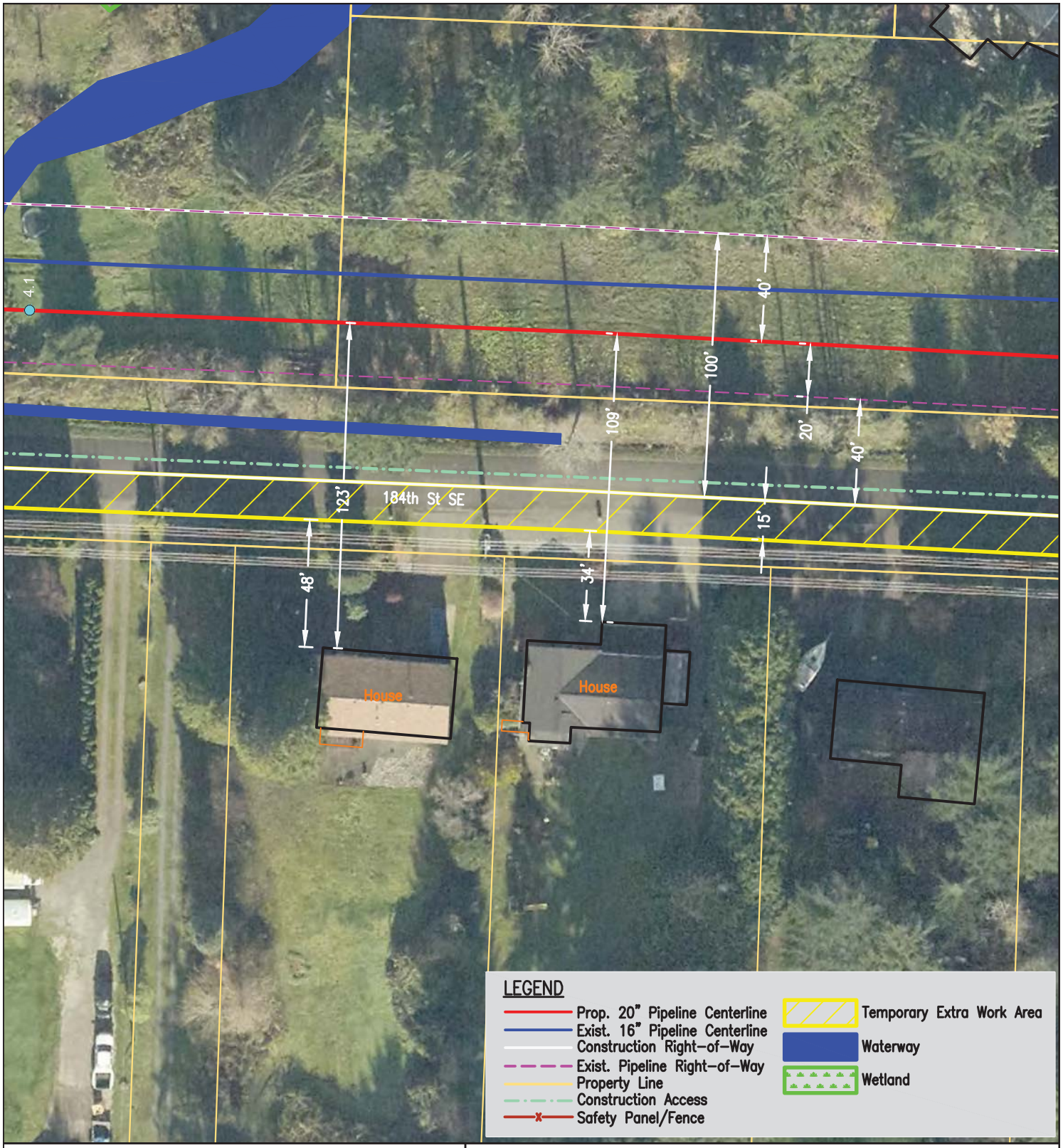
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-009	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 4.05 - 4.08
SEC 14, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-010	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

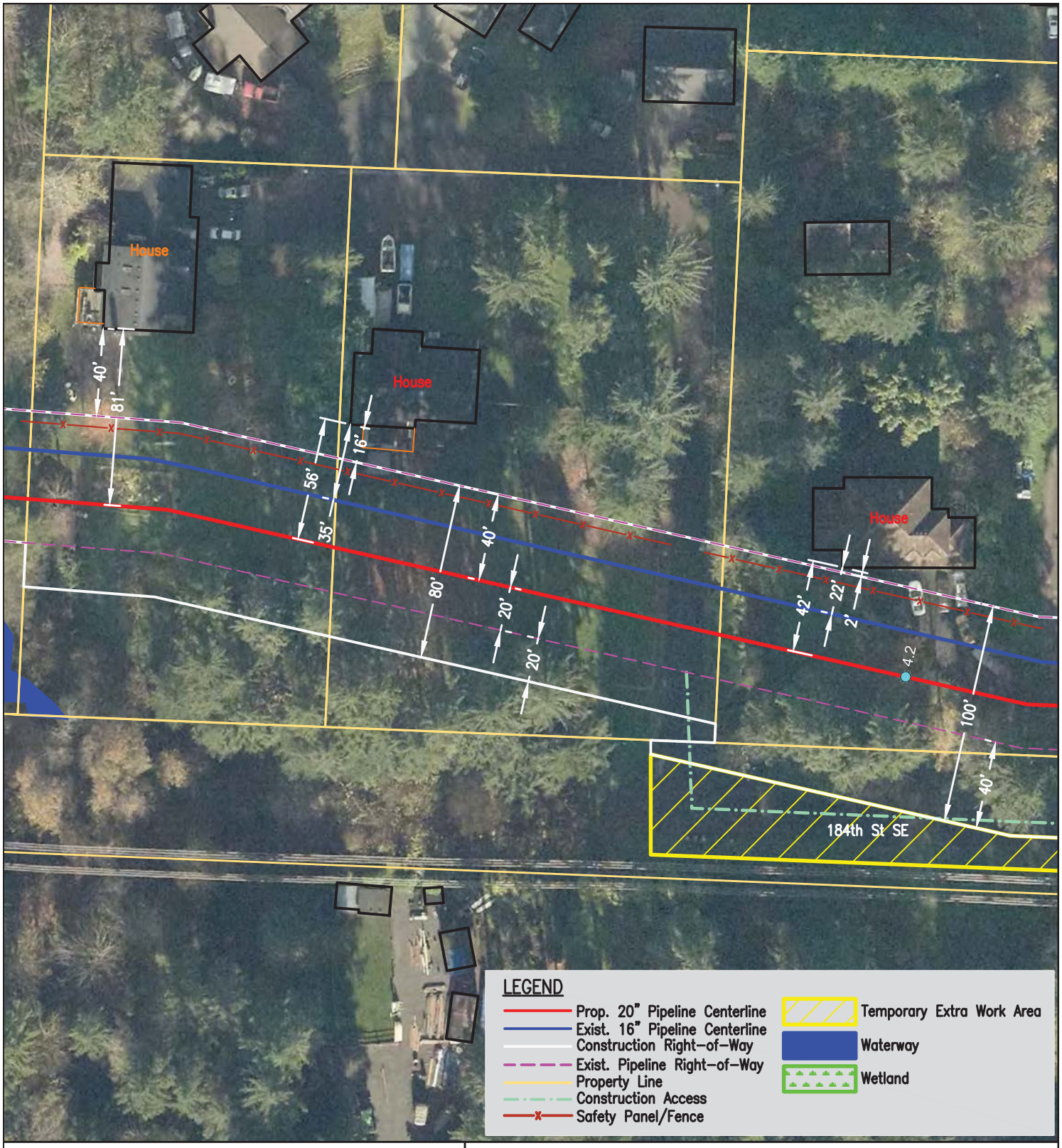
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 4.11 - 4.17
SEC 14, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-011	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 4.20 - 4.27
SEC 14, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-012	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

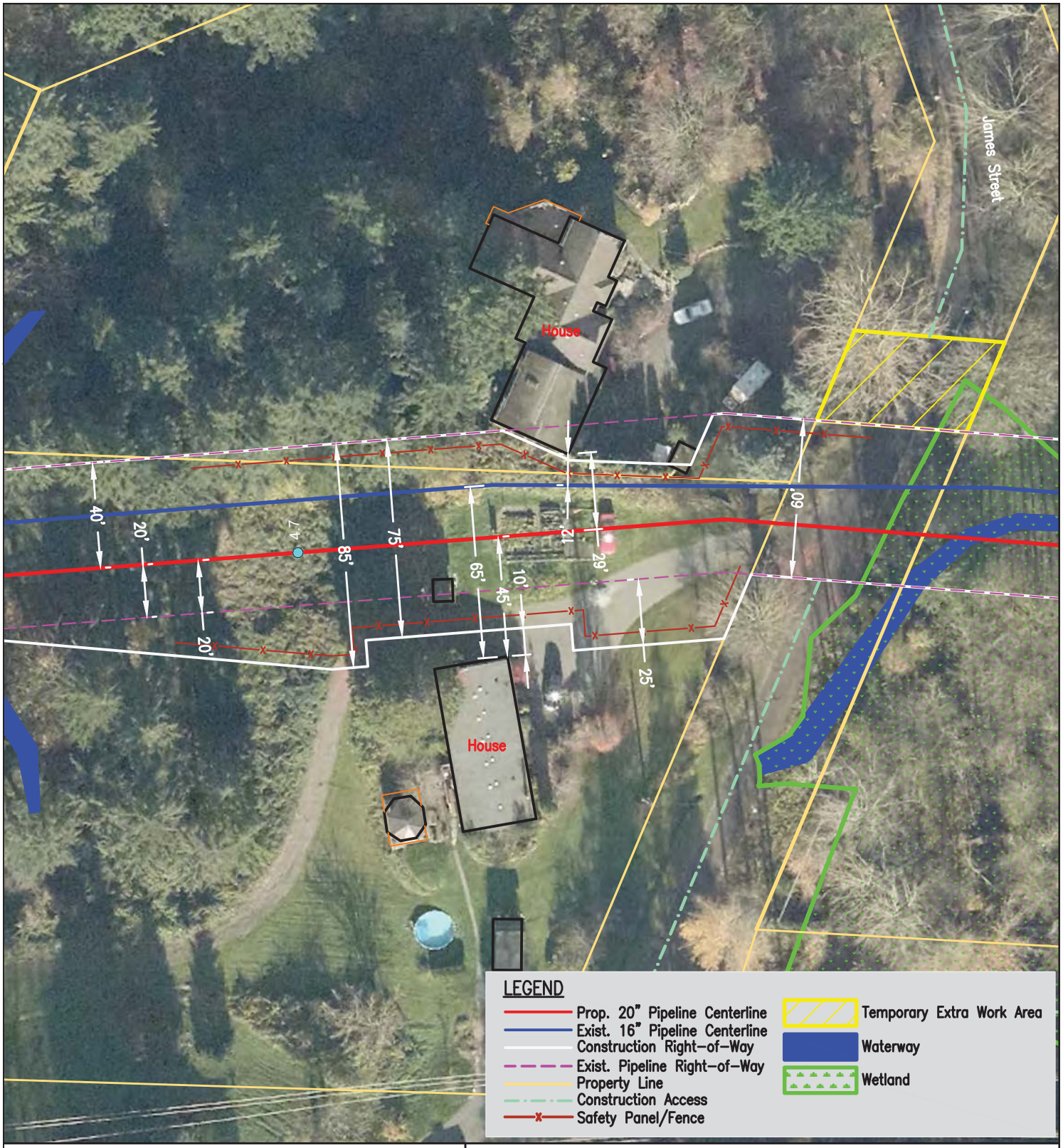
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 4.42
SEC 15, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-013	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 4.68
SEC 15, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

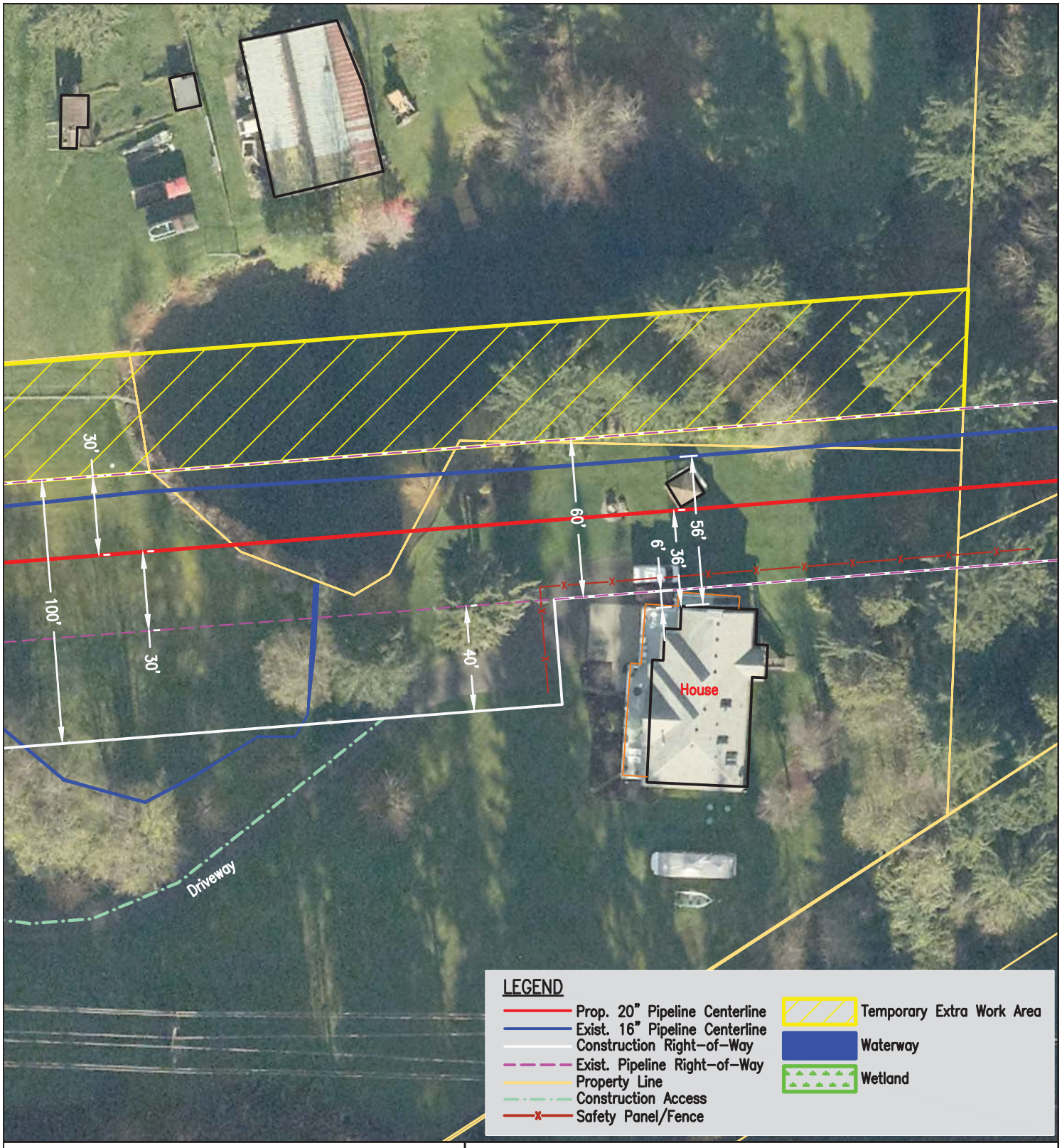
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-014	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 4.84
SEC 15, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-015	SHEET 1 OF 1	

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 4.92
SEC 15, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-016	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.0
SEC 15, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 4/5/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-016A	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.27
SEC 15, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-017	SHEET 1 OF 1	

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.36
SEC 15, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-018	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

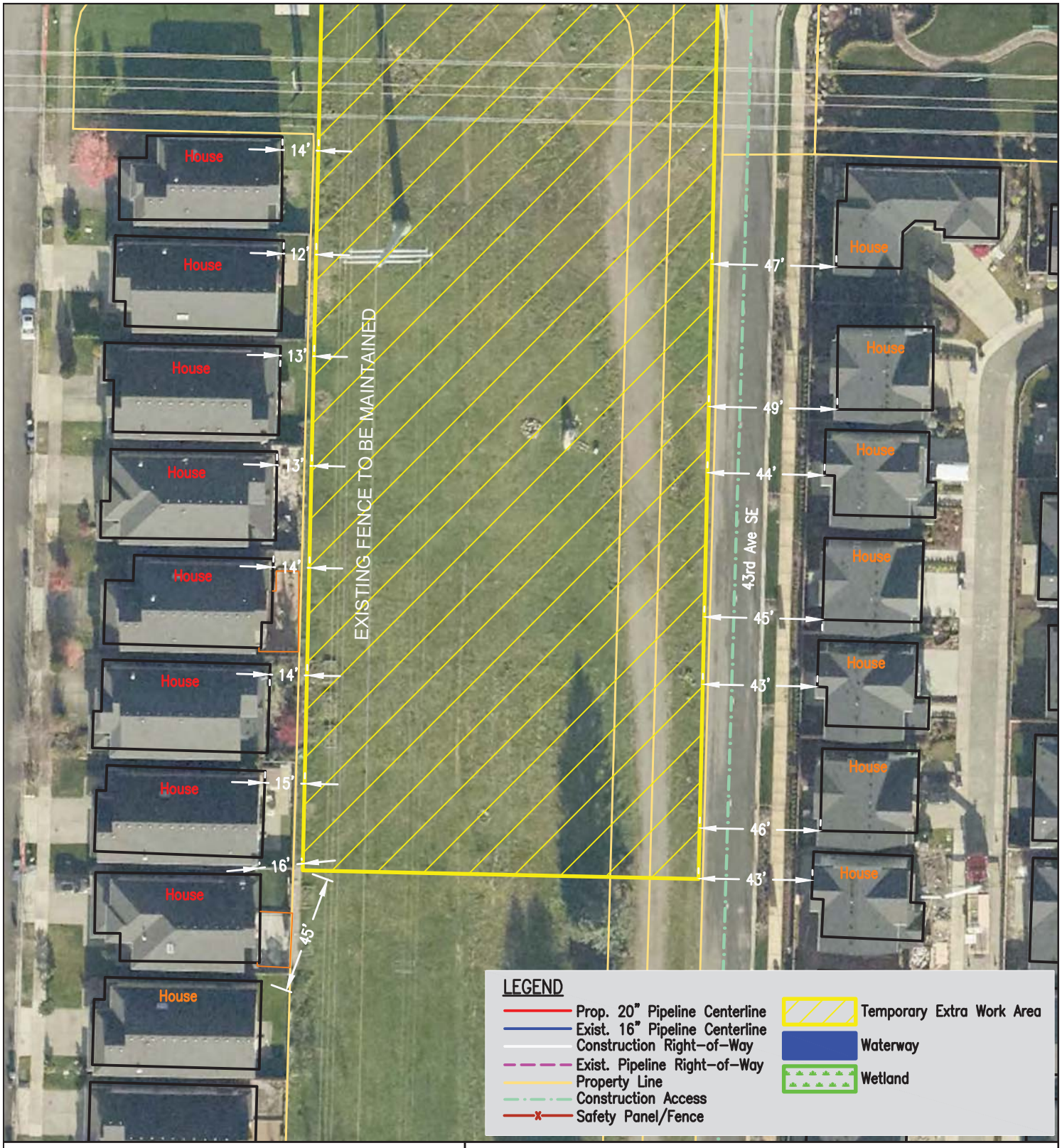
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.82 - 5.90
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-019	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.91 - 5.94
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-020	SHEET 1 OF 1	

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.91 - 5.94
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-021	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.94 - 5.98
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-022	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 5.98 - 6.02
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-023	SHEET 1 OF 1	

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.02 - 6.05
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-024	SHEET 1 OF 1	

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.07 - 6.11
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-025	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.12 - 6.16
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

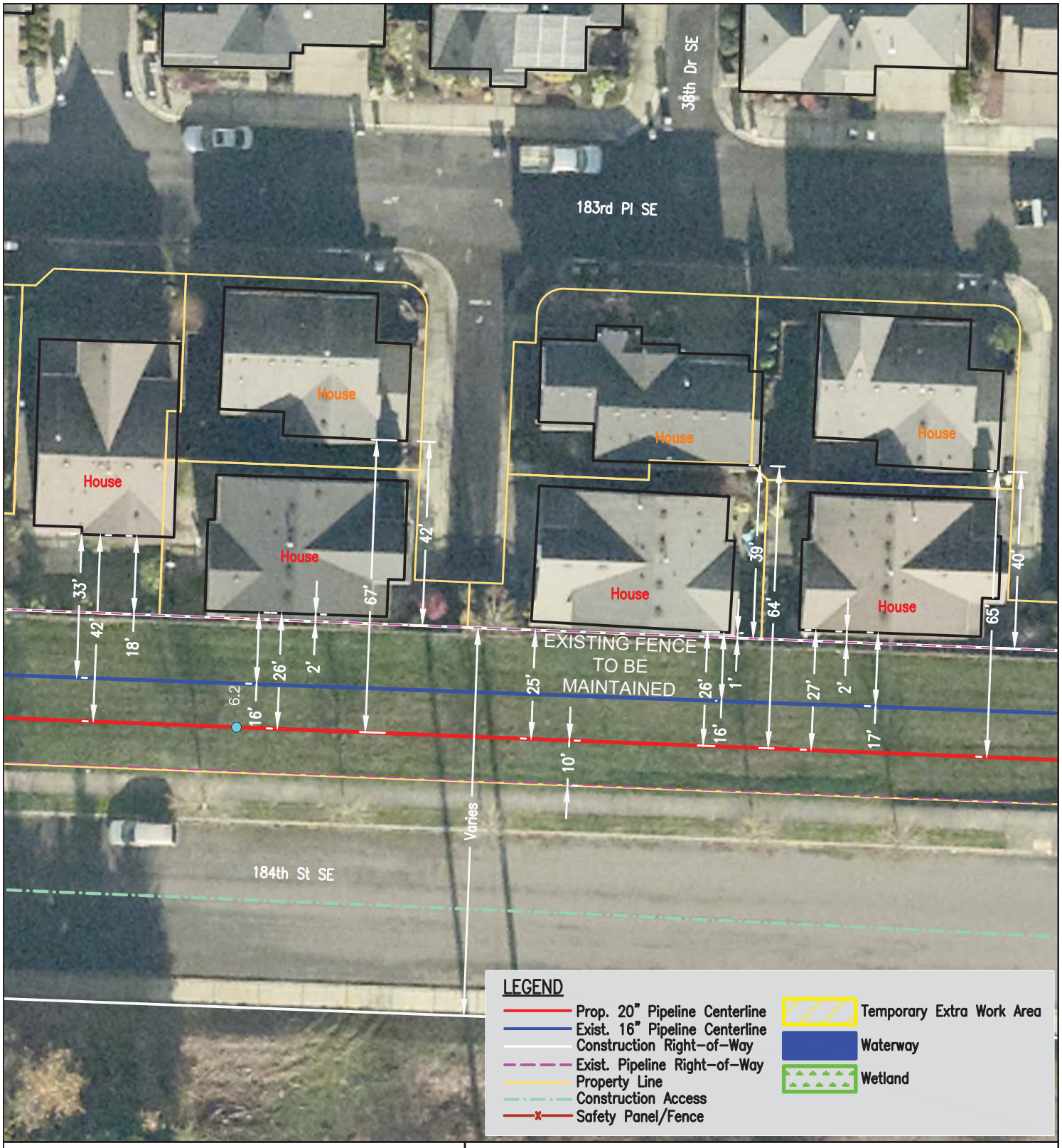
Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-026	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.17 - 6.21
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-027	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.21 - 6.24
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-028	SHEET 1 OF 1	

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.3
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 4/5/2017	ISSUED FOR BID:	SCALE: 1" = 30'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-028A	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.32 - 6.37
SEC 16, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 40'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-029	SHEET 1 OF 1	

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

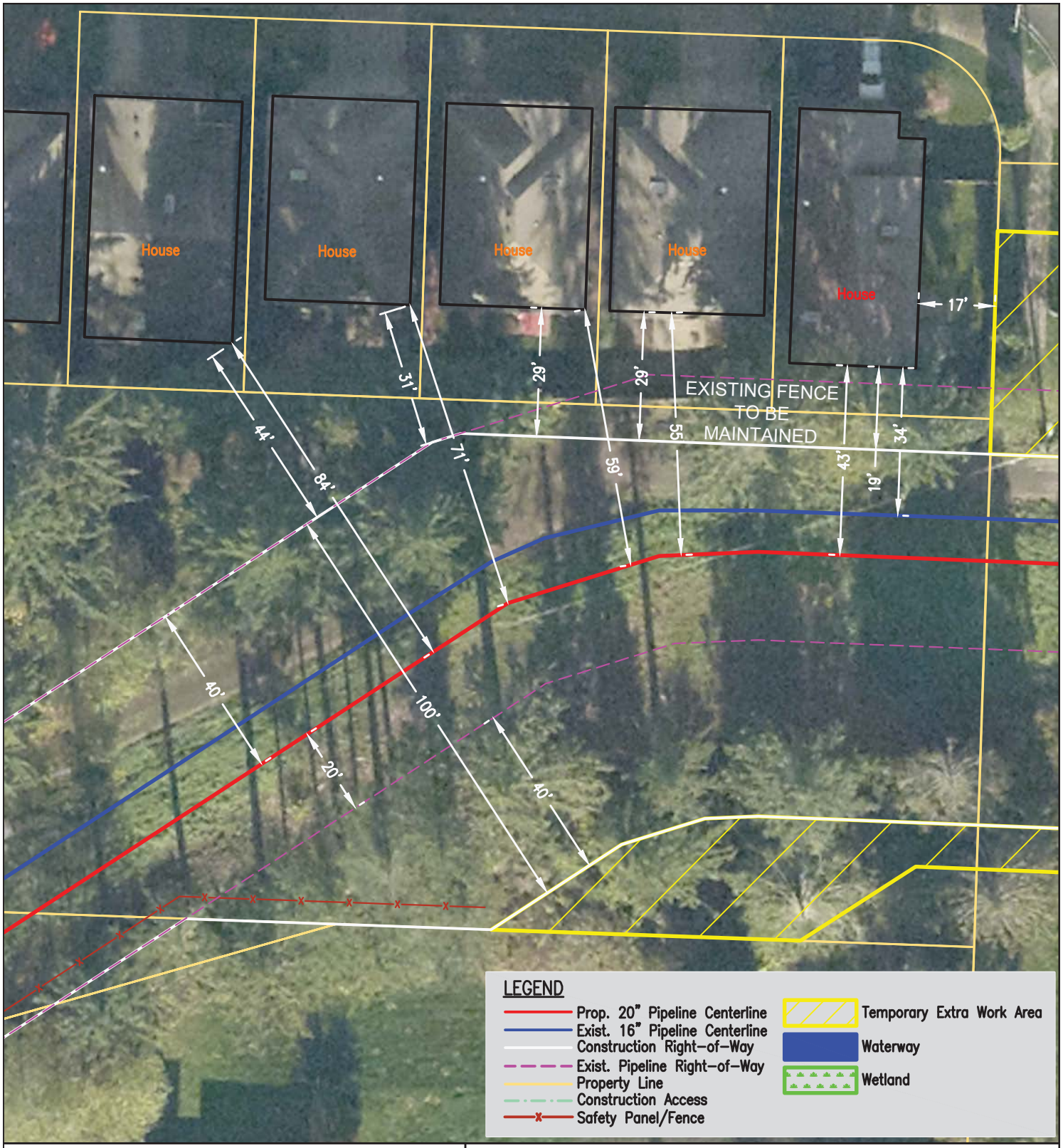
N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.37 - 6.40
SEC 16 & 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS												
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'		
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:			
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-030	SHEET 1 OF 1		



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.43 - 6.45
SEC 16 & 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 30'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-031	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.47
SEC 16 & 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 40'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-032	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

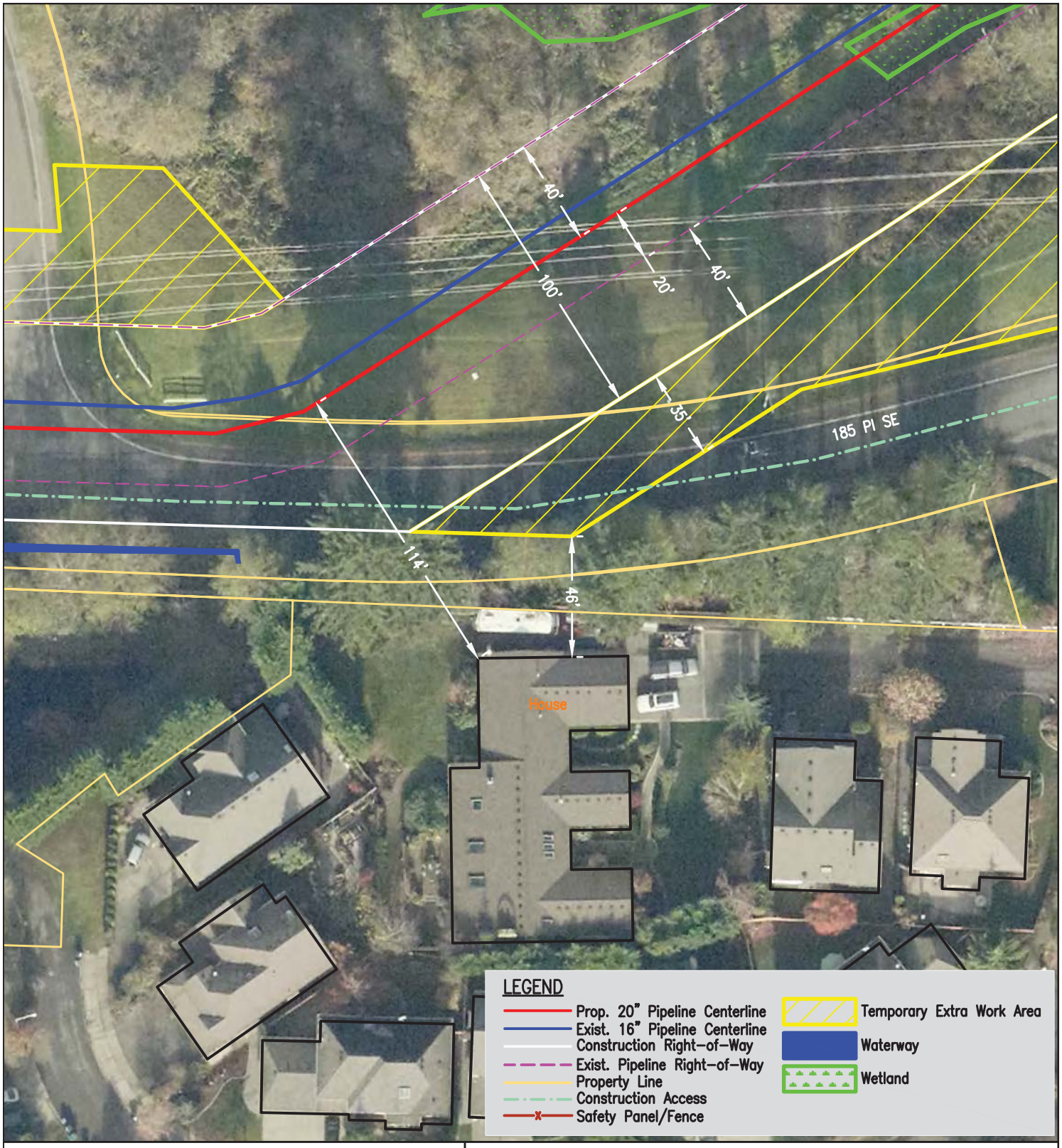
N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.5
SEC 16 & 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 4/5/2017	ISSUED FOR BID:	SCALE: 1" = 50'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-032A	SHEET 1 OF 1	



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

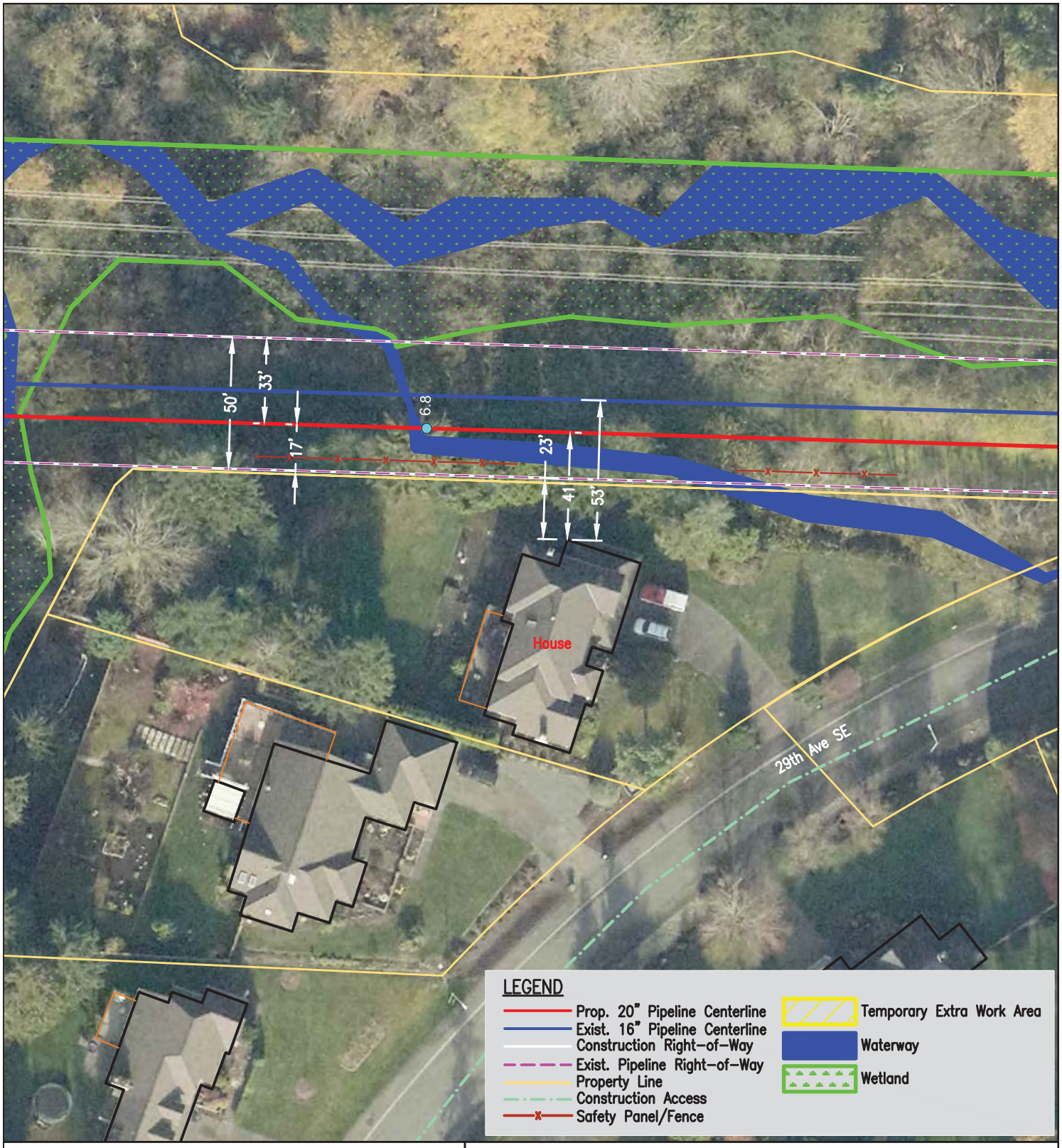
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.66
SEC 16 & 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-033	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.79
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-034	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

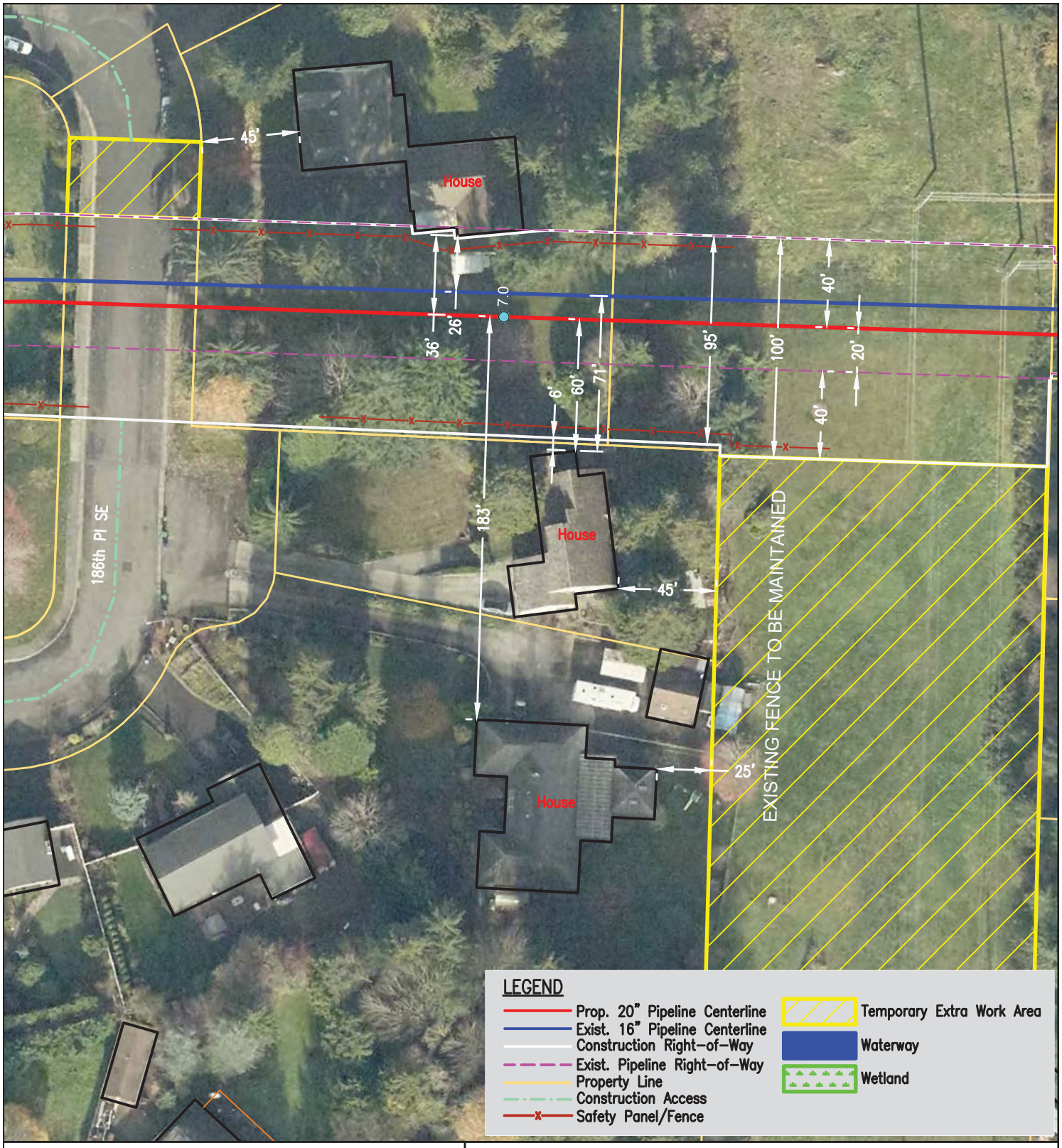
N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 6.88 - 6.93
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-035	SHEET 1 OF 1	



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

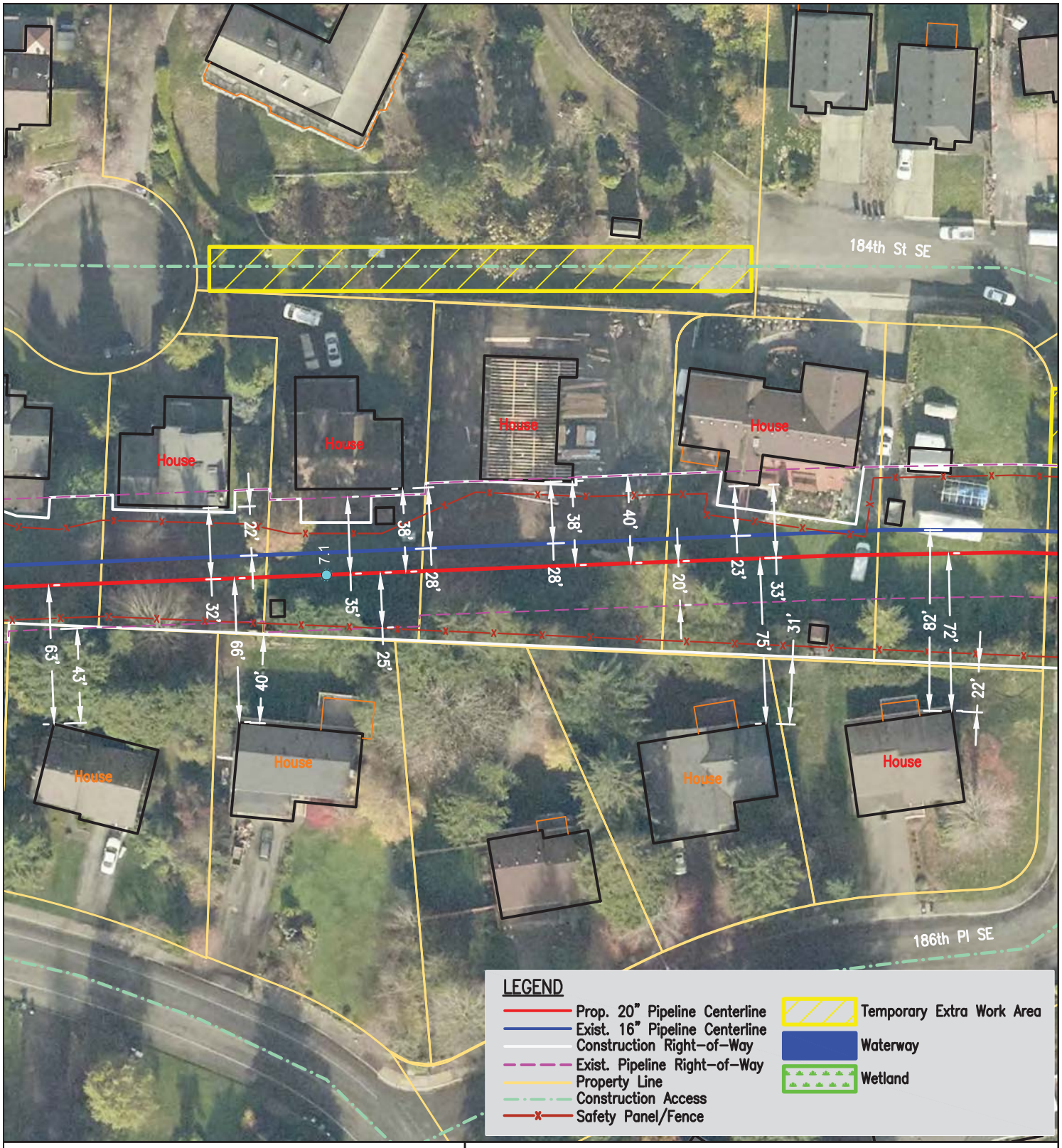
N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.0
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS											
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.	DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'	
							CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:		
							APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-036	SHEET 1 OF 1	



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.04 - 7.12
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-037	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.12 - 7.18
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-038	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

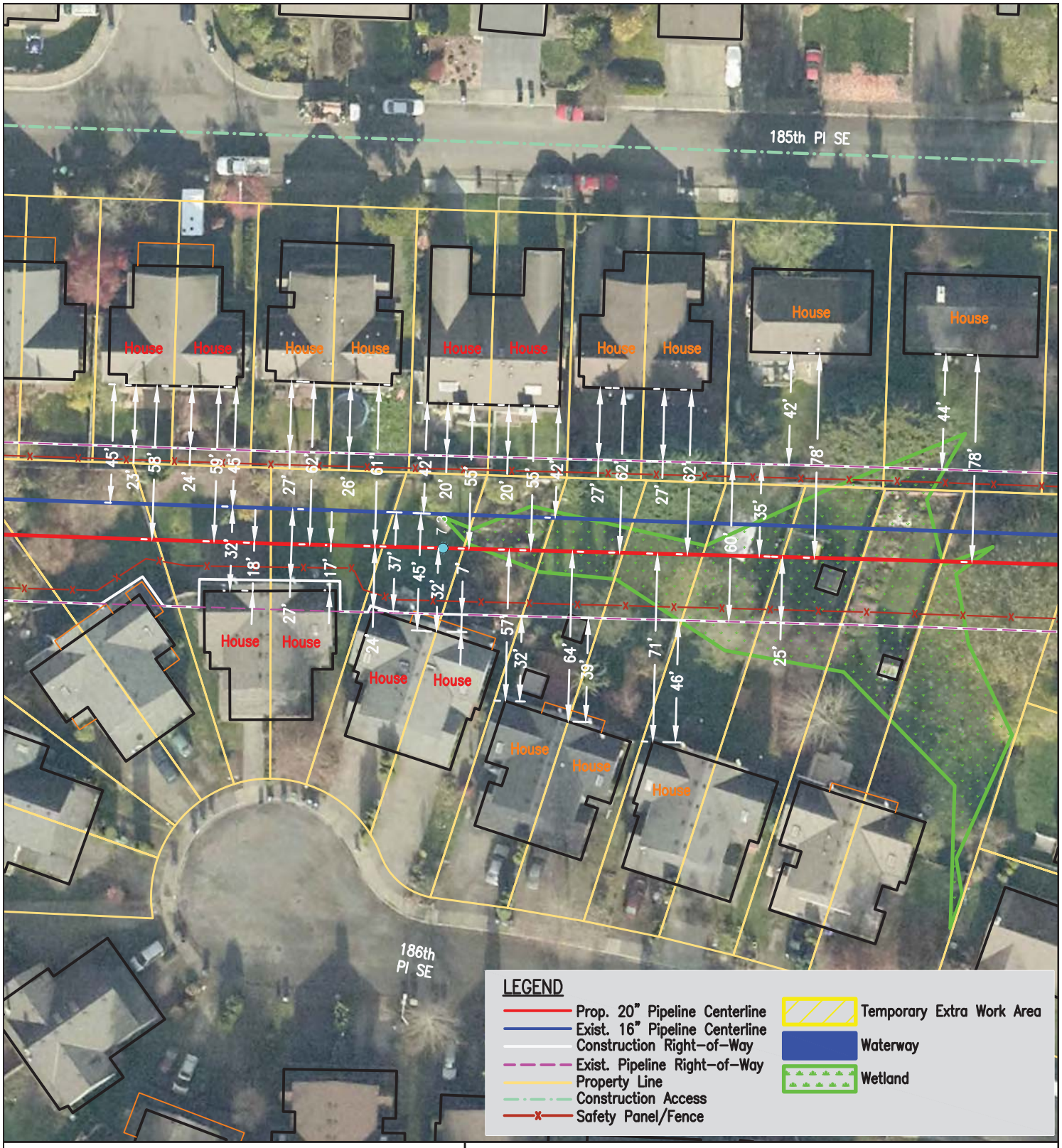
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.18 - 7.25
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-039	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

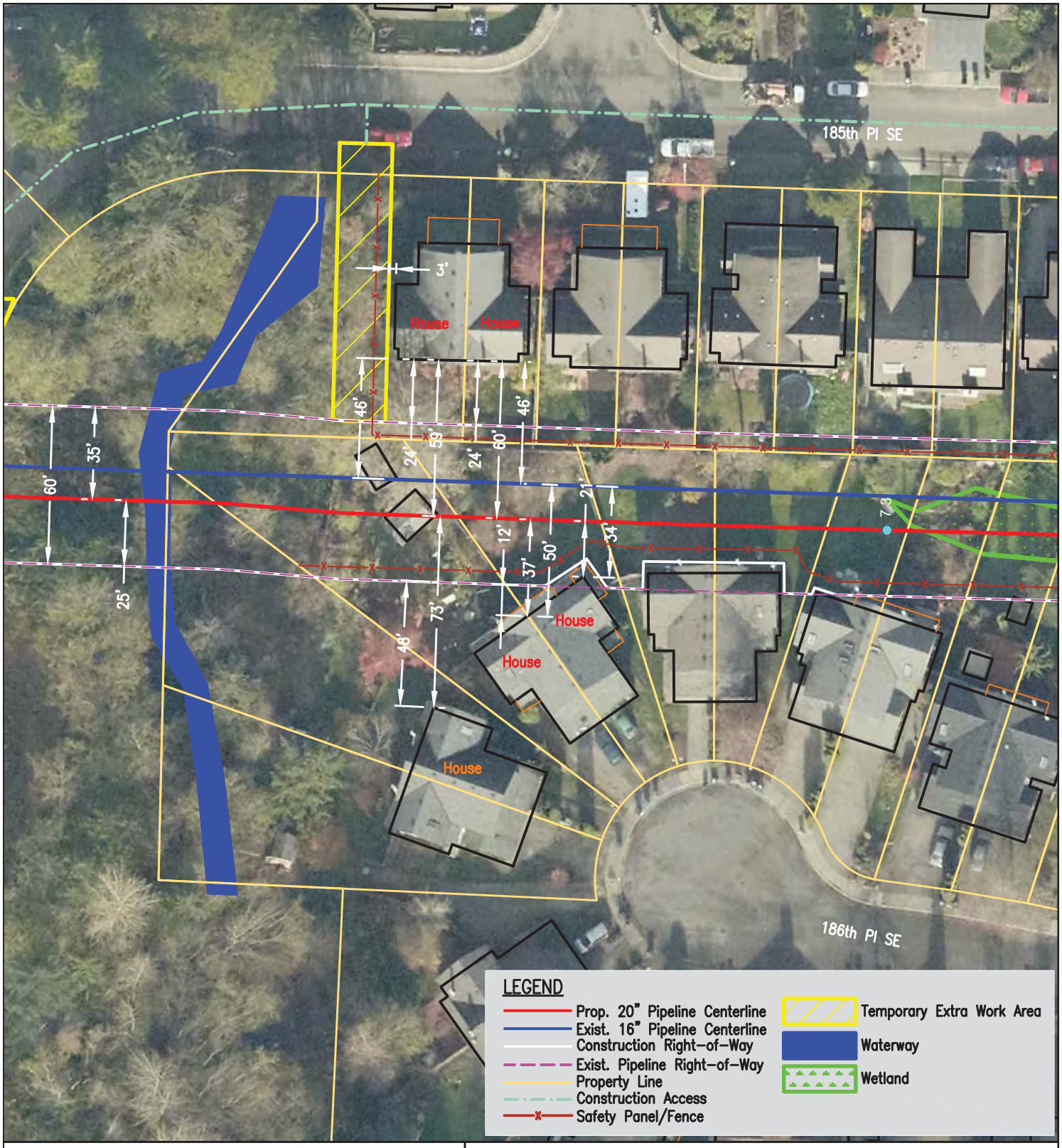
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.25 - 7.32
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-040	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

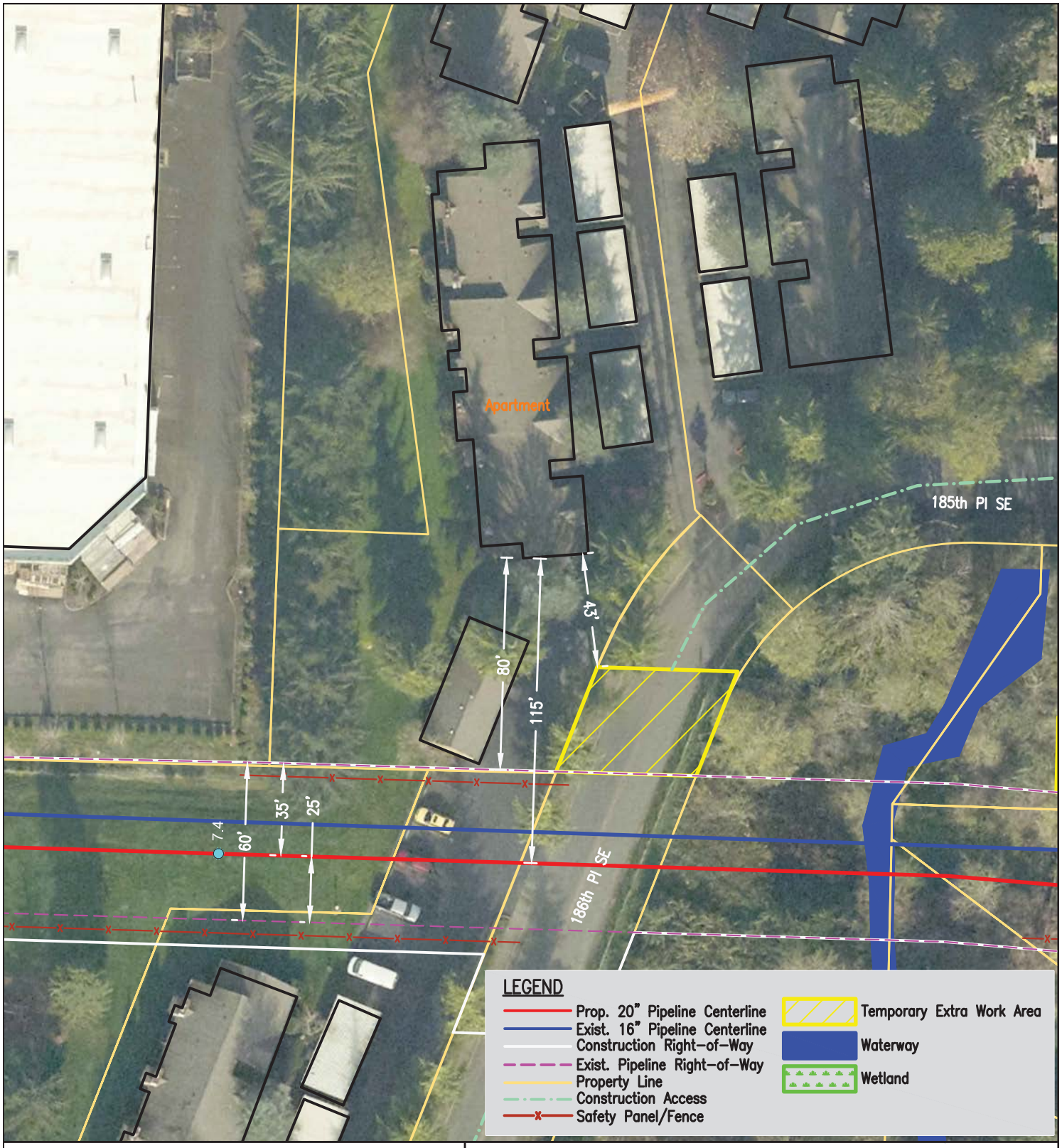
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.32 - 7.34
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-041	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

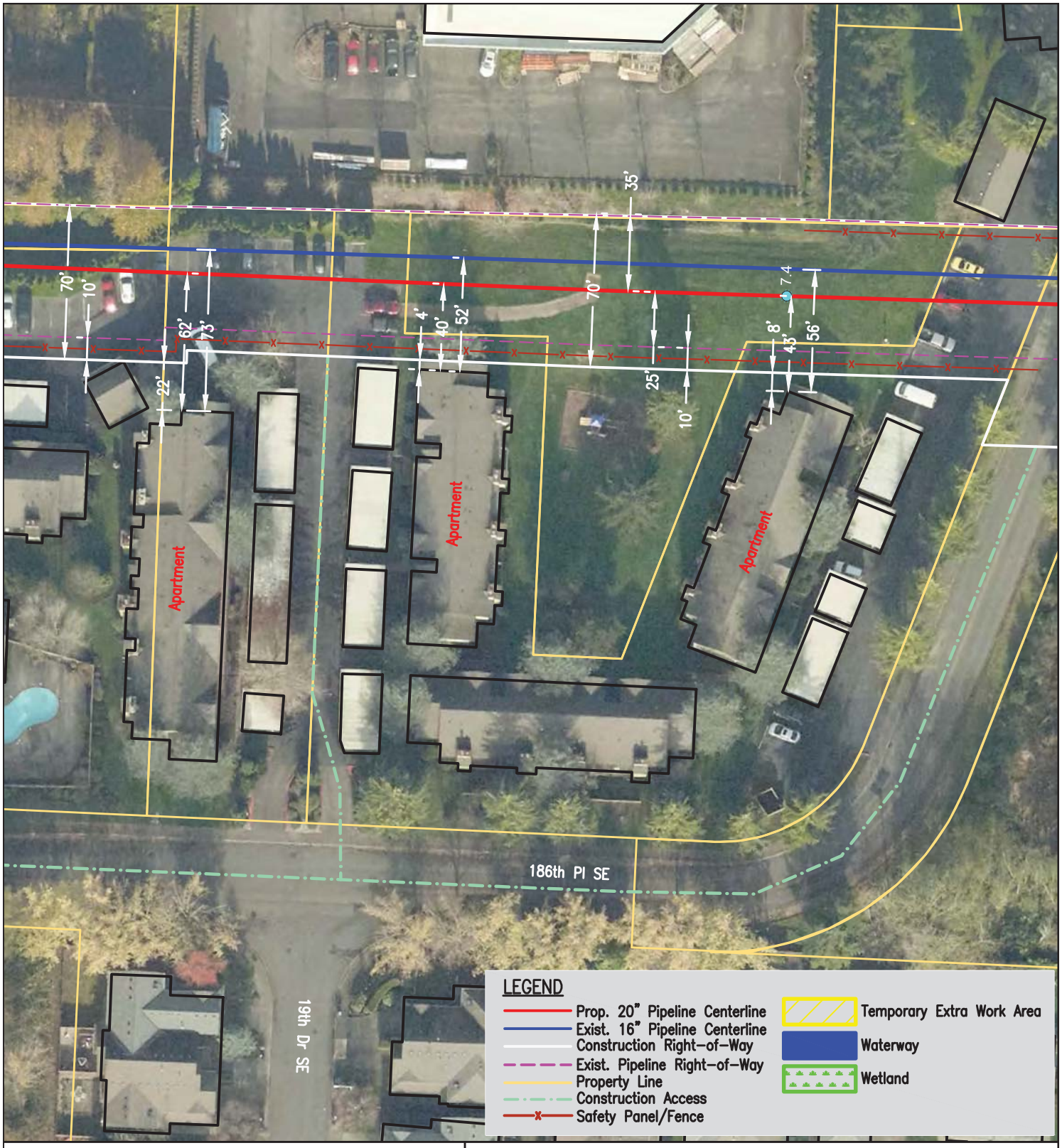
NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.39
SEC 17, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-041A	SHEET 1 OF 1



NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.39 - 7.46
SEC 17 & 18, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-042	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.46 - 7.52
SEC 17 & 18, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 60'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-043	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.68
SEC 18, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 5/1/2017	ISSUED FOR BID:	SCALE: 1" = 60'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-043A	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.75 - 7.80
SEC 18, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 40'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-044	SHEET 1 OF 1

NOTE:
House within 25' = House
House within 50' = House

Safety panel/fence will be installed as determined by the E.I. and/or land stipulation.

N

NORTHWEST PIPELINE LLC
20" NORTH SEATTLE LATERAL UPGRADE PROJECT
NORTH SEATTLE LATERAL (2428)
RESIDENTIAL SITE MAP - MP 7.80 - 7.86
SEC 18, T-27-N, R-5-E
SNOHOMISH COUNTY, WASHINGTON

Williams

PUBLIC

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	10/9/2017	KLL	MISC. REVISIONS	1199003	NWP	NWP

DRAWN BY: KLL	DATE: 1/17/2017	ISSUED FOR BID:	SCALE: 1" = 40'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 2428.33-X-045	SHEET 1 OF 1