APPENDIX J

WEP MITIGATION AND MONITORING PLANS

Appendix J1: Washington Expansion Project Erosion Control and Revegetation Plan

Appendix J2: Draft Unanticipated Discovery of Contamination Plan

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Appendix J4: Horizontal Directional Drilling Monitoring and Contingency Plan

APPENDIX J1:

WASHINGTON EXPANSION PROJECT EROSION CONTROL AND REVEGETATION PLAN

Washington Expansion Project
Erosion Control and Revegetation Plan

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Prepared by

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CH2MHILL®

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Acronyms and Abbreviations

BMP	best management practice
CFR	*Code of Federal Regulations*
DNR	Washington State Department of Natural Resources
DOT	U.S. Department of Transportation
ECRP	Erosion Control and Revegetation Plan
EI	Environmental Inspector
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
GIS	geographic information system
HDD	horizontal directional drilling
HPA	Hydraulic Project Approval
I-5	Interstate 5
lb/ac	pounds per acre
LWD	large woody debris
Northwest	Northwest Pipeline LLC
NRCS	Natural Resource Conservation Service
RCW	*Revised Code of Washington*
ROW	right-of-way
Spill Plan	Spill Plan for Oil and Hazardous Materials
TEWA	temporary extra workspace area
Upland Plan	*Upland Erosion Control, Revegetation, and Maintenance Plan*
WDFW	Washington Department of Fish and Wildlife
WEP	Washington Expansion Project
Wetland and Waterbody Procedures	*Wetland and Waterbody Construction and Mitigation Procedures*
WRCC	Western Regional Climate Center

SECTION 1

Introduction

This Erosion Control and Revegetation Plan (ECRP) outlines the erosion control and revegetation procedures that Northwest Pipeline LLC (Northwest) will use during construction of the Washington Expansion Project (WEP). The intent of this ECRP is to outline methods and procedures that will be implemented to minimize erosion, control sedimentation, and enhance revegetation success on all lands crossed by the WEP. The revegetation measures outlined in this ECRP have been prescribed to stabilize disturbed areas and to revegetate the right-of-way (ROW) to a condition that supports the preconstruction land uses as quickly as possible following construction.

This ECRP was developed using the Federal Energy Regulatory Commission's (FERC's) *Upland Erosion Control, Revegetation, and Maintenance Plan* (Upland Plan) (FERC, 2013a) and FERC's *Wetland and Waterbody Construction and Mitigation Procedures* (Wetland and Waterbody Procedures) (FERC, 2013b). 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, minimize erosion, and enhance revegetation success. The Upland Plan and Wetland and Waterbody Procedures were developed through a public process that included input from state, federal, and local agencies, industry, and the general public. In addition, this ECRP incorporates recommendations provided by the Natural Resource Conservation Service (NRCS, 2012) and by the design standards for best management practices (BMPs) presented in the Western Washington Stormwater Management Manual (Washington Department of Ecology, 2012). The intent of these resources was to identify structural and nonstructural practices that could be implemented during construction of the WEP to prevent and/or minimize, to the maximum extent practicable, the transport of sediment from the WEP site to drainage facilities, water resources, and adjacent properties.

1.1 Project Components

Northwest proposes to construct and operate the WEP, a capacity expansion to Northwest's existing natural gas transmission facilities along the Interstate 5 (I-5) corridor in the state of Washington. The WEP consists of approximately 140 miles of 36-inch-diameter pipeline to be constructed in ten noncontiguous segments (loops) between Woodland and Sumas, Washington, in Cowlitz, Lewis, Thurston, Pierce, King, Snohomish, Skagit, and Whatcom counties. To the extent practicable, Northwest proposes to install the pipeline in its existing ROW to minimize environmental, residential, and other impacts. In addition to the pipeline, Northwest will upgrade five existing compressor stations. A complete description of the WEP and its purpose and need can be found in Revised Resource Report 1—General Project Description.

1.2 Schedule

Northwest proposes to commence construction of the WEP in 2017 to meet the fourth quarter 2018 in-service schedule.

During 2017, Northwest plans to install trenchless crossings such as horizontal directional drilling (HDD) or Direct Pipe on major waterbodies listed in Revised Table 1.2-1 in Revised Resource Report 1—General Project Description. This schedule allows for sufficient time to pursue permits for alternative crossing locations or methods to cross these rivers in the event trenchless installation methods are unsuccessful. An alternate crossing method or trenchless crossing at an alternate location would then be completed in 2018 during the WEP pipeline construction.

In 2017, Northwest plans to conduct clearing in some large forested areas on the Woodland Loop, Chehalis Loop, and in selected other locations ahead of the WEP pipeline construction to minimize overall workspace, temporary extra workspace area (TEWA) requirements, and impacts on landowners. TEWA requirements will be minimized by proposing a multiple-year construction schedule because the same work areas used to stage ROW logging activities and provide timber storage and decking space in 2017 could be used for pipeline construction activities

in 2018. Timber removal concurrent with pipeline construction would require additional TEWAs to work safely and efficiently, and potential clearing delays could force construction activities into the winter rainy season, which increases the potential for erosion and safety hazards. Therefore, scheduling construction activities over a multiple-year period will minimize winter construction requirements resulting from seasonal construction windows and allow greater flexibility to remove forested habitat during non-nesting seasons for species protected under the Migratory Bird Treaty Act.

Northwest anticipates initiating work at the five existing compressor stations in fourth quarter 2017. Both pipeline and compressor station work will be completed in fourth quarter 2018. Revised Table 1.2-1 in Revised Resource Report 1—General Project Description provides a general schedule for the WEP.

SECTION 2

Site Description

2.1 Pipeline Facilities

The aboveground facility installations and modifications (i.e., cross-over assemblies, mainline block valves, and internal inspection device [pig] launchers/receivers) will be installed primarily within existing facility footprints or within the existing permanent ROW and will be permanently stabilized with gravel; therefore, these aboveground facilities are not discussed further. Temporary erosion control measures at these facilities will be installed as necessary during construction as determined by Northwest's Environmental Inspector (EI) using the BMPs outlined in this ECRP.

2.2 Existing Site Conditions

The WEP generally runs along the interface of the Puget Lowland and Cascade Range physiographic provinces, occasionally crossing back and forth from one province to the other. Washington's Cascade Range physiographic province consists of an active volcanic mountain range where Pliocene to recent uplift has resulted in relatively high topographic relief. The Cascade Range is typically divided into two sections, the North Cascades and the South Cascades. The WEP traverses the western boundary of both the North and South Cascades (Washington State Department of Natural Resources [DNR], 2012).The Puget Lowland physiographic province consists of a broad, low-lying region of subdued topography situated between the Cascade Range to the east and the Olympic Mountains and Willapa Hills to the west. The Puget Lowlands extend from the Canadian border southward to Eugene, Oregon, and the northern part of the Puget Lowlands is a flat glacial plain interrupted by the complex bays and inlets of Puget Sound (Lasmanis, 1991). The WEP area crosses nearly level glacial terraces and steep-sided valley walls.

The climate of the WEP area is tempered by air masses from the Pacific Ocean, which influence the climate throughout the year. Summers are fairly warm; hot days are rare. Winters are cool; snow and freezing temperatures are not common. During summer, rainfall is extremely light, and several weeks often pass without precipitation. During the rest of the year, rains are frequent, especially in late fall, winter, and spring.

In the winter, the average temperature is approximately 40.7 degrees Fahrenheit (°F) and the average monthly minimum temperature is about 33.7°F (Western Regional Climate Center [WRCC], 2013). In the summer, the average temperature is about 63.6°F and the average monthly maximum temperature is approximately 76.2°F. Total annual precipitation is about 38.3 inches. Of the total annual precipitation, about 18 percent usually falls during the dry season from May through September. The average snowfall is approximately 4.7 inches, and thunderstorms occur about five to ten times each year, mostly in the summer. Winter storms in the WEP area bring strong and sometimes damaging winds approximately once every 2 years, and streams may rise above flood stage several times each year (WRCC, 2013).

2.3 Proposed Pipeline Construction Activities

The WEP will be designed, constructed, operated, and maintained in accordance with the U.S. Department of Transportation (DOT) regulations in 49 *Code of Federal Regulations* (CFR) Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards;" 18 CFR Part 2.6, "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 and state regulations. In addition to the DOT requirements listed above, Northwest will also construct and reclaim the pipeline and aboveground facilities in accordance with FERC's Upland Plan and Wetland and Waterbody Procedures.

Generally, the pipeline will be installed within the existing easement to avoid creating new ROW impacts. Exceptions were made in several locations to accommodate a more suitable crossing location. Waterbody

crossings will be constructed as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit. Banks of waterbodies will be returned to preconstruction contours. If Northwest cannot restore the waterbody banks to preconstruction contours, then banks will be restored to a stable angle using bioengineered approaches, as approved by the EI.

Pipeline construction will primarily occur in 2018. Northwest will prepare to receive materials and pipe at contractor and pipe storage yards when materials are procured from vendors and after the contractor and pipe storage yards have been identified during easement negotiations. Revegetation will primarily occur during the fall of 2018. The general construction sequence is as follows:

- Preconstruction survey
- Installation of erosion control BMPs
- Clearing and grading
- Topsoil segregation
- Trenching, 26-inch pipeline removal (where necessary), and installation of 36-inch replacement pipeline
- Hydrostatic testing
- Restoration

Each step is described in more detail in the following sections.

2.3.1 Preconstruction Survey

The limits of disturbance will be clearly marked/staked prior to construction including the construction ROW, TEWAs, and access roads. Utility lines or other foreign line crossings will be located and marked to prevent accidental damage during pipeline construction. Sensitive areas to be protected from disturbance will be marked with highly visible construction sheeting and brightly colored flagging, or construction fence for equipment operators. Equipment will be allowed to enter and operate only within the delineated limits of disturbance and access roads. In addition, any state- or county-listed Class A or Class B noxious weed infestations will be mapped and flagged. The locations of the noxious weed infestations will be provided to the applicable county Noxious Weed Control Board. Flagging, signs, and other markings identifying the limits of disturbance will be maintained through all phases of construction and routinely checked by Northwest's EI (see Section 3.0 for the EI's responsibilities). Construction will generally use a 95-foot-wide construction ROW, with additional TEWAs required at designated locations such as at road or waterbody crossings and other areas where additional staging areas are required. A number of areas will require the construction ROWs to be reduced to 75 feet in width, such as in wetlands and in residential areas, to minimize disturbance. Where feasible, based on site-specific conditions and engineering constraints, TEWAs have been set back from wetland and waterbody boundaries to minimize impacts to wetland buffers and riparian areas consistent with the Wetland and Waterbody Procedures.

2.3.2 Installation of Erosion Control BMPs

Temporary erosion control measures will be installed in conjunction with clearing activities 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 proper installation of the BMPs, and installed BMPs could be damaged during clearing activities. Installed erosion control BMPs will be routinely inspected and any damaged or temporarily removed BMPs will be replaced at the end of each working day or sooner as required by applicable permits and authorizations. Temporary erosion control measures will be maintained until the area disturbed during construction is stabilized (i.e., successful revegetation has been achieved) and approval is achieved from local and state agencies to remove the BMPs. Section 3.1 describes in detail the temporary erosion control BMPs that will be implemented during construction to minimize erosion and potential impacts from offsite sedimentation.

During any prolonged period of inactivity, such as the time between timber clearing and construction, the BMPs will be inspected once every calendar month as required by the project-specific Stormwater Pollution Prevention Plan. During this time, the soils will be temporarily stabilized with a combination of a thick layer of mulch, soil binders, and tackifiers, and then temporarily seeded. Depending on site conditions, straw wattles and compost socks may also be installed to control stormwater runoff velocity.

2.3.3 Clearing and Grading

The flagged limits of disturbance will be maintained throughout all construction phases and will be monitored by Northwest's EI. Where feasible, previously identified noxious weed infestations will be removed prior to land-clearing activities. Noxious weeds and soil contaminated with noxious weeds will be transported offsite only in appropriate containers to prevent the migration of noxious weeds. Brush and trees within the construction ROW 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 after the pipeline has been installed and backfilling is complete, when the banks are being restored. Logs and slash will not be yarded across DNR Type F streams and, where possible, across DNR Type N streams. Temporary crossings of Type N streams will be installed such that the direction of log movement between stream banks shall be designed to minimize sediment delivery to streams. Landings for clearing operations will not be located in wetlands, and, where feasible, logs yarded out of wetlands or riparian zones will be skidded with at least one end suspended above the ground to minimize soil disturbance. Construction through these areas will be minimized and 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 WEP's Hydraulic Project Approval (HPA) issued by the Washington Department of Fish and Wildlife (WDFW).

No vegetation outside of the ROW will be cleared between the TEWAs and the edges of stream banks and/or wetlands. Grading of the construction ROW in upland areas shall 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 areas directly over the trench. Northwest will not grade or remove stumps or root systems from the rest of the ROW in wetlands unless it is determined that safety-related construction constraints require removal of tree stumps from under the working side of the ROW. Minimizing stump and root system removal will accelerate restoration efforts by allowing sprouting species to reestablish from existing root systems.

2.3.4 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 will be segregated. 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 ROW or trench and subsoil storage area stripping. Segregated topsoil will be stockpiled separately from subsoil in accordance with FERC's Upland Plan. Segregated topsoil stockpiles will be covered during periods of inactivity (more than 14 days) to protect the soil from noxious weed seeds and other propagative plant parts. In deep soils (more than 12 inches of topsoil), Northwest will segregate at least 12 inches of topsoil. In soils with less than 12 inches of topsoil, Northwest will make every effort to segregate the entire topsoil layer, as determined by Northwest's EI.

FERC's Wetland and Waterbody Procedures address topsoil segregation in wetlands. In wetland areas, FERC requires the top 12 inches over the trenchline to be salvaged, except in areas where standing water or saturated soils are present.

2.3.5 Trenching and Installation of 36-inch Pipeline

Northwest will excavate a trench, remove the existing pipe (if necessary), install the new pipe within the excavated trench, and backfill the trench. After installation of the 36-inch pipeline and prior to backfilling, Northwest will install trench plugs (see Drawing 1408.34-X-0011 in Attachment 1) consistent with the requirements of FERC's Upland Plan (Section IV.F.2). 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 or foam. Topsoil will not be used to fill the bags. Trench plugs will be installed on slopes to minimize water flow down the trench line to prevent potential subsurface erosion and to maximize stability.

The source of backfill material will be the material removed from the trench for placement of the pipe. This material, less the volume occupied by the 36-inch pipe, will be returned to the trench.

2.3.6 Hydrostatic Testing

After backfilling, the pipeline will be hydrostatically tested in accordance with DOT regulations to ensure that the system is capable of operating at the design pressure as described in Section 4.1 of this ECRP. Should a leak or break occur, the line will be repaired and retested until the 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 straw bale structure to dissipate energy and filter the test water, and the filtered water will be discharged as overland sheet flow (see Drawing 1408.34-X-0012 in Attachment 1).

2.3.7 Restoration

After the pipeline is backfilled and tested, disturbed areas will be restored as nearly as possible to their original contours. Permanent erosion control measures will be installed as discussed in Section 3.0 of this ECRP, and revegetation will be performed as outlined in Section 5.0.

2.4 Potential Sources of Contamination from Construction

The potential sources of pollutants that could be discharged in the receiving waterbodies through contact with stormwater during construction activities include the following:

- Vehicle and equipment fueling and maintenance areas
- Materials handling/loading and unloading areas
- Erosion (wind, water)
- Tracking from equipment
- Grading and site preparation
- Drilling
- Trenching
- Hazardous material storage areas
- Storage yards
- Mobile equipment
- Painting

2.4.1.1 Vehicle and Equipment Fueling and Maintenance

Fueling and minor maintenance of vehicles and equipment may be conducted on some construction sites. These activities can be potential sources of leaks and incidental spills of fuel (during fueling), oil, and grease.

2.4.1.2 Materials Handling/Loading and Unloading Areas

Materials handling/loading and unloading activities are common on construction sites. Materials may spill or leak during loading and unloading, and may collect in the soil or other surfaces and be carried away in stormwater. Machines used to unload materials also may be a source of stormwater pollution.

2.4.1.3 Erosion

Erosion is caused where soil is exposed to water or wind. Erosion can be caused by many construction-related activities, such as removing vegetation, compacting or disturbing the soil, changing natural drainage patterns, and covering the ground with impermeable surfaces. Erosion is a source of sediment in stormwater.

2.4.1.4 Tracking

Construction equipment and construction vehicles have the potential to track soils from the construction project into public roadways. Any soils tracked off the construction sites may be a possible source of sediment in stormwater.

2.4.1.5 Grading and Site Preparation

Grading and site preparation may be required at some locations and can be contributors of suspended solids concentration in stormwater. The possibility of erosion exists throughout the grading and site preparation phases of construction projects until construction is complete.

2.4.1.6 Drilling

Trenchless crossings such as HDD or Direct Pipe will be used at several waterbody crossings. Mud rotary techniques will be used to transport the cuttings to bins. The rotary mud (inert bentonite) could become a potential source of sediment-laden water if not managed appropriately.

2.4.1.7 Trenching

During the installation of pipeline sections, open trenching will be used throughout the route. During this type of installation, the stockpiled material will be exposed, and it could be a source of sediment if not managed appropriately.

2.4.1.8 Hazardous Material Storage Areas

Hazardous material storage areas have the potential to release hazardous substances that may pose a threat to human health or the environment. Hazardous materials may be toxic, corrosive, ignitable, explosive, or chemically reactive. There is a potential for hazardous materials to be stored on construction sites. Outdoor storage areas include drums, sheds, clamshells, and yellow flammable cabinets.

2.4.1.9 Storage Yards

Storage yards may contain equipment, construction materials, hazardous material storage areas, and construction debris that, when exposed to runoff, may pollute stormwater. A wide range of contaminants (metals, oil, and grease) may enter the environment by washing off or dissolving from stored material.

2.4.1.10 Mobile Equipment

Portable tanks and other mobile equipment are used extensively on construction sites. This equipment may generate fuel or oil leaks or spills. Closed portable tanks and bins will be used to store wastes generated during the WEP.

2.4.1.11 Painting

During painting and paint removal activities, materials may be used (and wastes created) that are harmful to humans and the environment. Pollutants may include solvents, solids, and metals. Any waste generated from these activities would be captured and removed following federal and state requirements.

SECTION 3

Best Management Practices

This ECRP will be used by contractors as a primary construction reference for the WEP. It provides site-specific directions for installing temporary and permanent erosion control measures (or BMPs) to prevent or minimize erosion. Attachment 1 provides drawings of typical BMPs that may be used during construction. BMP materials will be stored at the WEP's proposed yards.

Northwest will employ a team of EIs for the WEP. An EI will be onsite during active construction and will have peer status with all other utility inspectors. All EIs will have authority to stop activities that violate the measures set forth in this ECRP as well as other authorizations and will have the authority to order corrective action. At a minimum, the EIs will be responsible for:

- Ensuring compliance with the measures set forth in this ECRP, the requirements of FERC's Upland Plan, FERC's Wetland and Waterbody Procedures, Washington's Noxious Weeds regulations in *Revised Code of Washington* (RCW) 17.10, 18 CFR Part 380.15(e) (3), 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, areas of known noxious weed infestations, or areas with special requirements along the construction work area.
- Identifying areas needing noxious weed control and monitoring the results of removal efforts.
- Identifying erosion/sediment control and stabilization needs in all areas.
- Locating dewatering structures and slope breakers to ensure they will not direct water into sensitive 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 shall be stopped and corrective action taken to prevent reoccurrence.
- Testing subsoil and topsoil in pastures, active agricultural fields, and residential areas crossed by the WEP to measure compaction, and determining 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.
- Ensuring restoration of contours and topsoil.
- Approving imported fill material (including rock, gravel, or soils) for use in residential areas and verifying that the fill material is inspected for noxious weeds and soil pests.
- Determining the need for erosion controls and ensuring that they are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads. This includes evaluating controls prior to a predicted storm event, whenever possible, and installing additional measures as needed to control stormwater 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 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 after identification.
- Keeping records of compliance with the conditions of all environmental permits and approvals (including the measures set forth in this ECRP) during active construction and restoration.
- Identifying areas that should be given special attention to ensure stabilization, restoration, and the reduction of the spread of noxious weeds after the construction phase.

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 (such as 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 ingress/egress points using existing public and private roads that are crossed by the ROW. All access roads are shown on the Aerial Maps in Revised Appendix 1A and on the alignment sheets 1C of Revised Resource Report 1—General Project Description. Construction traffic will move up and down the construction ROW as much as possible.

In designated areas, as determined by the EI, Northwest will install construction entrances at ROW 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 Drawing 1408.34-X-0001 in Attachment 1.

3.1.2 Sediment Barriers

Sediment barriers will be used to confine sediment to the construction ROW and will be constructed of silt fence, straw bales, or straw wattles (see Drawing 1408.34-X-0002 in Attachment 1). Silt fence will be used where sediment barriers are required parallel to the ROW. Straw bales (weed-free) will be used in locations where sediment barriers are required to cross the construction ROW along the travel lane, such as at waterbody and wetland crossings. Straw wattles may also be used in appropriate areas as determined by the EI to reduce runoff velocity and confine sediment to the construction ROW. 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 ROW 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
- On the downslope side of the ROW where it traverses steep side slopes

Drawing 1408.34-X-0003 in Attachment 1 shows the placement of temporary sediment barriers adjacent to road crossings. An example of sediment control in ditches and swales is shown on Drawing 1408.34-X-0004 in Attachment 1. Examples of sediment barrier installations during construction at wetlands and streams are shown on Drawings 1408.34-X-0005, -0006, and -0007 in Attachment 1. Northwest's EI will determine where it may be necessary to provide added protection using sediment barriers to ensure that runoff is properly treated and that sediment is contained on the ROW.

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 each 0.5-inch or greater

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 as soon as possible but no more than 24 hours after discovery. 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-ROW 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 stabilized.

3.1.3 Storm Drain Inlet Protection

The EI will assess all storm drain inlets downslope and within the approved work areas and determine if potential runoff from the WEP could reach a storm drain. Where necessary, storm drain inlets will be protected with temporary devices to prevent sediment from entering them. There are various inlet protection filters that are effective in keeping sediment-laden water from entering a storm drainage system, such as block and gravel filters, gravel and wire-mesh filter barriers, or bag barriers filled with various filtering media, which are placed around the inlet to protect the storm drain. Drawing 1408.34-X-0014 provides examples of a few common inlet protection methods.

3.1.4 Temporary Slope Breakers and Runoff Controls

3.1.4.1 Temporary Slope Breakers

Northwest will install temporary slope breakers to reduce runoff velocity and concentrated flow, and to divert water off the construction ROW to avoid excessive erosion (see Drawing 1408.34-X-0008 in Attachment 1). 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 ROW. The outfall of the slope breakers will be positioned to avoid sedimentation of wetlands, waterbodies, and other sensitive areas. Northwest will use FERC's Upland Plan (Section IV.F.1.b.) for spacing of temporary and permanent slope breakers for WEP.

3.1.4.2 Runoff Controls

Interception of surface water on slopes reduces the possibility of erosion. Interceptor dikes and swales may be used to intercept storm runoff from undisturbed areas above disturbed areas or slopes and convey the runoff to stable points away from exposed soils. Stormwater runoff entering the construction ROW or TEWAs will be controlled to minimize erosion of disturbed areas and exposed cuts and fills. The EI will determine appropriate runoff control measures depending on site-specific and anticipated weather conditions. Potential control measures may include berms or interceptor dikes, swales, and piped slope drains as shown on Drawings 1408.34-X-0015 and 1408.34-X-0016 (see Attachment 1).

3.1.5 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 (FERC's Upland Plan IV. F.4.a.). 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 2 tons per acre of weed-free straw or 1 ton per acre of sterilized weed-free wood-fiber hydromulch. In addition, the mulch application rate will be increased to 3 tons per acre on steep slopes and all slopes within 100 feet of waterbodies and wetlands. The mulch will consist of weed-free straw or sterilized weed-free wood-fiber hydromulch.

Construction is scheduled to occur primarily in the dry season; however, if in the wet season (October 1 to April 30) an area is to remain unworked for more than 2 consecutive days, the area will be covered or appropriate BMPs installed to minimize erosion potential based on soil type, slope gradient, anticipated weather conditions, and other factors. The installation of BMPs, as determined by the EI, will retain sediment onsite or treat/filter runoff before it leaves the construction ROW or TEWA. BMPs may include berms or sediment barriers. Temporary

coverings may include weed-free straw or sterilized weed-free wood-fiber hydromulch materials or the application of plastic or tarps (see Drawing 1408.34-X-0017 in Attachment 1).

3.1.6 Erosion Control Fabric

Northwest will install erosion control fabric (such as jute or excelsior) on stream banks at the time of recontouring (see Drawing 1408.34-X-0009 in Attachment 1). 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.

3.1.7 Dust Control

During summer construction in the WEP area, fugitive dust may be a potential impact along the construction ROW, especially where construction occurs in residential or wetland/waterbody areas. To control dust the EI will limit traffic speeds and require 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 control dust. Any sediment generated from sweeping will be disposed of properly. Water for dust control will be obtained from a municipal source.

3.1.8 Waterbody and Wetland Crossings

The following construction methods and BMPs will be included at waterbodies and wetlands, in accordance with FERC's Upland Plan and Wetland and Waterbody Procedures.

3.1.8.1 Waterbody Crossings

All intermittent waterbody crossings will be completed using dry, open-cut procedures if the waterbody is flowing at the time of construction. Dry, open-cut procedures may include dam-and-pump or flume crossing techniques (see Drawings 1408.34-0006 and 0007 in Attachment 1) consistent with the requirements of federal, state, and local agencies with specific authority and expertise to regulate impacts from the WEP. Waterbody crossings will be made generally perpendicular to the axis of the waterbody channel. TEWAs have not been located within 50 feet of waterbody boundaries where feasible, based on site-specific conditions (i.e., topographic or engineering constraints) consistent with FERC's Wetland and Waterbody Procedures (Sections V.B.2.a. and V.B.3.b.). Northwest has proposed alternative measures where a TEWA setback from a wetland or waterbody could not be maintained.

One perennial waterbody crossing at the Toutle River will be completed using wet, open-cut methods. Wet, open-cut methods may include dam diversions of the waterbody to create a dry work space. The wet, open-cut methods will be completed in a manner consistent with the requirements of federal, state, and local agencies with specific authority and expertise to regulate impacts from the WEP. Similar to dry, open-cut methods, waterbody crossings will be made generally perpendicular to the axis of the waterbody channel. TEWAs have not been located within 50 feet of waterbody boundaries where feasible, based on site-specific conditions (i.e., topographic or engineering constraints), consistent with FERC's Wetland and Waterbody Procedures (Sections V.B.2.a. and V.B.3.b.). Northwest has proposed alternative measures where a TEWA setback from a waterbody is required.

Northwest will use temporary construction bridges during all phases of construction to cross intermittent waterbodies. Temporary construction bridges 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, WDFW, and local jurisdictions. 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 in place, and, where feasible, bridges will be designed to span the ordinary high water mark. Temporary bridges may consist of:

- Equipment mats and culvert(s)
- Equipment mats or railroad car bridges without culverts

- Clean rock fill and culvert(s)
- Flexi-float or portable bridges

Northwest may use other alternatives for equipment bridges that achieve the same performance and objective. Drawing 1408.34-X-0010 in Attachment 1 provides a typical drawing of a temporary crossing bridge. Bridges 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 ROW 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 the trench) until replaced by permanent erosion controls or until restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas. During restoration, waterbody banks will be returned to preconstruction contours and erosion control matting will be installed as directed by the EI (see Drawing 1408.34-0009 in Attachment 1). Bank stabilization measures for the river crossings will be addressed prior to construction.

3.1.8.2 Wetland Crossings

Wetlands will be crossed in accordance with FERC's Wetland and Waterbody Procedures except where an alternative measure has been proposed. Drawing 1408.34-X-0005 in Attachment 1 shows the typical wetland crossing methods that will be used. Wetlands crossed or that are in proximity to the WEP are shown on the alignment sheets in Revised Appendix 1C of Revised Resource Report 1—General Project Description.

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 ROW immediately upslope of the wetland boundary to prevent sediment flow into the wetland. Where wetlands are adjacent to the construction ROW, sediment barriers will be installed along the edge of the construction ROW, 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 (i.e., topographic or engineering constraints), Northwest has designed each crossing such that TEWAs are not closer than 50 feet from wetland boundaries, consistent with FERC's Wetland and Waterbody Procedures (VI.B.1.a. and b.). Northwest has proposed an alternative measure from FERC's Wetland and Waterbody Procedures because of site-specific conditions as shown in Revised Table 1.3-4 in Revised Resource Report 1—General Project Description.

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 distribute the weight of heavy equipment across a broader area. Rocks, soil imported from outside the wetland, tree stumps, or brush riprap will not be used to support equipment on the construction ROW. If trees are used as timber riprap or equipment mats to support equipment in saturated areas, 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 ROW. All materials used to support equipment on the construction ROW 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 that needed to clear the ROW, dig the trench, remove the pipe, fabricate and install the pipe, backfill the trench, and restore the ROW. All other construction equipment will use access roads located in upland areas to the maximum extent practicable. Where there is no upland access road available, Northwest will limit all other construction equipment to one pass through the wetland using the ROW if the area is not properly matted and stabilized.

3.1.8.3 Waterbody and Wetland Best Management Practices

Additional BMPs to be included at waterbodies and wetlands are as follows:

- Employ and monitor specific measures to ensure that sediment does not build up on temporary construction bridges, thus minimizing entrance of sediment into adjacent waterbodies.
- For streams flowing at the time of crossing, assume fish presence and implement alternate dry-crossing techniques (dam-and-pump, flumed, aerial, or trenchless methods) unless a site-specific plan drawing and method is approved by FERC and appropriate agencies.
- For major waterbody crossings (greater than 100 feet), adhere to the site-specific plan drawings provided in the Waterbody Crossing Plan.
- Locate TEWA at least 50 feet back from waterbody boundaries unless a reduced setback is requested on a site-specific basis, where there is no woody riparian cover within 50 feet back from the waterbody, and an alternative measure is approved by appropriate agencies.
- Maintain adequate flow rates throughout construction for aquatic life and to prevent the interruption of existing downstream uses.
- Restrict spoil placement near surface waters to the construction ROW at least 10 feet from the water's edge or within additional extra workspaces placed at least 50 feet from the water's edge.
- All equipment parked overnight and/or being fueled must be at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary.
- In certain instances, refueling or fuel storage may be unavoidable due to site-specific conditions or unique construction requirements (e.g., continuously operating pumps or refueling within wetlands). The following precautions will be taken when refueling within 100 feet of wetlands or waterbodies:
  - Adequate amounts of absorbent materials and containment booms will be kept on hand by each construction crew to enable the rapid cleanup of any spills.
  - If fuel must be stored within wetlands or near streams for refueling of continuously operating pumps, adequate secondary containment will be employed.
  - Secondary containment structures will be lined with suitable plastic sheeting. Provide a containment volume of at least 150 percent of the storage vessel and allow for at least 1 foot of freeboard.
  - Northwest will provide adequate lighting at sensitive fueling/storage locations.
- Northwest will not store hazardous materials (including chemicals, fuels, and lubricating oils) within 150 feet of a wetland, waterbody, or designated municipal watershed area. This applies to storage of these materials and not to normal operation or use of equipment in these areas.
- Concrete coating activities will not be performed within 100 feet of a wetland or waterbody boundary unless the location is an existing industrial site designated for such use or an alternative measure has been approved.
- Northwest will structure operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, Northwest and its contractors will:
  - Ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills.
  - Ensure that each construction crew has on hand sufficient tools and material to stop leaks.
  - Maintain a list of the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U.S. Environmental Protection Agency National Response Center) that must be notified of a spill.

- Follow the requirements of those agencies in cleaning up the spill, excavating and disposing of soils or other materials contaminated by a spill, and collecting and disposing of waste generated during spill cleanup.

3.1.8.4 Prohibited Practices

Many commonly applied BMPs have unacceptable levels of short- or long-term risk to aquatic species and habitat. Based on risk to species and habitat, Northwest will not use the following practices at any waterbody crossing sites unless there is no practical alternative to protect the integrity of the stream bank or safety of the pipeline:

- Grubbing in areas outside of the trench; grubbing is defined as the mechanical removal of roots and organic matter that occur below the ground surface
- Bank hardening methods for the purpose of stream bank stabilization (unless tying into existing hardened banks), such as:
  - Gabion baskets
  - Blanket riprap
  - Articulated concrete blocks
  - Concrete
- Concrete armoring anywhere in the active stream channel
- Use of temporary culverts or other streambed or floodplain fill as part of a temporary equipment bridge
- Upgrades of an existing road crossing over waterbodies
- Permanent installation of nonbiodegradable and/or nonwoven geotextile fabrics
- Chemical soil stabilizers on banks or adjacent slopes during any phase of construction or restoration
- Herbicides for treating noxious weeds within Endangered Species Act streams

3.1.9 Rugged Topography

The potential for surface erosion in areas of moderately sloping ground is high, and during construction the ROW in these areas will require substantial grading to provide a safe working plane. During restoration, these areas will be regraded to a stable configuration to minimize erosion and facilitate long-term maintenance. This ECRP provides the various BMPs that will be used, as necessary, to ensure erosion is minimized and slopes are revegetated and properly stabilized.

Northwest has developed, implemented and maintained a comprehensive geologic hazard identification, characterization and mitigation program throughout its pipeline system, including the existing I-5 corridor between Woodland and Sumas, Washington. The Northwest geologic hazards program was established in part to address and mitigate the potential adverse effects of landslides and slope instability. A more detailed discussion of this program, and mitigation and monitoring activities implemented by Northwest for known geohazard areas is provided in Revised Resource Report 6—Geological Resources.

3.1.10 Spill Prevention and Equipment Fueling and Maintenance

Northwest has developed a Spill Plan for Oil and Hazardous Materials (Spill Plan, Appendix 2E) 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 WEP construction 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. Maintenance and equipment storage will take place along the entire construction ROW; 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 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, refueling, and equipment maintenance activities will also be conducted according to FERC's Wetland and Waterbody Procedures. Concrete trucks will not be washed on the ROW. All hazardous materials will be handled in accordance with the Spill Plan. If an unanticipated spill occurs during construction, Northwest will implement the procedures outlined in the Spill Plan.

3.1.11 Material Delivery and Storage

Northwest will use contractor and pipe storage yards that will be identified and acquired during easement negotiation for the WEP for material delivery and storage. Materials will be brought onto the ROW as they are needed and will be located away from waterbodies and wetlands. Storage yards and construction equipment will be routinely inspected for noxious weeds. Construction equipment will be cleaned as needed to prevent mobilization of noxious weeds into the construction area. 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 all construction phases have been completed. Post-construction BMPs consist of permanent features and operational practices designed to minimize pollutant discharges, including sediments, from the site after the WEP is completed.

3.2.1 Trench Breakers

Trench breakers will be installed in the trench on slopes prior to backfilling to prevent water from flowing along the pipeline and eroding trench backfill materials (see Drawing 1408.34-X-0011 in Attachment 1). Northwest will use FERC's Upland Plan (Section V.B.1.d.) to determine spacing of temporary and permanent trench breakers for the WEP unless directed otherwise by the EI or authorized company representative.

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. Northwest will install a trench breaker at the base of slopes near the wetland boundary between the wetland and adjacent upland area. 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 areas. The trench breaker will be installed immediately upslope of the slope breaker. 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 2 to 8 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. The frequency of permanent slope breakers will be based on FERC's Upland Plan standards; however, state and other local jurisdictions may require a different slope breaker technology.

The EI or authorized representative may modify the spacing based on site-specific characteristics such as slope, surface materials, elevation, expected runoff, and opportunity to install the slope breakers based on the ROW configuration and topography, as well as experience. The permanent slope breakers will be installed in all areas except pastures and lawns. A typical design is provided in Attachment 1 (see Drawing 1408.34-X-0008). During installation of permanent slope breakers, interceptor dikes or swales, as described in Runoff Controls (Section 3.1.4) above, will also be installed at appropriate locations, as directed by the EI or authorized representative (see Drawing 1408.34-X-0015).

SECTION 4

Nonstormwater Discharges

The main nonstormwater discharges associated with construction of the pipeline are trench dewatering and hydrostatic test water discharge.

4.1 Trench Dewatering

During construction, trench dewatering may be required in areas of high groundwater. These areas are expected to be associated with floodplains, wetlands, or other areas where standing water is seasonally present. The construction schedule will coincide with the period when the soils in these areas are expected to be at their driest.

All water associated with trench dewatering will be pumped to a discharge structure similar to Drawing 1408.34-X-0013 in Attachment 1, which will be appropriately sized for the discharge volume. Discharge will occur in well-vegetated, gently sloping upland areas to promote infiltration. Water associated with trench dewatering will not be directly discharged to waterbodies.

4.2 Hydrostatic Testing

After backfilling, 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 or break occur, the pipeline will be repaired and retested until the specifications are achieved. Hydrostatic test water will be obtained from municipal and surface water sources.

Some of the hydrostatic test water will be discharged directly to waterbodies as identified in Revised Table 2.2-10 of Revised Resource Report 2—Water Use and Quality The water discharge from these activities will be directed to a straw bale dewatering structure to dissipate energy to prevent erosion and to filter the discharge in order to avoid sedimentation (see Drawings 1408.34-X-0012 and 1408.34-X-0013 in Attachment 1). Hydrostatic test water discharges to ground and surface water will occur through an appropriately sized discharge structure. The proposed hydrostatic test water discharge locations for the WEP will occur as shown on the alignment sheets in Revised Appendix 1C of Revised Resource Report 1—General Project Description and are listed in Revised Table 2.2-10 in Revised Resource Report 2—Water Use and Quality.

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 to ensure that the discharge to surface water is stopped and water quality standards are not exceeded.

SECTION 5

Restoration and Revegetation

Initial revegetation of disturbed areas will begin as soon as possible after construction. Waterbody crossings 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 cleanup and initial revegetation, permanent repairs of fences, gates, drainage ditches, and other structures removed or damaged during construction will be completed.

Streambeds will be returned to their preconstruction condition, and stream banks will be restored and mitigated in-kind or to a greater functional quality than their preconstruction condition and revegetated, in accordance with FERC's Wetland and Waterbody Procedures. Final cleanup will include regrading, mulching, placing erosion control mats, reseeding, and/or transplanting vegetation, as appropriate. Reseeding and revegetation will be accomplished as quickly as possible following pipe installation. If precipitation events or other complications preclude the completion of seeding and revegetation immediately following construction, exposed erodible substrates will be covered with straw or other suitable mulch until seeding is completed and seedlings are established as described below. New Attachment 2 contains a description of stream bank and streambed restoration methods. Northwest will work with individual landowners to address restoration of pastures and residential lawns, ornamental shrubs, and other landscaping. In residential areas, Northwest will use contractors familiar with local horticultural and lawn establishment procedures for revegetation work or will compensate landowners to restore these areas. Noxious weeds will not be introduced into the restored areas. The shrub containers will be inspected for signs of noxious weeds prior to planting in restoration areas. Specific revegetation procedures will be determined during easement negotiations with individual landowners.

Once site restoration is complete, as-built surveys and post-construction data for compliance and effectiveness monitoring will be collected (see Section 5.18, Monitoring and Maintenance).

5.1 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 entire ROW to its approximate original contours, to stabilize slopes, to control surface drainage, and to provide a more aesthetic appearance. All surface water and stormwater runoff from the WEP will be discharged to a natural location and not be diverted in a manner that would create an adverse impact on downhill properties.

Ruts and other scars will be filled and all drainage ditches will be returned to their preconstruction condition. 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 permitted by the appropriate federal, state, and/or local agencies.

At waterbodies, native materials will be backfilled in the top of the trench to ensure the existing channel condition is maintained. In-stream roughness elements, such as boulders and large wood, will be replaced in similar configurations to ensure that hydraulic roughness conditions are similar to preconstruction conditions. The original profiles and banks may be graded to a stable angle of repose to prevent erosion. Excess rock that cannot be returned to the trench or used for slope stabilization, and is not used as in-stream structure for habitat mitigation or enhancement, may be distributed throughout the ROW or be used as a barrier to block unauthorized vehicular access to the ROW. No solid waste or construction debris will be allowed to remain in the ROW after final grading.

5.2 Construction Debris Disposal

During final cleanup, all construction debris (e.g., timber, slash, mats, garbage, drilling fluids, excess rock) will be cleared from the ROW and disposed of in accordance with state and local regulations. Temporary erosion and sediment control measures will be removed and disposed of properly, and any sediment trapped by these measures will be removed or stabilized in such a manner that the trapped sediment does not reenter the stream system.

5.3 Soil Compaction

Northwest will test for soil compaction in residential areas, active agricultural fields, 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.

Over-compacted soil will be scarified (where necessary, as determined by the EI) by ripping or chiseling to loosen soils compacted by equipment traffic prior to reseeding the ROW. 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 unless approved by the EI. Ripping and chisel plowing will occur when materials are dry to promote the shattering of compacted layers.

In wetlands, scarification is not anticipated because traffic will be limited in these areas to that needed to clear the ROW, dig the trench, remove the 26-inch pipeline, fabricate and install the 36-inch pipeline, backfill the trench, and restore the ROW. Equipment mats will be used in wetlands where soils are saturated or where standing water is present to stabilize these areas and minimize compaction. 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.

5.4 Scarification

Prior to respreading the topsoil, the right-of-way 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, unless approved by the EI. 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 in these areas to that needed to clear the right-of-way, dig the trench, fabricate and install the 36-inch pipeline, backfill the trench, and restore the right-of-way. Equipment mats will be used 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.

5.5 Soil Replacement

All topsoil salvaged will be uniformly spread over the portions of the ROW 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 re-topsoiled areas will be restricted.

5.6 Large Woody Debris Placement in Streambeds

If large woody debris (LWD) is removed from the streambed during construction, it will be stockpiled until construction is completed and then replaced. LWD placement will be done in accordance with the state of Washington *Stream Habitat Restoration Guidelines* (Cramer, 2012). The EI will be responsible for ensuring that the LWD is appropriately anchored to prevent it from displacing downstream and that post-construction placement will provide similar habitat benefits to preconstruction conditions. Large trees removed from the construction ROW will also be stockpiled for use in post-construction restoration operations.

5.7 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 ROW (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. The use of alternate disposal locations will be approved by FERC.

5.8 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 minimize annual weeds that may have developed between initial revegetation and seeding. Noxious weeds with perennial roots or rhizomes will be controlled before seeding or replanting.

A seedbed will be prepared in disturbed areas, where necessary, to a depth of 3 to 4 inches using appropriate equipment to provide a seedbed that is firm, yet rough. A rough seedbed is conducive to capturing or lodging seed when broadcast 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 ROW 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 broadcast seed and trap moisture and runoff. However, additional preparation 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.

5.9 Fertilization

Northwest will use a standard fertilization rate of 200 pounds per acre bulk triple-16 fertilizer (16:16:16 - nitrogen, potassium, and phosphorus), or a suitable site-specific fertilizer, 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 (2012) indicated that the proposed fertilization rate, which has been used on Northwest's previous projects in western Washington, was acceptable for the WEP 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.

5.10 Seed Mixtures and Supplemental Plantings

As required by FERC's Upland Plan, Northwest has consulted with the NRCS (2012) regarding recommended seed mixtures for the WEP. The NRCS-recommended seed mixtures for the WEP are listed in Revised Table 5.10-1. The seed mixtures are based on bulk seeding rates and are not based on pure live seed. All seed will be tested for quantity of weed seed 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 NRCS-recommended seeding rates specified in Seed Mixtures 1, 2, 3, and 4 in Revised Table 5.10-1 are based on broadcast seeding methods. If hydroseeding occurs, the broadcast seeding rate will be used plus any adjustment the hydroseeding company recommends based on their equipment specifications. If drill seeding is conducted, the seeding rate could be divided in half. These mixtures have been used on Northwest's previous projects in western Washington and have been approved by permitting agencies including U.S. Army Corps of Engineers and Washington Department of Ecology. Individual landowners may also specify seed mixtures for their properties, provided that these seed mixes do not contain noxious weed seeds. Residential landscaping is discussed in Section 5.15.

REVISED TABLE 5.10-1
Recommended Seed Mixtures

Common Name	Scientific Name	Seeding Rate (lb/ac)
Seed Mixture 1 - Upland Right-of-Way Areas		
Perennial Grasses		
Redtop or Oregon bentgrass	*Agrostis alba or Agrostis oregonensis*	5
Fescue, fine or creeping red	*Festuca rubra*	10
Fescue, tall	*Festuca arundinacea*	10
Orchardgrass	*Dactylis glomerata*	7
Ryegrass, annual or Italian	*Lolium multiflorum*	10
Timothy	*Phleum pratense*	2
Legumes		
Clover, red	*Trifolium pratense*	4
Clover, white	*Trifolium repens*	4
Trefoil, birdsfoot	*Lotus corniculatus*	2
Annual Cereal Grains and Legumes		
Oats	*Avena sativa*	20
	Total Bulk	**74**
Seed Mixture 2 - Pasture Mix – Upland Sites		
Perennial Grasses		
Fescue, tall	*Festuca arundinacea*	8
Ryegrass, perennial or English	*Lolium perenne*	10
Orchardgrass	*Dactylis glomerate*	25
Legumes		
Clover, red	*Trifolium pratense*	3
Clover, white	*Trifolium repens*	5
	Total Bulk	**51**
Seed Mixture 3 – Pasture Mix – Wet Sites		
Perennial Grasses		
Fescue, tall	*Festuca arundinacea*	30
Ryegrass, perennial or English	*Lolium perenne*	20
Foxtail, meadow	*Alepocurus pratensis*	5

REVISED TABLE 5.10-1
Recommended Seed Mixtures

Common Name	Scientific Name		Seeding Rate (lb/ac)
Legumes			
Clover, alsike	*Trifolium hybridum*		4
Clover, white	*Trifolium repens*		4
Trefoil, birdsfoot	*Lotus corniculatus*		2
		Total Bulk	**65**
Seed Mixture 3a – Seed Mixture for Disturbed Emergent Wetlands			
Perennial Grasses			
Ryegrass, annual	*Lolium multiflorum*		20.0
Bentgrass, creeping	*Agrostis stolonifera*		0.4
Foxtail, Garrison creeping	*Alopercurus arundianceus*		3.0
Foxtail, meadow	*Alopercurus pratensis*		2.0
Fescue, red	*Festuca rubra*		2.0
Hairgrass, tufted	*Deschampsia caespitosa*		0.5
Sloughgrass, American[a]	*Beckmannia syzigachne*		2.0
Mannagrass, western[a]	*Glyceria occidentalis*		3.0
		Total Bulk	**32.9**
Seed Mixture 4 – Wetland Seed Mixture			
Grasses			
Ryegrass, annual	*Lolium multiflorum*		20
Quick Guard[b]			40
Fescue, fine or creeping red	*Festuca rubra*		5
Hairgrass, tufted	*Deschampsia caespitosa*		2
Mannagrass, reed[a]	*Glyceria grandis*		2
Barley, meadow[a]	*Hordeum Brachyantherum*		5
Foxtail, water[a]	*Aleopecurus geniculatus*		2
Rice cut-grass[a]	*Leersia oryzoides*		2
Clover, springbank[a]	*Trifolium wormskjoldii*		2
		Total Bulk	**80**
Temporary Seed Mixtures			
Cereal rye[c]	*Secale cereale L.*		120
Winter wheat[c]	*Triticum aestivum*		120
		Total Bulk	**120**

[a] These species may be included in the seed mixture if they are readily available from a commercial seed supplier.

[b] Quick Guard is a sterile hybrid of wheat and rye.

[c] Either cereal rye or winter wheat will be used.

lb/ac = pound(s) per acre

5.11 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 restored ROW areas may begin as early as mid-August and will proceed until about mid-September until all areas have been reseeded. According to the NRCS, seeding past October 10 will require mulching and may not germinate to provide an effective cover unless the weather is unseasonably warm. If seeding is not completed by mid-September, a temporary winter cover consisting of cereal rye or winter wheat at

a bulk rate of 120 pounds per acre will be considered by the EI or Northwest's authorized representative to ensure adequate erosion control (see Revised Table 5.10-1). Where a temporary winter cover is planted, it will be planted by mid-October and will be included with the permanent seed mixture.

5.12 Seeding Methods

Seeding will be conducted using either a seed drill or broadcast and 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.

5.13 Supplemental Wetland and Riparian Plantings

To mitigate impacts on 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 5.13-1 provides a list of suggested native trees and shrubs that are common in the WEP area in these habitats and which would be planted after final restoration and cleanup during appropriate planting periods (during the winter and early spring). To complete these restoration plantings, Northwest will select a restoration contractor who is knowledgeable about local wetland and riparian ecosystems and the species' characteristics and site growth requirements, and who is able to inspect the source of the plantings for indications of noxious weeds, where feasible. The shrubs and trees planted at each site will be determined at the time of planting based on the moisture regimes and site-specific conditions at each planting location and based on the plant spacing provided in Table 5.13-1.

TABLE 5.13-1
Native Shrub and Tree Planting for Restoring Riparian Areas

Common Name	Scientific Name	Planting Size[a]	Planting Spacing
Shrubs[b]			
Wet Sites			
Red-osier dogwood	*Cornus stolonifera*	36"	cuttings 3'
Willow spp.	*Salix* spp.	36"	cuttings 3'
Moist Sites			
Pacific ninebark	*Physocarpus capitatus*	1 gal	8'
Red elderberry	*Sambucus racemosa*	1 gal	8'
Blue elderberry	*Sambucus cerulean*	1 gal	8'
Salmonberry	*Rubus spectabilis*	1 gal	4'
Nootka rose/woods rose	*Rosa nutkana/Rosa woodsii*	1 gal	4'
Golden currant	*Ribes aureum*	1 gal	6'
Dry Sites			
Snowberry	*Symphoricarpos albus*	1 gal	4'
Beaked hazelnut	*Corylus cornuta*	1 gal	8'
Oregon grape	*Mahonia aquifolium*	1 gal	4'
Trees[b]			
Wet Sites			
Oregon ash	*Fraxinus latifolia*	1 gal	10'
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'
Oregon crabapple	*Malus fusca*	1 gal	10'
Black cottonwood	*Populus balsamifera* ssp. *trichocarpa*	36" cuttings or poles	10'

TABLE 5.13-1
Native Shrub and Tree Planting for Restoring Riparian Areas

Common Name	Scientific Name	Planting Size[a]	Planting Spacing
Moist Sites			
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’

[a] Planting stock sizes may include bare root equivalents.

[b] Shrubs will be installed in clusters of 5 to 10, while trees will be individual specimens.

Disturbed riparian areas will be replanted with trees and shrubs according to FERC’s Wetland and Waterbody Procedures (Sections V.C.6. and V.D.1). Shrubs will be planted and allowed to grow within 5 feet of the pipeline centerline. 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 ROW for a width of 25 feet from the waterbody banks subject to the existing land uses and landowner approval.

5.14 Mulch

Mulch will be applied on all slopes where necessary to stabilize the soil. The mulch will be uniformly applied at a rate of 2 tons per acre to cover at least 75 percent of the ground surface. If seeding occurs after October 10, 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 used for mulch will be weed-free. 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.

5.15 Residential Landscaping

In residential areas, Northwest will initiate cleanup operations within 10 days after backfilling the trench, consistent with FERC’s Upland Plan (Section V.A.1), or pursuant landowner construction stipulations. This includes final grading, topsoil replacement, and installation of permanent erosion control structures. Residential landscaping will be restored by a landscaping contractor familiar with local conditions. Landscaping may include lawns, shrubs, trees, fences, irrigation systems, and other landscape features as agreed to during Northwest’s easement negotiations. Noxious weeds and aggressive ground cover plants, such as English ivy, holly, and similar plants, will not be used.

5.16 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 ROW, boarding animals at alternate locations, purchasing supplemental feed, or other similar methods to minimize potential livestock disturbance to ROW revegetation efforts. Grazing deferments will be negotiated with livestock owners during the easement process.

5.17 Noxious Weeds

The NRCS (2012) was consulted for recommendations to prevent the introduction or spread of noxious weeds and soil pests. The NRCS has 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 competition. In addition, Northwest will include the following measures to ensure that the potential spread of noxious weeds is minimized:

- Prior to transport to the construction ROW, all equipment will be cleaned and inspected to ensure it is free of potential weed seeds or sources (i.e., soil, roots, or rhizomes). In addition, all equipment will be inspected and cleaned when leaving the ROW after construction to verify that it is free of potential weed seeds or sources. The EI or Northwest's authorized representative will be responsible for inspection of all equipment and trucks used on the WEP to ensure they are clean.
- Certified weed-free straw will be used for mulch and sediment barriers, dewatering structures, or other uses along the ROW. The EI or Northwest's authorized representative will be responsible to ensure that all straw hauled to the construction yard will be certified weed-free. The Washington State Department of Agriculture Plant Services Program has a weed-free hay and mulch program (Washington Department of Agriculture, 2013) and maintains a list of producers of certified hay and mulch.
- Prior to clearing, the WEP will be surveyed for areas that may be infested with priority noxious weeds that are listed in the specific county's priority noxious weed list and that require control. The results of these surveys will be provided to the specific county's Noxious Weed Control Board. Surveys will be conducted by Northwest's EI or authorized representative in consultation with the applicable county's Noxious Weed Control Board. Northwest's EI or authorized representative will have expertise in identifying noxious weeds and will be able to provide prevention training and appropriate invasive plant identification resources to contractors prior to beginning construction. Infested areas will be controlled in a manner consisted with RCW 17.10 prior to clearing. Identified noxious weed infestations will be cleared using standard best management practices as prescribed by the local county Noxious Weed Control Board and using methods that minimize transport of weed seeds, roots, and rhizomes or other vegetative materials and soil from the site along the construction ROW.
- Before stockpiling cleared vegetation and salvaging topsoil in areas where infestations have been identified or noted in the field, the contractor will control the noxious weed infestations as practicable to reduce the transport of soil-born noxious weed seeds, roots, or rhizomes. If noxious weed seeds or other propagative parts, such as rhizomes, are mixed in with other cleared vegetation, the material will not be transported offsite unless it is contained and disposed of an appropriate sanitary landfill.
- During revegetation, 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 county-listed weeds will be cleaned by hand or blown down with air prior to leaving the sites. Where possible, equipment will be rinsed off onsite, within a contained area. Infested areas will be mapped to ensure that these areas will be monitored during operations so that the weeds will be controlled and not spread.
- Where weed control is necessary, Northwest will employ mechanical methods (mowing, disking) to prevent the spread of these weeds or will employ a licensed contractor to ensure that the appropriate herbicides are used for the targeted weed species during the proper phenological period at the specified rate. Northwest will work with landowners and the county Noxious Weed Control Board to remove identified noxious weed communities in a manner that is consistent with the county's recommended practices and the landowner's preference, consistent with 18 CFR Part 380.15(e)(3). Methods likely to be employed include mechanical means, biological controls, and species-specific application of herbicides (with landowner approval).
- Weed control measures will conform with the requirements outlined in RCW 17.10 and *Washington Administrative Code* 16-750. 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 the herbicides' effectiveness and to minimize drift to nontargeted 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 its contractor will obtain all required permits from the local jurisdictions/authorities.

Northwest will use invasive species BMPs suggested by the appropriate county Noxious Weed Control Board.

5.18 Monitoring and Maintenance

Northwest will test, operate, and maintain the proposed WEP facilities in accordance with 49 CFR Part 192 and other applicable federal and state regulations. The pipeline ROW will be clearly marked where it crosses public roads, railroads, rivers, fenced property lines, and other locations as necessary. All pipeline facilities will be marked and identified in accordance with applicable regulations to avoid accidental excavation.

Routine vegetation maintenance (mowing and selective herbicide treatments) will not occur more frequently than every 3 years. However, to facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in an herbaceous state. Northwest will not conduct vegetation maintenance over the full width of the permanent ROW in wetlands and waterbody riparian areas. Vegetation maintenance adjacent to waterbodies will allow a riparian strip at least 25 feet wide, as measured from the mean high water mark of the waterbody, to permanently revegetate with native plant species across the entire construction ROW if permitted by the landowner.

5.18.1 Upland Areas

Northwest will conduct follow-up inspections of all disturbed areas after the first and second growing seasons 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, and noxious weeds are not present. If vegetative cover and density are not similar or there are excessive weeds after two full growing seasons, a professional agronomist or equally qualified professional shall determine the need for additional restoration measures. Northwest will continue revegetation efforts until revegetation is successful. Northwest will control noxious weeds regulated under RCW 17.10 that occur in the ROW until the site has been stabilized. Repair of erosion control structures will occur until the ROW has successfully revegetated and has stabilized. Once the site is stabilized, temporary erosion control measures will be removed.

5.18.2 Waterbodies and Wetlands

Post-construction monitoring will be conducted twice during the first year following construction at approximately 6-month intervals and annually thereafter for a total of 3 years or until successful revegetation is complete, whichever is longer.

Every attempt will be made to assess streams at the same time of year as their preconstruction site visit. The post-construction monitoring will focus on identifying problems with bank stabilization and revegetation.

During post-construction monitoring events, Northwest or a contractor will look for trench subsidence and erosion indicators such as gullies, undercutting banks, bare ground, bank slumping, and evidence of sheet erosion. If initial erosion control features are shown to be inadequate or if erosion control structures fail, Northwest will retain a contractor to conduct remedial actions as soon as site conditions allow. Repairs or remedial actions could include additional seeding or transplanting, installing more robust erosion/sediment control materials, maintaining or replacing the initial erosion control features, placing boulders or LWD, slope armoring, additional mulching, or matting. If trench subsidence is observed, Northwest will direct the contractor to fill and compact the trench to grade with appropriately sized substrate. If trench remediation is required below the ordinary high water mark, all activities will be conducted within authorized WDFW in-water work periods.

Revegetation monitoring will include a qualitative assessment of the following parameters in comparison to adjacent undisturbed areas:

- Percentage of total adjacent herbaceous cover (seeded/transplanted species plus desirable volunteers)
- New or expanded populations of noxious weeds
- Species composition

Post-construction surveys will be conducted by experienced biologists.

5.18.2.1 Success Criteria

A criterion for establishing adequate vegetation recruitment will be defined in the final Construction, Restoration, and Monitoring Plan following consultation with WDFW and DNR. For example, areas may be considered successfully reestablished if, after the first year, disturbed areas contain at least 50 percent of the herbaceous cover of adjacent undisturbed areas, with no bare spots greater than 2 feet in any dimension, and the species composition is a mixture of seeded/replanted species and desirable volunteers. At the end of 3 years, success may be defined as at least 80 percent of the herbaceous cover of adjacent undisturbed areas.

Areas with poor reestablishment or undesirable species mixes will be evaluated to determine, if possible, the cause of the problem (that is, poor germination, poor planting technique, herbivory), and corrective measures will be undertaken. Potential corrective measures include replanting, planting an alternative species mix, or protecting existing seedling from herbivory. Northwest will control any noxious weeds regulated under RCW 17.10 until the revegetation is successful.

The reclaimed ROW will be considered stable when the surface appears similar to adjacent undisturbed land and the following accelerated erosion indicators do not exist:

- Perceptible soil movement (exceeding preconstruction conditions)
- Flow pattern development resulting in rills or gullies greater than 3 inches deep
- Evidence of sheet erosion
- Evidence of siltation in stream substrates downstream of the crossing
- Perceptible downstream movement of in-stream rock or woody debris
- Trench subsidence or slumping

5.18.2.2 Reporting

Following each monitoring period (twice during the first year and annually thereafter), Northwest will prepare a report for submittal to the appropriate agencies. The report will contain the following:

- Summary of bank vegetation recruitment and species composition as compared with adjacent undisturbed areas
- Assessment of the condition of transplants in riparian areas
- Discussion of non-native species/noxious weeds in disturbed areas
- Description of any deviations from the monitoring plan
- Discussion of revegetation performance and an assessment of whether revegetation goals are being met
- Any observations not included on monitoring forms that further elucidate the success or potential for failure of revegetation/restoration efforts
- Identification of areas that require remedial action
- Recommendations and schedule for remedial action(s)
- Before/after photo pairs for each crossing
- Monitoring forms

5.18.2.3 Adaptive Management Contingency Plan

Relative to stream crossings, adaptive management will focus on several areas: (1) post-construction rehabilitation of stream banks; (2) monitoring slope stability and landslides; and (3) monitoring changes in stream geomorphology that have potential to expose the pipeline and have an effect on fluvial processes. Each area has independent time horizons. For example, expectations for rehabilitation fall within a timeframe of 3 years in which successful establishment can be measured and determined to be adequate. Slope and landslide risks are events that are monitored periodically, and continuously during the rainy season when soils are saturated. Depending on gradient, soils, and substrate, mass movements may be measured in terms of strains or

imperceptible movements from year to year, which can be followed by a sudden catastrophic event. Fluvial processes that result in vertical scour or channel migration are typically events, under normal circumstances, that occur over periods of decades to centuries and therefore may extend beyond the design life of the project.

Rehabilitation of Stream Banks. The purpose of semiannual to annual post-construction monitoring is to determine the success of plantings and stability of bioengineered bank restoration. At any point during the designated monitoring period, typically 5 to 10 years, corrective actions may be required if survival rates and plant cover are inadequate or if bank stabilization methods failed. Northwest will assess potential reasons for subpar performance or stabilization failure by evaluating a number of issues, including but not limited to the following: species composition, appropriateness of time of year of plant installation, quality of materials, causes of plant mortality, and whether bank or stream restoration procedures were properly engineered and installed. Adaptive management will be designed to address the specific reasons for subpar performance or stabilization failures. This may require substitute plant material, replanting, repairs, regrading, or reinstallation of stabilization structures.

In wetland areas, revegetation will be considered successful if the cover of herbaceous and/or woody species is at least 80 percent of the type, density, and distribution of the vegetation in adjacent wetland 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. Northwest will control any noxious weeds regulated under RCW 17.10 until the re-vegetation is successful.

Routine vegetation maintenance (mowing and selective herbicide treatments) shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in an herbaceous state. Northwest will not conduct vegetation maintenance over the full width of the permanent ROW in wetlands and waterbody riparian areas. Vegetation maintenance adjacent to waterbodies will allow a riparian strip at least 25 feet wide, as measured from the mean high water mark of the waterbody, to permanently revegetate with native plant species across the entire construction ROW if permitted by the landowner.

5.18.3 Data Storage and Analysis

Data collected during field reconnaissance, preconstruction, and post-construction surveys will be collected in log books, on field maps, on data sheets, in photographs, and in electronic form. The data will be put through quality control procedures every evening after data collection by the field biologists who collected the data and in the office after field downloads. Monitoring data will be stored and maintained by Northwest or its contractor. Data will be entered into geographic information system (GIS) or other standard database(s) for use and storage and will be made available to agencies within 30 days of a request. Data tables will be normalized to ensure consistent data formats among survey events. Where appropriate, data will be stored as attribute tables associated with GIS, either as part of shape files or as geodatabases. Selected datasets will be made available via File Transfer Protocol or other Web-based protocols.

Following each monitoring period (twice during the first year and annually thereafter) for a total of 3 years or until successful revegetation is complete, whichever is longer, Northwest will prepare a report for submittal to WDFW and other appropriate agencies. The report will contain the following components:

- Summary of bank vegetation recruitment and species composition as compared with adjacent undisturbed areas
- Assessment of the condition of transplants in riparian areas
- Discussion of non-native species/noxious weeds in disturbed areas
- Tabular and graphical summaries of results
- Description of any deviations from the monitoring plan
- Discussion of restoration performance and assessment of whether restoration goals are being met

- Any observations not included on monitoring forms that further elucidate the success or potential for failure of revegetation/restoration efforts
- Identification of areas that require remedial action
- Recommendations and schedule for remedial action(s)
- Before/after photo pairs for each waterbody crossing
- Monitoring forms

Northwest will contact the agencies immediately if there is a loss of fish passage or if dead fish are observed.

These reports will be submitted to WDFW and other appropriate agencies for a minimum of 30 days for review and comment. After the 30-day review period, Northwest will meet with the agencies if necessary to discuss any comments, recommendations, and future actions at the sites. If actions are required at any site, Northwest will prepare a plan of action for that year, with a 30-day minimum review. Upon agency approval, Northwest will implement the plan of action.

5.18.4 Monitoring Quality Assurance Plan

To ensure the quality of the monitoring program, Northwest will implement quality assurance and quality control procedures and apply them to the following aspects of the monitoring plan:

- Data collection
- Data storage
- Data analysis and reporting

The Northwest monitoring program manager will be responsible for quality assurance. Northwest will be responsible for ensuring that data collected within various disciplines meet professional standards and comply with appropriate methodologies and protocols. Where data must be integrated either for analysis or reporting, Northwest will develop consistent procedures. The following items will be addressed:

- Exact location and documentation of monitoring locations
- Training of individuals collecting data
- Documentation and records management regarding how field data are recorded, including development of standardized monitoring forms
- Data review, validation, and verification requirements (e.g., cross-checking field data sheets, looking for data gaps, checking calculations, looking for outliers)
- Data management protocols
- Reporting procedures

SECTION 6

References

Cramer, M.L. (managing editor). 2012. *Stream Habitat Restoration Guidelines*. Co-published by the Washington Departments of Fish and Wildlife, Natural Resources, Transportation, and Ecology; Washington State Recreation and Conservation Office; Puget Sound Partnership; and the U.S. Fish and Wildlife Service. Olympia, Washington.

Federal Energy Regulatory (FERC). 2013a. *Upland Erosion Control, Revegetation, and Maintenance Plan*. May 31, 2013.

Federal Energy Regulatory (FERC). 2013b. *Wetland and Waterbody Construction and Mitigation Procedures.* May 31, 2013.

Lasmanis, R. 1991. *The Geology of Washington: Rocks and Minerals*. Vol. 66, No. 4.

Natural Resource Conservation Service (NRCS). 2012. Web Soil survey. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm.

Washington Department of Agriculture. 2013. Washington Wilderness Hay & Mulch Management (WWHAM) Program. http://agr.wa.gov/PlantsInsects/WWHAM/WWHAM.aspx.

Washington Department of Ecology. 2012. *Western Washington Stormwater Management Manual*.

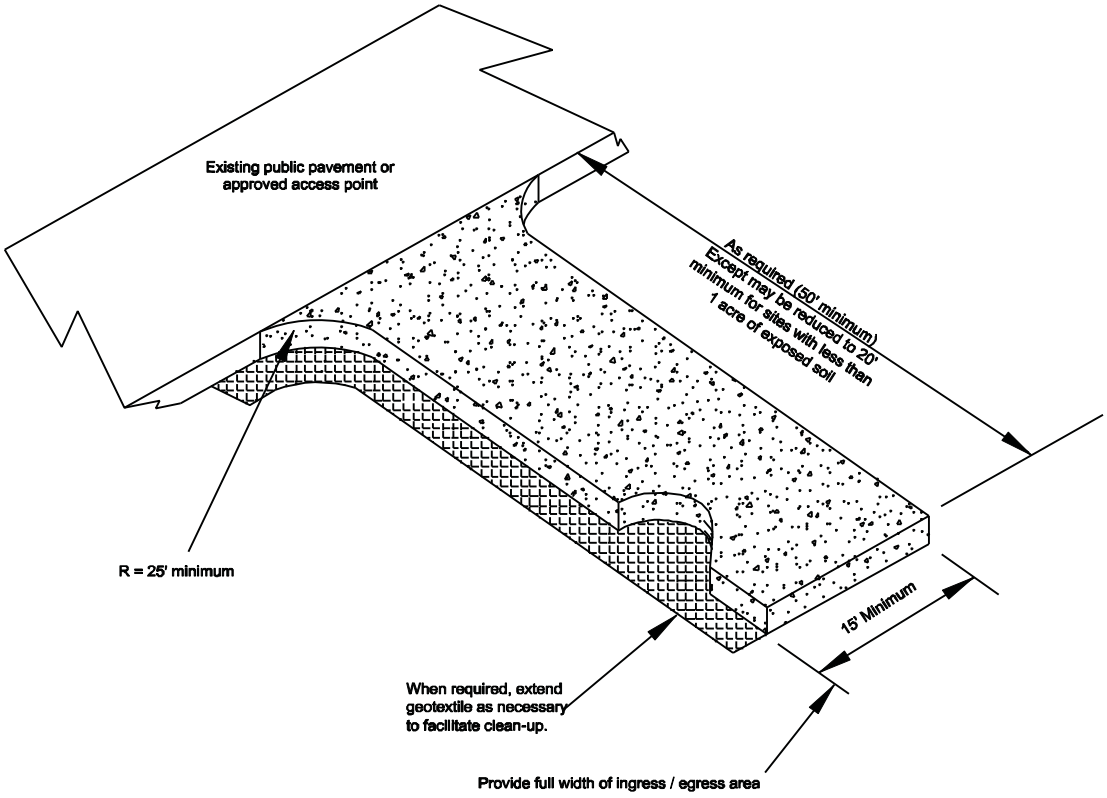
Washington State Department of Natural Resources (DNR). 2012. *The Geology of Washington State.* http://www.dnr.wa.gov/ResearchScience/Topics/GeologyofWashington/Pages/geolofwa.aspx. Last accessed September 26, 2012. Web site contained modified text from the following article: Lasmanis, R. 1991. *The Geology of Washington: Rocks and Minerals*. Vol. 66, No. 4, pp. 262-277. Copyright Heldref Publications.

Western Regional Climate Center (WRCC). 2013. Kent, Washington Period of Record Monthly Climate Summary. http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa4169.

Attachment 1
Best Management Practice Typical Drawings

Drawings in Attachment 1:

1408.34-X-0001	Typical Construction Entrance Access Pad
1408.34-X-0002	Typical Sediment Barrier – Silt Fence (Filter Fabric) Option, Sheet 1 of 3
1408.34-X-0002	Typical Sediment Barrier – Straw Bale Option, Sheet 2 of 3
1408.34-X-0002	Typical Sediment Barrier – Straw Wattle Option, Sheet 3 of 3
1408.34-X-0003	Temporary Sediment Barriers/Drivable Berms Adjacent to Road Crossings
1408.34-X-0004	Sediment Control in Ditches and Swales, Sheet 1 of 2
1408.34-X-0004	Sediment Control in Ditches and Swales, Sheet 2 of 2
1408.34-X-0005	Crossing Detail for Wetlands, Sheet 1 of 2
1408.34-X-0005	Crossing Detail for Wetlands, Sheet 2 of 2
1408.34-X-0006	Waterbody Crossing Detail, Dam-and-Pump Method
1408.34-X-0007	Waterbody Crossing Detail, Flumed Crossing Method
1408.34-X-0008	Typical Temporary and Permanent Slope Breakers
1408.34-X-0009	Typical Erosion Control Matting, Sheet 1 of 4
1408.34-X-0009	Typical Erosion Control Matting, Sheet 2 of 4
1408.34-X-0009	Typical Erosion Control Matting, Sheet 3 of 4
1408.34-X-0009	Typical Erosion Control Matting, Sheet 4 of 4
1408.34-X-0010	Typical Portable Bridge Crossing, Sheet 1 of 2
1408.34-X-0010	Typical Portable Bridge Crossing, Sheet 2 of 2
1408.34-X-0011	Trench Breaker Installation
1408.34-X-0012	Typical Hydrostatic Test Dewatering Structure, Sheet 1 of 3
1408.34-X-0012	Typical Hydrostatic Test Dewatering Structure, Sheet 2 of 3
1408.34-X-0012	Typical Hydrostatic Test Dewatering Structure, Sheet 3 of 3
1408.34-X-0013	Typical Trench Dewatering, Sheet 1 of 3
1408.34-X-0013	Typical Trench Dewatering, Sheet 2 of 3
1408.34-X-0013	Typical Trench Dewatering, Sheet 3 of 3
1408.34-X-0014	Stormwater Inlet Protection, Sheet 1 of 2
1408.34-X-0014	Stormwater Inlet Protection, Sheet 2 of 2
1408.34-X-0015	Interceptor Dikes and Swales
1408.34-X-0016	Pipe Drain
1408.34-X-0017	Typical Soil Stockpile Cover, Sheet 1 of 2
1408.34-X-0017	Typical Soil Stockpile Cover, Sheet 2 of 2
1408.34-X-0018	Typical Coir Roll



Notes:

1. Equipment mats or their equivalent may be used as a substitute for the graveled apron if approved by the Company.
2. Install construction entrances at construction right-of-way access points that intersect paved roads to reduce sediment transport onto roadway.
3. Install culverts in road ditches as necessary.
4. Crushed stone access pads shall be placed on synthetic fabric in residential or active agricultural areas to facilitate stone removal. Use Synthetic Industries style 22TEX, Light Stabilization Fabric, or equivalent (3 oz/yd woven geotextile).
5. INSTALLATION: The area of the entrance should be cleared of all vegetation, roots and other objectionable material. The gravel shall be placed to the specified dimensions. Any drainage facilities required because of washing should be constructed according to specifications in the plan. If wash racks are used, they should be installed accoriding to manufacturer's specifications.
6. AGGREGATE: 2" to 6" crushed Ballast Rock.
7. ENTRANCE DIMENSIONS: The aggregate layer must be at least 6 inches thick. It must extend the full width of the vehicular ingress and egress area. The length of the entrance must be at least 50 feet.
8. MAINTENANCE: The entrance shall be maintained in a condition which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with 2-inch stone, as conditions demand, and repair and/or clean out any structures used to trap sediment. All materials spilled, dropped, washed or tracked from vehicles onto roadway or into storm drains must be removed immediately.

DRAWING NO.	REFERENCE TITLE

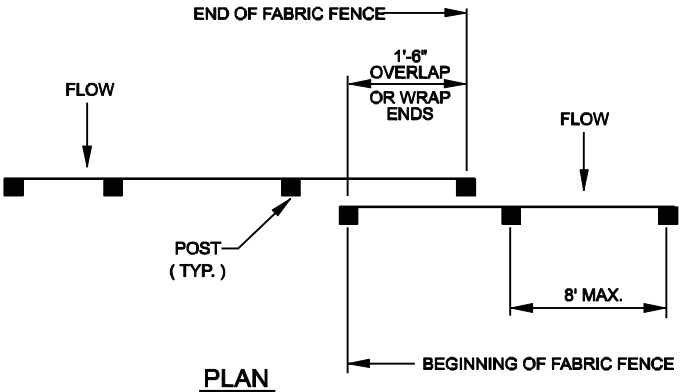
NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL CONSTRUCTION ENTRANCE ACCESS PAD

CE

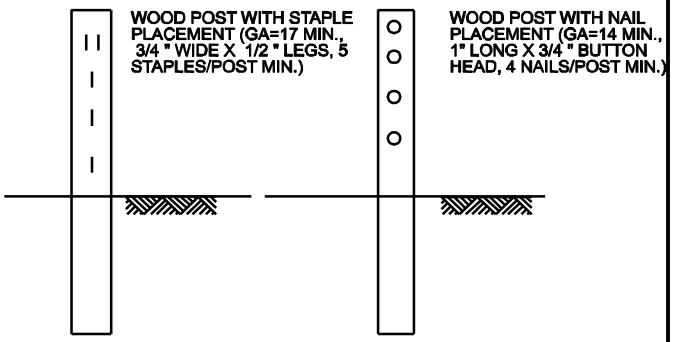
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

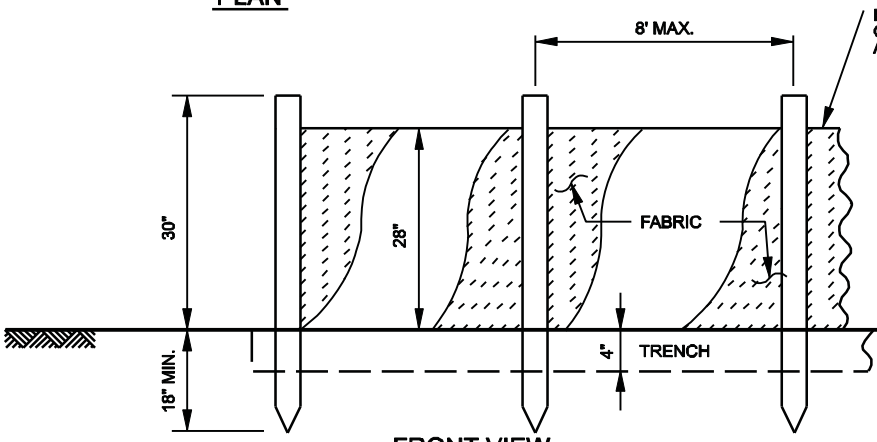
DRAWN BY: JST	DATE: JUNE 2007	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0001	SHEET
		%TIME% %PATH%	OF



PLAN

FASTENER LOCATION

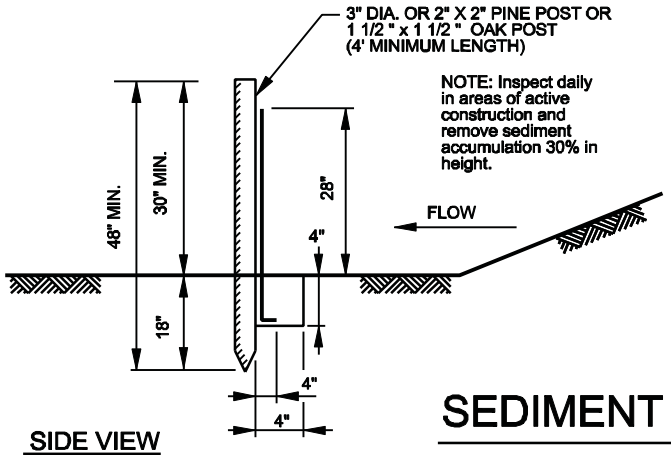




FRONT VIEW

In King County the Geotextile Used Must Meet the Following Standards	
AOS (ASTM D4751)	30-100 sieve size (0.60-0.15 mm) for slit film 50-100 sieve size (0.30-0.15 mm) for other fabrics.
Water Permittivity (ASTM D4491)	0.02 sec-1 minimum.
Grab Tensile Strength (ASTM D4632)	180 lbs. min. for extra strength fabric 100 lbs. min. for standard strength fabric.
Grab Tensile Elongation (ASTM D4632)	30% max.
Ultraviolet Resistance (ASTM D4355)	70% min.

FILTER FABRIC SHALL BE TRENCHED INTO SOIL AND BACKFILLED (SEE SIDE VIEW)



SIDE VIEW

NOTES:

1. Install filter fabric after revegetation clearing and immediately after soil disturbance:
   - At appropriate locations to prevent siltation into waterbodies, wetlands, roads or other sensitive areas crossed by the construction right-of-way.
   -To prevent stockpiled soil or spoil from leaving the work area.
2. Filter fabric shall be installed to filter sediment from surface runoff.
3. Installations shall be periodically checked according to FERC's Plan and Procedures, and if flow is obstructed, build-up of sediment shall be removed.
4. Filter fabric shall be left in place until permanent vegetative cover is established unless removal is authorized by company representative.
5. Filter fabric shall be replaced whenever it has deteriorated to such an extent that it reduces the effectiveness of the filter fabric.
6. Filter fabric shall be placed to follow (run parallel to) the contours.
7. On upslope installations, both ends of the filter fabric shall be turned and extended upslope.
8. Filter fabric shall be constructed of exxon gtf-180 fabric or a similar fabric with a tensile strength at 20% (max.) elongation of 50 lb./linear inch or greater.
9. Area disturbed as a result of removing the filter fabric shall be restabilized by seeding in accordance with the revegetation plan.

SEDIMENT BARRIER - SILT FENCE OPTION

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

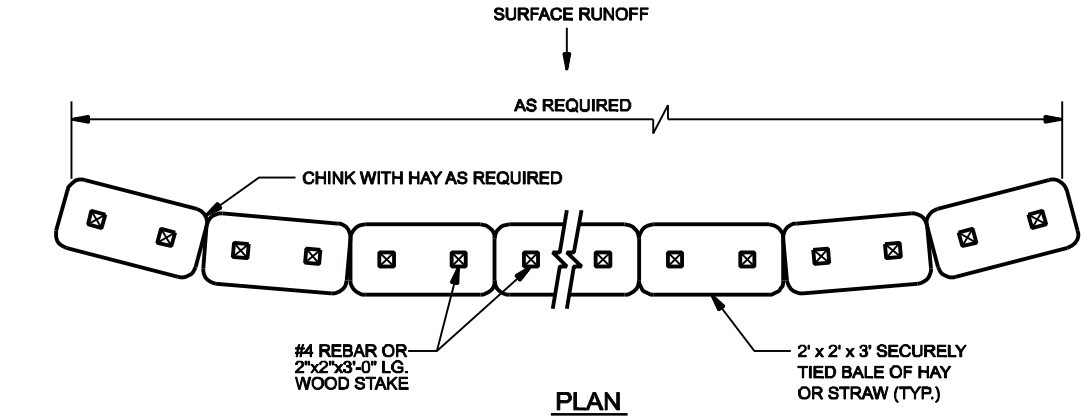
NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL SEDIMENT BARRIER - SILT FENCE (FILTER FABRIC) OPTION

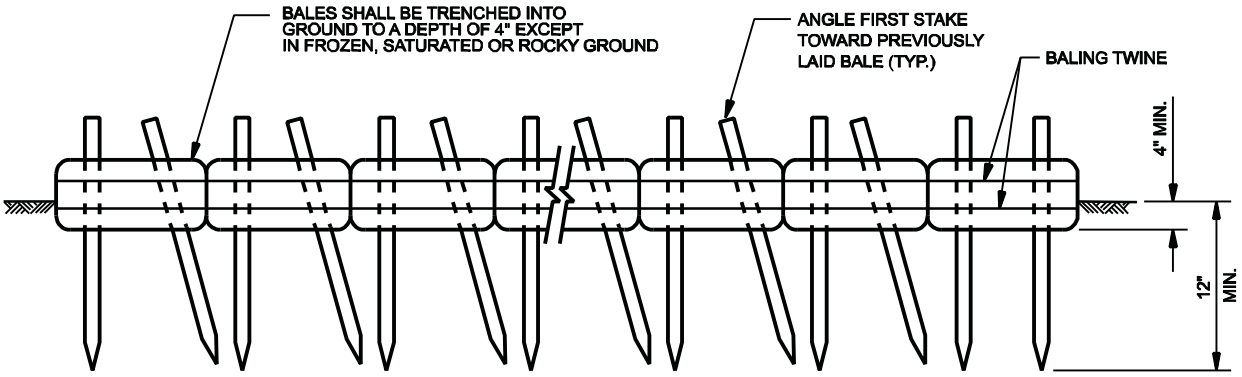
SB

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0002	SHEET 1 OF 3
		%TIME% %PATH%	



PLAN



NOT TO SCALE

ELEVATION

NOTES:

1. Bale barriers shall be placed to follow (run parallel to) the contours and shall not be located in areas of concentrated flow.
2. Installations shall be checked after each 0.5 inches of rainfall and if flow is obstructed, the sediment shall be removed.
3. Bale barriers shall be left in place until permanent vegetation cover is established. Material from bale barriers may then be used as mulch and scattered over the surrounding area as directed by company representative.
4. On upslope installations, both ends of the bale barrier shall be turned and extended upslope.
5. Area disturbed as a result of removing the bale barrier shall be restabilized by seeding according to the revegetation specifications.
6. Contractor shall use certified noxious weed free hay or straw.
7. Bales shall be placed such that ties or baling twine is not in contact with the ground.

SEDIMENT BARRIER - SILT FENCE OPTION

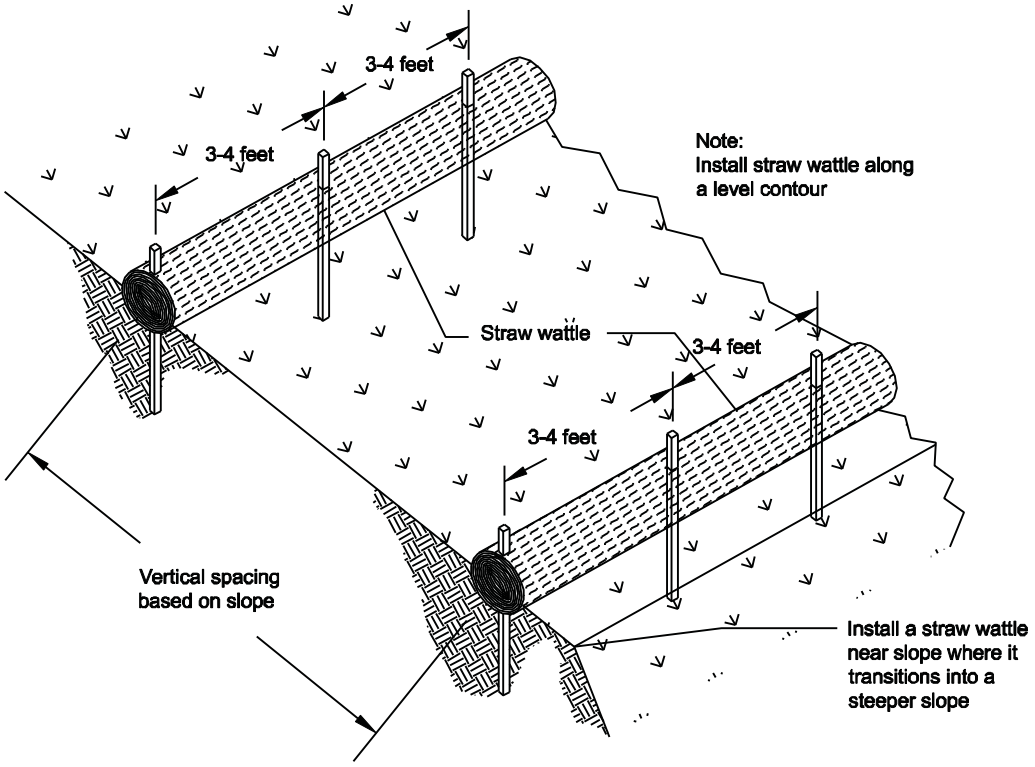
TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL
SEDIMENT BARRIER - STRAW BALE OPTION
SB

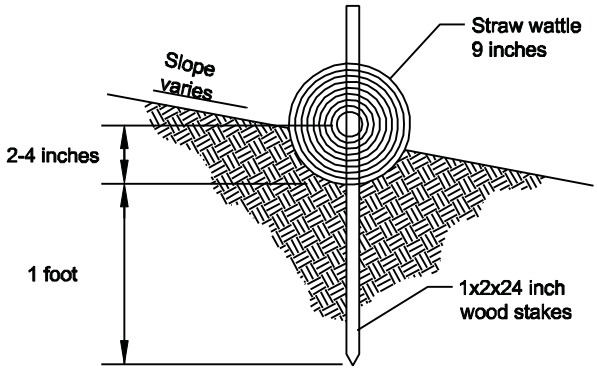
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0002	SHEET 2 OF 3
		%TIME% %PATH%	



TYPICAL STRAW WATTLE INSTALLATION

N.T.S.



NOTE:
Only loosely compacted rice straw with no wheat, rye, or grass and no Fiber Rolls.

ENTRENCHMENT DETAIL

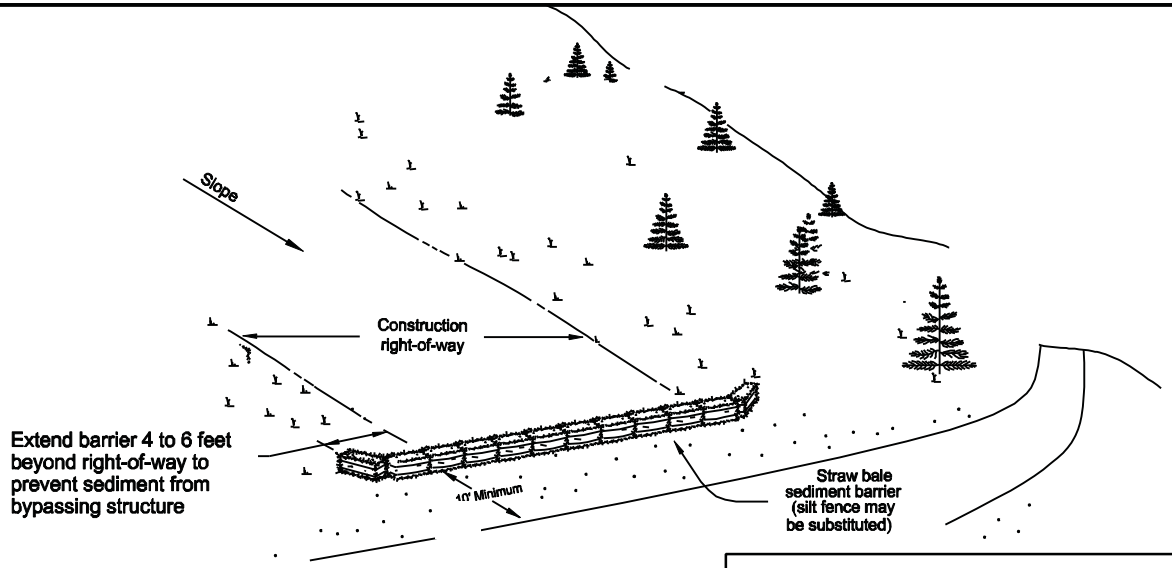
N.T.S.

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL
SEDIMENT BARRIER - STRAW WATTLE OPTION
SW

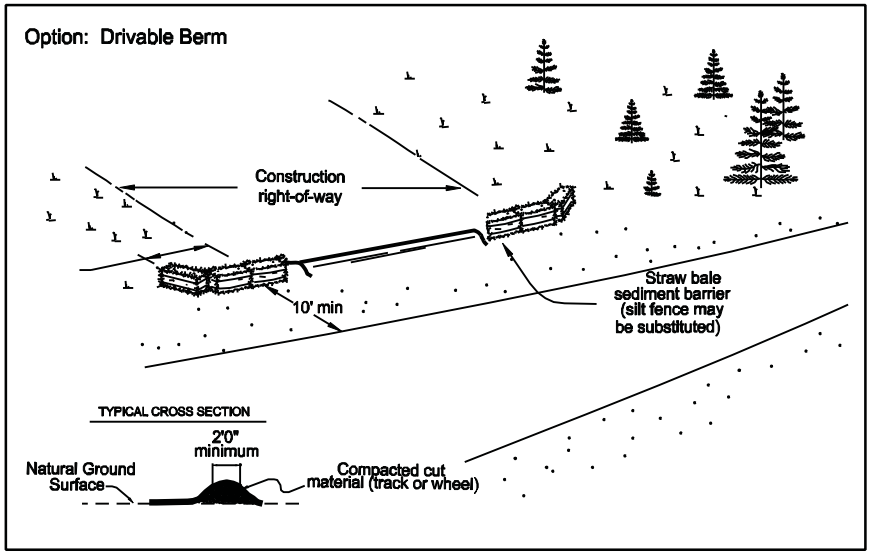
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0002	SHEET 3
		%TIME% %PATH%	OF 3



Notes:

1. Driving around sediment barriers is prohibited. Remove and replace barrier for access to right-of-way.
2. Install barriers off the construction right-of-way by hand only at location approved by Environmental Inspector.



DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

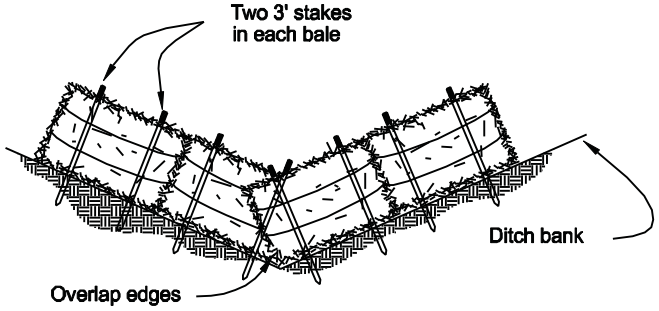
TEMPORARY SEDIMENT BARRIERS/DRIVABLE BERMS ADJACENT TO ROAD CROSSINGS

DB

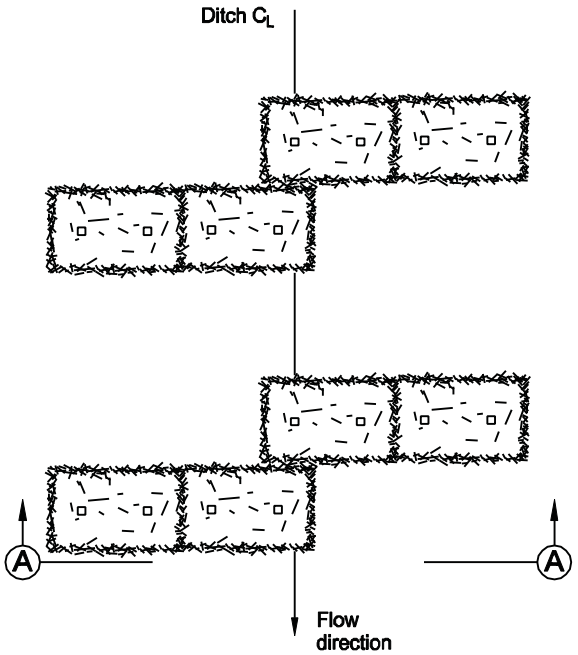
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: JST	DATE: 1-08-2004	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0003	SHEET
		%TIME% %PATH%	OF

SECTION A-A



PLAN VIEW



Notes:

1. Place straw bale sediment barriers in small intermittent drainages or road ditches that may convey sediment laden runoff from the right-of-way during storm events.
2. Drive stakes a minimum of 12 inches into the ground.
3. Use wood stakes whenever possible. Steel rebar may be used when soil is frozen or rocky.
4. Silt fence fabric may be used.
5. Sediment control structures can be placed off the construction right-of-way by hand if the location has been approved by the Environmental Inspector.

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

SEDIMENT CONTROL IN DITCHES AND SWALES

SC

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: JST	DATE: 1-08-2004	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0004	SHEET 1 OF 2
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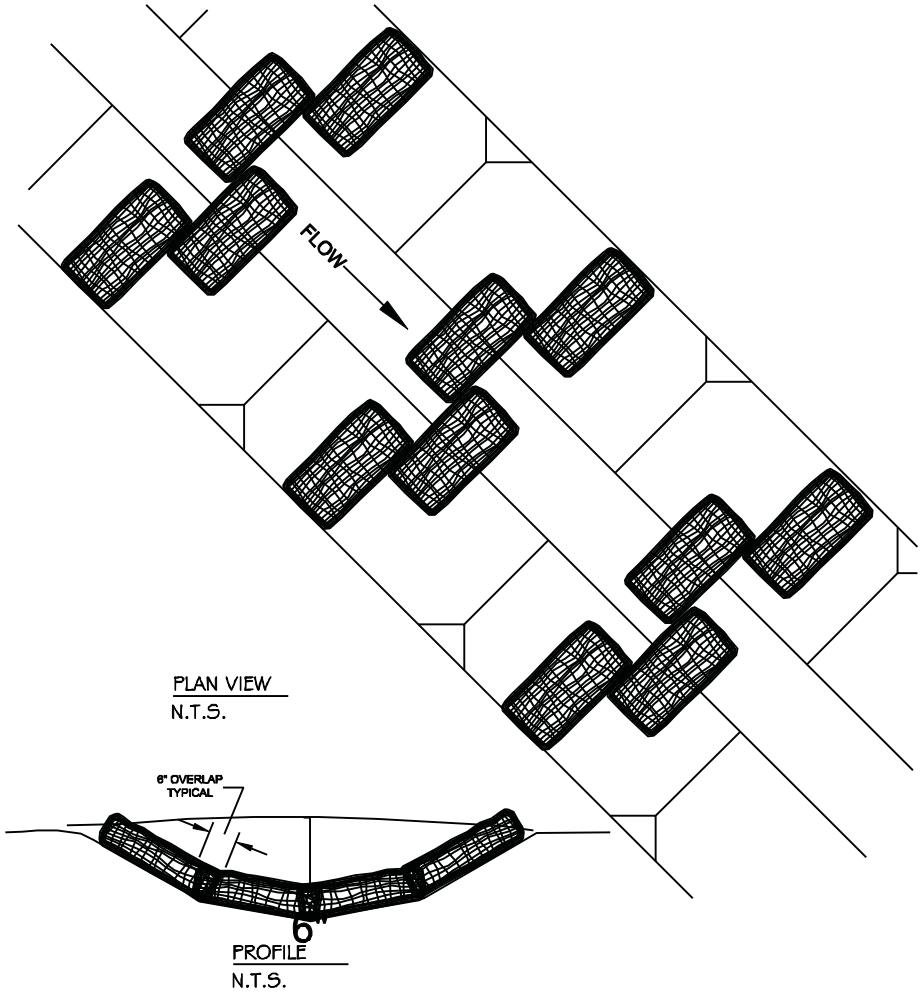


STRAW WATTLE CHECK DAM

Notes:

1. Bags are plastic mesh filled with various organic materials or approved equal.
2. Staking of bags required using (2) 1" x 2" wood stakes or approved equal per bag.
3. Surface must be smooth before application.
4. Check dams can be constructed using straw wattles or other approved materials.
5. Place straw wattle check dam sediment barriers in small intermittent drainages or road ditches that may convey sediment laden runoff from the right-of-way during storm events.
6. Drive stakes a minimum of 12 inches into the ground.
7. Use wood stakes whenever possible. Steel rebar may be used when soil is frozen or rocky.
8. Silt fence fabric may be used.
9. Sediment control structures can be placed off the construction right-of-way by hand if the location has been approved by the Environmental Inspector.

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

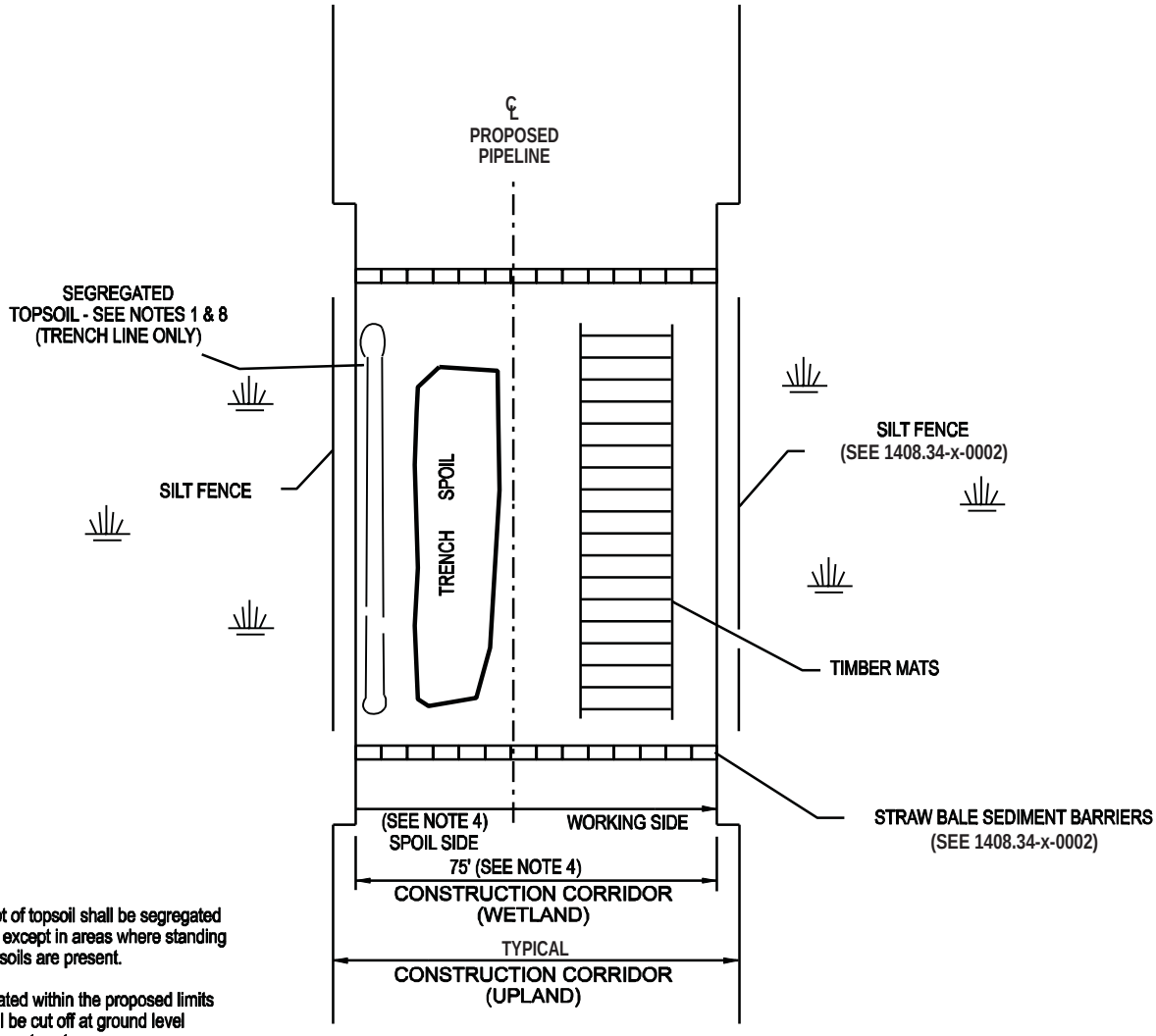
SEDIMENT CONTROL IN DITCHES AND SWALES

SC

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: JST	DATE: JUNE 2007	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0004	SHEET 2 OF 2
		%TIME% %PATH%	

WETLAND CROSSING DETAIL



NOTES:

1. The top one (1) foot of topsoil shall be segregated from the trenchline except in areas where standing water or saturated soils are present.
2. The vegetation located within the proposed limits of disturbance shall be cut off at ground level leaving the existing root systems
3. Pulling of tree stumps and grading activities shall be limited to the area directly over the trenchline unless safety conditions require the removal of tree stumps from under the working side of the work corridor.
4. Construction corridor through wetlands will be 75 feet wide unless a variance is granted. Configuration of right-of-way may vary.

PLAN VIEW

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

CROSSING DETAIL FOR WETLANDS

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: JST	DATE: JUNE 2007	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0005	SHEET 1 OF 2
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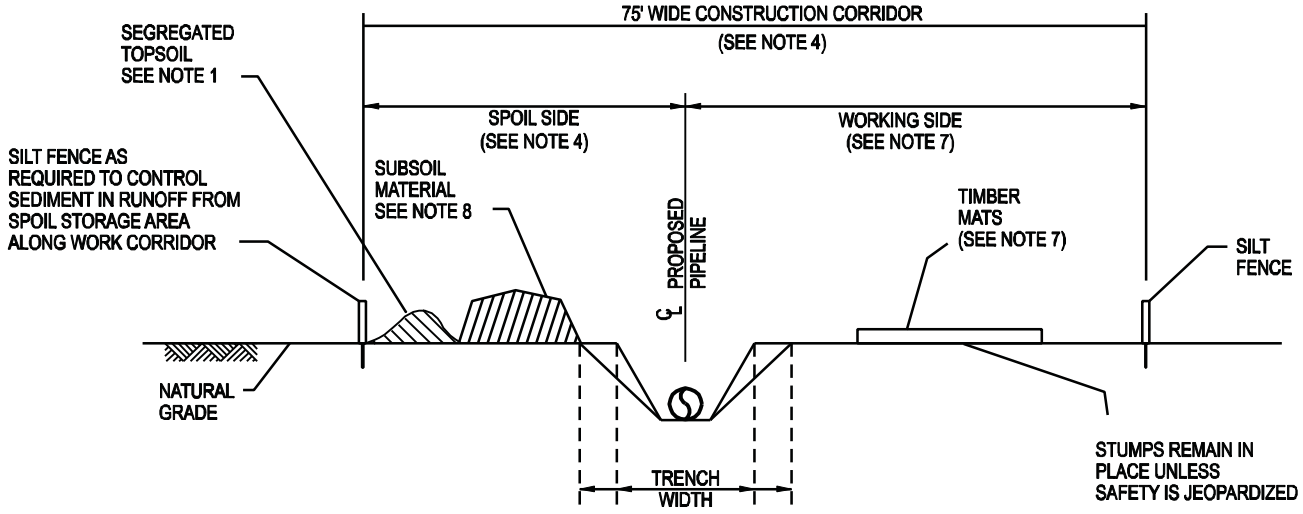
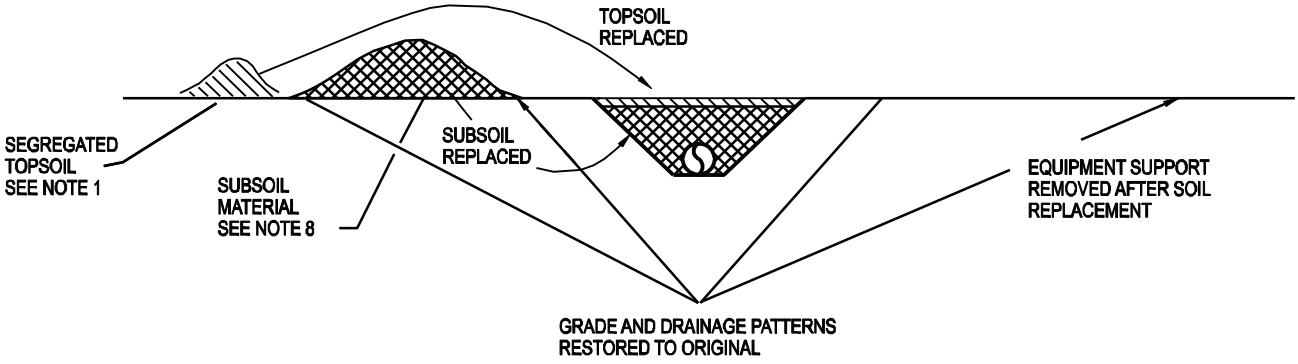


TRENCH WIDTH VARIES DEPENDING ON SOILS ENCOUNTERED DURING CONSTRUCTION

CROSS SECTION

NOTES Continued:

5. Silt fence or straw bales will be used where appropriate to prevent siltation into water bodies or wetlands.
6. Silt fences or straw bales will also be used to prevent stockpiled soil or spoil from leaving the construction right-of-way or workspaces.
7. Timber mats may be used over spoil storage where standing water or saturated soils are present.
8. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of topsoil and subsoil in wetlands, use low-ground weight equipment, or operate normal equipment on timber riprap, prefabricated equipment mats or terra mats.



WETLAND RESTORATION

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

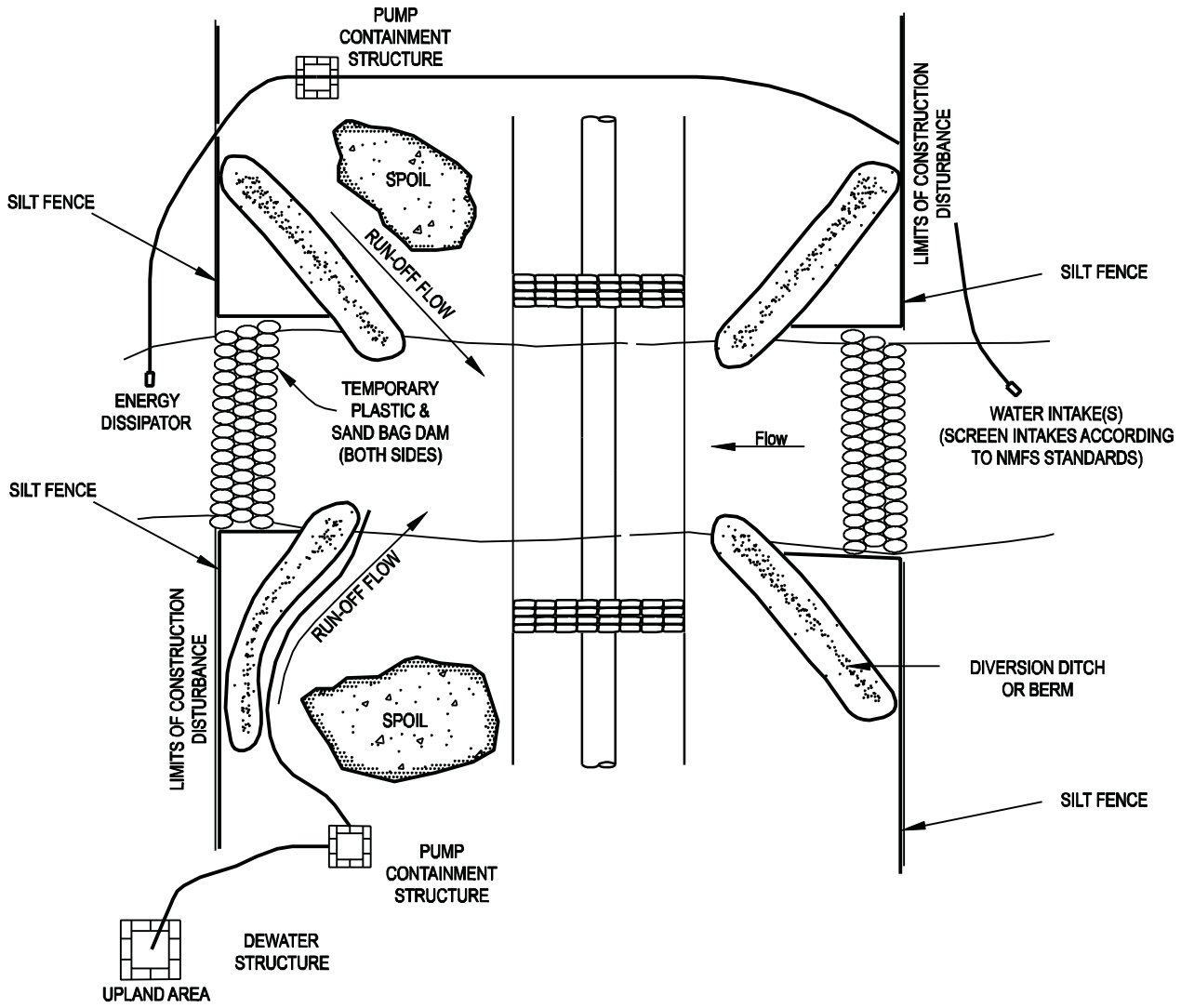
CROSSING DETAIL FOR WETLANDS

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: JST	DATE: JUNE 2007	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0005	SHEET 2 OF 2
		%TIME% %PATH%	

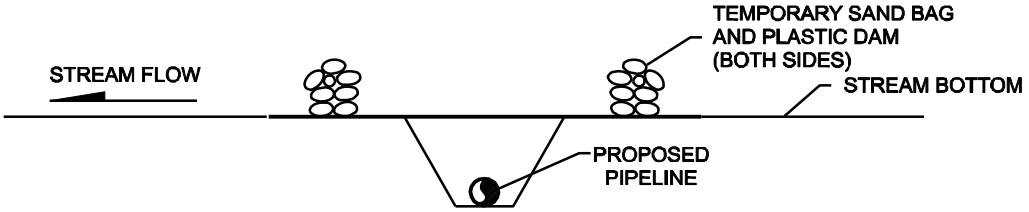
CONFIGURATION THROUGH WATERBODIES WITH ASSOCIATED WETLANDS IS VARIABLE
BUT WILL NOT EXCEED 75 FEET IN WIDTH UNLESS A VARIANCE IS GRANTED



PLAN VIEW OF DAM & PUMP CROSSING METHOD

NOTES:

1. Trench width will vary due to soil conditions which are not known until actual construction takes place.
2. Extra workspace will be located 50 feet from edge of waterbody unless a variance is granted. for extraworkspace locations and dimensions see environmental alignment sheets.
3. Temporary erosion control measures must be replaced at the end of each working day.



CROSS-SECTION OF DAM & PUMP CROSSING METHOD

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

WATERBODY CROSSING DETAIL
DAM & PUMP CROSSING METHOD

Williams

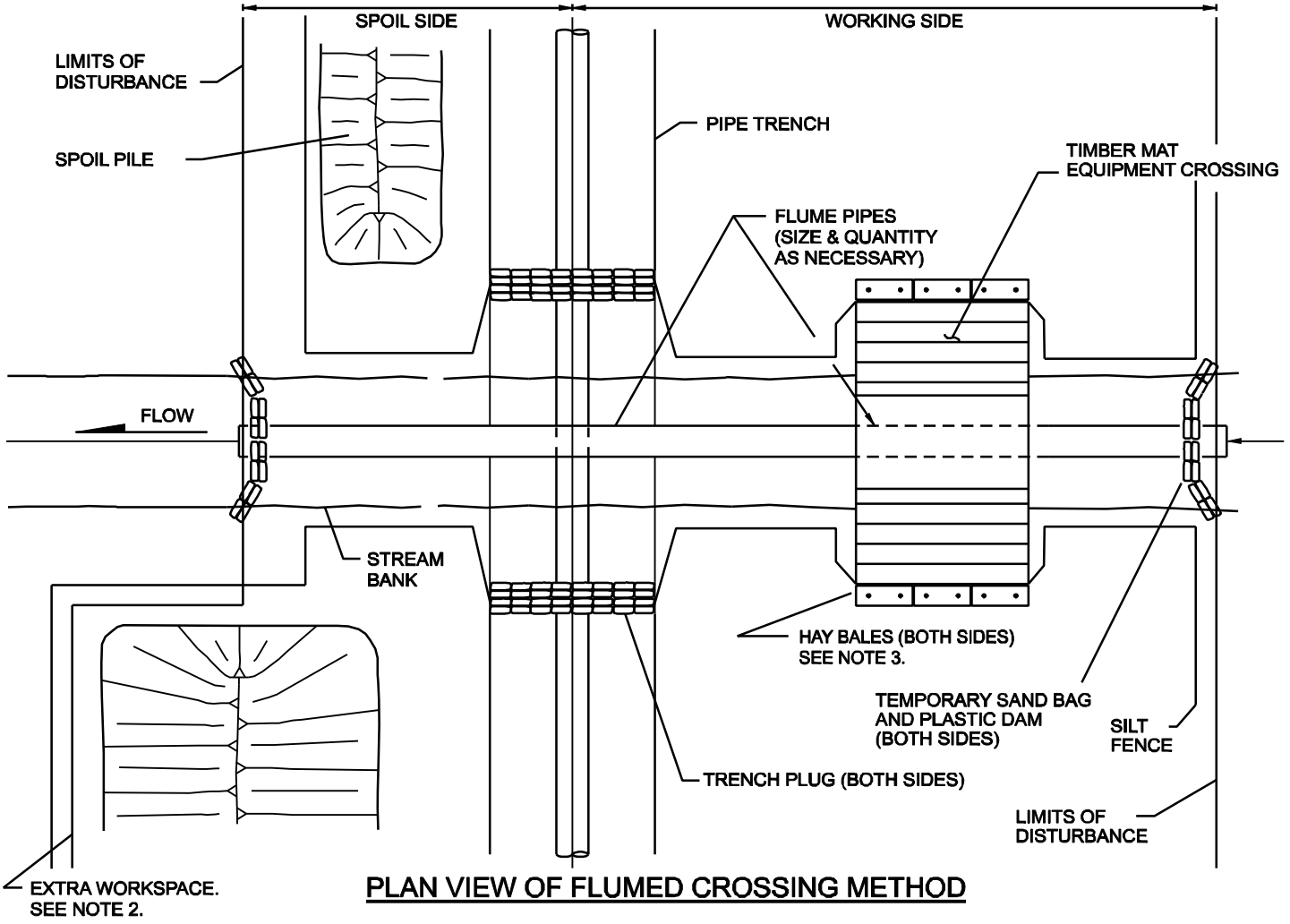
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: JST	DATE: JUNE 2007	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0006	SHEET OF

%TIME%
%PATH%

TYPICAL CONSTRUCTION CORRIDOR

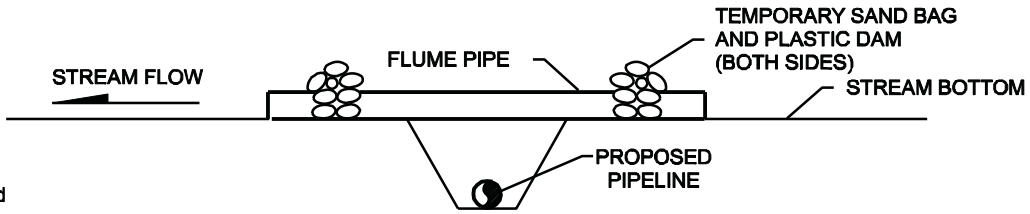
Configuration through waterbodies with associated wetlands is variable but will not exceed 75 feet in width unless a variance is granted.



PLAN VIEW OF FLUMED CROSSING METHOD

NOTES:

1. Trench width will vary due to soil conditions which are not known until actual construction takes place.
2. Extra workspace will be located 50 feet from edge of waterbody unless a variance is granted or the adjacent vegetation is actively cultivated as a rotated croplands. For extra workspace locations and dimensions see environmental alignment sheets.
3. Temporary erosion control measures must be replaced at the end of each working day.



CROSS-SECTION OF FLUMED CROSSING METHOD

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

WATERBODY CROSSING DETAIL
FLUMED CROSSING METHOD

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-05-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0007	SHEET
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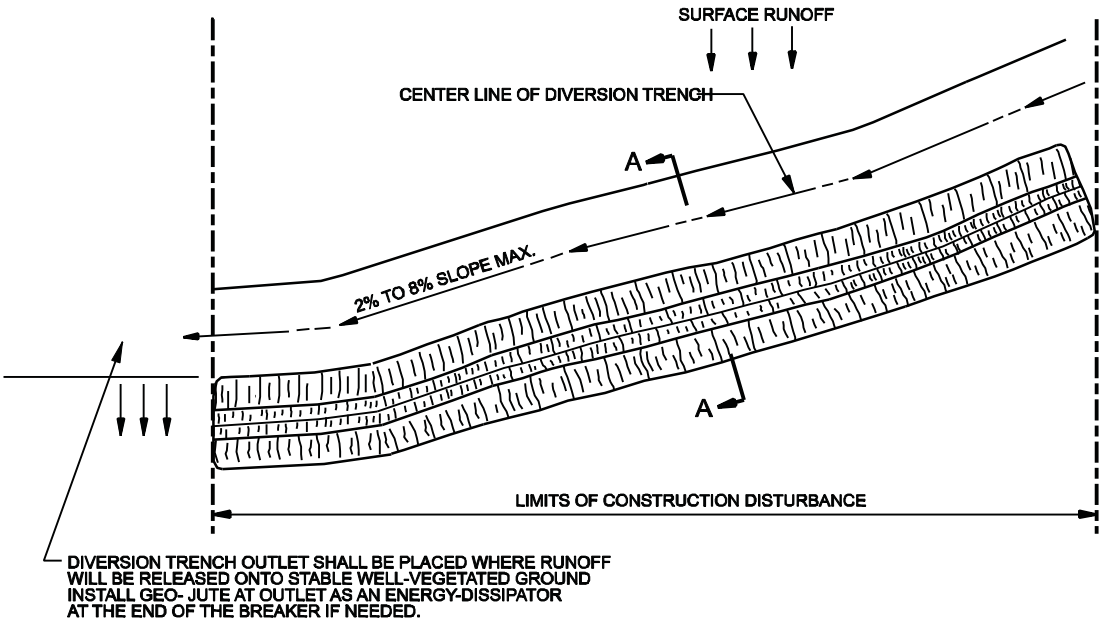
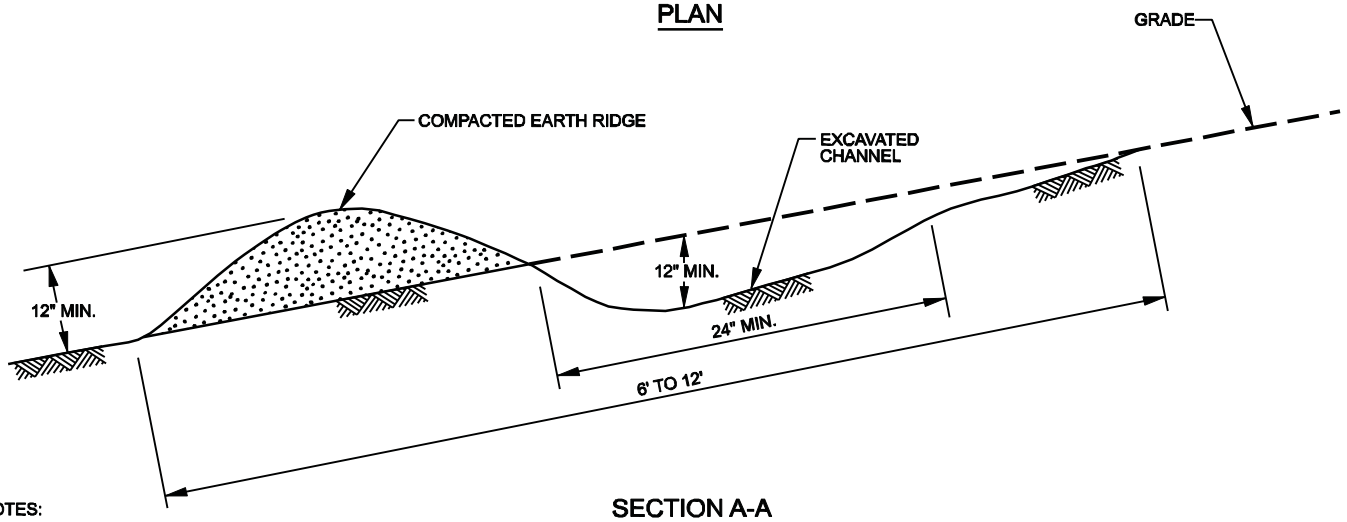


PLAN



SECTION A-A

NOTES:

1. SLOPE BREAKER SPACING WILL BE DETERMINED ACCORDING TO SECTION 3.2.1 OF THE ECRP.

2. SLOPE BREAKERS MAY EXTEND SLIGHTLY (ABOUT 4 FEET) BEYOND THE EDGE OF THE CONSTRUCTION RIGHT-OF-WAY TO EFFECTIVELY DRAIN WATER OFF THE DISTURBED AREA.

TEMPORARY AND PERMANENT SLOPE BREAKERS

TEMPORARY & PERMANENT EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL TEMPORARY AND PERMANENT SLOPE BREAKERS

TPSB

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-05-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0008	SHEET
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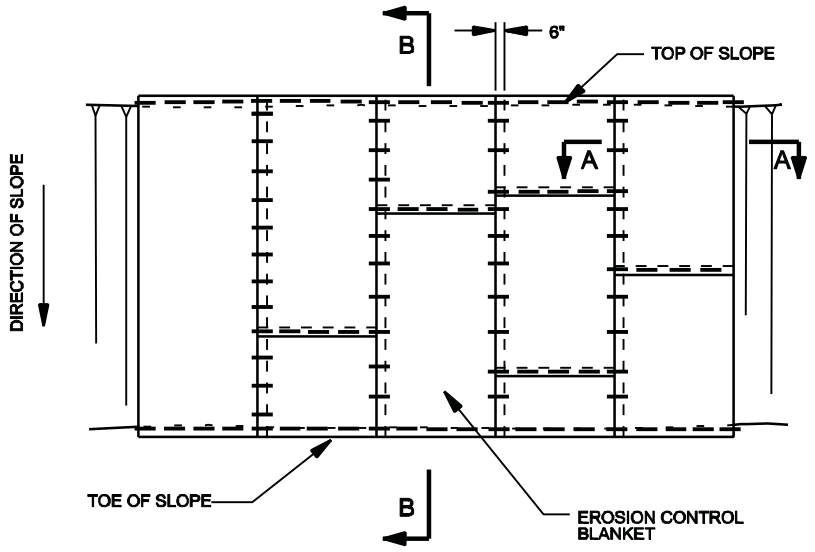

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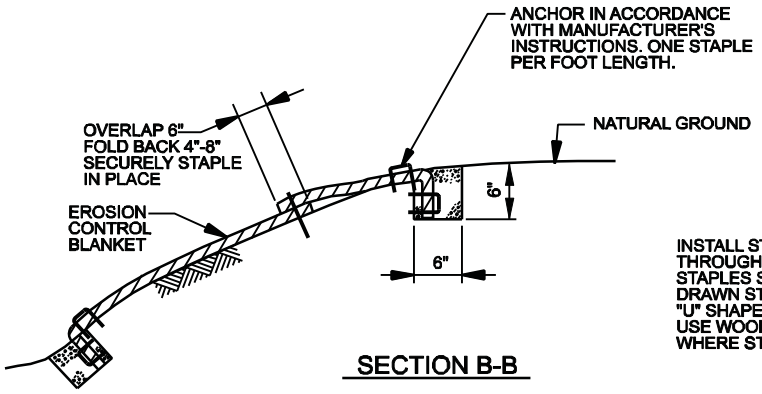
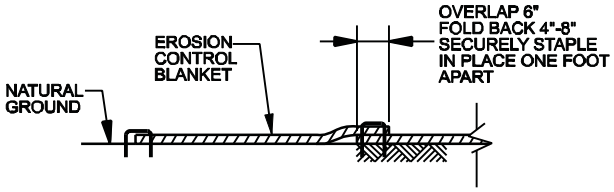


SECTION B-B

INSTALL STAPLES 18" TO 24" APART THROUGHOUT THE BLANKET/MAT. STAPLES SHALL BE 14-GAUGE COLD DRAWN STEEL WIRE FORMED IN A "U" SHAPE NOT LESS THAN 12" LENGTH. USE WOODEN STAKES AS AN ALTERNATIVE WHERE STOCK GRAZING IS ANTICIPATED.



SECTION A-A

EMBANKMENT INSTALLATION

EROSION CONTROL MATTING

PERMANENT EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL EROSION CONTROL MATTING
ECM

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0009	SHEET 1 OF 4
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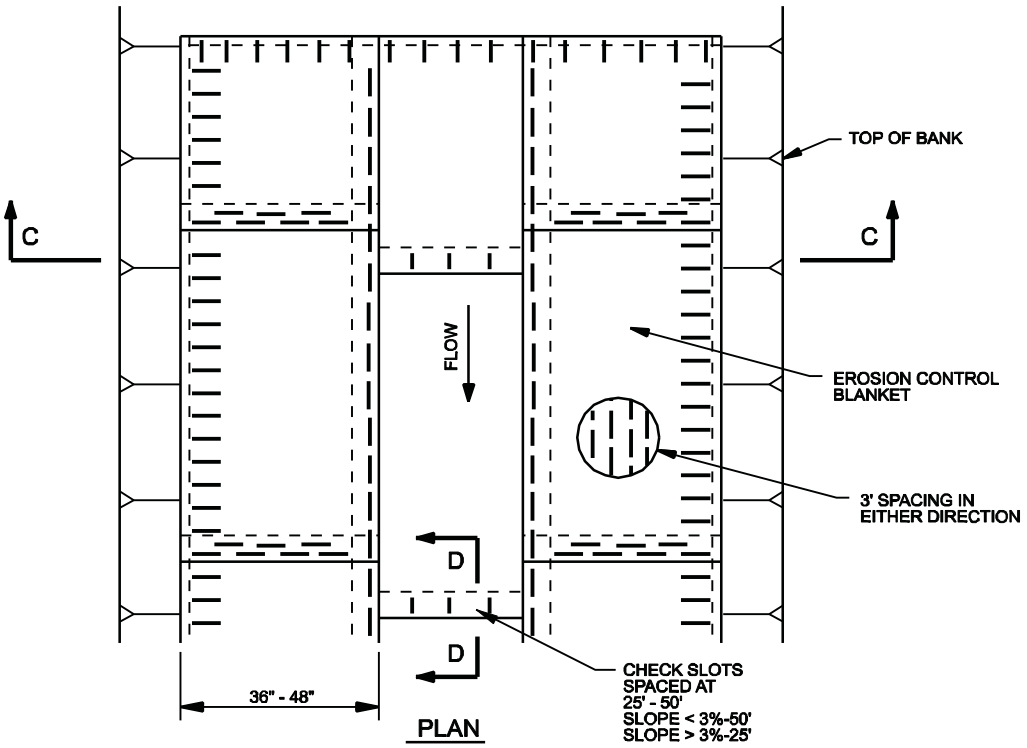

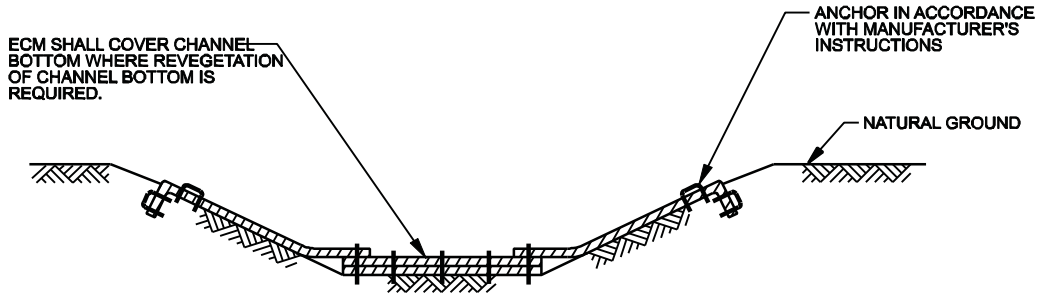

SECTION C-C

CHANNEL INSTALLATION

EROSION CONTROL MATTING

PERMANENT EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL EROSION CONTROL MATTING
ECM

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0009	SHEET 2 OF 4
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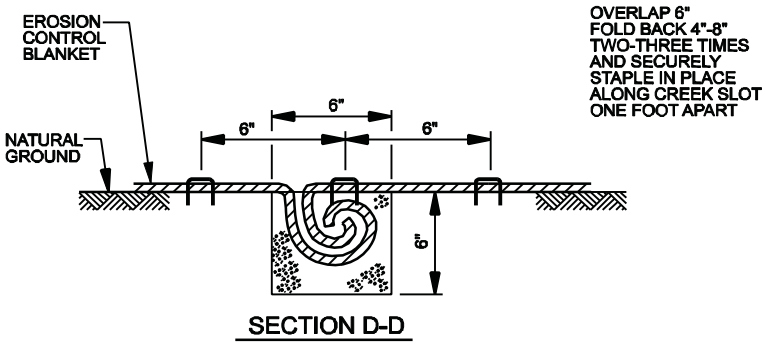

SECTION D-D

MATERIAL
NORTH AMERICAN GREEN SC150 (OR EQUIVALENT)

NOTES:

1. EROSION CONTROL BLANKETS SHALL EXTEND COMPLETELY ACROSS DISTURBED AREA TO PROTECT ERODIBLE SURFACES. THE SOIL SHALL BE PROPERLY PREPARED, SEEDED AND MULCHED PRIOR TO INSTALLATION.
2. INSTALL EROSION CONTROL BLANKETS ON FRESHLY GRADED EMBANKMENTS ON SLOPES IN EXCESS OF 3:1 (H:V) TO SUPPORT VEGETATION OR AS DIRECTED TO DO SO BY A COMPANY REPRESENTATIVE.
3. INSTALL BLANKETS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
4. BLANKET SHALL BE LOOSELY INSTALLED AND TAMPED OR ROLLED IN PLACE AFTER INSTALLATION. STAPLES SHALL BE DRIVEN FLUSH WITH THE GROUND.

EROSION CONTROL MATTING

PERMANENT EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL EROSION CONTROL MATTING

ECM

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
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APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0009	SHEET 3
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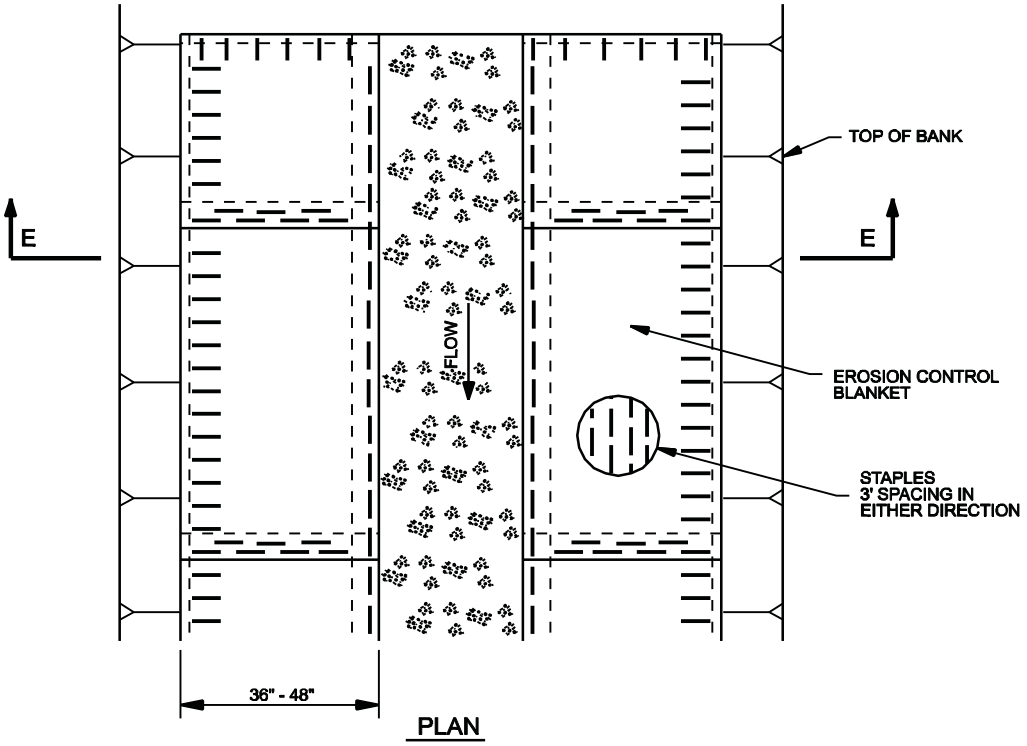
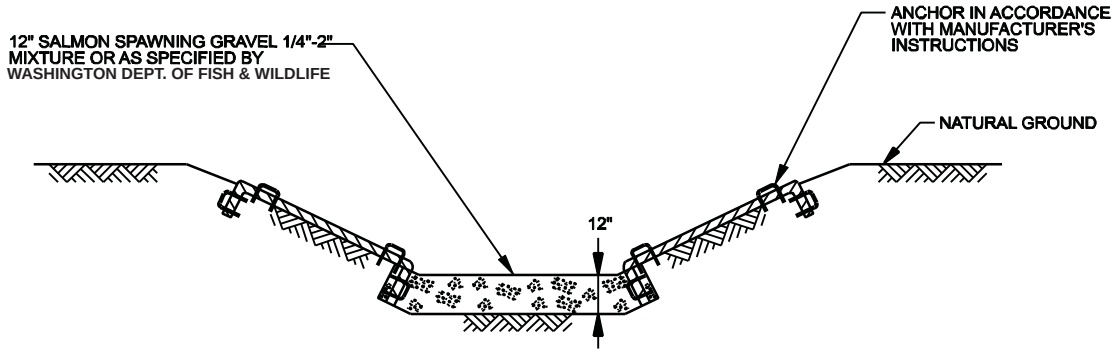


PLAN



SECTION E-E

SALMON STREAM RESTORATION ALTERNATIVE

EROSION CONTROL MATTING

PERMANENT EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL EROSION CONTROL MATTING
ECM

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

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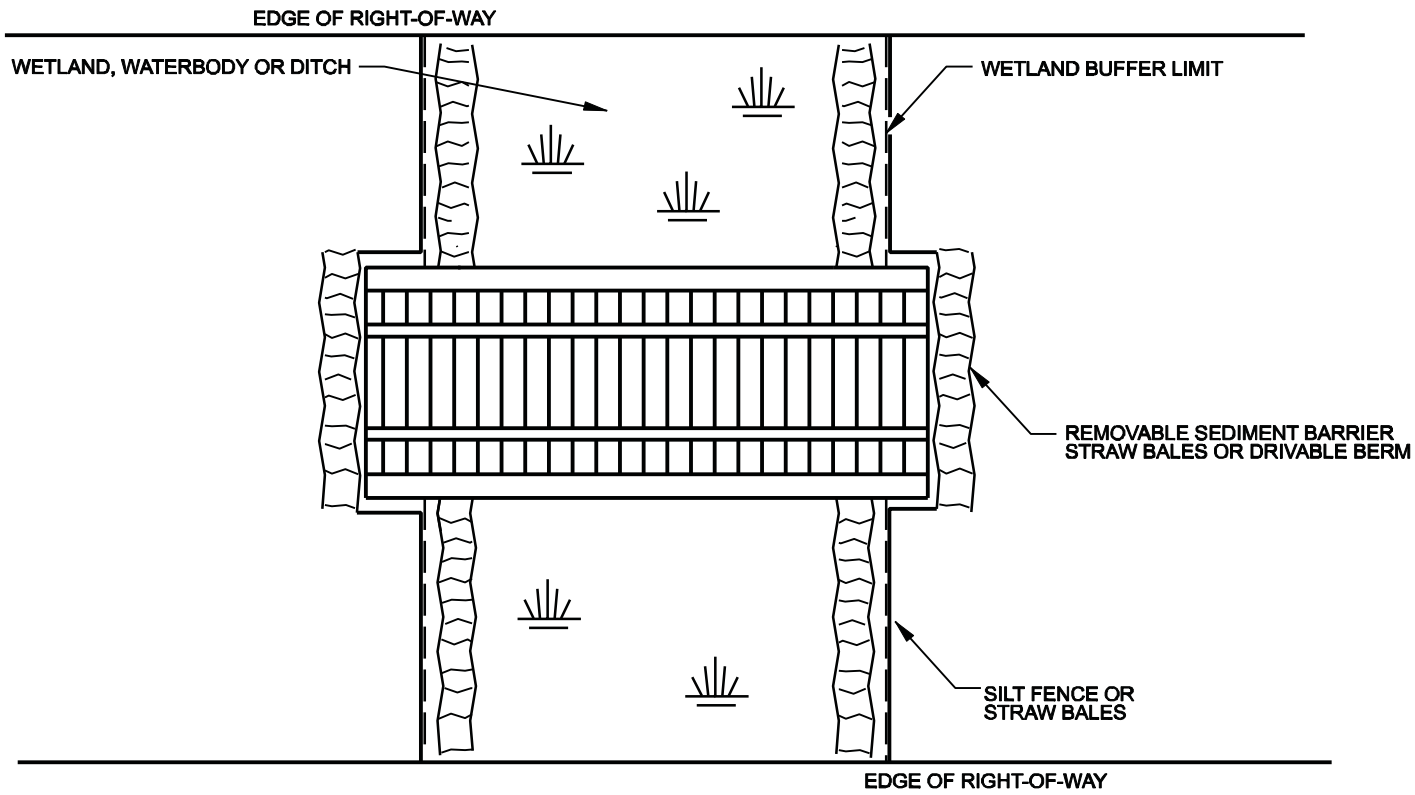

PLAN

PROFILE

NOTES:

1. Periodically check installation and remove build-up of sediment or debris.
2. Materials placed in wetlands shall be completely removed during final clean-up. removal of this structure is not contingent upon establishment of permanent vegetation.
3. Extend timber mats to equipment crossing at waterbody. continue equipment mats through the wetland and waterbody area.
4. Use additional timber mat layers to raise crossing above grade where poor soil conditions exist.

PORTABLE BRIDGE CROSSING

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL PORTABLE BRIDGE CROSSING

PB

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0010	SHEET 1
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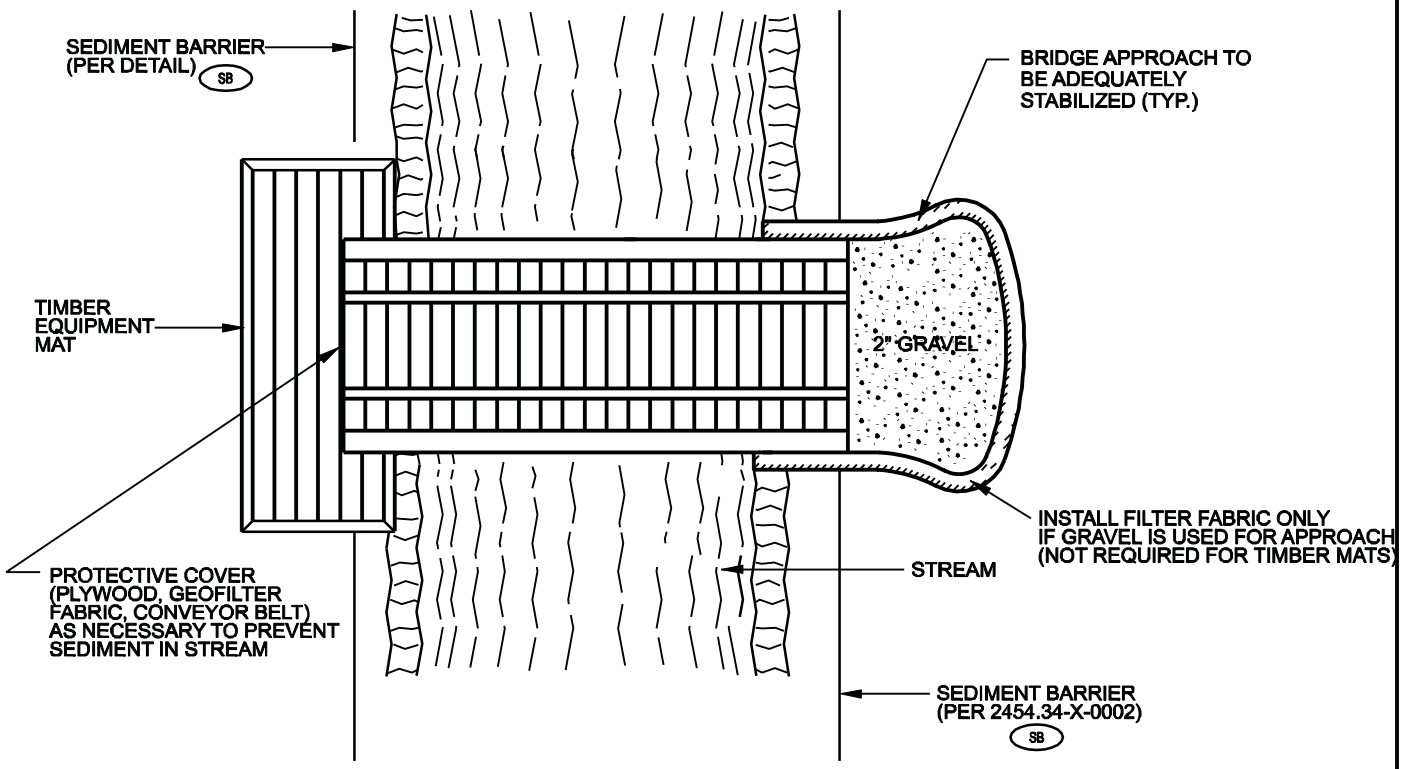
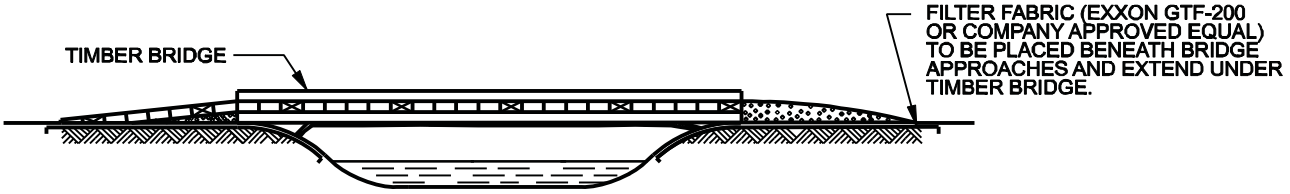


PLAN



PROFILE

NOTES:

1. Timber bridges shall be adequately anchored at one end.
2. Periodically check bridge installation and remove build-up of sediment or debris on bridge.
3. Bridge approaches shall be either coarse aggregate or timber equipment mats.
4. Materials placed along stream channel shall be completely removed during final clean-up. removal of this structure is not contingent upon establishment of permanent vegetation.
5. Culverts shall be used to support the timber bridge to prevent settlement of the bridge if necessary. the timber bridge shall remain above the water surface elevation at all times.
6. Contractor may use manufactured portable bridges or rail car bridges as substitutes for the measures shown, if approved by company representative.
7. Support culverts shall not restrict flow and shall be designed to withstand and pass the highest flow that would occur while the bridge is in place.
8. Sediment and debris shall not enter waterbody.

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL PORTABLE BRIDGE CROSSING

PB

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

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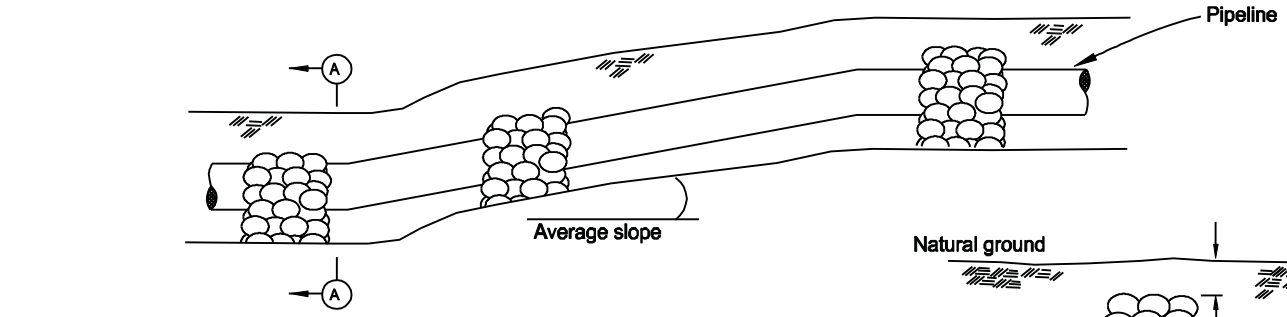
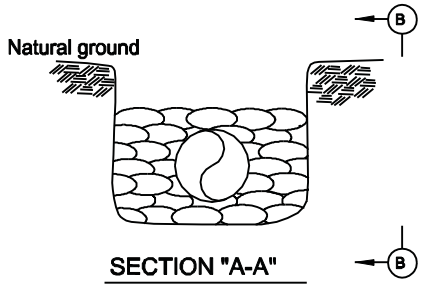
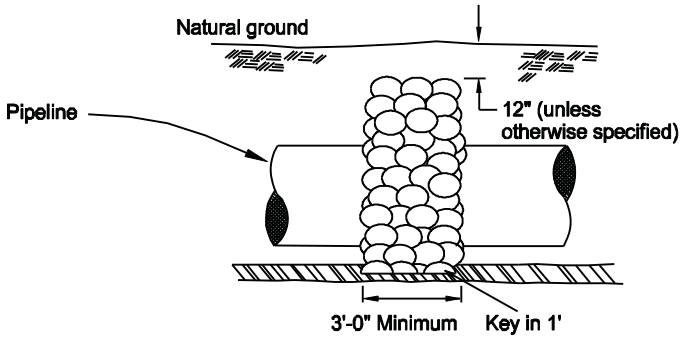




SECTION "A-A"



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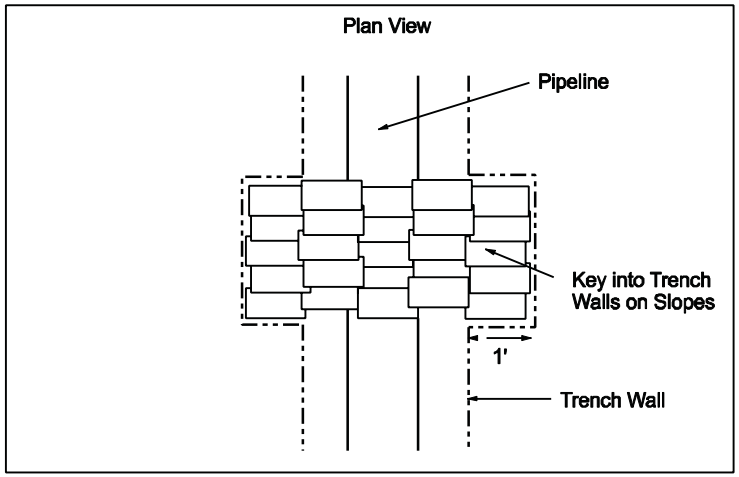

Notes:

1. Topsoil shall not be used in trench breakers.
2. Spacing of trench breakers shall be as shown on the Environmental Construction Alignment Sheets or as directed by a Northwest Pipeline GP authorized representative. Soft plugs (unexcavated sections along the pipeline trench line) may be left in place to perform function of permanent breakers prior to pipe placement.

SLOPE PERCENT	SPACING (feet)
10-15	500
15-20	300
20-30	150
>30	100

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TRENCH BREAKER INSTALLATION

TB

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: JST	DATE: 1-08-2004	ISSUED FOR BID:	SCALE: NONE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0011	SHEET
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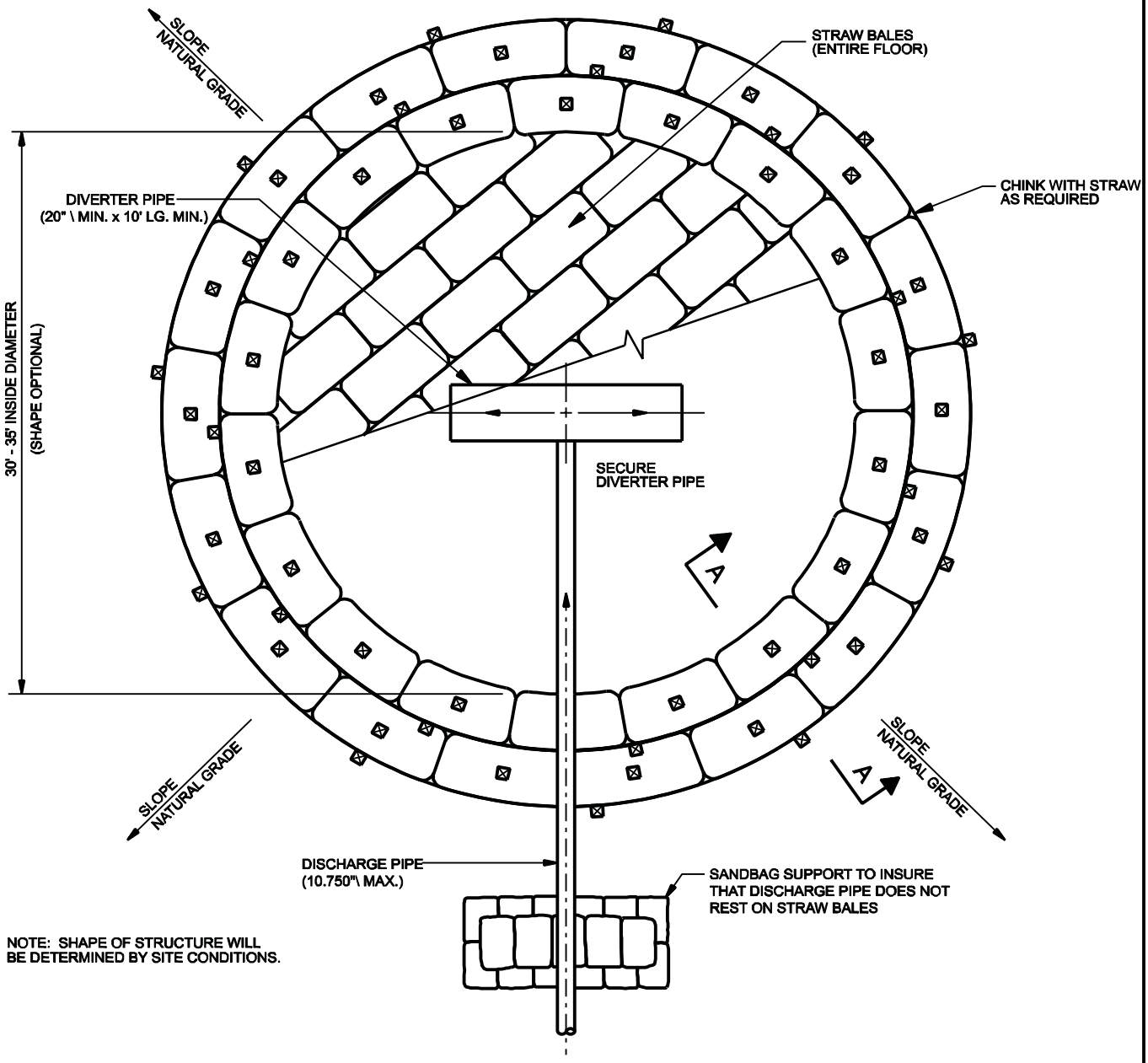

HYDROSTATIC TEST DEWATERING STRUCTURE

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL HYDROSTATIC TEST
DEWATERING STRUCTURE

HDW

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
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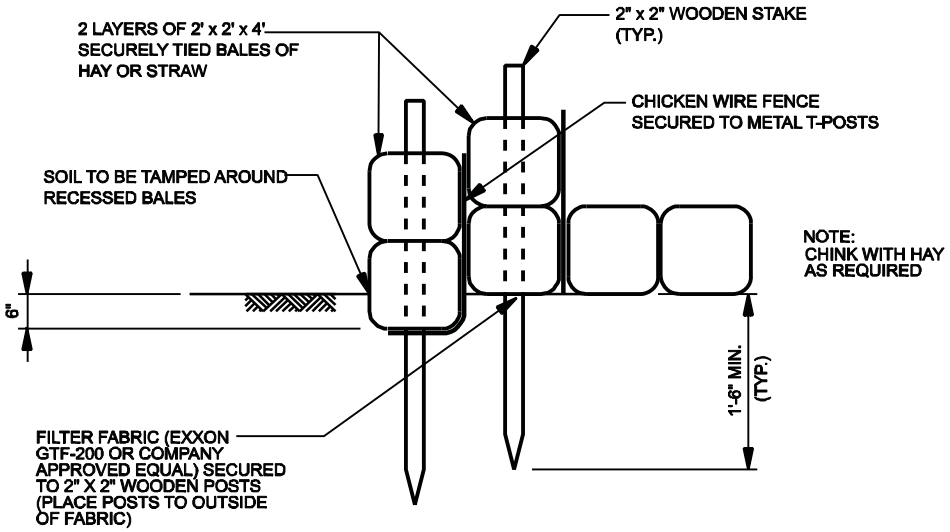

SECTION A-A

NOTE:
STAKES SECURING FILTER FABRIC AND CHICKEN WIRE FENCE ARE NOT SHOWN FOR CLARITY

NOTES:

1. Structure shall be placed on a level, well-vegetated site such that water will flow away from structure and any work areas.
2. Flow rates through discharge and diverter pipes shall be such that structure will not overflow.
3. Where conditions warrant a 30' x 30' rectangular structure may be substituted for the circular configuration shown.
4. Dimensions shown are the minimum acceptable values and may be varied depending upon specific location.
5. Contractor shall use certified noxious weed free hay or straw for structure.

HYDROSTATIC TEST DEWATERING STRUCTURE

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL HYDROSTATIC TEST DEWATERING STRUCTURE

HDW

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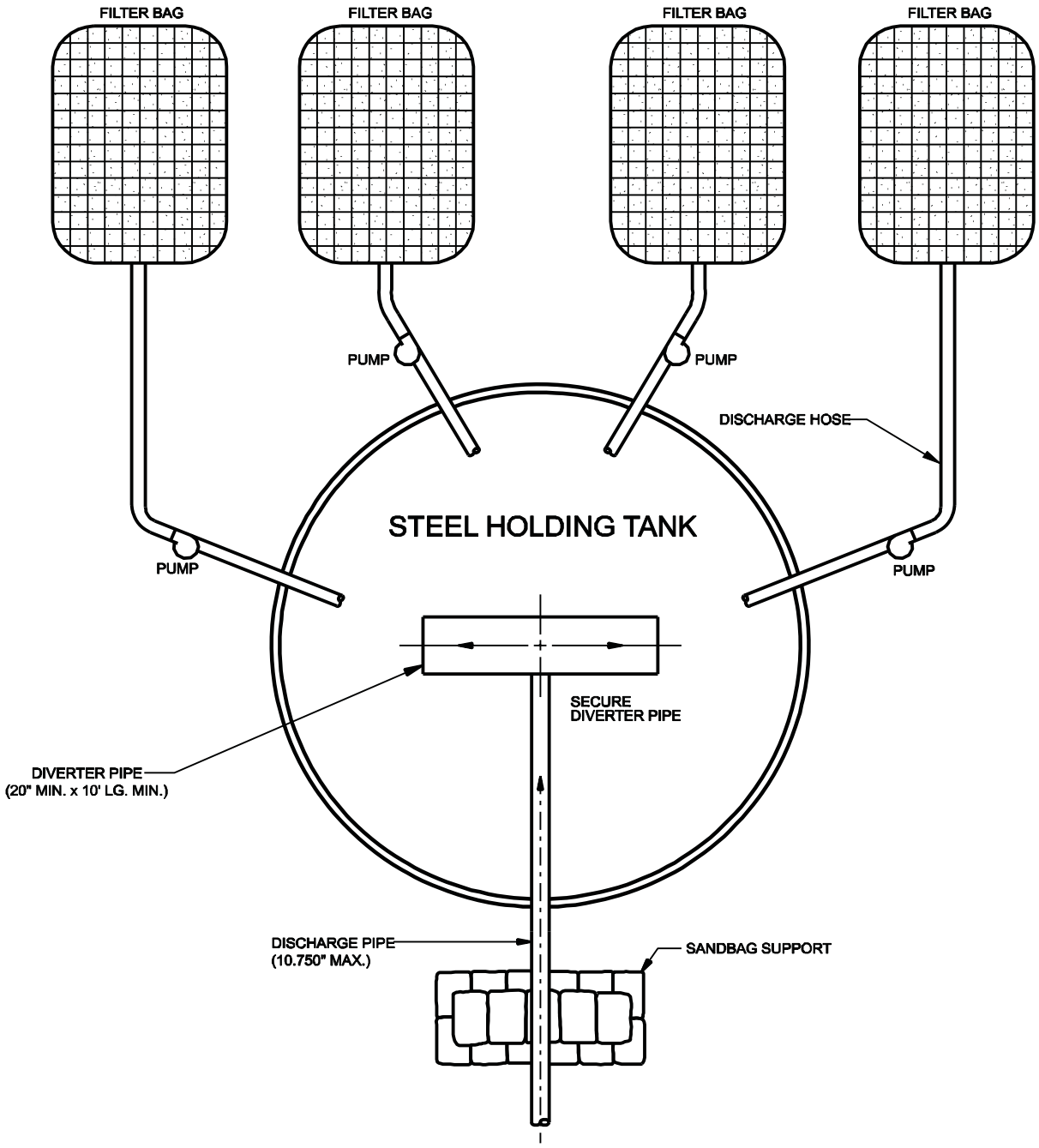

HYDROSTATIC TEST DEWATERING STRUCTURE

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL HYDROSTATIC TEST
DEWATERING STRUCTURE

HDW

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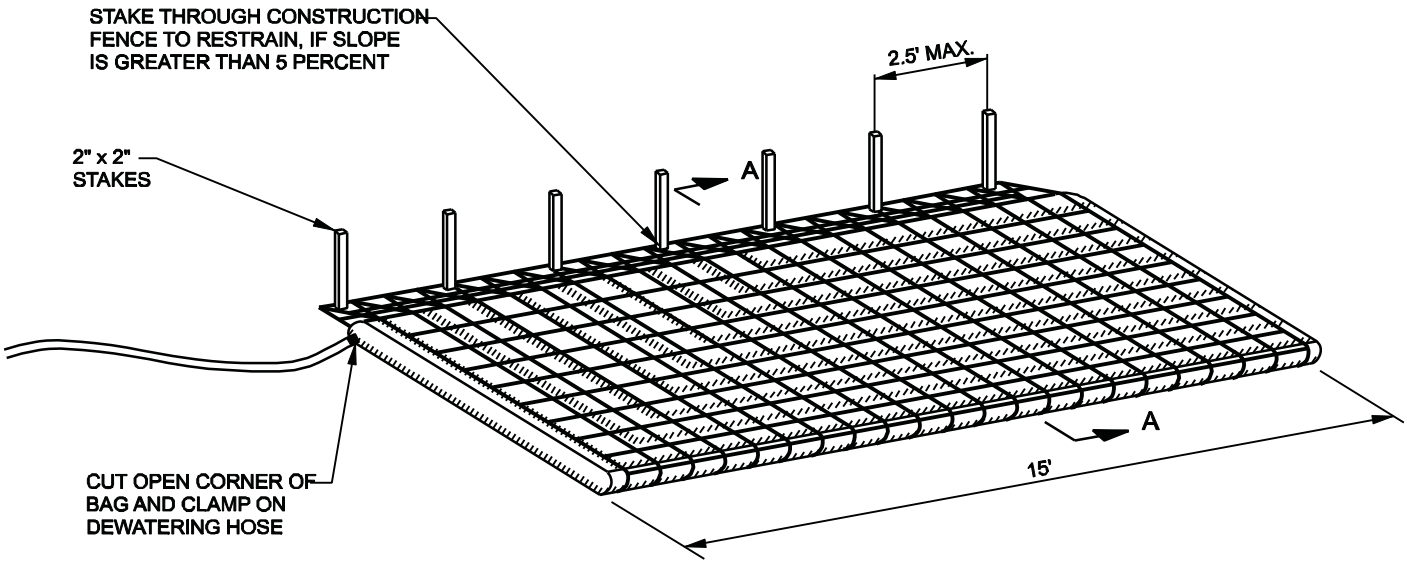

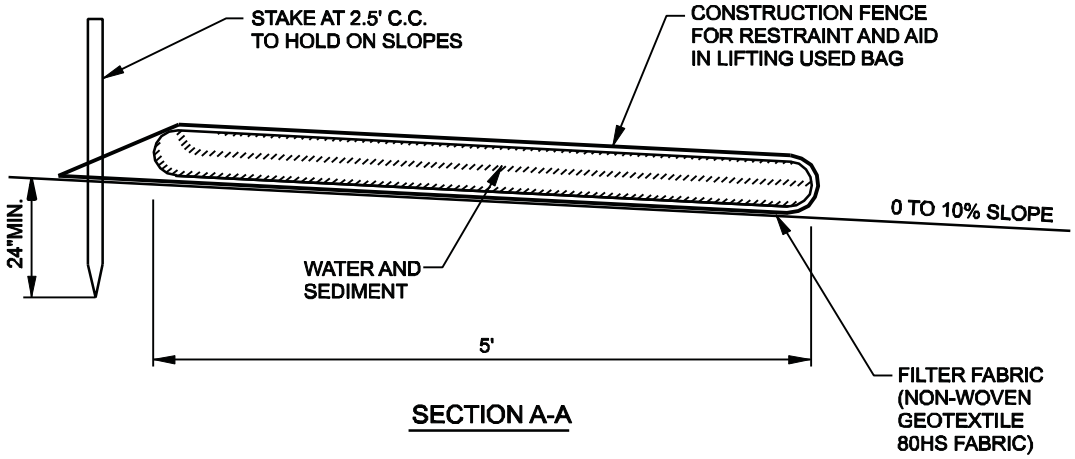

SECTION A-A

NOTES:

1. Filter bag shall be placed on a gently sloping or level, well-graded, vegetated site such that water will flow away from device, any work areas, waterbodies or wetlands.
2. The filter bag must be staked in place and secured to the pump discharge line.
3. Filter bag shall not be used for discharge flows greater than 300 gpm.
4. Device shall be removed and disposed of after bag is filled with sediment. Sediment from bag shall be spread in an upland area.

TRENCH DEWATERING

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL TRENCH DEWATERING
TDW

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

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CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
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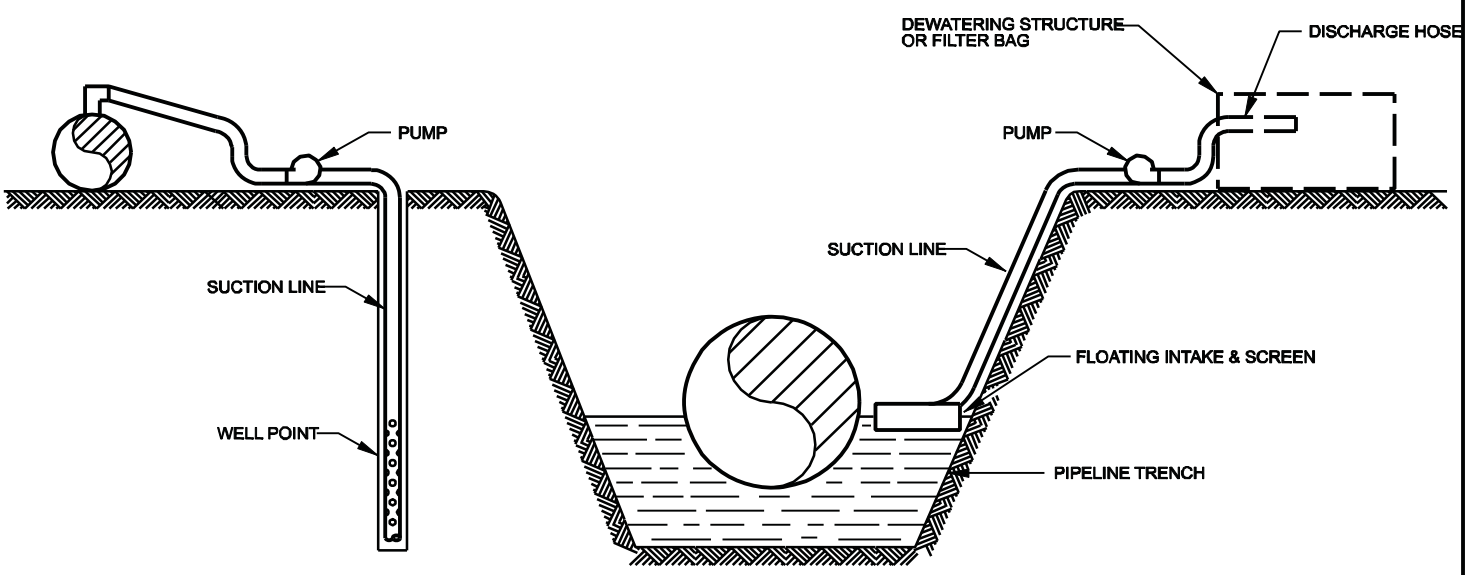

TRENCH DEWATERING

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL TRENCH DEWATERING

TDW

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

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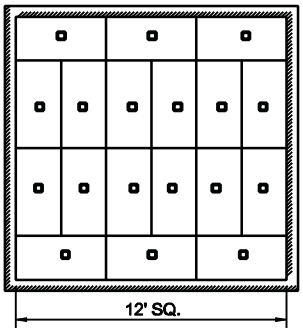
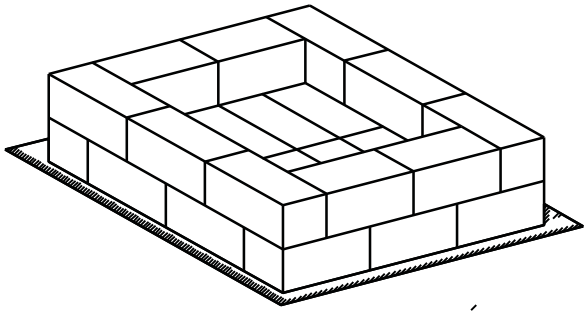


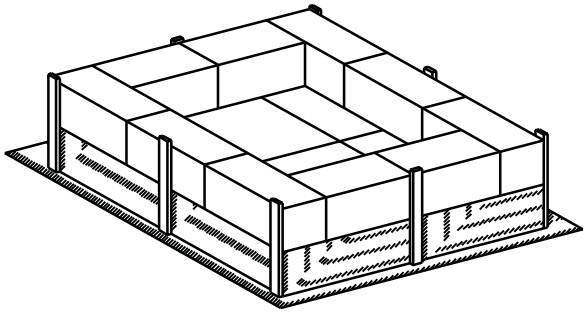
STEP 1

Arrange hay bales over filter fabric on level land tightly packed as shown to cover an area approximately 12' x 12'. Secure each haybale in place by driving rebar or a wooden stake through each of the hay bales.



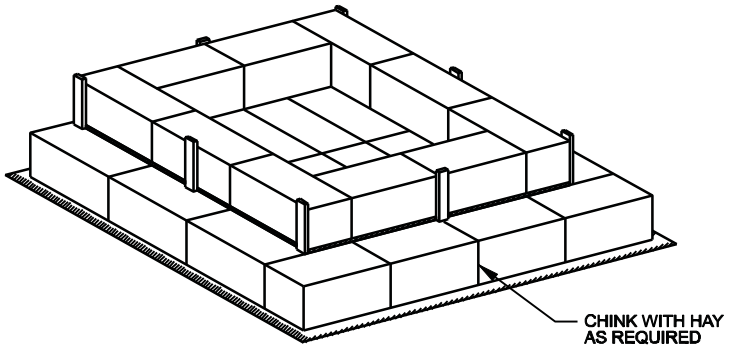
STEP 2

Install another layer of hay bales on the outer edge as shown.y



STEP 3

Install filter fabric all around hay bale structure as shown.



STEP 4

Install another layer of hay bales on the outside of the filter fabric and secure in place by driving rebar or a wooden stake through each of the outer hay bales.

NOTES:

1. Where possible structure shall be placed on a level, well-vegetated site such that water will flow away from structure and any work areas, waterbodies or wetlands.
2. This measure shall be removed upon completion of the project. Removal is not contingent upon establishment of permanent vegetation. Material from bales may be scattered on right-of-way.
3. Contractor shall use certified noxious weed free hay or straw for structure.

TRENCH DEWATERING

TEMPORARY EROSION CONTROL MEASURE

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL TRENCH DEWATERING

TDW

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

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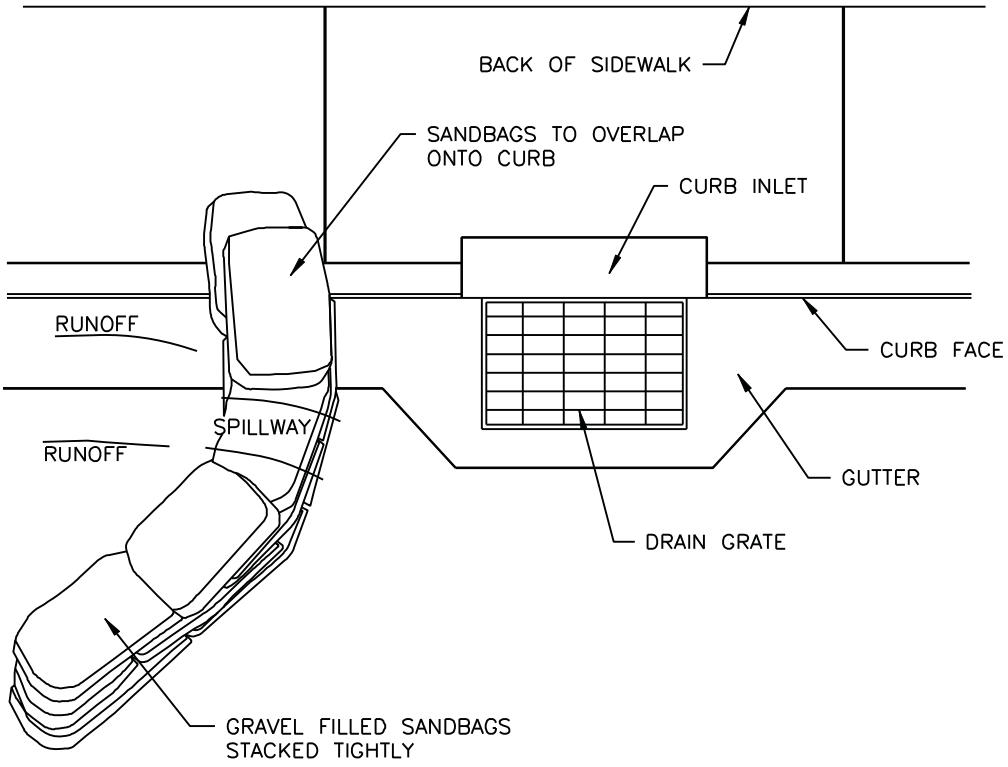

PLAN VIEW

NOTES:

1. PLACE CURB TYPE SEDIMENT BARRIERS ON GENTLY SLOPING STREET SEGMENTS, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. SANDBAGS OF EITHER BURLAP OR WOVEN GEOTEXTILE FABRIC, ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.
3. LEAVE A ONE SANDBAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY FOR OVERFLOW.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVEL WAY IMMEDIATELY.

CURB AND GUTTER BARRIER

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
STORM WATER INLET PROTECTION

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
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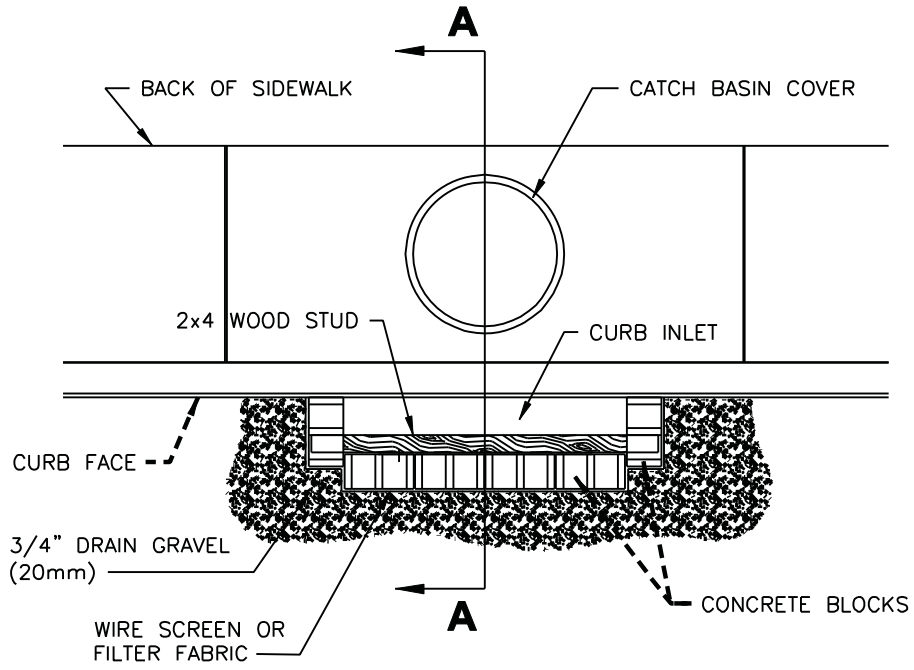
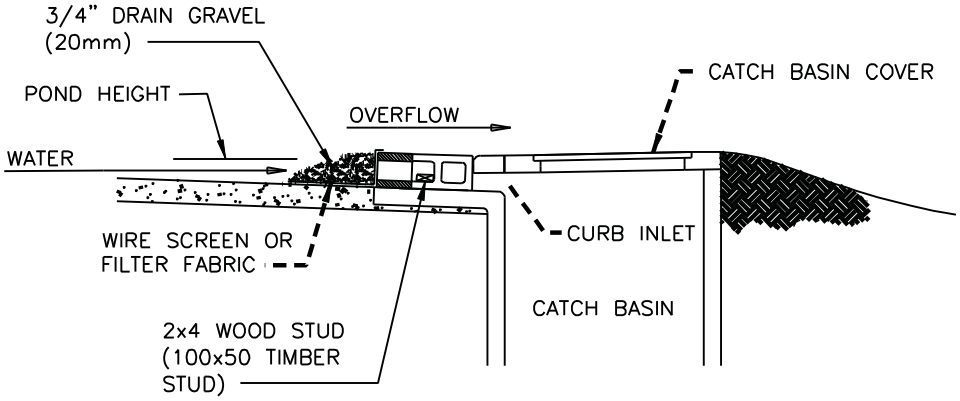


PLAN VIEW



SECTION A–A

NOTES:

1. USE BLOCK AND GRAVEL TYPE SEDIMENT BARRIER WHEN CURB INLET IS LOCATED IN GENTLY SLOPING SEGMENT, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. BARRIER SHALL ALLOW FOR OVERFLOW FROM SEVERE STORM EVENT.
3. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVEL WAY IMMEDIATELY.

BLOCK AND GRAVEL CURB INLET PROTECTION

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
STORM WATER INLET PROTECTION

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

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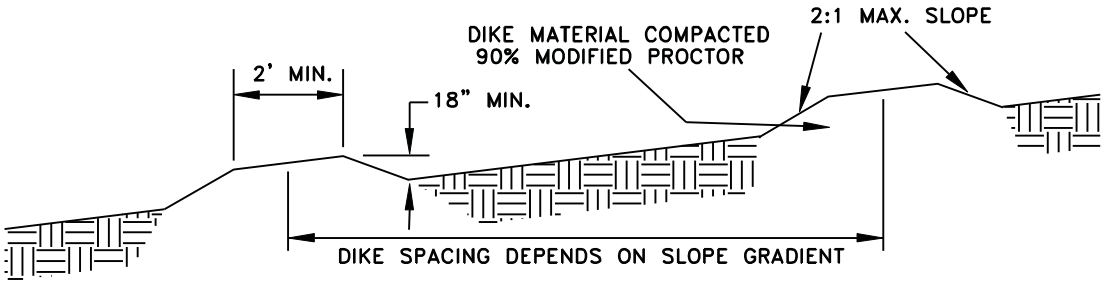

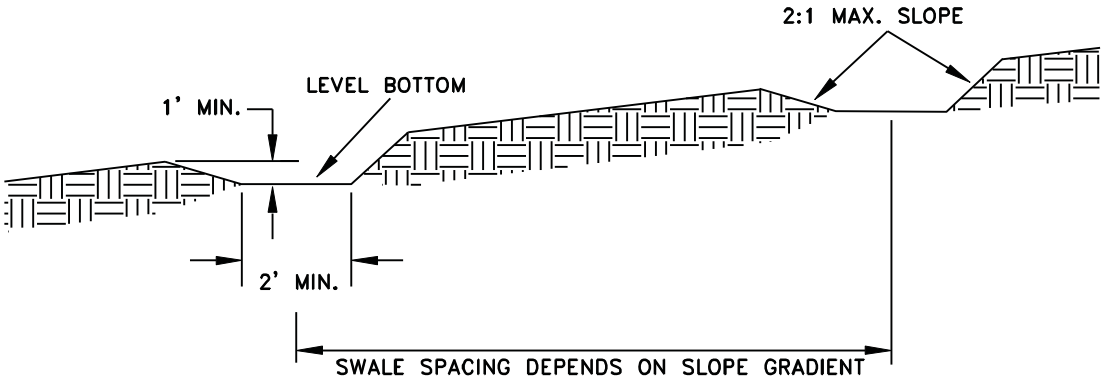

NOTE:

If the dike or swale intercepts runoff from disturbed areas, it shall discharge to a stable conveyance system that routes the runoff to a sediment barrier structure such as a silt fence or straw bale structure to filter runoff before leaving the construction right-of-way. If the dike or swale intercepts runoff that originates from undisturbed areas, it shall discharge to a stable area that routes/releases the runoff away from disturbed areas.

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
INTERCEPTOR DIKES AND SWALES

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
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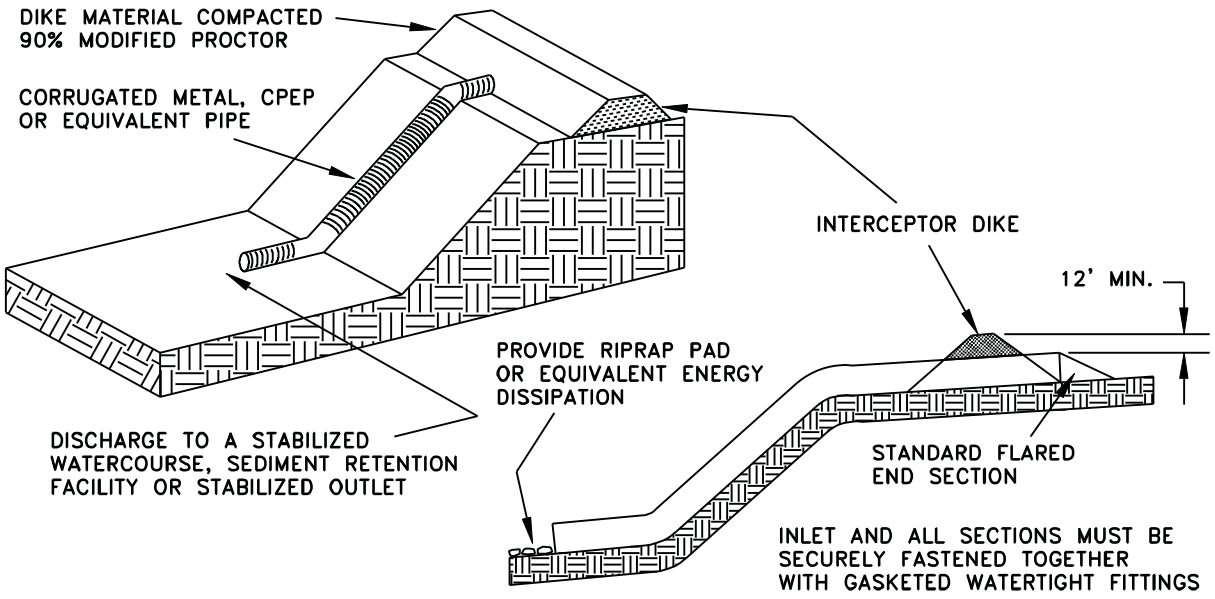

NOTES

1. Pipe slope drains are designed to carry concentrated runoff down steep slopes without causing erosion or saturation of slide-prone soils. Pipe slope drains may be used to divert water away from or over bare soil to prevent gullies, channel erosion, and saturation of slide prone soils. Pipe slope drains should be used when a temporary stormwater conveyance is needed to move water down a steep slope to avoid erosion. The following notes apply to pipe slope drains:
2. They may be used on any slope with a gradient of 2H:1V or greater and with at least 10 feet of vertical relief.
3. They may be used to collect clean runoff from plastic sheet cover and direct it away from any exposed soils.
4. They may be installed in conjunction with silt fence to drain collected water to a controlled area.
5. The soil around and under the pipe and entrance section shall be thoroughly compacted.
6. The flared inlet section shall be securely connected to the slope drain and be fused or welded, or have flange-bolted mechanical joints to ensure a watertight seal. Ensure that the entrance area is stable and large enough to direct flow into the pipe.
7. Slope drains shall be continuously fused, welded, or flange-bolted mechanical joint pipesystems with proper anchoring to the soil.
8. No erosion shall occur at the outlet point. If erosion occurs, additional protection shall be added.

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

PIPE DRAIN

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

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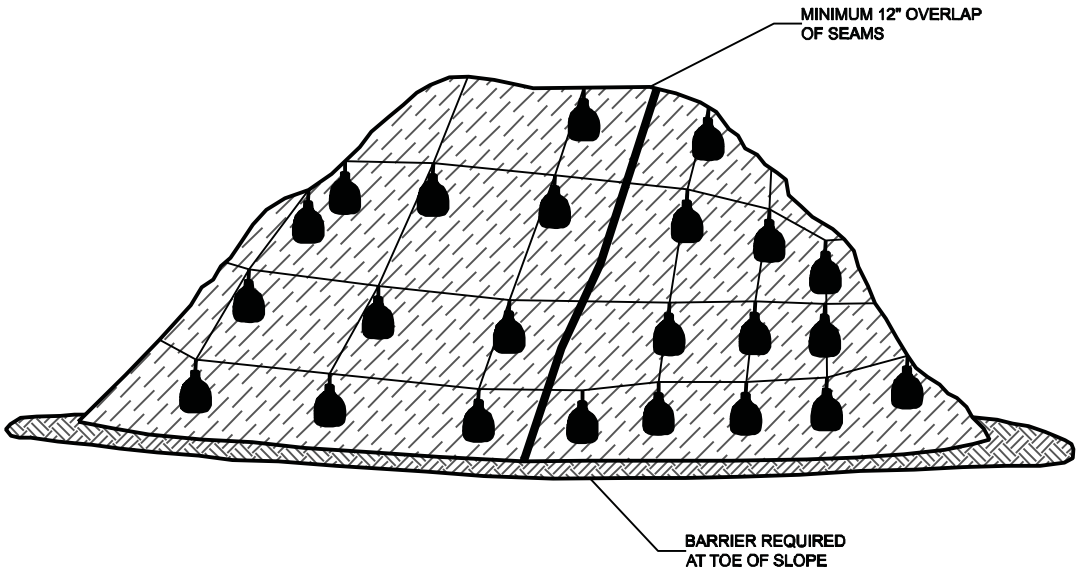


NOTES

1. MINIMUM 12" OVERLAP OF ALL SEAMS REQUIRED.
2. BARRIER REQUIRED AT TOE OF SLOPE.
3. COVERING MAINTAINED TIGHTLY IN PLACE BY USING SANDBAGS OR TIRES ON ROPES WITH A MAXIMUM 10' GRID SPACING IN ALL DIRECIONS.
4. PLASTIC (VISQUEEN) SHEETING CAN BE USED TO COVER SOIL STOCKPILES WHERE EROSION PROBLEMS OCCUR IN THE WET SEASON AND ARE UNABLE, DUE TO THE SOFT SOIL CONDITIONS, TO BE ACCESSED BY EQUIPMENT TO MAKE A PERMANENT REPAIR OR PLACEMENT OF OTHER APPROPRIATE BMPS. UNDER THESE CONDITIONS NORTHWEST WILL CONSIDER A TEMPORARY PLACEMENT OF PLASTIC SHEETING TO PROTECT THE AREA AND DIVERT RUNOFF AWAY FROM THE AREA OF CONCERN UNTIL A MORE PERMANENT SOLUTION CAN BE APPLIED.

SOIL STOCKPILE COVER

TEMPORARY EROSION CONTROL MEASURE

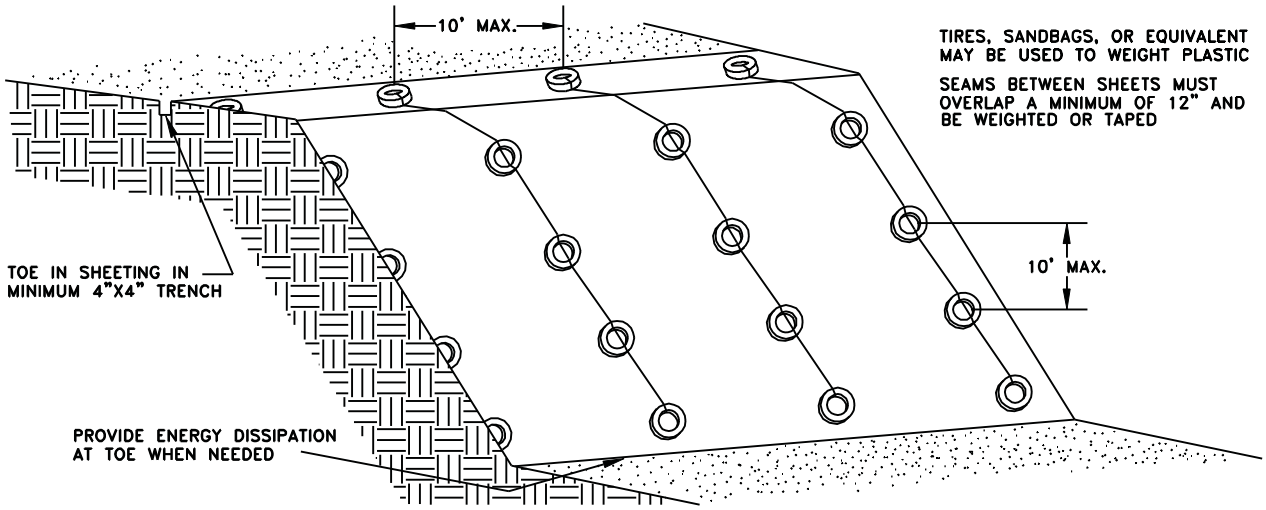
DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT
TYPICAL SOIL STOCKPILE COVER

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0017	SHEET 1
		%TIME% %PATH%	OF 2



DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

TYPICAL SOIL STOCKPILE COVER

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0017	SHEET 2 OF 2
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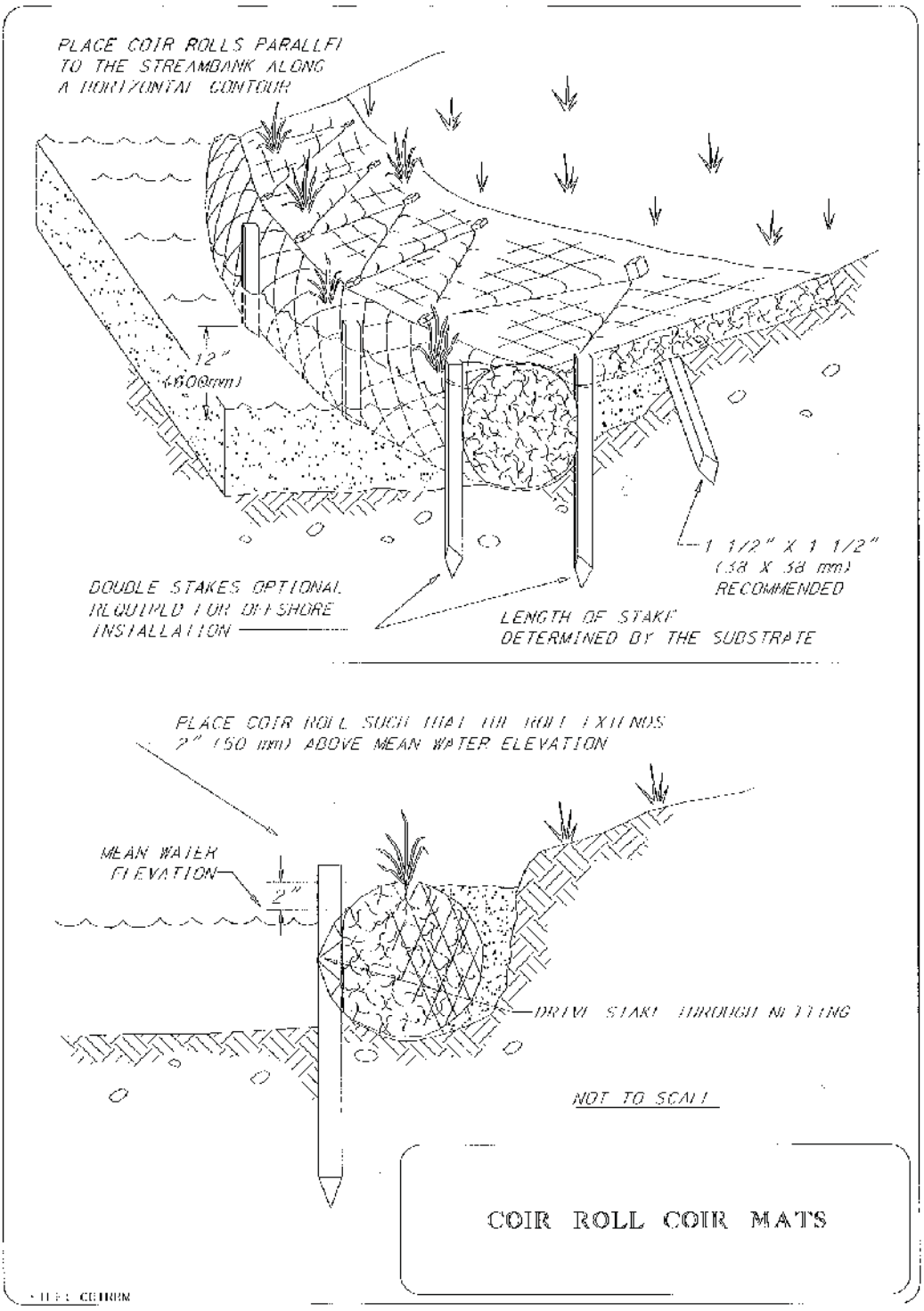


COIR ROLL COIR MATS

DRAWING NO.	REFERENCE TITLE

NORTHWEST PIPELINE GP
WASHINGTON EXPANSION PROJECT

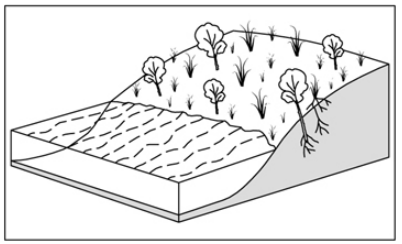
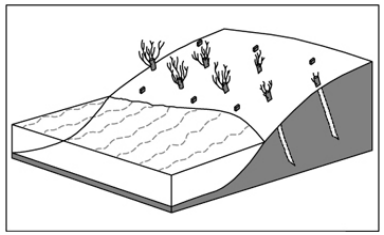
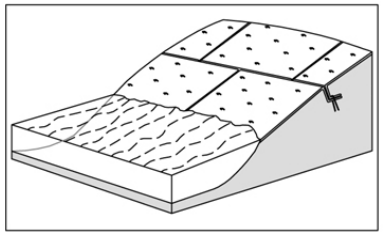
TYPICAL COIR ROLL

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

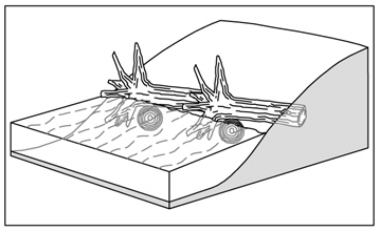
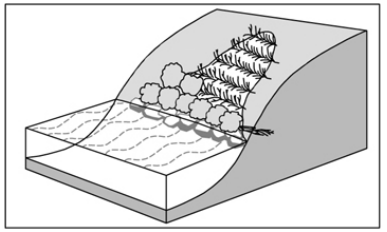
DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 1408.34-X-0018	SHEET 1
		%TIME% %PATH%	OF 1

Attachment 2
Streambank and Streambed Restoration Methods

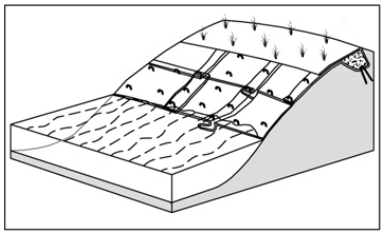
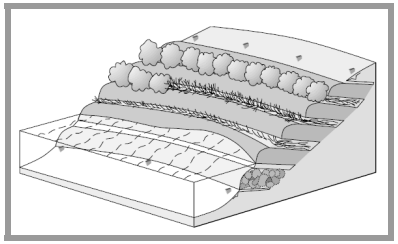
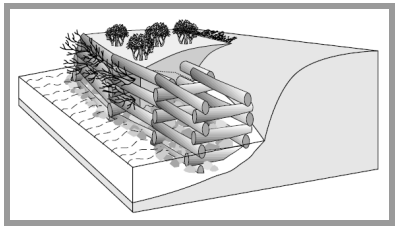
ATTACHMENT 2
Stream Bank and Streambed Restoration Methods

Vegetation Alone	Vegetation is established on bare soils to help prevent surficial erosion, minimize shallow seated mass movement, provide habitat, and enhance aesthetics or visual appearance.		
Live Staking	Live staking is used for revegetation, soil reinforcement, and anchoring erosion control materials. Willow cuttings are typically 1.5 to 3.3 feet long, 2/3 inserted in the ground. The portion of the stem in the soil will grow roots and the exposed portion will develop into a bushy riparian plant.		
Erosion Control Blankets	Erosion control blankets are temporary, rolled products consisting of flexible nets or mats manufactured from natural materials, usually straw, wood, excelsior, or coconut. Various grades of biodegradable fibers and netting are available.		

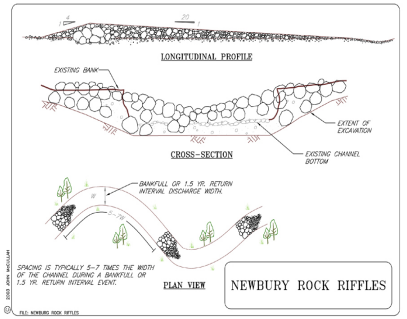
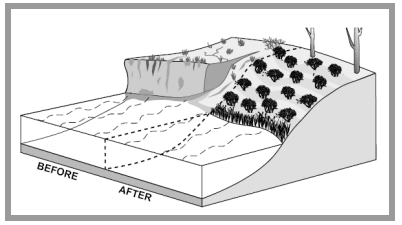
ATTACHMENT 2
Stream Bank and Streambed Restoration Methods

Rootwad Revetments	Rootwad revetments are interlocking tree materials that are continuous and resistive. The materials are designed to resist erosive flows, usually on the outer bank of a meander bend when habitat diversity is desirable and woody materials are available.		
Live Gully Fill Repair	Live gully fill repair consists of alternating layers of live branch cuttings and compacted soil. This reinforced fill can be used to stabilize trench backfill and is suitable for filling and repairing elongated voids in a slope.		

ATTACHMENT 2
Stream Bank and Streambed Restoration Methods

Turf Reinforcement Mats	Turf reinforcement mats (TRMs) are long lasting and designed to resist shear and tractive forces. They are specified for banks subjected to flowing water. Mats are ultraviolet fibers in a three-dimensional matrix. TRMs work with plant roots and shoots to be mutually reinforcing. The mats are best suited for low-energy systems with natural herbaceous riparian areas. Native grasses are used.		
Vegetated Geogrids	Vegetated geogrids are used to quickly establish riparian vegetation. Geogrids can be installed on a steeper and higher slope and have a higher initial tolerance of flow velocity than brush layering. The grid produces a newly constructed, well-reinforced streambank. This method is useful in restoring outside bends where erosion is a problem. The geogrid captures sediment and enhances conditions for colonization of native species. Slope stability analyses are recommended. The geogrid can be used to retain fines.		
Engineered Log Structure	Engineered log structures provide protection to the streambank in areas with near vertical banks where bank sloping options are limited. The structure creates a natural appearance, provides immediate protection, and accelerates the establishment of woody species. Effective on outside of bends of streams where high velocities are present. Appropriate (1) at the base of a slope where a low wall might be required to stabilize the toe and reduce slope steepness, and (2) above and below water levels where stable streambeds exist.		

ATTACHMENT 2
Stream Bank and Streambed Restoration Methods

Constructed Riffles	Pools and riffles are common features found in natural or lightly altered streams. Constructed riffles, such as Newbury Riffles, are intended to replace pool and riffle habitat lost due to channelization or other types of stream alterations. The riffles provide benthic habitat and contribute to bed stability. Although the coarse material that comprises constructed riffles is not intended to be mobile during higher flows like natural riffle material, correctly-designed structures function similar to natural features.		
Slope Flattening	Slope flattening is most successful on streambanks where moderate erosion and channel migration are anticipated. Reinforcement at the toe of the embankment is often needed. Used in conjunction with other protective practices where flow velocities exceed the tolerance range for available plants, and where erosion occurs below base flows. Slope stability analyses are recommended.		

Sources:

McCullah, J., and D. Gray. 2005. *Environmentally Sensitive Channel and Bank-Protection Measures.* NCHRP Report 544. Transportation Research Board. Washington, DC.

Newbury, R. W., Gaboury, M. W., and Watson, C. 1999. *Field Manual of Urban Stream Restoration—Illinois State Water Survey*, Champaign, Illinois.

APPENDIX J2:

DRAFT UNANTICIPATED DISCOVERY OF CONTAMINATION PLAN

Draft

Washington Expansion Project

Unanticipated Discovery of Contamination Plan

Prepared for

Northwest Pipeline GP

June 2013

Prepared by

CH2MHILL®

Contents

Acronyms and Abbreviations

CI	Chief Inspector
EDR	Environmental Data Resources
EI	Environmental Inspector
EPA	U.S. Environmental Protection Agency
Northwest	Northwest Pipeline GP
ROW	right-of-way

Unanticipated Discovery of Contamination Plan

The intent of this Unanticipated Discovery of Contamination Plan is to outline practices to employ in the event of an unanticipated discovery of contamination in soil, groundwater, and sediment when excavating during construction and/or maintenance activities, as well as debris or waste materials deposited on the pipeline right-of-way at Northwest Pipeline GP (Northwest) facilities. The purposes of this plan are to:

- Protect human health and worker safety;
- Prevent the spread of contamination; and
- Comply with applicable state and/or federal regulations.

1.0 Pre-Job Planning

When planning a project at Northwest facilities and/or along the pipeline right-of-way (ROW), the Chief Inspector (CI), Environmental Inspector (EI), District Manager, and/or their designees shall complete a review of the proposed pipeline and/or aboveground facility locations prior to the construction and/or maintenance activity in order to assess the potential for the presence of known or potential contamination. An assessment should also be made of the likelihood of encountering contamination during an excavation or along the surface. The scope of the review and assessment will depend upon the size of the project, past experience, and available information.

For pipeline construction projects, the review and assessment will consist of a site reconnaissance of the proposed work area, interviews with property owners, and a review of any readily available information. It may also be necessary to consult with the Environmental Permits and Natural Resources and/or Environmental Compliance Departments to conduct an environmental database search (e.g., Environmental Data Resources [EDR] search) and/or perform additional investigation. Generally, it is not anticipated that this review will identify contamination along the ROW, but it will likely identify areas where there is a higher potential for contamination.

For maintenance-related excavations at compressor and meter stations, these have a higher likelihood of encountering something unexpected due to the age of these facilities as well as the use of regulated substances at these facilities.

If it is determined that there is a high likelihood that the planned work will be conducted in close proximity to, or within, known or suspected contaminated sites, the Environmental Permits and Natural Resources and Environmental Compliance Departments should be consulted.

The results of this search/investigation will be reviewed prior to start of construction and/or maintenance activity and any identified contaminated sites and/or areas will be located and available information reviewed for potential impacts. In the event the planned work will impact a confirmed contaminated site, the Environmental Compliance Department will work with the appropriate regulatory agency, property owner, and responsible party to ensure the construction and/or maintenance activities are conducted in accordance with applicable and established site requirements. Where feasible, a re-route or other modification to the project should be considered. Postponement of the project may also be necessary.

If contaminated sites are identified for areas of the project, a list of the sites should be kept along with how the determination was made (EDR, property owner, agency report, etc.). An example of this list is included in Worksheet A in Attachment 1.

2.0 Unanticipated Discovery Response

In the event unanticipated contaminated soil, groundwater, or other potential environmental contamination is encountered during the project (e.g., malodorous soils and/or groundwater with visible staining and/or sheen), the following general procedures will be implemented:

1. All construction and/or maintenance work in the immediate vicinity of areas where suspected contamination or unknown wastes are encountered will be halted.
2. All construction, oversight, and observing personnel will be evacuated to a road or other accessible up-wind location until the types and levels of potential contamination can be verified by qualified personnel. This assessment may include, but not be limited to: observation by a qualified health and safety professional, field screening using the appropriate air sampling devices, and/or laboratory analysis of suspect material.
3. The CI, EI, and/or District Manager will be notified and they will consult with the company's Environmental Compliance Department. The contacts for the Environmental Compliance Department will be provided prior to construction.
4. Following consultation with onsite personnel, the Environmental Compliance Department will be responsible for designating follow-up actions, including mobilizing emergency response personnel and coordinating with the U.S. Environmental Protection Agency (EPA) and/or state and local agencies as appropriate.
5. If an immediate or imminent threat to human health or the environment exists, the EI, CI, District Manager, and/or their designee will immediately contact the appropriate responding agency. For construction projects, the contact numbers for fire, police, and the state environmental hotline can be found on the Environmental Contacts List for the project.
6. If an immediate or imminent threat to human health or the environment does **not** exist, or has been abated, a determination will be made, after consulting with all responsible parties, whether any remedial action is necessary. If the company or its qualified contractor personnel is responsible for any remedial action, it will be limited to the planned work area only and no additional disturbance should be made except as needed to facilitate construction and/or maintenance activities.
   - Representative samples of the suspected contaminated media (i.e., soil, water, and waste) may need to be submitted for laboratory analysis to determine waste classification and/or agency notification requirements, which can vary from state-to-state.
   - The CI, EI, District Manager, and/or their designee shall consult with the Environmental Compliance Department for the appropriate analyses, sampling methodology, and sampling frequency.
   - Any excavated soils or waste that are suspected of containing contamination above the appropriate cleanup standard, or otherwise regulated for disposal, will be placed on plastic sheeting and covered at the end of each work day or placed in an appropriate container to prevent the spread of contamination. Containers must be closed or covered and any storage areas cordoned off with orange safety fence. All containers should be clearly labeled with the name of the contents and any known hazard associated with the material identified on the container. Known hazardous wastes should be labeled with the words "Hazardous Waste" and the date the waste was placed in the container.
   - Water or groundwater suspected of being contaminated will **not** be discharged to grade without prior state approval. Options such as onsite storage tanks or discharge to a publicly owned treatment works should be considered. Limiting and/or diverting the flow of clean surface water away from the affected area, as well as other measures, may be implemented to minimize impacts and exposure to the work area.
7. If it is determined that the company or its qualified contractor will be responsible for arranging for disposal of any affected media (soil, water, waste), the material will be characterized and disposed of properly at a permitted facility in a timely manner. All disposal documentation should be obtained and filed in the project files and copies sent to the Environmental Compliance Department.
   - If EPA-regulated hazardous wastes, Toxic Substances Control Act wastes, or state hazardous wastes are generated, an EPA generator identification number will need to be obtained. The Environmental Compliance Department must be contacted to assist in either obtaining a project-specific identification number or providing an EPA identification number for an existing facility.

Attachment 1
Worksheet A – Known or Suspected Contaminated Sites

Worksheet A – Known or Suspected Contaminated Sites

Instructions: Please complete a separate sheet for each location where contamination has been noted.

I. Site Name

II. Physical Location

III. How Contamination Determination Was Determined
(visual, sampling, smell, etc.)

APPENDIX J3

WASHINGTON EXPANSION PROJECT
WATER QUALITY MONITORING PLAN

Draft

Washington Expansion Project Water Quality Monitoring Plan

June 2013

Prepared by

Northwest Pipeline GP

CH2MHILL®

Contents

Acronyms and Abbreviations

cfs	cubic feet per second
DMR	discharge monitoring report
Ecology	Washington Department of Ecology
Northwest	Northwest Pipeline GP
NTU	nephelometric turbidity unit
TPH	total petroleum hydrocarbons
WEP	Washington Expansion Project

SECTION 1

Introduction

This Water Quality Monitoring Plan addresses the requirements for water quality monitoring associated with construction of Northwest Pipeline GP's (Northwest's) Washington Expansion Project (WEP). This Plan addresses monitoring requirements associated with construction stormwater runoff and pipeline trench dewatering activities, waterbody crossings, and hydrostatic test water release. The Plan sets forth the monitoring procedures as well as reporting and record-keeping requirements.

SECTION 2

Purpose

The purpose of this Plan is to set forth procedures for water quality monitoring that will be followed by Northwest and its contractor during construction of the WEP.

SECTION 3

Responsibilities

Northwest is responsible for ensuring that all Northwest and contractor personnel associated with construction of the WEP are familiar with the requirements set forth in the Section 401 Water Quality Certification and the National Pollutant Discharge Elimination System Construction Stormwater General Permit as well as the procedures set forth in this Plan. The contractor is responsible for carrying out the procedures set forth in this Plan as directed by Northwest.

SECTION 4

Construction Stormwater and Trench Dewatering Discharges

4.1 Monitoring and Sampling

Potential discharges to receiving waters that may occur during construction include stormwater runoff and water from trench dewatering. It is not possible, prior to construction, to determine the locations for trench dewatering because it will depend on conditions in the field at the time of construction (such as seasonal groundwater levels) and the need for dewatering to access the trench. However, if it is determined that there is a discharge occurring either to surface water or groundwater, water quality monitoring will be initiated according to this Plan.

A discharge to surface water or wetlands would occur if it is observed that stormwater or water from trench dewatering is channeling and reaching surface water or wetlands. The potential outfalls for a discharge to surface water have been defined as the waterbodies that will be crossed by the proposed pipeline, which are listed in Attachment 1. If it is determined that there is a discharge to surface water or wetlands, weekly monitoring for the following parameters shall be initiated:

- **Turbidity.** If stormwater or water from dewatering is discharged to surface water or wetlands, monitoring (a grab sample) shall be conducted for turbidity at the receiving water and at the point of discharge. In the receiving water, monitoring shall be conducted both upstream and downstream of the discharge point. The effluent limitation for turbidity is 25 nephelometric turbidity units (NTU) at the point where stormwater is discharged from the site or nor more than 5 NTU over background turbidity when the background turbidity is 50 NTU or less, and shall not have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
- **Total petroleum hydrocarbons (TPH).** If stormwater or water from dewatering is discharged to surface water or wetlands and there is a visible sheen on the water, monitoring (a grab sample) shall be conducted for TPH at the point of discharge and in the receiving water. If there is no visible sheen, monitoring for TPH is not required. The maximum daily TPH effluent limitation for discharges to surface water is 5 milligrams per liter and no visible sheen at any time.
- **pH.** Monitoring for pH is required if engineered soils (i.e., concrete soil mixtures) are used and for the discharge of hydrostatic test water. Monitoring (a grab sample) shall be conducted for pH on a weekly basis at the point of discharge. The effluent limitation for pH is in the range of 6.5 to 8.5 standard units. It is assumed pH sampling will not be necessary except at potential open-cut road crossings where concrete soil mixture backfill may be used.

4.2 Reporting

The first monitoring period begins on the effective date of the permit. Monitoring results shall be submitted to Washington Department of Ecology (Ecology) monthly. Monitoring data obtained during each monitoring period shall be summarized, reported, and submitted on the discharge monitoring report (DMR) forms through Ecology's Water Quality Web Permitting Portal (WQWebPortal). DMR forms shall be received by Ecology no later than the 15th day of the month following the completed monitoring period. The DMRs shall be sent to:

WPLCS Coordinator/Water Quality
Washington Department of Ecology
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008-5452

DMRs must be submitted monthly whether or not the WEP was discharging. If there was no discharge during a given monitoring period, Northwest will submit the form as required, with the words “No discharge” entered in the place of monitoring results. For outfalls that had discharges during a given monitoring period, detailed DMR forms for each associated discharging outfall must be submitted.

4.3 Records Retention

The records of all monitoring information (site log book, inspection reports/checklists, etc.), this Water Quality Monitoring Plan, the WEP Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements will be retained during the life of the construction project and for a minimum of 3 years following the termination of permit coverage in accordance with permit condition S5.C of the Construction Stormwater General Permit.

4.4 Recording of Results

For each measurement or sample taken, Northwest shall record the following information:

- Date, exact place, method, and time of sampling or measurement
- Individual who performed the sampling or measurement
- Dates the analyses were performed
- Individual who performed the analyses
- Analytical techniques or methods used
- Results of analyses

4.5 Noncompliance Notification

If Northwest is unable to comply with any of the terms and conditions of the National Pollutant Discharge Elimination System permit, the following steps shall be taken:

- Immediately take action to stop, contain, and clean up unauthorized discharges or otherwise stop the noncompliance, correct the problem, and, if applicable, immediately repeat sampling and analysis of the noncompliant activity.
- Immediately notify Ecology of the failure to comply. After immediate notification, Northwest shall submit a detailed, written noncompliance report to Ecology within 5 days after becoming aware of the violation. The report shall contain a description of the noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue, and the steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
- Northwest shall document the follow-up monitoring triggered by noncompliance. Frequency of follow-up monitoring is once per day for each violated parameter until three consecutive daily samples show the discharge(s) is back in compliance. These monitoring results shall be reported on the monthly DMRs.

4.6 Laboratory Analyses

Prior to construction, Northwest will select a laboratory properly certified with the State of Washington to perform analyses of water quality samples.

If it is determined that sampling for TPH is necessary (as determined by a visible sheen on the water), bottles provided by the laboratory must be used to collect the samples. A supply of bottles should be obtained from the laboratory and kept onsite so that they are readily available if it is determined that sampling for TPH must be conducted. Chain-of-custody forms will be supplied by the laboratory and must be used. The sample bottles may have preservative in them and care should taken to not spill the preservative when collecting the sample. Once the sample is collected, it should be driven or shipped overnight to the laboratory.

SECTION 5

Waterbody Crossings

5.1 Crossing Methods

The WEP crosses many waterbodies, which vary in class. Intermittent waterbodies will be crossed within the Washington Department of Fish and Wildlife-recommended window for using flume or dam-and-pump methods if water is present at the time of construction. Waterbodies that are dry at the time of construction will be crossed by open-cut methods.

5.2 Monitoring and Sampling

During in-water construction, visual monitoring (inspections) of both the work area and the areas upstream and downstream of the work area will be conducted during and periodically between sampling efforts for turbidity. Inspections of these areas will occur during work activity and hourly throughout all in-water construction activity.

Samples for turbidity will be collected at each in-water construction location, including all waterbodies crossed by trenching with use of a flume or dam-and-pump methods. Sampling will occur every 2 hours throughout the first day of in-water construction activity at each location of such work. Subsequent sampling is dependent upon monitoring results, but will be a minimum of three times per day during in-water activity if no exceedances are detected. Sampling and visual monitoring will increase if turbidity exceedances are observed or measured to be above the temporary mixing zone criteria provided below.

For waterbodies flowing 10 cubic feet per second (cfs) or less at the time of construction (small waterbodies), the point of compliance will be 100 feet downstream of the in-stream activities. Samples will be taken at the following locations:

1. At a site just upstream of the work area to determine background water quality
2. At a site half the distance (50 feet downstream) between the activity and the point of compliance (100 feet downstream) to provide a margin of safety to protect water quality
3. At the point of compliance 100 feet downstream of the in-stream activities

For waterbodies flowing between 10 cfs and 100 cfs at the time of construction (medium-sized waterbodies), the point of compliance will be 200 feet downstream of the in-stream activities. Samples will be taken at the following locations:

1. At a site just upstream of the work area to determine background water quality
2. At a site half the distance (100 feet downstream) between the activity and the point of compliance (200 feet downstream) to provide a margin of safety to protect water quality
3. At the point of compliance 200 feet downstream of the in-stream activities

For sampling sites that must deviate from those designated above, Northwest will identify the reason for the deviation and propose an alternative sample location.

Turbidity will be measured using a turbidimeter properly calibrated according to the operator's manual.

The effluent limitation for turbidity is 25 NTU at the point where stormwater is discharged from the site or nor more than 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU. If water quality sampling at half the distance between the activity and the point of compliance downstream of the activity indicates that the turbidity plume compared to the background turbidity exceeds the 5 NTU or 10 percent increase, Northwest will reduce or eliminate the rate of activity immediately until turbidity at half the distance between the activity and the point of compliance downstream is within the turbidity criteria. After such an event, Northwest will assess the

efficacy of the site best management practices and update or improve the best management practices used at the work site in an effort to reduce or prevent recurrence of the turbidity exceedance in the waterbody (state waters).

5.3 Reporting

The first monitoring period begins on the effective date of the permit. Monitoring results shall be submitted to Ecology monthly. Monitoring data obtained during each monitoring period shall be summarized, reported, and submitted on the DMR forms. DMR forms shall be received electronically through Ecology's WebDMR program (http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html) no later than the 15th day of the month following the completed monitoring period.

If Northwest is unable to submit electronically (for example, those who do not have an internet connection) must contact Ecology to request a waiver and obtain instructions on how to obtain a paper copy DMR at:

Department of Ecology
Water Quality Program
Attn: Stormwater Compliance Specialist
P.O. Box 47696
Olympia, WA 98504-7696

If Northwest obtains a waiver not to use WebDMR, it must use the forms provided to them by Ecology; submittals must be mailed to the address above.

DMRs must be submitted monthly whether or not the WEP was discharging. If there was no discharge during a given monitoring period, Northwest will submit the form as required, with the words "No discharge" entered in the place of monitoring results. For outfalls that had discharges during a given monitoring period, detailed DMR forms for each associated discharging outfall must be submitted.

5.4 Records Retention

Monitoring and sampling reports will be retained as part of this Water Quality Monitoring Plan.

5.5 Noncompliance Notification

If the results of visual inspections or turbidity monitoring/sampling exceed the 250 NTU phone reporting level value at the point of discharge, Northwest will immediately telephone the Ecology Northwest or Southwest Region's Environmental Report Tracking System within 24 hours. Northwest will immediately take action to prevent the discharge/pollution, or otherwise stop or correct the noncompliance, and, if applicable, repeat sampling and analysis of any noncompliance immediately and submit the results to Ecology within five (5) days of becoming aware of the violation.

Northwest will provide Ecology with the following information:

1. A description of the nature and cause of noncompliance, including the quantity and quality of any unauthorized discharges
2. The period of noncompliance, including exact dates, durations, and times and/or the anticipated time when Northwest will return to compliance
3. The steps taken, or to be taken, to reduce, eliminate, and prevent recurrence of the noncompliance

Reports summarizing the scope of inspections, the personnel conducting the inspections, the results of turbidity sampling (both visual and physical), the dates of the inspections and/or sample events, and actions taken as a result of the inspections or monitoring results will be prepared and submitted to Ecology bi-weekly (every other week).

SECTION 6

Hydrostatic Test Water

6.1 Monitoring and Sampling

Northwest plans to discharge hydrostatic test water within several test segments and waterbodies along the right-of-way. All hydrostatic test water will be discharged to a discharge structure (straw bale containment structure) and at no time is the water allowed to flow into rivers, streams, lakes, ponds, wetlands, or other surface waterbodies (other than as minor seepage after the discharge has been treated through the straw bale containment structure). Any minor seepage shall not result in erosion or scouring of the rivers or creeks. The volume of the discharge shall not exceed 10 percent of the river or creek flow at the time of the discharge and shall not result in a visible increase in turbidity in the receiving water. Prior to and during the discharge, whichever is applicable, monitoring shall take place for the following parameters:

- **Flow.** The volume of the discharge shall be measured in gallons (per batch).
- **TPH.** Prior to discharge, the hydrostatic test water shall be monitored for TPH. The maximum daily TPH effluent limitation for discharge of the hydrostatic test water is 10 milligrams per liter.
- **Chlorination.** Northwest shall test the source water for chlorine. If chlorine levels are at a concentration of 0.1 parts per million or less, no further testing is required. If the chlorine levels are at a concentration of greater than 0.1 parts per million, Northwest shall ensure that all discharges occur to the land surface for infiltration.
- **pH.** Monitoring for pH is only required if engineered soils are used in the catchment where the water is being discharged. If engineered soils are used, monitoring (a grab sample) shall be conducted for pH (per batch). The effluent limitation for discharges to groundwater for pH is in the range of 6.5 to 8.5 standard units. (pH monitoring is not expected to be necessary.)
- **Oily sheen**. The hydrostatic test water and the water in the discharge structure shall be visually inspected (per batch) for an oily sheen.
- **Diesel range petroleum hydrocarbons, or heavy oils**. Northwest shall inspect the soils after infiltration is complete and if there is a visible layer of petroleum hydrocarbons on the soils, composite soil samples shall be collected from a depth of 0 to 12 inches at an area where a layer of petroleum hydrocarbons is observed. The effluent limitation for diesel range petroleum hydrocarbons or heavy oils is 2,000 milligrams per kilogram.

6.2 Reporting

Reporting requirements are the same as described in Section 5.2, Monitoring and Sampling, of this plan.

6.3 Records Retention

Records of all monitoring information (site log book, inspection reports/checklists, etc.), this Stormwater Pollution Prevention Plan, and any other documentation of compliance with permit requirements will be retained during the life of the construction project and for a minimum of three years following the termination of permit coverage in accordance with permit condition S5.C of the Construction Stormwater General Permit.

6.4 Recording of Results

For each measurement or sample taken, Northwest shall record the following information:

- Date, exact place, method, and time of sampling or measurement
- Individual who performed the sampling or measurement

- Dates the analyses were performed
- Individual who performed the analyses
- Analytical techniques or methods used
- Results of analyses

6.5 Noncompliance Notification

Noncompliance notification is the same as described in Section 5.5, Noncompliance Notification, of this plan.

6.6 Laboratory Analyses

Prior to construction, Northwest will select a laboratory properly certified with the State of Washington to perform analyses of water quality samples. Prior to release of the hydrostatic test water, the water in the pipe shall be sampled for TPH. Bottles from the laboratory must be used to collect the sample. A supply of bottles should be obtained from the laboratory and kept onsite so that they are readily available prior to the discharge. Chain-of-custody forms will be supplied by the laboratory and must be used. The sample bottles may have preservative in them and care should be taken to not spill the preservative when collecting the sample. Once the sample is collected, it should be driven or shipped overnight to the laboratory. The water should not be discharged from the pipe to the discharge structure until the results of the analysis are known.

If, after all the water has infiltrated to the ground, there is a visible layer of oil on the soil, a composite sample of the soil shall be obtained and sent to the laboratory for analysis.

Attachment 1
Waterbodies Crossed by Washington Expansion Project

Table contained in Appendix K1

APPENDIX J4

HORIZONTAL DIRECTIONAL DRILLING MONITORING AND CONTINGENCY PLAN

Horizontal Directional Drilling Monitoring and Contingency Plan

This horizontal directional drilling (HDD) monitoring and contingency plan provides specific preventative and mitigative measures to be used by Northwest Pipeline GP (Northwest) and its contractors during HDD installation. This is a preliminary plan, and specific procedures will be developed during final design for each location based on site-specific conditions. HDD operations potentially pose a risk to wetlands and waterbodies through an inadvertent release of drilling fluid. An inadvertent release occurs when the drilling fluid seeps through fractured overburden soil and finds a path to the ground surface. Drilling fluid typically consists of a mixture of bentonite, water, and soil cuttings. This mixture is not hazardous or toxic, but it could affect the water quality of any waterbody if introduced.

Inadvertent release can occur at any place along any point of an HDD installation, although they are more likely to be observed at the entry and exit points (locations where the drilling bit or head is shallow). If an inadvertent release occurs and no control measures are in place, the drilling fluid could potentially reach the surface water or wetland that is above the HDD installation. The contingency plan detailed in the following subsections will outline measures to minimize the potential for an inadvertent release. This plan also addresses the methodology that will be used to detect inadvertent releases, as well as countermeasures to be taken should an inadvertent release be detected.

Planning and Prevention

HDD crossings will be conducted only during recommended in-water work periods to minimize impacts from a potential inadvertent release. Northwest will use nontoxic bentonite-clay mixtures of drilling mud to assure that, if an inadvertent release occurs, it will not result in toxicity to aquatic life in the stream.

The contractor performing the HDD must have experienced personnel onsite who are familiar and experienced with the procedures for this type of installation. Before drilling activities begin, the contractor must submit any certifications and documentation of at least 2 years of experience for all personnel who will be performing drilling work. The Environmental Inspector must inspect all HDD activities with additional oversight from a utility inspector when available. Before any HDD occurs, a safety meeting will take place, the inadvertent release contingency plan will be discussed, and any questions will be answered.

From the day-to-day maintenance routine, the drilling personnel will be aware of what materials are critical during an inadvertent release and assure that these items are on hand. Because drilling fluid seepage resulting from an inadvertent release can be easily controlled on land where it has the greatest potential to occur, containment items such as lumber for temporary day operation and shoring, sand, portable pumps, hand tools, silt fence, and hay bales will be stored at the drilling sites. The drilling contractor will also have heavy equipment such as backhoes that can be used to control and clean up drilling fluid seepage.

Before drilling, the work area(s) will be flagged and the limits defined. Erosion and sediment controls (including silt fence, straw wattles, and temporary sediment trap) will be installed at the entrance and exit pits as needed to control surface erosion or migration of drilling fluid. Additional materials will be kept onsite at a designated location, and the presence of these materials will be verified in advance of any drilling activities. These materials will be placed in a dedicated location and denoted as the inadvertent release containment response kit. The kit will contain the following items:

- Silt fence
- Straw wattles
- Silt curtain (in-water work)
- Straw bales
- Submersible pumps

- Specialized filters
- Generator
- Appropriate hand tools
- Vacuum truck (available on call)
- Light towers for work at night
- Heavy equipment, such as backhoe or dozer, for containment and cleanup of drilling mud
- Boat for major waterbody crossings to allow for monitoring of releases to water

Inadvertent Release Monitoring

Once HDD begins, monitoring will be performed to determine whether an inadvertent release could occur. The bentonite mixture will be adjusted to match the conditions of the subsurface. The pressure levels will be set as low as possible, and the levels will be closely monitored to verify that the pressure on the drilling fluid is set to match the formation. The pressure should not exceed what is needed to penetrate the formation.

HDD is a technically advanced process involving skilled operators. The detection of an inadvertent release before it occurs is highly dependent on the skills and experience of the drilling crew. Each drilling situation is unique in that the behavior of the subsurface material is variable and difficult to predict. In-hole monitoring equipment for detecting an inadvertent release is not available. Detection of an inadvertent release relies on the proper interpretation of site-specific conditions with the potential to cause an inadvertent release. For this reason, Northwest will use firms that specialize in HDD to perform the HDD crossings. The selection and supervision of this drilling contractor will be the responsibility of Northwest.

An inadvertent release occurs when pressure in the hole is no longer maintained. The most obvious signs of an inadvertent release are surface seepage or loss of circulation of the drilling fluid. One of the functions of the drilling fluid is to seal the hole to maintain the downhole pressure. During drilling, the pressure will be closely watched and randomly checked by the Environmental Inspector (EI) or utility inspector. As the boring progresses, the pressure will be inspected and documented. Any drop in the pressure could indicate a potential inadvertent release, and drilling will be halted at the discretion of the EI. However, some loss of drilling fluid is also normal in the drilling process. During the drilling process, loose sand, gravel layer, or rock fracture could be encountered. These occurrences will require additional drilling fluids to fill in the voids. Consequently, drilling fluid loss in and of itself is not an indication of an inadvertent release. The loss of drilling fluid in combination with other factors may indicate a potential inadvertent release. For example, if there is a loss of drilling fluid and the return cuttings do not show a large quantity of gravel, then a loss of containment pressure within the hole may have occurred.

Inadvertent Release Response

Should the results of the monitoring indicate that an inadvertent release has occurred, the drilling will be stopped immediately and corrective actions implemented. The only pressure causing the inadvertent release to occur is the pressure from the drilling fluid pumps. Therefore, the most direct corrective action is to stop the drilling fluid pumps. By stopping the pumps, the pressure in the hole will quickly bleed off. With no pressure in the hole, the inadvertent release will stop. As soon as surface seepage is detected, the pumps will be stopped temporarily until the response process has contained the release. Once the cleanup process has contained the release, drilling activities will immediately resume while monitoring the pressure to prevent additional inadvertent release.

If an inadvertent release occurs in the waterbody, there may be a visible plume. Minor seepage may be difficult to detect owing to the turbidity of the waterbodies and the high specific gravity of bentonite clay drilling fluid. Only minimal pressure will occur to disturb sediments because of the distance that the drilling fluid must travel to reach the surface. The composition of the drilling fluid is primarily water and bentonite clay. If a small amount is released into the creek, the currents will quickly dissipate the inadvertent release. If seepage is detected in the creek, the drilling activities will continue, but corrective measures, if any, will be taken to try to minimize the seepage. If an inadvertent seepage does occur in the waterbody, it will be monitored and documented, but drilling activities will not be suspended unless returns create a threat to public health and safety. Additionally, no cleanup work in the waterbodies is proposed in response to a minor inadvertent release.

There is greater potential for an inadvertent release at the entry and exit locations. In the contingency planning for the HDD crossings, drilling fluid seepage at the entry and exit locations has been considered, and preventive actions have been developed. The entry and exit locations on all HDD crossings have dry land segments where drilling fluid seepage can be easily detected and contained. To isolate and contain potential drilling fluid seepage at each of the drill sites, a berm can be built around the entire drilling site area. Hay bales or silt screen can also be part of the berm on the water side of the drilling area. To contain and control drilling fluid seepage on the land area, earth-moving equipment such as backhoes or small bulldozers, portable pumps, sand, silt fences, and hay bales will be available at each of the drilling sites. Any drilling fluid seepage will first be contained and isolated using dirt berms, hay bales, or silt screens. The seepage will then be immediately cleaned up from the area and hauled or pumped to one of the storage pits at the closest drilling site.

After the drilling fluid seepage has been contained, the drilling contractor and Northwest will make every effort to determine why the seepage occurred. Once Northwest has determined the cause of the seepage, measures will be developed to control the factors causing the seepage and to minimize the chance of recurrence. Developing the corrective measure will be a joint effort of Northwest and the drilling contractor and will be site and problem specific.

In some cases, the corrective measure may involve a determination that the existing hole encountered a void, which could be bypassed with a slight change in the profile. In other cases, it may be determined that the existing hole encountered a zone of unsatisfactory soil material and the hole may have to be abandoned. If the hole is abandoned, it will be filled with cuttings and drilling fluid.

Inadvertent Release Notifications

In the event of an HDD drilling fluid release to waterbodies, sensitive areas, or riparian areas, appropriate local, state, and federal agencies will be notified. All appropriate agencies will be notified of the inadvertent release within 24 hours. Table 1 lists the agencies that will be notified. The following information will be provided to agencies:

- Time of inadvertent release
- Location of release
- Quantity and type of material released and amount of recovered materials
- Containment and cleanup measures
- Location of sensitive areas near the release

TABLE 1
Agency Contact List in the Event of an Inadvertent Release

Agency	Contact Person	Position	Location	Contact Number
Washington Department of Natural Resources	TBD	Forest Practices Division Manager		
U.S. Army Corps of Engineers	TBD	Project Manager		
Washington Department of Fish and Wildlife	TBD	Regional Manager(s)		
U.S. Environmental Protection Agency	Contacted by the National Response Hotline			
U.S. Fish and Wildlife Service	TBD	Branch Manager		

Abandonment and Contingency

A borehole will need to be abandoned if an inadvertent release cannot be avoided, or if an inadvertent release has occurred that cannot be controlled. The borehole will be completely abandoned and a new location determined. Any borehole abandonment locations will be documented and shown on any as-built documents.

If corrective actions do not prevent or control unacceptable releases of drilling fluid, Northwest may opt to redrill the hole along a different alignment. The HDD borehole will not simply be abandoned completely if difficulties are encountered during drilling or reaming of the borehole, or during pipe pullback operations. In fact, complete abandonment of an HDD borehole rarely occurs within the industry. Before abandoning a borehole, the HDD contractor will implement remedial measures to attempt to resolve the problems without the need for abandonment of the borehole. However, if problems with the borehole or section of the borehole cannot be resolved, the affected section of the borehole will be filled with grout, consisting of nontoxic, nonhazardous materials, to preclude communication between nearby boreholes. The following procedures will be implemented to abandon the drill hole:

- To seal the abandoned drill hole, thickened drilling fluid will be pumped into the hole as the drill assembly is extracted, and plugs will be used to create a cap.
- Closer to the surface at drilling locations (within approximately 10 feet of the HDD entrance), a soil cap will be installed by filling the borehole with soil extracted during construction of the pit and berms.
- The borehole entry location for HDD segments will be graded and seeded by the contractor to its original grade and condition after the drill hole has been abandoned.
- The contractor will drill a second pilot hole beginning near the initial entry point along a track that parallels the initial borehole.

A root cause analysis of the failed HDD will be conducted to minimize the risk of subsequent failure. The root cause analysis will guide the development of potential alternatives for the drilling plan. Depending on the cause of a failure, it would be preferable to continue to use the partially drilled pilot hole already underway, and simply redirect the drilling deeper or laterally around the cause of the failure, if possible, rather than initiate a secondary pilot hole.

If the cause(s) of the failure indicate that a completely new, “secondary” pilot hole is necessary, the separation distance required will depend entirely on the cause of the failure. Northwest anticipates that only the drill alignment between the original entry point and exit point will be adjusted deeper or laterally such that no additional work areas will be required. Before the initiation of a completely new “secondary” pilot hole, a modification request would be provided to the appropriate agencies.

APPENDIX K

WEP SOILS, WETLANDS, AND WATER RESOURCES INFORMATION

Appendix K1: Waterbodies and Wetlands Crossed by WEP

Appendix K2: Potential Landslide Hazard Areas Crossed by WEP

Appendix K3: Private Wells within 200 Feet of Workspace

Appendix K4: Site-specific Waterbody and Wetland Crossing Plans

Appendix K5: Fish and Waterbody Tables

APPENDIX K1

WATERBODIES AND WETLANDS CROSSED BY THE WEP

Table K1-1:

Waterbodies Crossed by the WEP

Name	Waterbody Identification	Milepost	U.S. Geological Survey Hydrologic Unit Code	Water Resource Inventory Area	Flow Type	Stream Width (ft)	FERC Class	Washington Department of Ecology Designated Use				DNR Stream Type[a]	DNR Aquatic Land (Y/N)	Proposed Crossing Method	Loop Number
								Aquatic (Y/N)	Recreational (Y/N)	Water Supply (Y/N)	Misc. (Y/N)				
Unnamed	S1_LO1_054	1244.30	17080002	WRIA 27 Lewis	Ephemeral	2	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_056	1245.25	17080002	WRIA 27 Lewis	Ephemeral	1	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1
Burris Creek	S3_LO1_048	1245.41	17080002	WRIA 27 Lewis	Intermittent	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_049	1246.26	17080005	WRIA 26 Cowlitz	Intermittent	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_002	1246.91	17080003	WRIA 27 Lewis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_003	1247.03	17080003	WRIA 27 Lewis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Canyon Creek	S1_LO1_004	1247.22	17080003	WRIA 27 Lewis	Intermittent	10	Intermediate	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_005	1247.48	17080003	WRIA 27 Lewis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_006	1247.69	17080003	WRIA 27 Lewis	Perennial	9	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1
Mill Creek	S1_LO1_007	1248.01	17080003	WRIA 27 Lewis	Perennial	7	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_008	1248.17	17080003	WRIA 27 Lewis	Perennial	12	Intermediate	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_009	1248.26	17080003	WRIA 27 Lewis	Perennial	5	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_011	1248.35	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_001	1249.52	17080003	WRIA 27 Lewis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_002	1249.60	17080003	WRIA 27 Lewis	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_003	1249.64	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_004	1249.73	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_006	1250.10	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_007	1250.17	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_008	1250.44	17080003	WRIA 27 Lewis	Perennial	6	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_009	1250.56	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_010	1250.82	17080003	WRIA 27 Lewis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_007	1251.15	17080003	WRIA 27 Lewis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Cedar Creek	S3_LO1_001	1251.41	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Cedar Creek	S3_LO1_003	1251.42	17080003	WRIA 27 Lewis	Intermittent	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_004	1251.92	17080003	WRIA 27 Lewis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_009	1252.73	17080003	WRIA 27 Lewis	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Kalama River	S3_LO1_012	1253.39	17080003	WRIA 27 Lewis	Perennial	238	Major	Y	Y	Y	Y	S	Y	Aerial Span	Loop 1
Unnamed	S1_LO1_013	1254.08	17080003	WRIA 27 Lewis	Perennial	5	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_014	1254.13	17080003	WRIA 27 Lewis	Perennial	9	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_010	1254.28	17080003	WRIA 27 Lewis	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_015	1254.39	17080003	WRIA 27 Lewis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_016	1255.20	17080003	WRIA 26 Cowlitz	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_015	1255.40	17080003	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_014	1255.53	17080003	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_011	1255.86	17080003	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_012	1256.24	17080003	WRIA 26 Cowlitz	Perennial	3	Minor	Y	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_013	1256.42	17080003	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Owl Creek	S1_LO1_019	1257.08	17080003	WRIA 26 Cowlitz	Perennial	15	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_020	1257.28	17080003	WRIA 26 Cowlitz	Ephemeral	9	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_022	1257.64	17080003	WRIA 26 Cowlitz	Perennial	8	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_023	1257.66	17080003	WRIA 26 Cowlitz	Intermittent	13	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_018	1257.85	17080003	WRIA 26 Cowlitz	Ephemeral	2	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_019	1257.90	17080003	WRIA 26 Cowlitz	Intermittent	2	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_020	1258.00	17080005	WRIA 26 Cowlitz	Ephemeral	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_024	1258.59	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_016	1259.27	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_017	1259.47	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_018	1259.64	17080005	WRIA 26 Cowlitz	Perennial	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_019	1259.92	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_020	1260.24	17080005	WRIA 26 Cowlitz	Intermittent	1	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 1
Coweeman River	S2_LO1_022	1260.49	17080005	WRIA 26 Cowlitz	Perennial	80	Intermediate	N	N	N	N	S	Y	Dry Open Cut	Loop 1
Unnamed	S2_LO1_023	1260.77	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_024	1260.83	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_025	1261.27	17080005	WRIA 26 Cowlitz	Intermittent	8	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_024	1261.33	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_021	1261.71	17080005	WRIA 26 Cowlitz	Ephemeral	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_023	1261.98	17080005	WRIA 26 Cowlitz	Perennial	6	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_025	1262.66	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_029	1262.94	17080005	WRIA 26 Cowlitz	Perennial	7	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_031	1263.17	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_038	1263.49	17080005	WRIA 26 Cowlitz	Perennial	7	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_039	1263.53	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_040	1263.77	17080005	WRIA 26 Cowlitz	Perennial	11	Intermediate	N	N	N	N	N	N	Dry Open Cut	Loop 1

Table K1-1:

Waterbodies Crossed by the WEP

Name	Waterbody Identification	Milepost	U.S. Geological Survey Hydrologic Unit Code	Water Resource Inventory Area	Flow Type	Stream Width (ft)	FERC Class	Washington Department of Ecology Designated Use				DNR Stream Type[a]	DNR Aquatic Land (Y/N)	Proposed Crossing Method	Loop Number
								Aquatic (Y/N)	Recreational (Y/N)	Water Supply (Y/N)	Misc. (Y/N)				
Unnamed	S1_LO1_042	1263.81	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_025	1264.13	17080005	WRIA 53 Cowlitz	Ephemeral	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
South Fork Ostrander Creek	S2_LO1_021	1264.91	17080005	WRIA 26 Cowlitz	Perennial	20	Intermediate	Y	Y	Y	Y	S	N	Dry Open Cut	Loop 1
Unnamed	SP_LO1_001	1265.12	17080005	WRIA 26 Cowlitz	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Ostrander Creek	S1_LO1_057	1265.25	17080005	WRIA 26 Cowlitz	Perennial	40	Intermediate	Y	Y	Y	Y	S	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_058	1265.93	17080005	WRIA 26 Cowlitz	Intermittent	6	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_045	1266.50	17080005	WRIA 26 Cowlitz	Perennial	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_048	1266.75	17080005	WRIA 26 Cowlitz	Intermittent	2	Minor	N	N	N	N	N	N	Span	Loop 1
Unnamed	S2_LO1_051	1267.04	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_054	1267.37	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_026	1267.63	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_027	1267.91	17080005	WRIA 26 Cowlitz	Intermittent	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_028	1267.97	17080005	WRIA 26 Cowlitz	Intermittent	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_029	1268.35	17080005	WRIA 26 Cowlitz	Intermittent	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_030	1268.56 and 1268.63	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Coal Mine Creek	S1_LO1_032	1269.36	17080005	WRIA 26 Cowlitz	Perennial	20	Intermediate	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_034	1269.83	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_035	1269.89	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_027	1270.66	17080005	WRIA 26 Cowlitz	Intermittent	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_028	1270.87	17080005	WRIA 26 Cowlitz	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_029	1271.10	17080005	WRIA 26 Cowlitz	Intermittent	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_035	1271.41	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_036	1271.89	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_038	1272.12	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	Y	N	N	N	N	N	Dry Open Cut	Loop 1
Salmon Creek	S3_LO1_039	1272.23	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	Y	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_040	1272.42	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_033	1273.11	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_032	1273.13	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_014	1273.58	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	Y	Y	Y	Y	U	N	Dry Open Cut	Loop 1
Toutle River	S3_LO1_013	1274.42	17080005	WRIA 26 Cowlitz	Perennial	415	Major	Y	Y	Y	Y	S	Y	Wet Open Cut	Loop 1
Unnamed	S3_LO1_041	1275.69	17080005	WRIA 26 Cowlitz	Intermittent	4	Minor	Y	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S4_LO1_003	1275.88	17080005	WRIA 26 Cowlitz	Intermittent	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S4_LO1_002	1276.08 and 1276.18	17080005	WRIA 26 Cowlitz	Ephemeral	2	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_062	1277.77	17080005	WRIA 26 Cowlitz	Perennial	7	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_061	1277.81	17080005	WRIA 26 Cowlitz	Perennial	15	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_060	1278.12	17080005	WRIA 26 Cowlitz	Intermittent	5	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_055	1278.82	17080005	WRIA 26 Cowlitz	Perennial	11	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Hill Creek	S2_LO1_056	1279.17	17080005	WRIA 26 Cowlitz	Perennial	10	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S4_LO1_004	1279.33	17080005	WRIA 26 Cowlitz	Ephemeral	6	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S4_LO1_005	1279.72	17080005	WRIA 26 Cowlitz	Intermittent	2	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S4_LO1_006	1280.07 and 1280.24	17080005	WRIA 26 Cowlitz	Intermittent	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S4_LO1_007	1280.28	17080005	WRIA 26 Cowlitz	Intermittent	6	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Roadside ditch	S4_LO1_008	1280.32	17080005	WRIA 26 Cowlitz	Ephemeral	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Foster Creek	S1_LO1_046	1280.82	17080005	WRIA 26 Cowlitz	Perennial	30	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_034	1281.52	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_035	1281.69	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1
Cowlitz River	S2_LO1_036	1282.51	17080005	WRIA 26 Cowlitz	Perennial	280	Major	Y	Y	Y	Y	S	Y	HDD	Loop 1
Unnamed	S3_LO1_047	1282.65	17080005	WRIA 26 Cowlitz	Perennial	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_043	1283.37	17080005	WRIA 26 Cowlitz	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_047	1283.74	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_048	1284.56	17080005	WRIA 26 Cowlitz	Perennial	20	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_049	1284.78	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_050	1284.92	17080005	WRIA 26 Cowlitz	Intermittent	12	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Lacamas Creek	S2_LO1_038	1285.35	17080005	WRIA 26 Cowlitz	Perennial	7	Minor	N	N	N	N	S	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_039	1285.43	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	X	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_037	1286.17	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S3_LO1_046	1286.77	17080005	WRIA 26 Cowlitz	Perennial	3	Minor	N	N	N	N	X	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_051	1287.51	17080005	WRIA 26 Cowlitz	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S1_LO1_052	1287.90	17080005	WRIA 26 Cowlitz	Intermittent	9	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_040	1288.11	17080005	WRIA 26 Cowlitz	Intermittent	6	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1

Table K1-1:

Waterbodies Crossed by the WEP

Name	Waterbody Identification	Milepost	U.S. Geological Survey Hydrologic Unit Code	Water Resource Inventory Area	Flow Type	Stream Width (ft)	FERC Class	Washington Department of Ecology Designated Use				DNR Stream Type[a]	DNR Aquatic Land (Y/N)	Proposed Crossing Method	Loop Number
								Aquatic (Y/N)	Recreational (Y/N)	Water Supply (Y/N)	Misc. (Y/N)				
Unnamed	S2_LO1_041	1288.14	17080005	WRIA 26 Cowlitz	Ephemeral	1	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_044	1288.52	17080005	WRIA 26 Cowlitz	Perennial	10	Intermediate	N	N	N	N	N	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_043	1288.56	17080005	WRIA 26 Cowlitz	Perennial	12	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	S2_LO1_045	1288.90	17080005	WRIA 26 Cowlitz	Intermittent	1	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 1
Olequa Creek	S2_LO1_046	1289.32	17080005	WRIA 26 Cowlitz	Perennial	10	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 1
Unnamed	1291.5	1291.42	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	1292.4	1292.65	17100103	WRIA 23 Upper Chehalis	Intermittent	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	1293.1	1293.20 and 1293.26	17100103	WRIA 23 Upper Chehalis	Intermittent	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Newaukum River	1294.2	1294.13	17100103	WRIA 23 Upper Chehalis	Perennial	126	Major	N	N	N	N	S	Y	HDD	Loop 2
Unnamed	1295.1	1295.08	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	1295.4	1295.44	17100103	WRIA 23 Upper Chehalis	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	1296.1	1296.14	17100103	WRIA 23 Upper Chehalis	Perennial	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	1296.45	1296.50	17100103	WRIA 23 Upper Chehalis	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	1296.6	1296.66	17100103	WRIA 23 Upper Chehalis	Perennial	5	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Berwick Creek	1296.9	1296.78	17100103	WRIA 23 Upper Chehalis	Perennial	6	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 2
Dillenbaugh Creek	1297.6	1297.41	17100103	WRIA 23 Upper Chehalis	Perennial	8	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Unnamed	1298.0	1297.97	17100103	WRIA 23 Upper Chehalis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Salzer Creek	1299	1299.03	17100103	WRIA 23 Upper Chehalis	Perennial	7	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Unnamed	1299.95	1299.93	17100103	WRIA 23 Upper Chehalis	Perennial	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	1300.2	1300.05	17100103	WRIA 23 Upper Chehalis	Perennial	6	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Unnamed	1300.9	1300.78	17100103	WRIA 23 Upper Chehalis	Perennial	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
S. Hanaford Creek	1301.6	1301.68	17100103	WRIA 23 Upper Chehalis	Perennial	6	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Unnamed	S2_LO2_002	1303.23	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Unnamed	S2_LO2_001	1303.50	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S3_LO2_001	1304.26	17100103	WRIA 23 Upper Chehalis	Intermittent	5	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Unnamed	S3_LO2_004	1305.14	17100103	WRIA 23 Upper Chehalis	Perennial	5	Minor	Y	Y	Y	Y	U	N	Dry Open Cut	Loop 2
Packwood Creek	S3_LO2_005	1305.28	17100103	WRIA 23 Upper Chehalis	Perennial	4	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 2
Hanaford Creek	S3_LO2_006	1306.25	17100103	WRIA 23 Upper Chehalis	Perennial	5	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 2
Snyder Creek	S3_LO2_007	1306.55	17100103	WRIA 49 Upper Chehalis	Perennial	4	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_002	1307.66	17100103	WRIA 23 Upper Chehalis	Ephemeral	2	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 2
North Hanaford Creek	S4_LO2_001	1307.69	17100103	WRIA 23 Upper Chehalis	Ephemeral	2	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 2
Unnamed	S1_LO2_100	1307.94	17100103	WRIA 23 Upper Chehalis	Perennial	12	Intermediate	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 2
Unnamed	S1_LO2_101	1308.33	17100103	WRIA 23 Upper Chehalis	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Thompson Creek	S1_LO2_103	1308.97	17100103	WRIA 23 Upper Chehalis	Perennial	20	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 2
Skookumchuck River	S2_LO2_004	1309.36	17100103	WRIA 23 Upper Chehalis	Perennial	90	Intermediate	Y	Y	Y	Y	S	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_003	1310.72	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_004	1310.79	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_005	1311.07	17100103	WRIA 23 Upper Chehalis	Ephemeral	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_006	1311.19	17100103	WRIA 23 Upper Chehalis	Ephemeral	2	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_007	1311.23	17100103	WRIA 23 Upper Chehalis	Ephemeral	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_008	1311.41	17100103	WRIA 23 Upper Chehalis	Intermittent	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_009	1311.43	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S2_LO2_008	1311.65	17100103	WRIA 23 Upper Chehalis	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S2_LO2_007	1312.14	17100103	WRIA 23 Upper Chehalis	Perennial	5	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S2_LO2_005	1312.60	17100103	WRIA 23 Upper Chehalis	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S1_LO2_104	1313.05	17100103	WRIA 23 Upper Chehalis	Perennial	8	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 2
Unnamed	S2_LO2_010	1313.35	17100103	WRIA 23 Upper Chehalis	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S2_LO2_009	1313.80	17100103	WRIA 23 Upper Chehalis	Ephemeral	1	Minor	N	N	N	N	U	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_010	1314.86	17100103	WRIA 23 Upper Chehalis	Intermittent	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 2
Unnamed	S4_LO2_011	1314.96	17100103	WRIA 13 Deschutes	Intermittent	2	Minor	Y	Y	Y	Y	U	N	Dry Open Cut	Loop 2
Deschutes River	SP_LO2_001	1315.10	17100103	WRIA 13 Deschutes	Perennial	78	Intermediate	Y	Y	Y	Y	S	Y	Dry Open Cut	Loop 2
Unnamed	S1_LO3_002	1339.33	17110019	WRIA 12 Chambers - Clover	Intermittent	10	Intermediate	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 3
Tributary to Clover Creek	FL-3	1339.74 and 1339.79	17110019	WRIA 12 Chambers - Clover	Intermittent	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 3
Unnamed	S1_LO3_003	1342.22	17110014	WRIA 10 Puyallup - White	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 3
Unnamed	S1_LO3_004	1342.62	17110014	WRIA 10 Puyallup - White	Ephemeral	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 3
Unnamed	S2_LO3_002	1346.10	17110019	WRIA 12 Chambers - Clover	Intermittent	2	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 3
Unnamed	S3_LO3_004	1346.82	17110019	WRIA 12 Chambers - Clover	Perennial	2	Minor	Y	Y	Y	Y	U	N	Dry Open Cut	Loop 3

Table K1-1:

Waterbodies Crossed by the WEP

Name	Waterbody Identification	Milepost	U.S. Geological Survey Hydrologic Unit Code	Water Resource Inventory Area	Flow Type	Stream Width (ft)	FERC Class	Washington Department of Ecology Designated Use				DNR Stream Type[a]	DNR Aquatic Land (Y/N)	Proposed Crossing Method	Loop Number
								Aquatic (Y/N)	Recreational (Y/N)	Water Supply (Y/N)	Misc. (Y/N)				
Unnamed	S3_LO3_003	1346.97	17110014	WRIA 10 Puyallup - White	Perennial	2	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 3
Unnamed	S3_LO3_002	1347.92	17110014	WRIA 10 Puyallup - White	Perennial	3	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 3
Puyallup River	S3_LO3_001	1347.98	17110014	WRIA 10 Puyallup - White	Perennial	191	Major	Y	Y	Y	Y	S	Y	Trenchless	Loop 3
Unnamed Agricultural Ditch	S4_LO3_101	1349.23 and 1349.27	17110014	WRIA 10 Puyallup - White	Intermittent	19	Intermediate	N	N	N	N	N	N	Dry Open Cut	Loop 3
Roadside ditch	S4_LO3_102	1349.31	17110014	WRIA 10 Puyallup - White	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 3
Salmon Creek	S1_LO3_005	1349.99	17110014	WRIA 10 Puyallup - White	Perennial	12	Intermediate	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 3
Unnamed	S1_LO3_006	1350.05	17110014	WRIA 10 Puyallup - White	Perennial	3	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 3
Unnamed	S1_LO4_001	1357.14	17110013	WRIA 9 Duwamish - Green	Perennial	20	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 4
Unnamed	S1_LO4_002	1357.17	17110013	WRIA 9 Duwamish - Green	Perennial	6	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 4
Unnamed	S1_LO4_003	1357.31	17110013	WRIA 9 Duwamish - Green	Perennial	8	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 4
Covington Creek	S3_LO4_001	1359.62	17110013	WRIA 9 Duwamish - Green	Perennial	25	Intermediate	N	N	N	N	S	N	Span	Loop 4
Unnamed	S4_LO4_001	1360.98	17110013	WRIA 9 Duwamish - Green	Perennial	14	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 4
Unnamed	S4_LO4_002	1361.48	17110013	WRIA 9 Duwamish - Green	Intermittent	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 4
Cranmar Creek	S1_LO4_004	1362.66	17110013	WRIA 9 Duwamish - Green	Perennial	14	Intermediate	N	N	N	N	F	N	Trenchless	Loop 4
Issaquah Creek	S1_LO5_001	1371.05	17110012	WRIA 8 Cedar - Sammamish	Perennial	30	Intermediate	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 5
Unnamed	S3_LO5_003	1371.51	17110012	WRIA 8 Cedar - Sammamish	Perennial	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 5
Unnamed	S1_LO5_005	1371.73	17110012	WRIA 8 Cedar - Sammamish	Perennial	12	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 5
Fifteenmile Creek	S2_LO5_006	1371.96	17110012	WRIA 8 Cedar - Sammamish	Perennial	21	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 5
Unnamed	S2_LO5_005	1372.35	17110012	WRIA 8 Cedar - Sammamish	Perennial	5	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 5
Unnamed	S2_LO5_002	1372.60	17110012	WRIA 8 Cedar - Sammamish	Perennial	6	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 5
Unnamed	S2_LO5_001	1372.69	17110012	WRIA 8 Cedar - Sammamish	Perennial	4	Minor	Y	Y	Y	Y	U	N	Dry Open Cut	Loop 5
Unnamed	S4_LO5_002	1373.66	17110012	WRIA 8 Cedar - Sammamish	Perennial	10	Intermediate	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 5
Unnamed	S2_LO5_010	1374.25	17110012	WRIA 8 Cedar - Sammamish	Perennial	5	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 5
Unnamed	S2_LO5_009	1374.57	17110012	WRIA 8 Cedar - Sammamish	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 5
Unnamed	S2_LO5_007	1374.92	17110012	WRIA 8 Cedar - Sammamish	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 5
Unnamed	S3_LO5_007	1375.88	17110012	WRIA 8 Cedar - Sammamish	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 5
East Fork Issaquah Creek	S2_LO5_004	1376.12	17110012	WRIA 8 Cedar - Sammamish	Perennial	16	Intermediate	Y	Y	Y	Y	F	N	Span	Loop 5
Unnamed	S2_LO5_003	1376.21	17110012	WRIA 8 Cedar - Sammamish	Intermittent	6	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 5
North Fork Issaquah Creek	S3_LO5_004	1377.34	17110012	WRIA 8 Cedar - Sammamish	Perennial	4	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 5
Unnamed	S3_LO5_005	1378.08	17110012	WRIA 8 Cedar - Sammamish	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 5
Unnamed	S1_LO5_002	1379.62	17110012	WRIA 8 Cedar - Sammamish	Intermittent	20	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 5

Table K1-1:

Waterbodies Crossed by the WEP

Name	Waterbody Identification	Milepost	U.S. Geological Survey Hydrologic Unit Code	Water Resource Inventory Area	Flow Type	Stream Width (ft)	FERC Class	Washington Department of Ecology Designated Use				DNR Stream Type[a]	DNR Aquatic Land (Y/N)	Proposed Crossing Method	Loop Number
								Aquatic (Y/N)	Recreational (Y/N)	Water Supply (Y/N)	Misc. (Y/N)				
Tributary to Lake Sammamish	SN-45	1381.25	17110012	WRIA 8 Cedar - Sammamish	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 5
George Davis Creek	SP_LO5_001	1381.31	17110012	WRIA 8 Cedar - Sammamish	Perennial	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 5
Unnamed	S4_LO6_002	1395.98	17110011	WRIA 7 Snohomish	Ephemeral	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 6
Unnamed	S4_LO6_005	1396.59	17110011	WRIA 7 Snohomish	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 6
Elliott Creek	S4_LO6_003	1396.71	17110011	WRIA 7 Snohomish	Perennial	10	Intermediate	N	N	N	N	F	N	Span	Loop 6
Unnamed	S4_LO6_101	1397.36 and 1397.52	17110011	WRIA 7 Snohomish	Perennial	5	Minor	Y	N	N	N	F	N	Dry Open Cut	Loop 6
Snohomish River	S4_LO6_004	1397.56	17110011	WRIA 7 Snohomish	Perennial	900	Major	Y	Y	Y	Y	S	Y	Trenchless	Loop 6
Unnamed	S1_LO6_002	1398.19	17110011	WRIA 7 Snohomish	Intermittent	4	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 6
Unnamed	S1_LO6_003	1398.62	17110011	WRIA 7 Snohomish	Perennial	8	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 6
Unnamed	S1_LO6_004	1399.44	17110011	WRIA 7 Snohomish	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 6
Unnamed	S1_LO6_005	1399.67	17110011	WRIA 7 Snohomish	Perennial	12	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 6
Unnamed	S2_LO6_001	1400.46	17110011	WRIA 7 Snohomish	Perennial	11	Intermediate	N	N	N	N	N	N	Dry Open Cut	Loop 6
Unnamed	S2_LO6_002	1401.53	17110011	WRIA 7 Snohomish	Perennial	8	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 6
French Creek	S3_LO6_001	1402.42	17110011	WRIA 7 Snohomish	Perennial	10	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 6
Unnamed	S1_LO6_008	1404.64	17110011	WRIA 7 Snohomish	Intermittent	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 6
Unnamed	S1_LO6_007	1405.39	17110011	WRIA 7 Snohomish	Perennial	6	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 6
Pilchuck River	S3_LO6_002	1407.81	17110011	WRIA 7 Snohomish	Perennial	82	Intermediate	Y	Y	Y	Y	S	Y	Dry Open Cut	Loop 6
Tributary to Walker Creek	MV-25	1439.07	17110007	WRIA 3 - Lower Skagit - Samish	Perennial	6	Minor	F	N	N	N	F	N	Dry Open Cut	Loop 7
Unnamed	S4_LO8_008	1440.25 and 1440.27	17110007	WRIA 3 Lower Skagit - Samish	Intermittent	4	Minor	N	N	N	N	S	N	Dry Open Cut	Loop 8
East Fork Nookachamps Creek	S4_LO8_007	1440.42	17110007	WRIA 3 Lower Skagit - Samish	Perennial	50	Intermediate	Y	Y	Y	Y	S	N	Dry Open Cut	Loop 8
Unnamed	S4_LO8_005	1441.21	17110007	WRIA 3 Lower Skagit - Samish	Intermittent	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 8
Unnamed	S4_LO8_004	1441.28	17110007	WRIA 3 Lower Skagit - Samish	Intermittent	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 8
Turner Creek	S4_LO8_003	1441.44	17110007	WRIA 3 Lower Skagit - Samish	Perennial	9	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 8
Unnamed	S2_LO8_004	1442.10	17110007	WRIA 3 Lower Skagit - Samish	Intermittent	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 8
Unnamed	S2_LO8_003	1442.68	17110007	WRIA 3 Lower Skagit - Samish	Perennial	10	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 8
Unnamed	S4_LO8_002	1444.26	17110007	WRIA 3 Lower Skagit - Samish	Intermittent	5	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 8
Unnamed	S1_LO9_001	1453.67	17110002	WRIA 3 Lower Skagit - Samish	Perennial	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 9
Unnamed	S1_LO9_002	1453.76	17110002	WRIA 3 Lower Skagit - Samish	Perennial	12	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 9
Mills Creek	S1_LO9_003	1454.18	17110002	WRIA 3 Lower Skagit - Samish	Perennial	20	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 9
Unnamed	S1_LO9_004	1454.40	17110002	WRIA 3 Lower Skagit - Samish	Perennial	15	Intermediate	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 9
Unnamed	S1_LO9_006	1454.51	17110002	WRIA 3 Lower Skagit - Samish	Perennial	3	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 9
Unnamed	S1_LO9_007	1454.57	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	5	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 9
Unnamed	S1_LO9_008	1454.61	17110002	WRIA 3 Lower Skagit - Samish	Perennial	3	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_010	1454.81	17110002	WRIA 3 Lower Skagit - Samish	Ephemeral	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_009	1454.90	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	4	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_008	1454.91	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	12	Intermediate	N	N	N	N	F	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_007	1455.22	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_006	1455.42	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	2	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 9

Table K1-1:

Waterbodies Crossed by the WEP

Name	Waterbody Identification	Milepost	U.S. Geological Survey Hydrologic Unit Code	Water Resource Inventory Area	Flow Type	Stream Width (ft)	FERC Class	Washington Department of Ecology Designated Use				DNR Stream Type[a]	DNR Aquatic Land (Y/N)	Proposed Crossing Method	Loop Number
								Aquatic (Y/N)	Recreational (Y/N)	Water Supply (Y/N)	Misc. (Y/N)				
Unnamed	S2_LO9_005	1455.54	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	3	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_004	1455.63	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	6	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_003	1455.71	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	3	Minor	Y	Y	Y	Y	N	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_002	1455.87	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	8	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_001	1456.03	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	11	Intermediate	N	N	N	N	N	N	Dry Open Cut	Loop 9
Unnamed	S3_LO9_002	1456.62	17110002	WRIA 3 Lower Skagit - Samish	Intermittent	2	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 9
Little Innis Creek	S3_LO9_003	1457.40	17110002	WRIA 3 Lower Skagit - Samish	Perennial	10	Intermediate	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 9
Unnamed	S4_LO9_002	1457.70	17110002	WRIA 3 Lower Skagit - Samish	Ephemeral	1	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 9
Unnamed	S4_LO9_001	1457.88	17110002	WRIA 3 Lower Skagit - Samish	Ephemeral	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 9
Unnamed	S4_LO9_003	1458.87	17110003	WRIA 3 Lower Skagit - Samish	Ephemeral	6	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 9
Samish River	S2_LO9_011	1460.01	17110004	WRIA 3 Lower Skagit - Samish	Perennial	10	Intermediate	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 9
Unnamed	S2_LO9_012	1460.42	17110004	WRIA 1 - Nooksack	Intermittent	4	Minor	Y	Y	Y	Y	F	N	Dry Open Cut	Loop 9
Landing Strip Creek	SP_LO9_001	1461.32	17110004	WRIA 1 - Nooksack	Perennial	6	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 9
South Fork Nooksack River	S4_LO9_101	1461.56	17110004	WRIA 1 - Nooksack	Perennial	170	Major	N	N	N	N	S	Y	HDD	Loop 9
Breckenridge Creek	S-22	1478.87	17110001	WRIA 1 - Nooksack	Perennial	30	Intermediate	Y	Y	Y	Y	S	N	Dry Open Cut	Loop 10
Kinney Creek	S-21	1479.05	17110001	WRIA 1 - Nooksack	Perennial	8	Minor	N	N	N	N	F	N	Dry Open Cut	Loop 10
Tributary to Kinney Creek	S-16	1479.99	17110001	WRIA 1 - Nooksack	Intermittent	2	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 10
Tributary to Lake	S-9	1481.02	17110001	WRIA 1 - Nooksack	Perennial	3	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 10
Tributary to Lake	S-7	1481.40	17110001	WRIA 1 - Nooksack	Perennial	4	Minor	N	N	N	N	N	N	Dry Open Cut	Loop 10
Saar Creek	S-4B	1482.80	17110001	WRIA 1 - Nooksack	Perennial	12	Intermediate	N	N	N	N	S	N	Dry Open Cut	Loop 10
Saar Creek	S-4A	1483.08	17110001	WRIA 1 - Nooksack	Perennial	12	Intermediate	N	N	N	N	S	N	Dry Open Cut	Loop 10

[a] DNR Stream Types: F= Contain Fish Habitat, S= Shoreline of the state, Np=Perennial non-fish streams, Ns=Seasonal non-fish streams, U= Untyped water feature
Y/N - yes or no

Table K1-2

Wetlands Crossed by the WEP

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)
Wetland Crossings												
Woodland Loop												
W1_LO1_049	1244.29	PEM	IV	97.601	0.505	0.132	2.679	Y	0.000	3.315	Y	TRUE
W1_LO1_050	1244.62	PEM	IV	184.154	0.166	0.113	0.000	Y	0.000	0.279	Y	TRUE
W1_LO1_051	1245.24	PEM	IV	12.796	0.191	0.000	0.000	Y	0.000	0.191	N	TRUE
W4_LO1_001	1246.74	PEM	IV	85.581	0.122	0.000	0.000	Y	0.000	0.122	N	FALSE
W1_LO1_001	1247.48	PEM	IV	38.288	0.119	0.003	0.000	Y	0.000	0.122	N	TRUE
W1_LO1_003	1247.65	PEM	IV	191.540	0.338	0.000	0.000	Y	0.000	0.338	N	TRUE
W1_LO1_002	1247.66	PFO	IV	0.000	0.019	0.000	0.000	Y	0.019	0.000	N	FALSE
W1_LO1_005	1247.73	PEM	IV	76.657	0.086	0.000	0.000	Y	0.000	0.086	N	FALSE
W1_LO1_007	1248.25	PEM	IV	38.716	0.054	0.002	0.000	Y	0.000	0.056	Y	TRUE
W1_LO1_008	1248.30	PEM	IV	114.647	0.140	0.000	0.000	Y	0.000	0.140	Y	FALSE
W2_LO1_001	1248.97	PEM	IV	0.000	0.074	0.000	0.000	Y	0.000	0.074	N	FALSE
W2_LO1_001	1248.97	PFO	IV	0.000	0.000	0.000	0.000	Y	0.000	0.000	N	FALSE
W2_LO1_002	1249.15	PEM	IV	11.863	0.041	0.000	0.000	Y	0.000	0.041	N	TRUE
W2_LO1_003	1249.52	PEM	III	8.620	0.029	0.000	0.000	Y	0.000	0.029	N	TRUE
W2_LO1_004	1250.09	PEM	III	0.000	0.006	0.000	0.000	Y	0.000	0.006	N	TRUE
W2_LO1_005	1250.56	PEM	III	25.138	0.019	0.000	0.000	Y	0.000	0.019	N	TRUE
W3_LO1_007	1251.15	PEM	III	24.985	0.032	0.000	0.000	Y	0.000	0.033	N	TRUE
W3_LO1_001	1251.41	PEM	IV	0.000	0.011	0.000	0.000	Y	0.000	0.011	N	TRUE
W3_LO1_002	1251.71	PEM	IV	69.274	0.141	0.000	0.000	Y	0.000	0.141	N	TRUE
W3_LO1_003	1251.90	PEM	IV	14.033	0.049	0.000	0.000	Y	0.000	0.049	N	TRUE
W3_LO1_003	1251.90	PFO	IV	14.033	0.032	0.000	0.000	Y	0.032	0.000	N	TRUE
W3_LO1_004	1252.00	PEM	IV	0.000	0.023	0.000	0.000	Y	0.000	0.023	N	TRUE
W3_LO1_005	1252.04	PEM	IV	85.222	0.059	0.000	0.000	Y	0.000	0.059	N	TRUE
W3_LO1_006	1252.08	PEM	IV	32.690	0.024	0.000	0.000	Y	0.000	0.024	N	TRUE
W3_LO1_009	1252.61	PEM	III	76.093	0.114	0.000	0.000	Y	0.000	0.114	Y	TRUE
W1_LO1_010	1254.13	PSS	IV	5.976	0.040	0.003	0.000	Y	0.043	0.000	N	TRUE
W1_LO1_011	1254.55	PEM	IV	14.109	0.027	0.000	0.000	Y	0.000	0.027	N	TRUE
W1_LO1_012	1254.73	PEM	IV	17.794	0.049	0.000	0.000	Y	0.000	0.049	N	TRUE
W1_LO1_013	1254.80	PEM	IV	10.338	0.011	0.001	0.000	Y	0.000	0.012	N	TRUE
W2_LO1_012	1254.99	PEM	IV	21.780	0.026	0.000	0.000	Y	0.000	0.026	N	TRUE
W2_LO1_011	1255.31	PEM	III	57.203	0.103	0.000	0.000	Y	0.000	0.103	N	FALSE
W2_LO1_010	1255.63	PEM	IV	35.990	0.029	0.006	0.000	Y	0.000	0.035	N	TRUE
W2_LO1_006	1256.24	PEM	III	0.000	0.046	0.001	0.000	Y	0.000	0.046	N	TRUE
W2_LO1_006	1256.24	PFO	III	0.000	0.001	0.000	0.000	Y	0.001	0.000	N	TRUE
W2_LO1_008	1256.42	PSS	III	0.000	0.003	0.000	0.000	Y	0.003	0.000	N	TRUE
W2_LO1_007	1256.42	PEM	IV	204.252	0.350	0.001	0.000	Y	0.000	0.351	N	TRUE
W2_LO1_009	1256.67	PEM	IV	131.248	0.124	0.000	0.000	Y	0.000	0.124	N	TRUE
W1_LO1_014	1257.00	PEM	IV	426.507	0.695	0.000	0.000	Y	0.000	0.695	Y	FALSE
W1_LO1_015	1257.26	PEM	III	137.333	0.263	0.000	0.000	Y	0.000	0.263	Y	FALSE
W1_LO1_016	1257.31	PEM	III	928.502	1.349	0.000	0.000	Y	0.000	1.349	Y	FALSE
W1_LO1_017	1257.56	PEM	IV	0.000	0.106	0.000	0.000	Y	0.000	0.106	Y	TRUE
W1_LO1_018	1257.60	PEM	III	201.831	0.341	0.000	0.000	Y	0.000	0.341	Y	FALSE
W1_LO1_019	1257.64	PEM	III	309.828	0.464	0.000	0.000	Y	0.000	0.464	Y	FALSE
W2_LO1_015	1257.83	PEM	IV	1.164	0.044	0.036	0.000	Y	0.000	0.080	N	TRUE
W2_LO1_016	1257.85	PEM	IV	43.168	0.026	0.003	0.000	Y	0.000	0.028	N	TRUE
W2_LO1_017	1257.89	PEM	IV	75.764	0.172	0.015	0.000	Y	0.000	0.187	N	TRUE
W1_LO1_021	1258.21	PEM	IV	716.067	0.938	0.000	0.000	Y	0.000	0.938	Y	FALSE
W1_LO1_022	1258.58	PEM	III	0.000	0.052	0.000	0.000	Y	0.000	0.052	Y	TRUE
W1_LO1_020	1258.83	PEM	III	22.566	0.077	0.000	0.000	Y	0.000	0.077	N	TRUE
W3_LO1_013	1259.39	PEM	IV	68.114	0.077	0.000	0.000	Y	0.000	0.077	N	TRUE
W3_LO1_014	1259.46	PEM	IV	80.872	0.071	0.005	0.000	Y	0.000	0.076	N	TRUE
W3_LO1_014	1259.46	PFO	IV	80.872	0.000	0.015	0.000	Y	0.015	0.000	N	TRUE
W3_LO1_015	1259.61	PEM	III	171.136	0.131	0.002	0.000	Y	0.000	0.133	N	TRUE
W3_LO1_015	1259.61	PFO	III	171.136	0.000	0.026	0.000	Y	0.026	0.000	N	TRUE
W3_LO1_016	1259.73	PEM	IV	105.390	0.047	0.000	0.000	Y	0.000	0.047	N	TRUE
W3_LO1_017	1259.93	PEM	IV	7.059	0.019	0.000	0.000	Y	0.000	0.019	N	TRUE
W3_LO1_018	1260.25	PEM	IV	51.379	0.048	0.008	0.000	Y	0.000	0.056	N	TRUE
W1_LO1_024	1260.33	PEM	IV	0.000	0.004	0.005	0.000	Y	0.000	0.009	Y	TRUE
W1_LO1_025	1260.35	PEM	IV	553.472	0.978	0.258	0.515	Y	0.000	1.751	Y	TRUE
W2_LO1_018	1260.76	PEM	IV	4.153	0.108	0.000	0.000	Y	0.000	0.108	Y	TRUE
W2_LO1_020	1260.83	PEM	II	0.000	0.000	0.000	0.000	Y	0.000	0.000	Y	FALSE
W3_LO1_024	1261.05	PEM	III	52.498	0.086	0.000	0.000	Y	0.000	0.086	N	TRUE

Table K1-2

Wetlands Crossed by the WEP

Wetland Crossings

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)
W3_LO1_023	1261.21	PEM	IV	41.996	0.067	0.000	0.000	Y	0.000	0.067	N	FALSE
W3_LO1_019	1261.65	PEM	IV	9.020	0.022	0.000	0.000	Y	0.000	0.022	N	TRUE
W3_LO1_020	1261.69	PEM	IV	124.702	0.222	0.000	0.000	Y	0.000	0.222	N	TRUE
W3_LO1_021	1261.81	PEM	IV	24.027	0.066	0.000	0.000	Y	0.000	0.066	N	TRUE
W3_LO1_022	1261.97	PEM	IV	0.000	0.037	0.000	0.000	Y	0.000	0.037	N	TRUE
W3_LO1_025	1262.06	PEM	IV	33.254	0.045	0.000	0.000	Y	0.000	0.045	N	TRUE
W1_LO1_023	1262.66	PEM	IV	142.584	0.156	0.000	0.000	Y	0.000	0.156	N	TRUE
W1_LO1_026	1262.88	PEM	IV	83.428	0.112	0.002	0.000	Y	0.000	0.113	N	TRUE
W1_LO1_027	1262.98	PEM	III	28.650	0.062	0.000	0.000	Y	0.000	0.062	N	TRUE
W1_LO1_032	1263.49	PEM	IV	41.937	0.155	0.000	0.000	Y	0.000	0.155	N	TRUE
W1_LO1_033	1263.50	PEM	IV	264.386	0.399	0.000	0.000	Y	0.000	0.399	N	TRUE
W1_LO1_034	1263.76	PEM	III	46.629	0.139	0.000	0.000	Y	0.000	0.139	N	TRUE
W1_LO1_035	1263.80	PEM	IV	0.000	0.037	0.000	0.000	Y	0.000	0.037	N	TRUE
W1_LO1_055	1265.11	PEM	IV	297.321	0.582	0.049	0.001	Y	0.000	0.632	Y	TRUE
W1_LO1_054	1265.26	PEM	II	0.000	0.532	0.000	0.000	Y	0.000	0.532	N	FALSE
W1_LO1_054	1265.26	PFO	II	0.000	0.015	0.000	0.000	Y	0.015	0.000	N	FALSE
W1_LO1_053	1265.47	PEM	IV	36.349	0.050	0.000	0.000	Y	0.000	0.051	N	TRUE
W1_LO1_052	1265.80	PEM	IV	22.109	0.034	0.000	0.000	Y	0.000	0.034	N	TRUE
W1_LO1_057	1265.93	PEM	IV	31.553	0.078	0.000	0.000	Y	0.000	0.078	N	TRUE
W1_LO1_056	1266.02	PEM	IV	47.094	0.078	0.000	0.000	Y	0.000	0.078	N	TRUE
W1_LO1_036	1266.55	PEM	IV	195.381	0.754	0.000	0.000	Y	0.000	0.754	N	TRUE
W2_LO1_044	1266.92	PEM	IV	349.819	0.519	0.064	0.000	Y	0.000	0.583	N	TRUE
W2_LO1_045	1267.03	PEM	IV	193.701	0.314	0.041	0.000	Y	0.000	0.355	Y	TRUE
W2_LO1_046	1267.17	PEM	IV	0.000	0.047	0.000	0.000	Y	0.000	0.047	N	TRUE
W2_LO1_047	1267.35	PEM	IV	262.550	0.397	0.169	0.000	Y	0.000	0.566	N	TRUE
W3_LO1_027	1267.97	PEM	III	37.107	0.058	0.013	0.000	Y	0.000	0.071	N	TRUE
W3_LO1_028	1268.44	PEM	IV	28.544	0.034	0.016	0.000	Y	0.000	0.049	N	FALSE
W3_LO1_029	1268.51	PEM	II	289.231	0.489	0.118	0.000	Y	0.000	0.607	Y	FALSE
W3_LO1_029	1268.51	PSS	II	289.231	0.000	0.013	0.000	Y	0.013	0.000	Y	FALSE
W3_LO1_029	1268.51	PFO	II	289.231	0.016	0.000	0.000	Y	0.016	0.000	Y	FALSE
W3_LO1_030	1268.87	PEM	IV	158.295	0.228	0.122	0.000	Y	0.000	0.350	N	FALSE
W3_LO1_031	1269.17	PEM	IV	38.142	0.039	0.016	0.000	Y	0.000	0.056	N	FALSE
W3_LO1_031	1269.17	PFO	IV	38.142	0.000	0.001	0.000	Y	0.001	0.000	N	FALSE
W1_LO1_029	1269.35	PEM	IV	101.082	0.152	0.030	0.000	Y	0.000	0.182	Y	TRUE
W1_LO1_030	1269.39	PEM	II	206.678	0.184	0.103	0.000	Y	0.000	0.287	Y	TRUE
W1_LO1_031	1269.42	PFO	II	0.000	0.192	0.000	0.000	Y	0.192	0.000	Y	TRUE
W2_LO1_022	1270.66	PEM	III	49.780	0.090	0.016	0.000	Y	0.000	0.105	N	TRUE
W2_LO1_021	1270.69	PFO	III	0.000	0.003	0.000	0.000	Y	0.003	0.000	N	TRUE
W2_LO1_023	1270.87	PEM	IV	23.134	0.051	0.000	0.000	Y	0.000	0.051	N	TRUE
W2_LO1_024	1271.10	PEM	IV	85.625	0.056	0.000	0.000	Y	0.000	0.056	N	TRUE
W3_LO1_032	1271.41	PEM	IV	32.760	0.024	0.000	0.000	Y	0.000	0.024	N	TRUE
W3_LO1_033	1271.89	PEM	IV	2.551	0.025	0.000	0.000	Y	0.000	0.025	N	TRUE
W3_LO1_034	1272.23	PEM	III	46.457	0.066	0.014	0.000	Y	0.000	0.080	N	TRUE
W3_LO1_035	1272.32	PEM	III	18.748	0.045	0.001	0.000	Y	0.000	0.046	N	TRUE
W2_LO1_025	1273.43	PEM	IV	0.000	0.000	0.000	0.000	Y	0.000	0.000	Y	TRUE
W3_LO1_012	1273.58	PEM	IV	22.391	0.032	0.009	0.000	Y	0.000	0.041	N	TRUE
W3_LO1_026	1273.96	PEM	IV	0.000	0.000	0.000	0.000	Y	0.000	0.000	Y	TRUE
W3_LO1_010	1274.01	PEM	III	67.644	0.120	0.000	0.000	Y	0.000	0.120	Y	FALSE
W4_LO1_007	1275.89	PEM	IV	0.000	0.110	0.000	0.000	Y	0.000	0.110	N	TRUE
W4_LO1_006	1275.95	PSS	IV	0.000	0.004	0.018	0.000	Y	0.021	0.000	N	TRUE
W4_LO1_005	1276.04	PFO	IV	120.595	0.109	0.000	0.000	Y	0.109	0.000	N	FALSE
W4_LO1_004	1276.09	PFO	IV	50.188	0.049	0.000	0.000	Y	0.049	0.000	N	FALSE
W4_LO1_003	1276.17	PFO	IV	94.435	0.189	0.061	0.000	Y	0.250	0.000	N	TRUE
W4_LO1_002	1276.25	PEM	IV	70.284	0.038	0.000	0.000	Y	0.000	0.038	N	TRUE
W1_LO1_058	1277.81	PEM	III	36.664	0.054	0.019	0.000	Y	0.000	0.074	N	FALSE
W2_LO1_048	1278.81	PEM	II	296.654	0.402	0.075	0.000	Y	0.000	0.477	N	FALSE
W2_LO1_049	1278.94	PEM	IV	102.021	0.214	0.008	0.000	Y	0.000	0.223	N	TRUE
W2_LO1_050	1278.96	PEM	IV	16.001	0.027	0.002	0.000	Y	0.000	0.029	N	TRUE
W2_LO1_051	1279.17	PEM	II	84.322	0.113	0.022	0.000	Y	0.000	0.135	N	FALSE
W4_LO1_008	1279.72	PSS	III	35.454	0.035	0.000	0.000	Y	0.035	0.000	N	FALSE
W4_LO1_009	1279.83	PEM	IV	0.000	0.044	0.000	0.000	Y	0.000	0.044	N	TRUE
W4_LO1_011	1280.30	PEM	IV	324.274	0.743	0.000	0.000	Y	0.000	0.743	Y	FALSE
W1_LO1_037	1280.38	PEM	III	246.778	0.534	0.000	0.016	Y	0.000	0.550	Y	FALSE

Table K1-2

Wetlands Crossed by the WEP

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)
Wetland Crossings												
W1_LO1_038	1280.50	PFO	II	0.000	0.054	0.000	0.000	Y	0.054	0.000	N	FALSE
W1_LO1_039	1280.78	PEM	II	3402.312	5.238	0.046	0.000	Y	0.000	5.283	Y	FALSE
W2_LO1_026	1281.38	PEM	IV	84.441	0.122	0.000	0.000	Y	0.000	0.122	Y	FALSE
W2_LO1_027	1281.69	PEM	III	21.576	0.044	0.000	0.000	Y	0.000	0.044	Y	FALSE
W3_LO1_043	1282.70	PEM	II	311.424	0.000	0.000	0.002	Y	0.000	0.377	N	TRUE
W3_LO1_043	1282.75	PFO	II	0.000	0.000	0.000	0.168	Y	0.168	0.000	N	TRUE
W3_LO1_043	1282.82	PSS	II	0.000	0.000	0.000	0.809	Y	0.809	0.000	N	TRUE
W3_LO1_042	1282.89	PFO	III	0.000	0.000	0.000	0.000	Y	0.000	0.000	N	FALSE
W3_LO1_041	1282.95	PEM	IV	0.000	0.000	0.000	0.000	Y	0.000	0.000	N	FALSE
W3_LO1_039	1283.14	PFO	III	0.000	0.034	0.000	0.000	Y	0.034	0.000	N	FALSE
W3_LO1_039	1283.14	PEM	III	100.942	0.090	0.000	0.000	Y	0.000	0.090	N	FALSE
W3_LO1_037	1283.39	PEM	III	38.830	0.038	0.000	0.000	Y	0.000	0.038	N	FALSE
W3_LO1_036	1283.42	PEM	III	0.000	0.072	0.000	0.000	Y	0.000	0.072	N	FALSE
W3_LO1_038	1283.48	PFO	III	0.000	0.011	0.000	0.000	Y	0.011	0.000	N	FALSE
W1_LO1_040	1284.06	PEM	IV	0.000	0.000	0.000	0.000	Y	0.000	0.000	Y	FALSE
W1_LO1_041	1284.34	PEM	IV	107.573	0.363	0.000	0.000	Y	0.000	0.363	Y	FALSE
W1_LO1_043	1284.76	PSS	II	33.341	0.076	0.001	0.000	Y	0.076	0.000	N	TRUE
W2_LO1_032	1285.30	PEM	IV	74.731	0.252	0.005	0.012	Y	0.000	0.268	N	TRUE
W2_LO1_033	1285.35	PEM	III	55.857	0.090	0.000	0.000	Y	0.000	0.090	N	TRUE
W2_LO1_034	1285.67	PEM	III	1693.575	2.499	0.000	0.000	Y	0.000	2.499	N	TRUE
W2_LO1_031	1285.80	PFO	IV	102.206	0.167	0.000	0.000	Y	0.167	0.000	N	FALSE
W2_LO1_029	1286.03	PEM	IV	2074.774	3.389	0.000	0.000	Y	0.000	3.389	N	FALSE
W2_LO1_030	1286.19	PFO	III	0.000	0.000	0.000	0.000	Y	0.000	0.000	N	FALSE
W3_LO1_044	1286.80	PEM	IV	196.367	0.298	0.000	0.000	Y	0.000	0.298	N	FALSE
W3_LO1_044	1286.81	PFO	IV	0.000	0.001	0.000	0.000	Y	0.001	0.000	N	FALSE
W1_LO1_044	1287.41	PFO	III	0.000	0.034	0.000	0.000	Y	0.034	0.000	N	TRUE
W1_LO1_045	1287.48	PEM	IV	425.543	0.731	0.153	0.000	Y	0.000	0.883	Y	TRUE
W1_LO1_047	1287.74	PSS	IV	58.314	0.105	0.000	0.000	Y	0.106	0.000	Y	TRUE
W1_LO1_048	1288.01	PSS	IV	144.393	0.299	0.057	0.000	Y	0.356	0.000	Y	TRUE
W2_LO1_035	1288.24	PEM	II	1684.681	2.681	0.274	0.077	Y	0.000	3.032	Y	TRUE
W2_LO1_039	1288.47	PEM	IV	514.054	0.878	0.241	0.000	Y	0.000	1.119	Y	TRUE
W2_LO1_038	1288.57	PSS	II	168.592	0.344	0.072	0.000	Y	0.416	0.000	N	TRUE
W2_LO1_037	1288.70	PEM	IV	571.094	0.816	0.094	0.000	Y	0.000	0.909	N	TRUE
W2_LO1_036	1288.75	PEM	IV	241.211	0.359	0.000	0.000	Y	0.000	0.359	N	TRUE
W2_LO1_040	1288.88	PSS	IV	206.151	0.302	0.000	0.000	Y	0.302	0.000	N	FALSE
W2_LO1_042	1288.93	PEM	III	237.473	0.354	0.000	0.000	Y	0.000	0.354	N	FALSE
W2_LO1_043	1289.33	PEM	III	129.965	0.178	0.001	0.000	Y	0.000	0.179	Y	TRUE
W2_LO1_041	1289.35	PEM	III	474.719	0.812	0.220	0.000	Y	0.000	1.032	Y	TRUE
CS-1E	1289.49	PEM	IV	45.287	0.000	0.000	0.042	Y	0.000	0.042	Y	TRUE
CS-1A	1289.56	PEM	IV	0.000	0.000	0.000	2.188	Y	0.000	2.188	Y	TRUE
Woodland Subtotal									**3.377**	**45.819**		
Chehalis Loop												
1291.5	1291.41	PSS	III	190.115	0.084	0.071	0.276	Y	0.431	0.000	Y	TRUE
1291.5	1291.41	PFO	III	190.115	0.022	0.181	0.000	Y	0.203	0.000	Y	TRUE
1291.5	1291.41	PEM	III	190.115	5.259	0.504	0.000	Y	0.000	5.763	Y	TRUE
1292.4	1292.26	PFO	III	0.000	0.166	0.452	0.053	Y	0.671	0.000	N	TRUE
1292.4	1292.26	PEM	III	0.000	3.297	0.001	0.000	Y	0.000	3.298	N	TRUE
1292.8	1292.77	PEM	III	1702.917	2.956	0.777	0.000	Y	0.000	3.733	Y	TRUE
1292.8	1292.77	PFO	III	1702.917	0.055	0.065	0.000	Y	0.120	0.000	Y	TRUE
1293.1	1293.10	PEM	III	589.893	2.558	0.099	0.238	Y	0.000	2.895	Y	TRUE
1293.1	1293.10	PFO	III	589.893	0.212	0.280	0.000	Y	0.492	0.000	Y	TRUE
1293.8	1293.64	PEM	II	1314.839	2.046	0.000	0.000	Y	0.000	2.046	N	TRUE
1293.8	1293.64	PFO	II	1314.839	0.172	0.309	0.000	Y	0.481	0.000	N	TRUE
1294.2	1294.13	PFO	II	0.000	0.000	0.000	0.023	Y	0.023	0.000	Y	TRUE
1294.2	1294.13	PSS	II	0.000	0.752	0.110	1.377	Y	2.239	0.000	Y	TRUE
1294.7	1294.41	PEM	IV	430.466	0.945	0.272	11.446	Y	0.000	12.663	Y	TRUE
1294.8	1294.53	PEM	III	1525.733	2.718	0.594	0.318	Y	0.000	3.630	N	TRUE
1294.8	1294.53	PSS	III	1525.733	0.080	0.069	0.133	Y	0.282	0.000	N	TRUE
1294.8	1294.53	PFO	III	1525.733	0.028	0.072	0.000	Y	0.100	0.000	N	TRUE
1294.9	1294.90	PFO	III	236.550	0.368	0.018	0.000	Y	0.386	0.000	N	TRUE
1295.1	1295.08	PEM	III	65.215	0.086	0.032	0.000	Y	0.000	0.117	N	TRUE
1295.2	1295.20	PFO	IV	35.474	0.050	0.000	0.000	Y	0.050	0.000	N	TRUE

Table K1-2

Wetlands Crossed by the WEP

Wetland Crossings

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)
1295.4	1295.43	PFO	II	51.101	0.007	0.000	0.000	Y	0.007	0.000	Y	TRUE
1295.4	1295.43	PEM	II	51.101	0.086	0.014	0.001	Y	0.000	0.101	Y	TRUE
1295.9	1295.96	PEM	III	120.763	0.182	0.000	0.000	Y	0.000	0.182	N	FALSE
1295.9	1295.96	PFO	III	120.763	0.037	0.000	0.000	Y	0.037	0.000	N	FALSE
1296.1	1296.14	PEM	II	19.280	0.019	0.000	0.000	Y	0.000	0.019	N	TRUE
1296.1	1296.14	PFO	II	19.280	0.014	0.022	0.000	Y	0.036	0.000	N	TRUE
1296.15	1296.15	PEM	III	46.612	0.047	0.000	0.000	Y	0.000	0.047	N	TRUE
1296.15	1296.15	PFO	III	46.612	0.024	0.016	0.000	Y	0.039	0.000	N	TRUE
1296.45	1296.50	PEM	II	74.515	0.059	0.000	0.000	Y	0.000	0.059	Y	TRUE
1296.45	1296.50	PFO	II	74.515	0.063	0.037	0.000	Y	0.100	0.000	Y	TRUE
1296.6	1296.66	PFO	II	68.177	0.108	0.030	0.000	Y	0.137	0.000	N	TRUE
1296.9	1296.73	PFO	II	634.092	1.102	0.220	0.000	Y	1.321	0.000	N	TRUE
1297.6	1297.40	PFO	I	113.268	0.207	0.035	0.000	Y	0.242	0.000	N	TRUE
1298.0	1297.96	PEM	II	0.000	0.111	0.000	0.000	Y	0.000	0.111	N	TRUE
1298.0	1297.96	PFO	II	0.000	0.146	0.000	0.000	Y	0.146	0.000	N	TRUE
1298.5	1298.36	PEM	III	369.672	0.604	0.054	0.000	Y	0.000	0.658	N	TRUE
1298.5	1298.36	PFO	III	369.672	0.004	0.000	0.000	Y	0.004	0.000	N	TRUE
1298.5	1298.36	PSS	III	369.672	0.000	0.129	0.000	Y	0.129	0.000	N	TRUE
1299	1298.99	PEM	II	225.169	0.631	0.133	0.000	Y	0.000	0.764	Y	TRUE
1299.1	1299.11	PEM	II	249.322	0.429	0.000	0.000	Y	0.000	0.429	Y	FALSE
1299.8	1299.73	PFO	IV	0.000	0.133	0.000	0.000	Y	0.133	0.000	N	TRUE
1299.8	1299.73	PEM	IV	0.000	0.861	0.032	0.000	Y	0.000	0.893	N	TRUE
1299.95	1299.93	PEM	III	0.000	0.060	0.012	0.000	Y	0.000	0.072	N	TRUE
1299.95	1299.93	PFO	III	0.000	0.008	0.005	0.000	Y	0.013	0.000	N	TRUE
1300.2	1300.05	PEM	III	94.967	0.132	0.014	0.023	Y	0.000	0.169	N	TRUE
1300.9	1300.78	PEM	II	0.000	0.035	0.000	0.000	Y	0.000	0.035	N	FALSE
1300.9	1300.78	PFO	II	0.000	0.014	0.000	0.000	Y	0.014	0.000	N	FALSE
1301.5	1301.46	PEM	IV	644.490	0.960	0.315	2.274	Y	0.000	3.549	Y	TRUE
1301.6	1301.59	PEM	III	464.061	2.707	0.739	0.258	Y	0.000	3.705	Y	TRUE
1302.8	1302.71	PEM	III	273.857	0.488	0.000	0.000	Y	0.000	0.488	N	FALSE
1303.2	1303.01	PEM	IV	148.350	0.168	0.062	0.000	Y	0.000	0.231	N	TRUE
1303.2	1303.01	PFO	IV	148.350	0.099	0.000	0.000	Y	0.099	0.000	N	TRUE
1303.3	1303.10	PEM	III	79.753	0.186	0.040	0.000	Y	0.000	0.225	N	TRUE
1303.3	1303.10	PFO	III	79.753	0.087	0.000	0.000	Y	0.087	0.000	N	TRUE
W2_LO2_002	1303.23	PSS	IV	32.876	0.080	0.000	0.000	Y	0.080	0.000	N	TRUE
W2_LO2_001	1303.49	PEM	IV	107.573	0.146	0.000	0.000	Y	0.000	0.146	N	TRUE
W3_LO2_001	1304.18	PEM	IV	0.000	0.018	0.000	0.000	Y	0.000	0.018	N	TRUE
W3_LO2_002	1304.30	PEM	III	25.400	0.048	0.010	0.135	Y	0.000	0.192	N	TRUE
W3_LO2_003	1304.40	PEM	IV	105.508	0.149	0.074	0.000	Y	0.000	0.223	N	TRUE
W3_LO2_004	1304.46	PSS	III	341.806	0.496	0.197	0.000	Y	0.693	0.000	N	TRUE
W3_LO2_004	1304.46	PEM	III	341.806	1.317	0.655	0.000	Y	0.000	1.973	N	TRUE
W3_LO2_005	1304.89	PEM	III	86.488	0.118	0.053	0.000	Y	0.000	0.172	N	TRUE
W3_LO2_007	1305.15	PEM	III	809.106	1.164	0.541	0.000	Y	0.000	1.704	N	TRUE
W3_LO2_008	1305.71	PEM	IV	13.002	0.016	0.000	0.000	Y	0.000	0.016	N	TRUE
W3_LO2_009	1306.16	PEM	III	457.323	0.765	0.251	0.000	Y	0.000	1.015	Y	TRUE
W3_LO2_012	1306.55	PEM	IV	56.662	0.092	0.029	0.000	Y	0.000	0.121	Y	TRUE
W3_LO2_010	1306.57	PEM	IV	132.546	0.174	0.078	0.000	Y	0.000	0.252	Y	TRUE
W3_LO2_010	1306.57	PFO	IV	132.546	0.001	0.000	0.000	Y	0.001	0.000	Y	TRUE
W4_LO2_008	1306.71	PEM	IV	110.001	0.216	0.045	0.000	Y	0.000	0.261	Y	TRUE
W4_LO2_007	1306.80	PEM	IV	103.362	0.183	0.043	0.000	Y	0.000	0.226	N	TRUE
W4_LO2_006	1307.00	PEM	IV	89.647	0.150	0.043	0.000	Y	0.000	0.193	N	TRUE
W4_LO2_005	1307.11	PEM	IV	275.803	0.566	0.052	0.000	Y	0.000	0.619	N	TRUE
W4_LO2_004	1307.22	PEM	IV	313.095	0.635	0.060	0.022	Y	0.000	0.718	N	TRUE
W4_LO2_003	1307.47	PEM	IV	44.832	0.071	0.023	0.000	Y	0.000	0.094	N	TRUE
W4_LO2_002	1307.66	PEM	IV	49.600	0.062	0.022	0.000	Y	0.000	0.084	N	TRUE
W4_LO2_001	1307.69	PEM	IV	52.081	0.081	0.008	0.000	Y	0.000	0.089	N	TRUE
W1_LO2_100	1307.92	PEM	IV	127.391	0.170	0.001	0.000	Y	0.000	0.171	N	TRUE
W1_LO2_101	1308.33	PEM	III	62.026	0.073	0.013	0.000	Y	0.000	0.086	N	TRUE
W1_LO2_102	1308.66	PEM	III	79.153	0.078	0.000	0.000	Y	0.000	0.078	N	TRUE
W1_LO2_103	1308.75	PEM	III	1040.415	1.196	0.241	0.000	Y	0.000	1.436	N	TRUE
W1_LO2_103	1308.75	PFO	III	1040.415	0.125	0.128	0.000	Y	0.253	0.000	N	TRUE
W1_LO2_105	1309.05	PSS	III	0.000	0.000	0.000	0.103	Y	0.103	0.000	N	TRUE
W4_LO2_009	1310.21	PEM	IV	144.500	0.136	0.171	0.000	Y	0.000	0.307	N	TRUE

Table K1-2

Wetlands Crossed by the WEP

Wetland Crossings

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)
W4_LO2_010	1310.79	PEM	IV	44.457	0.052	0.016	0.000	Y	0.000	0.067	Y	TRUE
W4_LO2_011	1311.19	PEM	IV	42.122	0.045	0.000	0.000	Y	0.000	0.045	N	TRUE
W4_LO2_012	1311.40	PEM	III	60.951	0.069	0.002	0.000	Y	0.000	0.071	N	TRUE
W4_LO2_013	1311.43	PEM	III	34.063	0.041	0.005	0.000	Y	0.000	0.046	N	TRUE
W2_LO2_007	1311.64	PSS	II	94.769	0.111	0.025	0.000	Y	0.136	0.000	N	TRUE
W2_LO2_006	1312.36	PEM	IV	48.528	0.142	0.000	0.000	Y	0.000	0.142	N	TRUE
W2_LO2_005	1312.60	PEM	IV	75.614	0.171	0.031	0.000	Y	0.000	0.201	N	TRUE
W2_LO2_004	1312.65	PEM	IV	110.066	0.223	0.020	0.000	Y	0.000	0.242	N	TRUE
W2_LO2_003	1312.72	PEM	IV	118.563	0.178	0.047	0.031	Y	0.000	0.256	N	TRUE
W1_LO2_104	1313.05	PEM	III	165.798	0.300	0.058	0.000	Y	0.000	0.359	N	TRUE
W2_LO2_009	1313.34	PEM	IV	144.716	0.234	0.055	0.000	Y	0.000	0.290	N	TRUE
W2_LO2_008	1313.80	PEM	IV	97.394	0.132	0.005	0.000	Y	0.000	0.138	N	TRUE
W4_LO2_014	1314.60	PEM	IV	95.315	0.126	0.032	0.007	Y	0.000	0.165	N	TRUE
W4_LO2_015	1314.72	PEM	IV	143.037	0.230	0.010	0.000	Y	0.000	0.240	N	TRUE
W4_LO2_016	1314.86	PEM	IV	164.323	0.161	0.052	0.000	Y	0.000	0.213	N	TRUE
W4_LO2_017	1314.95	PEM	IV	90.458	0.080	0.001	0.000	Y	0.000	0.082	N	TRUE
JW-WA-3-2	1315.03	PSSC	No Rating	416.712	0.681	0.202	0.000	Y	0.883	0.000	N	TRUE
Chehalis Subtotal									**10.170**	**58.633**		
Sumner South												
FL-7	1339.15	PSS	III	135.815	0.128	0.072	0.031	Y	0.231	0.000	N	TRUE
W1_LO3_002	1339.30	PEM	III	19.874	0.077	0.000	0.000	Y	0.000	0.077	N	TRUE
FL-5	1339.34	PEM	III	58.681	0.343	0.139	0.000	Y	0.000	0.482	N	TRUE
W1_LO3_001	1339.80	PFO	III	388.026	0.544	0.222	0.000	Y	0.766	0.000	Y	TRUE
W1_LO3_005	1341.91	PFO	IV	0.000	0.022	0.000	0.000	Y	0.022	0.000	N	TRUE
W1_LO3_004	1341.94	PSS	IV	654.728	1.113	0.000	0.000	Y	1.113	0.000	N	FALSE
W1_LO3_003	1342.03	PFO	IV	0.000	0.001	0.000	0.000	Y	0.001	0.000	N	FALSE
W1_LO3_101	1342.11	PEM	IV	0.000	0.000	0.000	0.155	Y	0.000	0.155	Y	TRUE
W1_LO3_006	1342.19	PEM	IV	564.174	0.813	0.015	0.000	Y	0.000	0.829	N	TRUE
W1_LO3_007	1342.33	PEM	IV	171.487	0.275	0.000	0.000	Y	0.000	0.275	N	FALSE
W1_LO3_008	1342.45	PFO	IV	59.037	0.189	0.000	0.000	Y	0.189	0.000	N	FALSE
W2_LO3_001	1344.47	PFO	III	0.000	0.030	0.000	0.000	Y	0.030	0.000	N	FALSE
W2_LO3_003	1345.17	PEM	IV	33.562	0.046	0.012	0.000	Y	0.000	0.058	N	FALSE
W2_LO3_004	1345.27	PFO	II	124.382	0.161	0.021	0.000	Y	0.182	0.000	N	FALSE
W2_LO3_005	1346.09	PEM	II	76.100	0.103	0.000	0.000	Y	0.000	0.103	N	FALSE
W3_LO3_003	1346.82	PEM	III	116.121	0.249	0.000	0.000	Y	0.000	0.249	Y	FALSE
W3_LO3_003	1346.82	PSS	III	116.121	0.155	0.000	0.000	Y	0.155	0.000	Y	FALSE
W4_LO3_101	1346.91	PEM	IV	0.000	0.000	0.000	1.024	Y	0.000	1.024	N	TRUE
W3_LO3_002	1346.96	PEM	III	656.121	0.716	0.000	0.000	Y	0.000	0.716	N	FALSE
W3_LO3_002	1346.96	PSS	III	656.121	0.223	0.000	0.000	Y	0.223	0.000	N	FALSE
W4_LO3_102	1347.31	PEM	IV	0.000	0.000	0.000	0.066	Y	0.000	0.066	Y	TRUE
W3_LO3_001	1347.94	PSS	III	34.352	0.016	0.000	0.143	Y	0.159	0.000	Y	FALSE
W4_LO3_103	1349.07	PEM	IV	913.579	1.549	0.256	0.149	Y	0.000	1.954	Y	TRUE
WP_LO3_007	1349.07	PEM	No Rating	0.000	0.000	0.000	0.389	Y	0.000	0.389	Y	TRUE
W1_LO3_010	1349.54	PEM	IV	312.363	0.506	0.132	0.025	Y	0.000	0.663	Y	TRUE
W1_LO3_009	1349.98	PEM	III	382.103	0.479	0.052	0.000	Y	0.000	0.531	N	TRUE
W2_LO3_006	1350.46	PEM	IV	96.673	0.152	0.000	0.000	Y	0.000	0.152	N	TRUE
Sumner South Subtotal									**3.072**	**7.724**		
Sumner North A												
WP_LO4_001	1356.90	PFO	No Rating	0.000	0.000	0.000	0.044		0.044	0.000	Y	FALSE
W1_LO4_001	1357.13	PEM	III	59.196	0.101	0.026	0.000	Y	0.000	0.127	Y	TRUE
W1_LO4_002	1357.18	PEM	III	164.698	0.296	0.000	0.000	Y	0.000	0.296	Y	FALSE
W1_LO4_003	1357.77	PEM	III	80.990	0.182	0.012	0.000	Y	0.000	0.194	N	TRUE
W2_LO4_004	1358.11	PEM	III	260.025	0.454	0.000	0.000	Y	0.000	0.454	N	FALSE
W2_LO4_005	1358.29	PEM	III	288.613	0.404	0.000	0.000	Y	0.000	0.404	N	FALSE
W2_LO4_003	1358.49	PEM	III	58.558	0.047	0.000	0.000	Y	0.000	0.047	N	FALSE
W2_LO4_002	1358.69	PEM	II	477.196	0.661	0.000	0.000	Y	0.000	0.661	N	FALSE
W2_LO4_001	1358.86	PEM	III	0.000	0.003	0.000	0.000	Y	0.000	0.003	N	FALSE
W4_LO4_001	1360.93	PEM	III	673.467	1.203	0.163	0.000	Y	0.000	1.367	Y	TRUE
W4_LO4_002	1362.43	PEM	IV	326.606	0.500	0.000	0.000	Y	0.000	0.500	N	FALSE
Sumner North A Subtotal									**0.044**	**4.055**		

Table K1-2

Wetlands Crossed by the WEP

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)
Wetland Crossings												
Sumner North B												
W1_LO5_001	1370.93	PEM	III	5.791	0.063	0.000	0.000	Y	0.000	0.063	N	TRUE
W1_LO5_003	1371.00	PEM	III	291.665	0.396	0.113	0.000	Y	0.000	0.509	N	TRUE
W1_LO5_004	1371.06	PEM	II	479.812	0.580	0.052	0.002	Y	0.000	0.634	N	TRUE
W1_LO5_006	1371.65	PEM	IV	268.210	0.308	0.000	0.000	Y	0.000	0.308	N	TRUE
W1_LO5_005	1371.72	PEM	IV	61.018	0.052	0.000	0.000	Y	0.000	0.052	N	TRUE
W2_LO5_002	1371.96	PEM	II	35.947	0.093	0.000	0.000	Y	0.000	0.093	N	FALSE
W2_LO5_001	1372.73	PEM	IV	105.062	0.119	0.000	0.000	Y	0.000	0.119	N	TRUE
W4_LO5_004	1373.29	PEM	IV	774.401	1.268	0.281	0.000	Y	0.000	1.549	N	TRUE
W4_LO5_003	1373.66	PFO	III	0.000	0.024	0.000	0.000	Y	0.024	0.000	N	FALSE
W2_LO5_006	1374.50	PEM	IV	49.791	0.081	0.002	0.000	Y	0.000	0.083	N	TRUE
W2_LO5_005	1374.67	PEM	IV	35.337	0.129	0.010	0.000	Y	0.000	0.138	N	TRUE
W2_LO5_004	1374.87	PEM	IV	170.214	0.327	0.000	0.000	Y	0.000	0.327	N	TRUE
W2_LO5_003	1375.19	PEM	IV	349.489	0.456	0.001	0.000	Y	0.000	0.458	N	TRUE
W3_LO5_004	1375.86	PSS	III	103.498	0.088	0.000	0.000	Y	0.088	0.000	N	FALSE
W3_LO5_005	1375.88	PSS	IV	0.000	0.003	0.000	0.000	Y	0.003	0.000	N	FALSE
1376.9	1376.82	PEM	No Rating	116.519	0.686	0.000	0.000	Y	0.000	0.686	N	FALSE
W3_LO5_001	1377.30	PSS	II	524.042	0.888	0.247	0.045	Y	1.180	0.000	N	TRUE
W3_LO5_002	1378.06	PSS	III	167.511	0.293	0.000	0.000	Y	0.293	0.000	N	FALSE
W4_LO5_002	1378.55	PFO	III	0.000	0.029	0.000	0.000	Y	0.029	0.000	N	TRUE
W4_LO5_001	1379.07	PSS	I	360.051	0.597	0.081	0.000	Y	0.678	0.000	N	TRUE
W1_LO5_002	1379.62	PFO	II	18.819	0.035	0.000	0.000	Y	0.035	0.000	N	FALSE
SN-48	1380.18	PFO	III	0.000	0.002	0.000	0.000	Y	0.002	0.000	N	TRUE
SN-48	1380.18	PSS	III	0.000	0.133	0.000	0.000	Y	0.133	0.000	N	TRUE
SN-46	1380.72	PFO	III	0.000	0.001	0.000	0.000	Y	0.001	0.000	N	TRUE
SN-44	1381.30	PEM	I	0.000	1.219	0.000	0.034	Y	0.000	1.253	N	TRUE
SN-44	1381.30	PSS	I	0.000	0.161	0.174	0.000	Y	0.335	0.000	N	TRUE
SN-44	1381.30	PFO	I	0.000	0.041	0.044	0.121	Y	0.207	0.000	N	TRUE
Sumner North B Subtotal									**3.008**	**6.273**		
Snohomish												
W3_LO6_001	1394.35	PSS	IV	0.000	0.063	0.000	0.000	Y	0.063	0.000	N	TRUE
W3_LO6_002	1394.42	PSS	II	71.620	0.116	0.000	0.000	Y	0.116	0.000	N	FALSE
W3_LO6_003	1394.46	PSS	II	336.077	0.041	0.000	0.000	Y	0.041	0.000	N	TRUE
W3_LO6_003	1394.46	PEM	II	336.077	0.253	0.000	0.000	Y	0.000	0.253	N	FALSE
W3_LO6_004	1394.80	PEM	IV	6.346	0.123	0.000	0.000	Y	0.000	0.123	N	TRUE
W3_LO6_005	1394.83	PEM	IV	108.473	0.094	0.000	0.000	Y	0.000	0.094	N	TRUE
W3_LO6_006	1394.88	PEM	IV	66.443	0.089	0.000	0.000	Y	0.000	0.089	N	FALSE
W3_LO6_008	1395.32	PSS	III	0.000	0.041	0.000	0.000	Y	0.041	0.000	N	FALSE
W3_LO6_007	1395.35	PSS	III	0.000	0.153	0.000	0.000	Y	0.153	0.000	N	TRUE
W3_LO6_009	1395.42	PSS	III	379.023	0.597	0.000	0.000	Y	0.597	0.000	N	FALSE
W3_LO6_010	1395.57	PEM	IV	204.778	0.200	0.005	0.000	Y	0.000	0.205	N	TRUE
W4_LO6_003	1395.99	PEM	III	240.373	0.335	0.086	0.000	Y	0.000	0.421	Y	TRUE
W4_LO6_004	1396.61	PSS	IV	6.735	0.104	0.000	0.000	Y	0.104	0.000	N	TRUE
W4_LO6_005	1396.63	PEM	III	323.885	0.515	0.000	0.000	Y	0.000	0.515	N	TRUE
W4_LO6_102	1397.19	PEM	III	119.496	0.200	0.075	0.000	Y	0.000	0.275	Y	TRUE
W4_LO6_103	1397.43	PSS	III	0.000	0.000	0.000	3.503	Y	3.503	0.000	Y	TRUE
W1_LO6_002	1398.08	PEM	IV	52.881	0.045	0.000	0.000	Y	0.000	0.045	N	TRUE
W1_LO6_003	1398.08	PFO	IV	0.000	0.024	0.012	0.000	Y	0.035	0.000	N	TRUE
W1_LO6_004	1398.19	PEM	III	67.976	0.059	0.000	0.000	Y	0.000	0.059	Y	TRUE
W1_LO6_005	1398.58	PEM	IV	50.047	0.037	0.039	0.000	Y	0.000	0.076	N	TRUE
W1_LO6_006	1398.60	PEM	III	157.116	0.252	0.054	0.000	Y	0.000	0.306	N	TRUE
W1_LO6_007	1398.62	OW	No Rating	0.000	0.016	0.000	0.000	Y	0.016	0.000	N	TRUE
W1_LO6_008	1398.67	PEM	III	463.390	0.650	0.280	0.000	Y	0.000	0.930	N	TRUE
W1_LO6_009	1399.07	PFO	III	0.000	0.029	0.000	0.000	Y	0.029	0.000	N	TRUE
W1_LO6_011	1399.34	PEM	IV	135.691	0.163	0.008	0.000	Y	0.000	0.171	N	TRUE
W1_LO6_012	1399.41	PEM	IV	192.276	0.290	0.033	0.000	Y	0.000	0.323	N	TRUE
W1_LO6_015	1399.74	PEM	III	154.673	0.121	0.000	0.000	Y	0.000	0.121	N	TRUE
W2_LO6_001	1400.34	PEM	IV	69.437	0.048	0.000	0.000	Y	0.000	0.048	N	TRUE
W2_LO6_003	1400.43	PEM	IV	95.367	0.096	0.000	0.000	Y	0.000	0.096	N	FALSE
W2_LO6_005	1400.87	PEM	II	3537.883	3.917	3.386	0.000	Y	0.000	7.303	Y	TRUE
W2_LO6_004	1401.48	PFO	II	143.687	0.766	0.000	0.000	Y	0.766	0.000	N	TRUE
WP_LO6_001	1401.65	PEM	No Rating	0.000	0.016	0.000	0.000	Y	0.000	0.016	Y	TRUE

Table K1-2

Wetlands Crossed by the WEP

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)
Wetland Crossings												
W4_LO6_101	1402.90	PEM	IV	46.131	0.059	0.034	0.469	Y	0.000	0.562	Y	TRUE
W1_LO6_016	1404.19	PEM	III	275.161	0.391	0.110	0.274	Y	0.000	0.775	N	TRUE
W1_LO6_017	1404.33	PEM	III	76.702	0.143	0.000	0.000	Y	0.000	0.143	N	FALSE
W1_LO6_018	1404.41	PEM	I	161.267	0.332	0.000	0.000	Y	0.000	0.332	N	FALSE
WP_LO6_002	1405.21	PFO	No Rating	0.000	0.002	0.010	0.000	Y	0.011	0.000	N	TRUE
W1_LO6_019	1405.34	PEM	II	287.890	0.373	0.011	0.000	Y	0.000	0.384	N	TRUE
W2_LO6_006	1405.85	PEM	IV	479.945	0.718	0.000	0.000	Y	0.000	0.718	N	FALSE
W2_LO6_007	1406.04	PEM	IV	410.200	0.447	0.172	0.000	Y	0.000	0.619	Y	TRUE
W2_LO6_008	1406.38	PSS	III	111.335	0.410	0.000	0.000	Y	0.410	0.000	N	FALSE
W2_LO6_009	1406.54	PEM	IV	411.006	0.593	0.000	0.000	Y	0.000	0.593	Y	FALSE
W2_LO6_011	1407.45	PEM	III	530.784	0.676	0.000	0.000	Y	0.000	0.676	N	FALSE
W3_LO6_011	1408.20	PEM	III	98.849	0.110	0.000	0.000	Y	0.000	0.110	Y	FALSE
W3_LO6_011	1408.20	PFO	III	98.849	0.003	0.000	0.000	Y	0.003	0.000	Y	FALSE
W4_LO6_008	1408.35	PEM	III	58.247	0.086	0.003	0.000	Y	0.000	0.088	N	TRUE
W4_LO6_010	1408.96	PEM	IV	72.865	0.061	0.000	0.000	Y	0.000	0.061	N	FALSE
MV-71	1409.32	PSS	II	160.373	0.196	0.000	0.000	Y	0.196	0.000	N	TRUE
MV-71	1409.32	PEM	II	160.373	0.035	0.000	0.000	Y	0.000	0.035	N	TRUE
MV-71	1409.32	PFO	II	160.373	0.001	0.000	0.000	Y	0.001	0.000	N	TRUE
MV-70	1409.39	PEM	III	0.000	0.001	0.003	0.000	Y	0.000	0.004	N	TRUE
MV-70	1409.39	PSS	III	0.000	0.000	0.004	0.000	Y	0.004	0.000	N	TRUE
Snohomish Subtotal									**6.092**	**16.568**		
Mt Vernon South (Proxy Data)												
MV-17	1436.79	PFO	III	0.000	0.060	0.000	0.000	Y	0.060	0.000	N	TRUE
MV-20	1437.79	PFO	II	105.887	0.491	0.144	0.000	Y	0.635	0.000	N	TRUE
MV-20	1437.79	PSS	II	105.887	1.561	0.069	0.000	Y	1.629	0.000	N	TRUE
MV-21a	1438.45	PFO	III	201.418	0.334	0.096	0.060	Y	0.490	0.000	N	TRUE
MV-21b	1438.55	PFO	III	39.253	0.105	0.000	0.021	Y	0.126	0.000	N	TRUE
MV-21c	1438.58	PFO	III	190.784	0.265	0.093	0.002	Y	0.360	0.000	N	TRUE
MV-22	1438.73	PFO	III	153.715	0.241	0.000	0.000	Y	0.241	0.000	N	FALSE
MV-23a	1438.88	PEM	IV	387.662	0.704	0.000	0.000	Y	0.000	0.704	Y	FALSE
MV-23b	1438.98	PEM	IV	0.000	0.108	0.000	0.000	Y	0.000	0.108	Y	TRUE
MV-24	1439.03	PEM	IV	54.802	0.246	0.000	0.000	Y	0.000	0.246	Y	TRUE
MV-27a	1439.13	PEM	III	140.171	0.166	0.063	0.000	Y	0.000	0.228	Y	TRUE
MV-27b	1439.19	PEM	III	755.201	1.286	0.348	0.319	Y	0.000	1.952	Y	TRUE
MV-29.1	1439.34	PEM	IV	416.643	0.661	0.197	0.000	Y	0.000	0.858	N	TRUE
MV-29.2	1439.44	PEM	IV	0.000	0.000	0.000	0.003	Y	0.000	0.003	N	TRUE
MV-29.3	1439.48	PEM	IV	202.917	0.369	0.147	0.000	Y	0.000	0.516	N	TRUE
MV-28	1439.53	PFO	IV	22.127	0.030	0.013	0.000	Y	0.043	0.000	N	TRUE
MV-29.4	1439.58	PEM	IV	50.799	0.113	0.010	0.007	Y	0.000	0.130	Y	TRUE
MV-29.5	1439.62	PEM	IV	0.000	0.029	0.000	0.051	Y	0.000	0.080	Y	TRUE
MV-29.6	1439.64	PEM	IV	15.776	0.088	0.175	0.000	Y	0.000	0.263	Y	TRUE
MV-29.7	1439.64	PEM	IV	0.000	0.046	0.000	0.027	Y	0.000	0.073	Y	TRUE
MV-29.8	1439.68	PEM	IV	0.000	0.003	0.000	0.015	Y	0.000	0.018	Y	TRUE
MV-30a	1439.86	PEM	III	628.965	1.078	0.325	0.000	Y	0.000	1.404	Y	TRUE
MV-31	1440.15	PEM	III	0.000	0.000	0.000	0.318	Y	0.000	0.318	Y	TRUE
Mt. Vernon South Subtotal									**3.584**	**6.900**		
Mt. Vernon North A												
W4_LO8_009	1440.26	PEM	III	135.859	0.205	0.037	0.000	Y	0.000	0.242	Y	TRUE
W4_LO8_008	1440.59	PEM	IV	0.000	0.000	0.000	0.000	Y	0.000	0.000	Y	TRUE
W4_LO8_007	1440.62	PEM	IV	216.024	0.371	0.091	0.000	Y	0.000	0.463	Y	TRUE
W4_LO8_006	1441.06	PEM	IV	144.627	0.250	0.083	0.000	Y	0.000	0.333	Y	TRUE
W4_LO8_005	1441.10	PEM	IV	896.077	1.540	0.415	0.000	Y	0.000	1.955	Y	TRUE
W4_LO8_004	1441.45	PSS	III	37.118	0.096	0.000	0.000	Y	0.096	0.000	Y	FALSE
W2_LO8_005	1441.81	PEM	IV	100.921	0.118	0.029	0.000	Y	0.000	0.147	N	TRUE
W2_LO8_004	1442.10	PEM	III	101.460	0.167	0.000	0.000	Y	0.000	0.167	N	FALSE
W2_LO8_003	1442.50	PEM	III	515.916	0.874	0.246	0.000	Y	0.000	1.120	N	TRUE
W2_LO8_002	1442.78	PEM	IV	30.819	0.063	0.000	0.000	Y	0.000	0.063	Y	TRUE
W2_LO8_001	1442.92	PEM	IV	665.874	1.278	0.088	0.000	Y	0.000	1.366	N	TRUE
W4_LO8_001	1444.26	PEM	IV	26.421	0.019	0.004	0.000	Y	0.000	0.023	N	TRUE
W4_LO8_003	1444.59	PEM	IV	0.000	0.024	0.000	0.000	Y	0.000	0.024	N	TRUE
W4_LO8_002	1444.61	PEM	IV	169.748	0.117	0.000	0.000	Y	0.000	0.117	N	TRUE
Mt. Vernon North A Subtotal									**0.096**	**6.021**		

Table K1-2

Wetlands Crossed by the WEP

Wetland Crossings												
Wetland	**Milepost**	**Cowardin Classification[a, c]**	**Wetland Category (Ecology)[b]**	**Length of Ditch Excavated in Wetland (feet)**	**Acres of Wetland in Permanent Easement**	**Acres of Wetland in the Temporary Construction ROW**	**Acres of Wetland in ATWS**	**Crosses CAO Wetland Buffer (Y/N)**	**Total Permanent Wetland Disturbance (acres)**	**Total Temporary Wetland Disturbance (acres)**	**Agricultural Wetland (Y/N)**	**Wetland Crossing >75 ft (width)**
Mt. Vernon North B												
W1_LO9_001	1453.68	PEM	IV	0.000	0.020	0.000	0.000	Y	0.000	0.020	N	TRUE
W1_LO9_002	1453.71	PEM	IV	6.061	0.036	0.006	0.000	Y	0.000	0.042	N	TRUE
W1_LO9_003	1453.77	PEM	IV	0.000	0.024	0.055	0.000	Y	0.000	0.078	N	TRUE
W1_LO9_004	1453.86	PEM	IV	77.019	0.067	0.019	0.000	Y	0.000	0.085	N	TRUE
W1_LO9_005	1454.21	PEM	IV	127.311	0.154	0.000	0.000	Y	0.000	0.154	N	TRUE
W1_LO9_006	1454.34	PEM	II	306.644	0.271	0.018	0.000	Y	0.000	0.289	N	TRUE
W1_LO9_007	1454.49	PSS	III	0.000	0.000	0.000	0.000	Y	0.000	0.000	N	TRUE
W1_LO9_008	1454.60	PSS	III	0.000	0.028	0.000	0.000	Y	0.028	0.000	N	TRUE
W1_LO9_008	1454.60	PEM	III	0.000	0.082	0.000	0.000	Y	0.000	0.082	N	TRUE
W1_LO9_009	1454.67	PEM	III	208.238	0.354	0.000	0.000	Y	0.000	0.354	N	TRUE
W2_LO9_004	1455.13	PEM	III	0.000	0.123	0.000	0.000	Y	0.000	0.123	N	TRUE
WP_LO9_004	1455.27	PFO	No Rating	0.000	0.000	0.000	0.161	Y	0.161	0.000	Y	TRUE
W2_LO9_003	1455.45	PEM	IV	0.000	0.000	0.018	0.000	Y	0.000	0.018	N	TRUE
W2_LO9_002	1455.67	PEM	III	65.303	0.073	0.000	0.000	Y	0.000	0.073	N	TRUE
W2_LO9_001	1455.80	PEM	III	459.601	0.640	0.048	0.000	Y	0.000	0.688	N	TRUE
W3_LO9_001	1457.22	PEM	IV	35.870	0.016	0.000	0.000	Y	0.000	0.016	N	TRUE
W4_LO9_001	1457.70	PEM	IV	66.509	0.057	0.012	0.000	Y	0.000	0.069	N	TRUE
W4_LO9_002	1457.76	PSS	III	342.636	0.312	0.088	0.000	Y	0.400	0.000	N	TRUE
W4_LO9_003	1458.31	PEM	III	636.447	1.050	0.182	0.000	Y	0.000	1.232	Y	TRUE
W4_LO9_004	1458.48	PEM	I	642.533	0.791	0.514	0.000	Y	0.000	1.305	Y	TRUE
W4_LO9_006	1458.74	PEM	IV	157.053	0.125	0.121	0.000	Y	0.000	0.246	Y	TRUE
W4_LO9_005	1458.83	PEM	IV	225.268	0.182	0.206	0.000	Y	0.000	0.388	Y	TRUE
W3_LO9_002	1458.89	PEM	III	276.019	0.203	0.176	0.000	Y	0.000	0.378	Y	TRUE
WP_LO9_001	1458.92	PEM	No Rating	0.000	0.000	0.000	0.025	Y	0.000	0.025	Y	TRUE
W3_LO9_003	1459.04	PEM	IV	209.555	0.134	0.003	0.000	Y	0.000	0.137	N	TRUE
W3_LO9_003	1459.04	PFO	IV	209.555	0.000	0.069	0.000	Y	0.069	0.000	N	TRUE
W3_LO9_004	1459.13	PEM	III	468.678	0.379	0.428	0.000	Y	0.000	0.807	Y	TRUE
W3_LO9_005	1459.25	PEM	III	721.818	0.581	0.657	0.000	Y	0.000	1.238	Y	TRUE
W2_LO9_005	1459.89	PEM	II	3028.364	3.632	2.766	0.000	Y	0.000	6.398	Y	TRUE
RF-2	1461.22	PEM	IV	110.177	0.149	0.076	0.056	Y	0.000	0.281	Y	TRUE
WP_LO9_003	1461.51	PSS	No Rating	233.175	0.108	0.000	0.174	Y	0.282	0.000	Y	FALSE
Mt. Vernon North B Subtotal									**0.940**	**14.526**		
Sumas												
S-21	1479.01	PEM	II	16.536	0.484	0.006	0.000	Y	0.000	0.490	Y	TRUE
S-21	1479.01	PFO	II	16.536	0.017	0.035	0.000	Y	0.052	0.000	Y	TRUE
S-21	1479.01	PSS	II	16.536	0.066	0.040	0.000	Y	0.106	0.000	Y	TRUE
S-20	1479.23	PEM	IV	583.727	0.951	0.086	0.000	Y	0.000	1.037	Y	TRUE
S-20	1479.23	PSS	IV	583.727	0.000	0.001	0.000	Y	0.001	0.000	Y	TRUE
S-19	1479.56	PEM	IV	55.607	0.061	0.009	0.000	Y	0.000	0.070	N	TRUE
S-18	1479.74	PEM	IV	94.793	0.157	0.000	0.000	Y	0.000	0.157	N	FALSE
S-17	1479.87	PEM	III	556.327	0.986	0.065	0.000	Y	0.000	1.051	N	TRUE
S-16	1479.99	PFO	III	0.000	0.000	0.000	0.000	Y	0.000	0.000	N	FALSE
S-16	1479.99	PEM	III	0.000	0.091	0.000	0.000	Y	0.000	0.091	N	FALSE
S-14	1480.03	PEM	III	81.377	0.155	0.000	0.000	Y	0.000	0.155	Y	FALSE
S-14	1480.03	PSS	III	81.377	0.005	0.000	0.000	Y	0.005	0.000	Y	FALSE
S-13	1480.39	PEM	III	0.000	0.091	0.000	0.000	Y	0.000	0.091	Y	TRUE
S-13	1480.39	PFO	III	0.000	0.002	0.000	0.000	Y	0.002	0.000	Y	TRUE
S-13	1480.39	PSS	III	0.000	0.000	0.000	0.000	Y	0.000	0.000	Y	TRUE
S-12	1480.71	PEM	III	3.229	0.015	0.000	0.000	Y	0.000	0.015	N	FALSE
S-11	1480.87	PEM	III	92.507	0.136	0.001	0.000	Y	0.000	0.138	Y	TRUE
S-11	1480.87	PSS	III	92.507	0.000	0.000	0.000	Y	0.000	0.000	Y	TRUE
S-10	1480.92	PEM	III	0.000	0.283	0.003	0.000	Y	0.000	0.286	Y	TRUE
S-9	1481.01	PEM	II	0.000	0.000	0.000	0.000	Y	0.000	0.000	Y	TRUE
S-9	1481.01	PSS	II	0.000	0.036	0.007	0.000	Y	0.043	0.000	Y	TRUE
S-6	1482.25	PEM	III	0.000	0.001	0.000	0.000	Y	0.000	0.001	Y	TRUE
S-4B	1482.80	PEM	III	2.723	0.006	0.003	0.000	Y	0.000	0.009	Y	TRUE
S-4A	1483.07	PEM	III	16.329	0.021	0.013	0.000	Y	0.000	0.034	Y	TRUE
S-2	1483.98	PEM	IV	679.669	0.885	0.526	0.000	Y	0.000	1.411	Y	TRUE
WP_L010_001	1484.18	PEM	No Rating	0.000	0.000	0.000	4.710	Y	0.000	4.710	Y	TRUE
S-1	1484.31	PEM	IV	140.518	0.234	0.117	0.000	Y	0.000	0.351	Y	TRUE
Sumas Subtotal									**0.209**	**10.098**		
WEP Totals				**91934.124**	**143.776**	**27.412**	**35.647**	See Table 2A-5 for Totals adjusted for Cowardin Class.				

Table K1-2

Wetlands Crossed by the WEP

Wetland Crossings

Wetland	Milepost	Cowardin Classification[a, c]	Wetland Category (Ecology)[b]	Length of Ditch Excavated in Wetland (feet)	Acres of Wetland in Permanent Easement	Acres of Wetland in the Temporary Construction ROW	Acres of Wetland in ATWS	Crosses CAO Wetland Buffer (Y/N)	Total Permanent Wetland Disturbance (acres)	Total Temporary Wetland Disturbance (acres)	Agricultural Wetland (Y/N)	Wetland Crossing >75 ft (width)

[a] Cowardin et al. (1979) class based on vegetation: PEM = Palustrine emergent; PSS = Palustrine scrub-shrub; PFO = Palustrine forested; PSSC= Palustrine scrub-shrub seasonally flooded.

[b] Wetland category according to the Ecology rating system (Hruby, 2008).

[c] In cases where multiple Cowardin classes were described for a single feature in the Evergreen Report, the most sensitive class (PFO>PSS>PEM) was used.

Notes:

ROW = right-of-way

ATWS = additional temporary workspace

CAO = Critical Areas Ordinance

Y/N = yes or no

OW= Open Water wetland. Ecology does not have categories for nonvegetated wetlands.

Categorizing impacts as temporary or permanent assumes that the existing cleared easement is an accurate representation of Williams' easement, and the existing cleared easement following construction will be the same as the existing cleared easement.

PEM regardless if within the existing easement will be temporary impacts.

PSS inside existing easement would be permanent, outside existing easement would be temporary.

PFO regardless if within the existing easement will be permanent impacts because of the time it takes to grow trees.

Wetlands in this table are potentially subject to federal, state, and local jurisdiction. Final jurisdictional determinations, including the applicability of exemptions, are made by a case-by-case basis by the U.S. Army Corps of Engineers, Ecology, and local jurisdictions.

APPENDIX K2

POTENTIAL LANDSLIDE HAZARD AREAS CROSSED BY THE WEP

Table K2-1

Potential Landslide Hazard Areas Crossed by the WEP

Loop	Mapped Landslide Hazard From Milepost	Mapped Landslide Hazard To Milepost	Information Source	Type of Hazard
Woodland	1244.33	1244.40	WDNR, 2006	Potentially unstable slopes
Woodland	1260.62	1260.65	WDNR, 2006	Potentially unstable slopes
Woodland	1260.75	1260.84	WDNR, 2006	Potentially unstable slopes
Woodland	1260.85	1260.87	WDNR, 2006	Potentially unstable slopes
Woodland	1261.00	1261.05	WDNR, 2006	Potentially unstable slopes
Woodland	1261.25	1261.28	WDNR, 2006	Potentially unstable slopes
Woodland	1261.31	1261.43	WDNR, 2006	Potentially unstable slopes
Woodland	1271.78	1271.97	WDNR, 2006	Potentially unstable slopes
Woodland	1274.20	1274.21	WDNR, 2006	Potentially unstable slopes
Woodland	1275.21	1275.32	WDNR, 2006	Potentially unstable slopes
Woodland	1275.52	1275.53	WDNR, 2006	Potentially unstable slopes
Sumner South	1338.43	1338.58	Pierce County, 2011	Potential landslide hazard
Sumner South	1338.92	1339.01	Pierce County, 2011	Potential landslide hazard
Sumner South	1338.94	1338.96	Pierce County, 2003	20 to 40% slopes
Sumner South	1339.62	1339.82	Pierce County, 2011	Potential landslide hazard
Sumner South	1339.63	1339.65	Pierce County, 2003	20 to 40% slopes
Sumner South	1339.67	1339.68	Pierce County, 2003	20 to 40% slopes
Sumner South	1339.68	1339.68	Pierce County, 2003	20 to 40% slopes
Sumner South	1339.69	1339.70	Pierce County, 2003	20 to 40% slopes
Sumner South	1339.71	1339.73	Pierce County, 2003	20 to 40% slopes
Sumner South	1339.91	1339.93	Pierce County, 2011	Potential landslide hazard
Sumner South	1339.94	1339.97	Pierce County, 2011	Potential landslide hazard
Sumner South	1340.03	1340.05	Pierce County, 2011	Potential landslide hazard
Sumner South	1340.06	1340.16	Pierce County, 2001	Potential landslide hazard
Sumner South	1340.18	1340.67	Pierce County, 2011	Potential landslide hazard
Sumner South	1340.21	1340.22	Pierce County, 2003	20 to 40% slopes
Sumner South	1340.22	1340.28	Pierce County, 2003	20 to 40% slopes
Sumner South	1340.31	1340.35	Pierce County, 2003	20 to 40% slopes
Sumner South	1340.36	1340.39	Pierce County, 2003	20 to 40% slopes
Sumner South	1340.50	1340.50	Pierce County, 2003	20 to 40% slopes
Sumner South	1340.50	1340.51	Pierce County, 2003	20 to 40% slopes
Sumner South	1340.69	1340.74	Pierce County, 2011	Potential landslide hazard
Sumner South	1340.70	1340.72	Pierce County, 2003	20 to 40% slopes
Sumner South	1341.37	1341.45	Pierce County, 2011	Potential landslide hazard
Sumner South	1341.39	1341.39	Pierce County, 2003	20 to 40% slopes
Sumner South	1341.40	1341.42	Pierce County, 2003	20 to 40% slopes
Sumner South	1343.87	1343.92	Pierce County, 2011	Potential landslide hazard
Sumner South	1344.06	1344.07	Pierce County, 2003	20 to 40% slopes
Sumner South	1344.09	1344.09	Pierce County, 2003	20 to 40% slopes
Sumner South	1345.61	1345.64	Pierce County, 2003	20 to 40% slopes
Sumner South	1346.07	1346.07	Pierce County, 2003	20 to 40% slopes
Sumner South	1346.22	1346.24	Pierce County, 2003	20 to 40% slopes

Table K2-1

Potential Landslide Hazard Areas Crossed by the WEP

Loop	Mapped Landslide Hazard From Milepost	Mapped Landslide Hazard To Milepost	Information Source	Type of Hazard
Sumner South	1346.24	1346.32	Pierce County, 2003	20 to 40% slopes
Sumner South	1346.43	1346.51	Pierce County, 2003	20 to 40% slopes
Sumner South	1346.55	1346.57	Pierce County, 2003	20 to 40% slopes
Sumner South	1346.66	1346.66	Pierce County, 2003	20 to 40% slopes
Sumner South	1346.80	1346.83	Pierce County, 2003	20 to 40% slopes
Sumner South	1347.90	1347.93	Pierce County, 2011	Potential landslide hazard
Sumner South	1347.91	1347.91	Pierce County, 2003	20 to 40% slopes
Sumner South	1347.96	1347.98	Pierce County, 2011	Potential landslide hazard
Sumner South	1347.97	1347.98	Pierce County, 2003	20 to 40% slopes
Sumner South	1349.57	1349.57	Pierce County, 2003	20 to 40% slopes
Sumner South	1349.58	1349.58	Pierce County, 2003	20 to 40% slopes
Sumner South	1349.60	1349.60	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.06	1350.16	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.16	1350.16	Pierce County, 2003	40 to 100% slopes
Sumner South	1350.16	1350.18	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.19	1350.19	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.19	1350.19	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.21	1350.28	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.65	1350.91	Pierce County, 2011	Potential landslide hazard
Sumner South	1350.68	1350.72	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.73	1350.77	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.85	1350.87	Pierce County, 2003	20 to 40% slopes
Sumner South	1350.98	1351.08	Pierce County, 2011	Potential landslide hazard
Sumner South	1351.00	1351.01	Pierce County, 2003	20 to 40% slopes
Sumner South	1351.04	1351.06	Pierce County, 2003	20 to 40% slopes
Sumner South	1351.12	1351.25	Pierce County, 2011	Potential landslide hazard
Sumner South	1351.16	1351.19	Pierce County, 2003	20 to 40% slopes
Sumner South	1351.49	1351.63	Pierce County, 2011	Potential landslide hazard
Sumner South	1351.50	1351.51	Pierce County, 2003	20 to 40% slopes
Sumner South	1351.55	1351.58	Pierce County, 2003	20 to 40% slopes
Sumner North A	1357.18	1357.50	King County, 2006	any combination of: slopes greater than 15 percent, impermeable soils frequently interbedded with granular soils, springs or groundwater seepage, any area that has shown movement during the Holocene epoch or that is underlain by mass wastage debris of that epoch, any area potentially unstable as a result of rapid stream incision or stream bank erosion or undercutting by wave action, any area that shows evidence of snow avalanches, and any area located on an alluvial fan
Sumner North A	1359.58	1359.68	King County, 2006	any combination of: slopes greater than 15 percent, impermeable soils frequently interbedded with granular soils, springs or groundwater seepage, any area that has shown movement during the Holocene epoch or that is underlain by mass wastage debris of that epoch, any area potentially unstable as a result of rapid stream incision or stream bank erosion or undercutting by wave action, any area that shows evidence of snow avalanches, and any area located on an alluvial fan

Table K2-1

Potential Landslide Hazard Areas Crossed by the WEP

Loop	Mapped Landslide Hazard From Milepost	Mapped Landslide Hazard To Milepost	Information Source	Type of Hazard
Sumner North A	1360.83	1360.91	King County, 2006	any combination of: slopes greater than 15 percent, impermeable soils frequently interbedded with granular soils, springs or groundwater seepage, any area that has shown movement during the Holocene epoch or that is underlain by mass wastage debris of that epoch, any area potentially unstable as a result of rapid stream incision or stream bank erosion or undercutting by wave action, any area that shows evidence of snow avalanches, and any area located on an alluvial fan
Sumner North A	1361.11	1361.22	King County, 2006	any combination of: slopes greater than 15 percent, impermeable soils frequently interbedded with granular soils, springs or groundwater seepage, any area that has shown movement during the Holocene epoch or that is underlain by mass wastage debris of that epoch, any area potentially unstable as a result of rapid stream incision or stream bank erosion or undercutting by wave action, any area that shows evidence of snow avalanches, and any area located on an alluvial fan
Sumner North B	1376.13	1376.33	King County, 2006	any combination of: slopes greater than 15 percent, impermeable soils frequently interbedded with granular soils, springs or groundwater seepage, any area that has shown movement during the Holocene epoch or that is underlain by mass wastage debris of that epoch, any area potentially unstable as a result of rapid stream incision or stream bank erosion or undercutting by wave action, any area that shows evidence of snow avalanches, and any area located on an alluvial fan
Snohomish	1396.52	1396.55	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.56	1396.56	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.60	1396.60	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.69	1396.71	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.72	1396.74	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.90	1396.91	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.93	1396.95	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.94	1396.94	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1396.97	1396.98	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1397.03	1397.04	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1397.51	1397.52	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1397.94	1397.94	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1397.95	1397.99	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1398.21	1398.21	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet

Table K2-1

Potential Landslide Hazard Areas Crossed by the WEP

Loop	Mapped Landslide Hazard From Milepost	Mapped Landslide Hazard To Milepost	Information Source	Type of Hazard
Snohomish	1398.22	1398.23	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1398.24	1398.29	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1398.40	1398.40	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1400.25	1400.25	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1400.44	1400.45	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1401.56	1401.57	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1401.58	1401.58	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1402.91	1402.91	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1404.37	1404.38	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1404.38	1404.38	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1404.66	1404.66	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1407.72	1407.79	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1407.79	1407.80	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1408.36	1408.39	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet
Snohomish	1408.39	1408.39	Snohomish County, 1999	Slopes greater than 33% and an elevation change greater than 10 feet

Note: No potential landslides or steep slopes are mapped along the Chehalis, Mt. Vernon South, Mt. Vernon North A, Mt. Vernon North B, and Sumas loops. Large portions of these loops are located within Lewis, Thurston, and Skagit Counties, which do not have landslide information. The absence of information from these counties does not indicate that landslides are not a hazard.

WDNR = Washington State Department of Natural Resources

References

King County. 2006. *Landslide Hazard Areas.* King County Geographic Information System Center GIS data dated August 5, 2006. http://www5.kingcounty.gov/gisdataportal/Default.aspx. Accessed November 5, 2012.

Pierce County. 2003. *Steep Slopes (Urban)*. Pierce County Geographic Information Services GIS data dated February, 25, 2003. http://yakima.co.pierce.wa.us/geodataexpress/main.html. Accessed November 5, 2012.

Pierce County. 2011. *Landslide Hazard Areas*. GIS data dated June 15, 2011. http://yakima.co.pierce.wa.us/geodataexpress/main.html. Accessed November 5, 2012.

Snohomish County. 1999. *Slopes*. Derived from the USGS 10-meter Digital Elevation Model. Snohomish County Planning and Development Services, Cartography-Geographic Information System Section. December 1999.

Washington State Department of Natural Resources (DNR). 2006. *Digital Landslide Inventory for the Cowlitz County Urban Corridor, Washington, version 1.0*. Map Scale 1:24,000. http://www.dnr.wa.gov/ResearchScience/Topics/GeologyPublicationsLibrary/Pages/pub_ri35.aspx. Accessed November 5, 2012.

Table K2-2

State and County Documented Landslide Hazards Crossed

Loop	Mapped Landslide Hazard From Milepost	Mapped Landslide Hazard To Milepost	Primary Information Source(s)	Landslide Hazard Information Provided by the Data Sources
Woodland	1245.21	1245.41	WDNR, 2006	Rotational-translational slide.
Woodland	1245.23	1245.24	WDNR, 2006	Translational slide.
Woodland	1245.45	1245.57	WDNR, 2006	Rotational slide.
Woodland	1246.24	1246.28	WDNR, 2006	Rotational slide.
Woodland	1246.51	1246.57	WDNR, 2006	Translational to flow slide.
Woodland	1247.63	1247.75	WDNR, 2006	Translational to flow slide. Very large slide complex. No evidence of recent movement.
Woodland	1249.38	1249.81	WDNR, 2006	Translational slide. Very large slide complex. No evidence of recent movement.
Woodland	1251.89	1251.98	WDNR, 2006	Translational to flow slide.
Woodland	1252.09	1252.44	WDNR, 2006	Rotational-translational slide. No evidence of recent movement.
Woodland	1253.08	1253.10	WDNR, 2006	Shallow landslide.
Woodland	1253.64	1253.93	WDNR, 2006	Rotational-translational slide. Reactivation of landslide caused by a natural gas pipeline failure in 1996. Later monitoring identified movement continuing into 1999.
Woodland	1254.27	1254.39	WDNR, 2006	Translational slide.
Woodland	1255.30	1255.63	WDNR, 2006 WDNR, 2010b	Deep-seated rotational-translational slide. Very large multipart slide. No evidence of recent movement.
Woodland	1259.27	1259.93	WDNR, 2006 WDNR, 2010b	Deep-seated rotational-translational slide.
Woodland	1261.35	1261.38	WDNR, 2006 WDNR, 2010b	Deep-seated rotational slide.
Woodland	1268.36	1268.67	WDNR, 2006 WDNR, 2010b	Deep-seated rotational-translational slide. Very large deep-seated rock slide. Possibly old rock avalanche complex.
Woodland	1268.98	1269.30	WDNR, 2006 WDNR, 2010b	Deep-seated rotational-translational slide.
Woodland	1269.71	1269.83	WDNR, 2006 WDNR, 2010b	Deep-seated translational slide.
Woodland	1270.10	1270.46	WDNR, 2006 WDNR 2010b	Deep-seated translational slide. Only evidence of recent activity is back-tilting trees.
Woodland	1270.46	1270.69	WDNR, 2006 WDNR, 2010b	Deep-seated rotational-translational slide. A small failure affecting the pipeline right-of-way. Possibly reactivation of toe of larger slide. Strain gauge installed on pipe.
Woodland	1271.10	1271.18	WDNR, 2006 WDNR, 2010b	Deep-seated rotational-translational slide. Small tension cracks noted along west edge of pipeline right-of-way. Possibly related to reactivation of this slide.
Woodland	1271.39	1271.47	WDNR, 2006 WDNR, 2010b	Deep-seated rotational-translational slide. Small tension cracks noted along west edge of pipeline right-of-way. Possibly related to reactivation of this slide.
Woodland	1272.43	1272.53	WDNR, 2006 WDNR, 2010b	Deep-seated translational slide. Pipeline rerouted across toe of this slide after the slide caused failure (explosion) of pipeline. Evidence of movement in recent past.
Woodland	1283.20	1283.50	WDNR, 2010a	Mapped landslide deposits.
Chehalis	1292.33	1292.45	WDNR, 2010a	Mapped landslide deposits.
Chehalis	1294.77	1295.16	WDNR, 2010a	Mapped landslide deposits.
Chehalis	1299.03	1299.45	WDNR, 2010a	Mapped landslide deposits.
Chehalis	1303.59	1303.84	WDNR, 2010a	Mapped landslide deposits.
Chehalis	1304.02	1304.04	WDNR, 2010a	Mapped landslide deposits.

Table K2-2

State and County Documented Landslide Hazards Crossed

Loop	Mapped Landslide Hazard From Milepost	Mapped Landslide Hazard To Milepost	Primary Information Source(s)	Landslide Hazard Information Provided by the Data Sources
Chehalis	1305.02	1305.11	WDNR, 2010a	Mapped landslide deposits.
Chehalis	1306.50	1306.97	WDNR, 2010a	Mapped landslide deposits.
Chehalis	1314.60	1314.77	WDNR, 2010b	Deep-seated.
Sumner North A	1357.18	1357.50	King County, 2006	Unknown.
Sumner North A	1359.58	1359.68	King County, 2006	Unknown.
Sumner North A	1360.83	1360.91	King County, 2006	Unknown.
Sumner North A	1361.11	1361.22	King County, 2006	Unknown.
Sumner North B	1373.50	1374.32	WDNR, 2010a	Mapped landslide deposits.
Sumner North B	1374.02	1374.17	WDNR, 2010b	Deep-seated earthflow.
Sumner North B	1376.13	1376.33	King County, 2006	Unknown.

Note: No state or county documented landslide hazards are mapped along the Sumner South, Snohomish, Mt. Vernon South, Mt. Vernon North A, Mt. Vernon North B, and Sumas loops. Large portions of these loops are located within Lewis, Thurston, and Skagit Counties, which do not have landslide information. The absence of information from these counties does not indicate that landslides are not a hazard.

References

King County. 2006. Landslide Hazard Areas. King County Geographic Information System Center GIS data dated August 5, 2006. http://www5.kingcounty.gov/gisdataportal/Default.aspx. Accessed November 5, 2012.

Washington State Department of Natural Resources (WDNR). 2006. Digital Landslide Inventory for the Cowlitz County Urban Corridor, Washington, version 1.0. Map Scale 1:24,000. http://www.dnr.wa.gov/ResearchScience/Topics/GeologyPublicationsLibrary/Pages/pub_ri35.aspx. Accessed November 5, 2012.

Washington State Department of Natural Resources (DNR). 2010a. Surface Geology. Map Scale 1:100,000. GIS data dated June 2010. http://www.dnr.wa.gov/ReseaerchScience/Topics/GeosciencesData/Pages/gis_data.aspx. Last accessed November 5, 2012.

Washington State Department of Natural Resources (WDNR). 2010b. Ground Response. GIS data dated June 2010. http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/gis_data.aspx. Last accessed November 5, 2012.

Table K2-3

Active Landslide Hazards Identified from Previous Northwest Operations Experience

Loop	Landslide ID No.	Mapped Landslide Hazard Milepost	Size (feet by feet)	Landslide Hazard	Movement	Landslide Cause	Mitigation/Monitoring [a]
Woodland	1	1245.27	700 x 1,000 old landslide, 50-70 x 100-150 recent failure	Recent small landslide about 10 feet west of right-of-way	Recent activation of smaller failure within old landslide. Visual monitoring indicates there is no ongoing slope instability.	Undetermined.	Visual monitoring at least annually, or as needed.
Woodland	2	1245.76	At least 200 feet from right-of-way, 260 x 450	Green Mountain Road Landslide; rock slide – debris flow	Initial movement occurred in 1994 following road widening and realignment. Additional movement occurred in 1995 and 1996. Site stabilized after remediation by Cowlitz County. No ongoing slope instability.	Steep road cut created as a result of the Green Mountain Road widening and realignment.	Remediation conducted by County in 1996. Surface displacement survey every 5 years.
Woodland	3	1245.92	At least 200 feet east of right-of-way, 400 x 800	Rock slide – debris flow	Recent movement in 1996. Visual monitoring indicates there is no ongoing slope instability.	Undetermined.	Visual monitoring at least annually, or as needed.
Woodland	4	1246.53	240 x 640 slide within older (5,000 to 10,000 years ago) 350-400 x 1,500 slide	Shirley Gordon Road Landslide; rock slide – debris flow	Movement identified in 1996. After mitigation, strain gauge readings have not exceeded thresholds to require further action.	Elevated groundwater levels resulting from recent heavy precipitation.	Remediation conducted in 1996. Surface and subsurface drainage measures installed and maintained. Manual strain gauges (2) installed. Surface displacement survey every 3 years, or as needed.
Woodland	5	1248.20	60 x 60	Fill failure	Fill failure in 1970s to 1980s. No recent movement after regrading and shoring installed.	Undetermined.	Regrading and shoring mitigated fill failure. Visual monitoring at least annually, or as needed.
Woodland	6	1253.20	60 x 140, 2003 landslide is about 30 percent of 1996 landslide	Kalama South Landslide	First occurred in 1996 from saturation of loose fill. Additional fill failure in 2003 from fiber-optic installation. No additional movement observed.	Saturation of the loose fill located along the outboard (west) side of the right-of-way.	Reconstruct slide area with engineered fill. Drainage measures installed in 1996 and repaired after fiber installation. Surface displacement survey every 3 years, or as needed.

Table K2-3

Active Landslide Hazards Identified from Previous Northwest Operations Experience

Loop	Landslide ID No.	Mapped Landslide Hazard Milepost	Size (feet by feet)	Landslide Hazard	Movement	Landslide Cause	Mitigation/Monitoring [a]
Woodland	7	1253.92	200 x 700 within older 480 x 700 slide	Kalama North Landslide	Landslide caused 26-inch pipe rupture in 1997. Since 2007, strain gauge readings have not exceeded thresholds to require further action.	Elevated groundwater levels resulting from unusually heavy precipitation and rapid snow melt.	Strain relief excavation in 1997, 1999, and 2007 and backfilled with engineered fill. Surface and subsurface drainage measures installed, enhanced, and maintained. Manual (6) and automated (4) strain gauges installed. Surface displacement survey annually, or as needed. Visual monitoring at least annually, or as needed.
Woodland	8	1254.27	100 x 220 recent landslide within older 1600 x 3000 landslide	Mt. Pleasant Landslide	First identified in 1986. After mitigation, strain gauge readings have not exceeded thresholds to require further action.	High groundwater levels.	Strain relief excavation in 1987 and backfilled with engineered fill. Drainage measures installed in 1987. Automated strain gauges (2) installed. Surface displacement survey annually, or as needed. Visual monitoring at least annually, or as needed.
Woodland	9	1255.56	Upslope of right-of-way, 70 x 4000	Olsen Road/Kool Road Landslide	Tension cracks identified in adjacent roadways in 1999 during a geologic hazard study. No ongoing slope instability.	Undetermined.	Manual (1) strain gauge installed in 1999. Surface displacement survey at least every 3 years, or as needed. Visual monitoring at least annually, or as needed.
Woodland	10	1259.60	Area of 86 acres, 1600 feet length along right-of-way	Active landslide downslope of right-of-way	Slope movement observed downslope of right-of-way in 1998. No ongoing slope instability.	Undetermined.	Visual monitoring at least annually, or as needed.
Woodland	11	1261.37	240 x 480	Harris Street Landslide	Initial movement identified during right-of-way inspection in 1997. Strain gauge readings have not exceeded thresholds to require further action since regrading and drainage measures installed in 2002.	Slow moving feature.	Partial strain relief excavation in 1999 and strain relief excavation in 2002 with installation of drainage measures and site regrading. Automated strain gauges (6) installed. Surface displacement survey annually, or as needed. Visual monitoring at least annually, or as needed.

Table K2-3

Active Landslide Hazards Identified from Previous Northwest Operations Experience

Loop	Landslide ID No.	Mapped Landslide Hazard Milepost	Size (feet by feet)	Landslide Hazard	Movement	Landslide Cause	Mitigation/Monitoring [a]
Woodland	12	1261.56	Area of about 2 acres	Active landslide 50 feet east of right-of-way	Geomorphic evidence of recent movement observed In 2000 during geohazard reconnaissance,	Undetermined.	Visual monitoring at least annually, or as needed.
Woodland	13	1266.38	Area less than 1 acre	Walnut acres or KB Landslide	Fill failure along west side of right-of-way. No geomorphic evidence of ongoing activity.	Undetermined.	Visual monitoring at least annually, or as needed.
Woodland	14	1270.44	200-300 x 200	Castle Rock Metering Station Landslide	Landslide that occurred before 1969 required moving the metering station to its current location. In 1999, additional movement was noted but area has been stable since.	Placement of recent fill or slow movement of the larger slide.	Manual strain gauge (2) installed in 1999. Visual monitoring at least annually, or as needed.
Woodland	15	1270.56	35 x 200	Powell Road Landslide	Landslide first observed during annual inspection in 1999. Stable since 2005 strain relief.	Uncontrolled surface water and groundwater.	Surface and subsurface drainage measures and manual strain gauges (6) installed and enhanced in 1999 and 2005. Strain relief excavation in 2005 and backfilled with engineered fill. Surface displacement survey every 2 years, or as needed. Visual monitoring at least annually, or as needed.
Woodland	16	1272.50	Recent 250-600 x 1200 landslide within an ancient landslide	Castle Rock Landslide	Landslide in 1995 caused 26-inch pipe to rupture. Strain gauge readings have not exceeded thresholds to require further action since reroute.	Placement of the State Route 504 fill upslope of pipeline and high groundwater levels.	26- and 30-inch pipelines rerouted around slide area. Manual strain gauges (2) installed. Visual monitoring at least annually, or as needed.
Chehalis	17	1295.10	350 x 350	MacMillan Landslide	Stability issues first identified in 1977. Strain gauge readings have not exceeded thresholds to require further action since 1994.	High groundwater levels in a topographic depression.	Strain relief excavation of the 30-inch pipeline and replacement of 320 feet of 26-inch pipe in 1978. Manual strain gauges (3) installed in 1994. Surface displacement survey every 3 years, or as needed. Visual monitoring at least annually, or as needed.

Table K2-3

Active Landslide Hazards Identified from Previous Northwest Operations Experience

Loop	Landslide ID No.	Mapped Landslide Hazard Milepost	Size (feet by feet)	Landslide Hazard	Movement	Landslide Cause	Mitigation/Monitoring [a]
Chehalis	18	1304.89	375 x 150	TransAlta Coal Mine Landslide	Landslide movement occurred in 2005. Strain gauge readings have not exceeded thresholds to require further action.	Direct effect of blasting and/or the loss of shear strength due to stress relaxation.	Surface and subsurface drainage measures installed. Strain relief excavation and backfilled with engineered fill. Automated strain gauges (6) installed in 2005. Visual monitoring at least annually, or as needed.
Chehalis	19	1309.13	260 x 210	Skookumchuck Landslide	Old landslide movement occurred before installation of pipeline. Stability problems were first identified in 1971 and again in 1978 and 1979. Stable since drainage measures installed in 2005.	Erosion of the landslide toe during high flows in the Skookumchuck River.	Surface displacement monitors installed in 1979. Strain relief excavation. Manual strain gauges (7) installed in 1987. Drainage measures installed and enhanced in 1987, 1994, and 2005. Surface displacement survey every 3 years, or as needed. Visual monitoring at least annually, or as needed.
Chehalis	20	1314.65	100-120 x 250	Vail Mountain Landslide	Landslide first identified in 1997 during annual inspection. Strain gauge readings have not exceeded thresholds to require further action since mitigation.	Preexisting landslide with elevated groundwater levels.	Strain relief excavation in 1997. Automated strain gauges (2) installed in 1997. Drainage measures installed in 1997. Surface displacement survey every 3 years, or as needed. Visual monitoring at least annually, or as needed.
Snohomish	21	1407.72	Undefined	Pilchuck River Landslide	Pilchuck River undercut south riverbank causing landslide prior to 1971. No additional movement observed since reroute.	Pilchuck River undercutting the southern riverbank.	26-inch pipeline was rerouted to more stable area and 30-inch pipeline was later installed parallel to it. Visual monitoring at least annually, or as needed.
Mt. Vernon North A	22	1444.87	Undefined	South Skagit Span Landslide	Shallow slope failure observed in 2002.	Near surface sloughing and soil creep.	Visual monitoring at least annually, or as needed.

[a] Annual low-level patrol in a helicopter and weekly aerial patrols of all geohazards sites.

APPENDIX K3

PRIVATE WELLS WITHIN 200 FEET OF WORKSPACE

Appendix K3

Private Wells within 200 Feet of Workspace

Well Owner	Well Name	Type-Use	Depth (ft)	Township	Range	Section	1/4, 1/4 Section		Closest Milepost	Distance from Construction Right-of-Way (ft)	Direction from Work Area	Loop Number
GREG COWELL	AFN757	Domestic	624	5N	1E	7	NW	NW	1245.0	81	E	1
PERRY MAGSTADT	AKP906	Domestic	524	5N	1E	7	NW	NW	1245.0	81	E	1
BRIAN TRAFFIE	ACB247	Domestic	265	5N	1W	1	SE	NE	1245.6	60	SW	1
HARRY LEFEBER	AHP841	Domestic	123	5N	1W	1	SE	NE	1245.6	60	SW	1
CINDY MUINIO	ACR164	Domestic	443	5N	1W	1	SE	NE	1245.6	60	SW	1
RIDGECREST III	AKA886	Domestic	404	5N	1W	1	SE	NE	1245.6	60	SW	1
RIDGECREST III	AKA888	Domestic	502	5N	1W	1	SE	NE	1245.6	60	SW	1
AMERICAN MARINE BANK	AGK073	Domestic	373	5N	1W	1	NE	NW	1246.2	51	SW	1
ROBERT REED		Domestic	142	5N	1W	1	NE	NW	1246.2	51	SW	1
LANNY CAWLEY		Domestic	202	5N	1W	1	NE	NW	1246.2	51	SW	1
THOMAS & TERA MOORE	ABC880	Domestic	510	5N	1W	1	NE	NW	1246.2	51	SW	1
MARK COOK		Domestic	343	6N	1W	36	SW	NE	1246.7	0	NA	1
DARIN HAGEN	AAH767	Domestic	225	6N	1W	36	SW	NE	1246.7	0	NA	1
JOHN COVINGTON	ACR047	Domestic	285	6N	1W	36	SW	NE	1246.7	0	NA	1
PERRY STEVE	AFB689	Domestic	203	6N	1W	36	NW	NW	1247.3	80	NE	1
PAUL AND LORETTA UNREIN	BAH600	Domestic	580	6N	1W	36	NW	NW	1247.3	80	NE	1
GEORGE & MARIANNE SELLERS	AEN971	Domestic	600	6N	1W	26	SE	NE	1247.8	73	W	1
LOREN SIEVITA	BAS561	Domestic	804	6N	1W	26	SE	NE	1247.8	73	W	1
DAN HAUSER	ACF177	Domestic	60	6N	1W	23	SW	NE	1249.0	61	NE	1
PEDER PEDERSON		Domestic	460	6N	1W	23	NW	NW	1249.6	0	NA	1
NEIL ROSEVEAR	ACR686	Domestic	142	6N	1W	15	NE	SE	1250.4	93	SW	1
CROW BUTTE DEVELOPMENT	ACD846	Domestic	181	6N	1W	10	SE	NW	1251.1	115	NE	1
CROW BUTTE DEVELOPMENT	ACD849	Domestic	323	6N	1W	10	SE	NW	1251.1	115	NE	1
WESLEY WYNN		Domestic	84	6N	1W	10	0	0	1251.3	147	NW	1
TOM GRIGGS		Domestic	343	6N	1W	10	0	0	1251.3	147	NW	1
RUSSELL VEAZIE		Domestic	141	6N	1W	10	0	0	1251.3	147	NW	1
MICHAEL HAUSE		Domestic	122	6N	1W	10	0	0	1251.3	147	NW	1
DONALD STEWART		Domestic	180	6N	1W	10	0	0	1251.3	147	NW	1
CALVIN ARN		Domestic	135	6N	1W	10	0	0	1251.3	147	NW	1
WATERMARK ESTATES INC	APQ365	Domestic	0	6N	1W	10	0	0	1251.3	147	NW	1
DARREN JOY	AHP522	Domestic	365	7N	1W	20	SE	SE	1255.4	128	W	1
D. L. BRANHAM		Domestic	67	7N	1W	20	SE	NE	1255.7	92	E	1
LARRY HORST	AAH892	Domestic	402	7N	1W	20	SE	NE	1255.7	92	E	1
MARY ROBBINS	ACR983	Domestic	425	7N	1W	20	SE	NE	1255.7	92	E	1
WALT CROWE		Domestic	242	7N	1W	20	NE	0	1256.1	34	NE	1
AUDREY RITCHIE		Domestic	321	7N	1W	17	0	0	1256.9	64	E	1
TERRY HERNDON	BBC264	Domestic	281	7N	1W	17	0	0	1256.9	64	E	1

Appendix K3

Private Wells within 200 Feet of Workspace

Well Owner	Well Name	Type-Use	Depth (ft)	Township	Range	Section	1/4, 1/4 Section		Closest Milepost	Distance from Construction Right-of-Way (ft)	Direction from Work Area	Loop Number
JULIO MENDEZ		Domestic	0	7N	1W	17	0	0	1256.9	64	E	1
JULIO MENDEZ		Domestic	240	7N	1W	17	0	0	1256.9	64	E	1
KAREN RICHARDS		Domestic	419	7N	1W	17	0	0	1256.9	64	E	1
JAMES HERNDORL		Domestic	202	7N	1W	17	0	0	1256.9	64	E	1
DONALD STEARNS		Domestic	141	7N	1W	17	0	0	1256.9	64	E	1
COLLIER MCDANIEL		Domestic	100	7N	1W	17	0	0	1256.9	64	E	1
JAMES HERNDON		Domestic	419	7N	1W	17	0	0	1256.9	64	E	1
DAVID AND KATHY MORGAN		Domestic	285	7N	1W	17	0	0	1256.9	64	E	1
MIKE MURRAY	AHP855	Domestic	0	7N	1W	17	0	0	1256.9	64	E	1
MIKE MURRAY	AHP855	Domestic	0	7N	1W	17	0	0	1256.9	64	E	1
ROBERT KELLEY		Domestic	140	7N	1W	17	NW	SE	1257.1	0	NA	1
JULIO MENDEZ		Domestic	245	7N	1W	17	NW	SE	1257.1	0	NA	1
WILBUR PARSONS		Domestic	461	7N	1W	17	NW	NE	1257.4	0	NA	1
JERRY AND PAMELA GOMES	ALJ444	Domestic	484	7N	1W	8	SW	SE	1257.6	135	NE	1
RALPH FONTANA	AAH893	Domestic	142	7N	1W	8	SW	0	1257.8	0	NA	1
ART MELTON		Domestic	245	7N	1W	6	NE	SE	1259.2	0	NA	1
RANDY KOTKA		Domestic	381	7N	1W	6	NE	SE	1259.2	0	NA	1
JACOB BLANKSMA		Domestic	90	8N	1W	31	SE	0	1259.1	73	E	1
CLAUDE MONTGOMERY		Domestic	0	8N	1W	30	NW	SW	1261.4	7	W	1
CLAUDE MONTGOMERY		Domestic	148	8N	1W	30	NW	SW	1261.4	7	W	1
RONALD CHAMBERLAIN		Domestic	242	8N	2W	12	0	0	1264.5	0	NA	1
MRS., CHANDLER		Domestic	130	8N	2W	12	0	0	1264.5	0	NA	1
L. B. HOLLINGER		Domestic	164	8N	2W	12	0	0	1264.5	0	NA	1
G E STEED		Domestic	230	8N	2W	12	0	0	1264.5	0	NA	1
CLOYD BRISTER		Domestic	125	8N	2W	12	0	0	1264.5	0	NA	1
DON & SHERI ABBOTT		Domestic	225	8N	2W	12	NE	NW	1264.9	137	SE	1
KEVIN JORGENSON		Domestic	325	8N	2W	1	0	0	1265.6	145	SW	1
THOMAS BROOKERSON	BBC296	Domestic	398	9N	2W	25	SW	NE	1267.6	101	E	1
KENNETH & PATRICIA HENSEN		Domestic	303	9N	2W	25	SW	NE	1267.6	101	E	1
Thomas Brookerson	BAS598	Domestic	462	9N	2W	25	SW	NE	1267.6	101	E	1
ARIN HARPER	AKR796	Domestic	360	9N	2W	25	NW	SE	1267.8	0	NA	1
MIKE NEUNEKER	AHG116	Domestic	245	9N	2W	25	NW	NE	1268.1	127	E	1
LARRY SCHMIDT	ABK497	Domestic	83	9N	2W	13	SW	SW	1269.3	7	E	1
DENNIS PAGE	ACB741	Domestic	140	9N	2W	13	SW	NW	1269.6	0	NA	1
DENNIS PAGE	ACB744	Domestic	140	9N	2W	13	SW	NW	1269.6	0	NA	1
DENNIS PAGE	ABK491	Domestic	141	9N	2W	13	SW	NW	1269.6	0	NA	1
BP OLYMPIC PIPELINES CO	ALH957	Domestic	420	9N	2W	13	SW	NW	1269.6	0	NA	1

Appendix K3

Private Wells within 200 Feet of Workspace

Well Owner	Well Name	Type-Use	Depth (ft)	Township	Range	Section	1/4, 1/4 Section		Closest Milepost	Distance from Construction Right-of-Way (ft)	Direction from Work Area	Loop Number
SPENCER PARTRIDGE	AEK017	Domestic	187	9N	2W	13	NW	SW	1269.9	7	E	1
SPENCER PARTRIDGE	AEK023	Domestic	157	9N	2W	13	NW	SW	1269.9	7	E	1
KAY RUPE	ACR972	Domestic	390	10N	2W	36	SW	SW	1272.5	54	E	1
BOYD GOODRICH		Domestic	246	10N	2W	36	NW	SW	1273.0	44	NW	1
CHARLES KINCAID		Domestic	106	11N	2W	25	0	0	1280.8	64	W	1
ERNIE BAYDE JR	AFC857	Domestic	220	11N	2W	13	SW	SE	1282.5	0	NE	1
RON PEDERSON	AET191	Domestic	75	11N	2W	13	NW	SE	1283.0	85	E	1
SON BOND		Domestic	72	11N	2W	12	0	0	1283.9	0	NA	1
RICHARD CATLIN		Domestic	74	11N	2W	12	0	0	1283.9	0	NA	1
BRUCE REYNOLDS		Domestic	71	11N	2W	12	0	0	1283.9	0	NA	1
SCOTT THOMPSON		Domestic	78	11N	2W	12	0	0	1283.9	0	NA	1
CHARLES RUETHER		Domestic	72	12N	2W	24	NE	NW	1288.3	91	W	1
CARL SCHWGARTH		Domestic	36	12N	2W	13	SE	NW	1288.8	48	W	1
DAVID MILLS	ALK431	Domestic	59	12N	2W	13	SE	NW	1288.8	48	W	1
ROB THOMSEN	AKS565	Domestic	56	12N	2W	13	SE	NW	1288.8	48	W	1
CHRIS COMSTOCK	BAK551	Domestic	69	12N	2W	13	SE	NW	1288.8	48	W	1
DAN REES		Domestic	80	12N	2W	13	NE	SW	1289.1	50	W	1
AL SCHARISOW		Domestic	80	12N	2W	13	NE	NW	1289.3	50	W	1
RONALD REED		Domestic	90	13N	2W	36	SE	SW	1291.4	122	W	2
TONY CRITCHER		Domestic	75	13N	2W	36	SE	NW	1291.7	108	SW	2
TONY CRITCHER		Domestic	77	13N	2W	36	SE	NW	1291.7	108	SW	2
TONY CRITCHER		Domestic	80	13N	2W	36	SE	NW	1291.7	108	SW	2
TONY CRITCHER		Domestic	75	13N	2W	36	SE	NW	1291.7	108	SW	2
JOHN MATSON	AFC563	Domestic	60	13N	2W	36	NE	SW	1291.9	91	W	2
TIM SZAMBELAN		Domestic	60	13N	2W	25	NE	NW	1293.2	155	W	2
E.C. CASE		Domestic	65	13N	2W	25	NE	NW	1293.2	155	W	2
WARREN GUERR, JR.		Domestic	110	13N	2W	13	SE	SW	1294.5	0	NA	2
MICHAEL STEDHAM		Domestic	0	13N	2W	12	SE	SE	1295.5	64	NW	2
LEEDS B. A.		Domestic	52	13N	2W	12	SE	SE	1295.5	64	NW	2
NANEY A TUCKER	AFC469	Domestic	154	13N	2W	12	SE	SE	1295.5	64	NW	2
JOE AND KELLEY BREMGARTNER	AHG731	Domestic	127	13N	2W	12	SE	SE	1295.5	64	NW	2
BOB TEITZEL		Domestic	62	14N	2W	24	NE	SE	1300.1	61	NW	2
Lorna and Geoffrey Mueller		Domestic	0	15N	1W	13	NW	NW	1309.5	0	NA	2
CONLEY ROSS	AAT380	Domestic	91	16N	1E	32	SW	SW	1312.8	50	NW	2
AMA TIMBER PRODUCTS		Domestic	57	19N	3E	36	SE	SE	1338.2	66	NW	3
DONNA WINKLE		Domestic	78	19N	3E	36	SE	SE	1338.2	66	NW	3
DONNA WINKLE		Domestic	77	19N	3E	36	SE	SE	1338.2	66	NW	3

Appendix K3

Private Wells within 200 Feet of Workspace

Well Owner	Well Name	Type-Use	Depth (ft)	Township	Range	Section	1/4, 1/4 Section		Closest Milepost	Distance from Construction Right-of-Way (ft)	Direction from Work Area	Loop Number
DONNA WINKLE		Domestic	77	19N	3E	36	SE	SE	1338.2	66	NW	3
SAM KUHUSKI		Domestic	140	19N	4E	31	NW	NE	1339.3	76	S	3
GREG PIERCE		Domestic	158	19N	4E	31	NW	NE	1339.3	76	S	3
BILL GARRETT		Domestic	66	19N	4E	29	NW	SW	1340.3	0	NA	3
CHARLES EATON		Domestic	59	19N	4E	29	NW	SW	1340.3	0	NA	3
ELWOOD LARGENT		Domestic	76	19N	4E	29	NW	SW	1340.3	0	NA	3
JERRY MORRIS		Domestic	60	19N	4E	29	NW	SW	1340.3	0	NA	3
JOANNE BRADNEY		Domestic	160	19N	4E	29	NW	SW	1340.3	0	NA	3
LESTER SCHIAGEI		Domestic	40	19N	4E	29	NW	SW	1340.3	0	NA	3
STEVE RONALD		Domestic	118	19N	4E	29	NW	SW	1340.3	0	NA	3
VIOLET YARBOROUGH		Domestic	100	19N	4E	29	NW	SW	1340.3	0	NA	3
LTZ INC.	ABE548	Domestic	57	19N	4E	29	NW	SW	1340.3	0	NA	3
JOYCE BOSARGE		Domestic	79	19N	4E	29	NW	0	1340.5	122	E	3
KOCH - VANDERSCHELDEM		Domestic	0	19N	4E	20	SW	SE	1340.9	106	E	3
CHARLES DON		Domestic	124	19N	4E	20	SW	NE	1341.1	0	NA	3
GEORGE DELGADO	BAC427	Domestic	48	20N	4E	35	SE	NW	1346.5	74	W	3
DON HAUPT	ACV718	Domestic	164	20N	4E	35	NE	NE	1347.1	89	SE	3
LEO GARRETT		Domestic	116	20N	4E	35	NE	NE	1347.1	89	SE	3
PHILLIP PAULLUS		Domestic	94	20N	4E	35	NE	NE	1347.1	89	SE	3
SIMON VAN LIEROP		Domestic	113	20N	4E	25	SW	SW	1347.5	18	S	3
GEORGE RICHARDS		Domestic	314	20N	5E	18	NE	0	1351.5	134	W	3
JOE NISHIMOTO (NISHIMOTO FARMS)		Domestic	30	21N	5E	22	SE	0	1357.1	0	NA	4
KEITH EUHUS		Domestic	160	21N	6E	6	SW	NW	1361.0	0	NA	4
JIM DOUVIER		Domestic	77	21N	6E	6	SW	NW	1361.0	0	NA	4
DAVE BECK	APR016	Domestic	81	21N	6E	6	SW	NW	1361.0	0	NA	4
COOPER JIM	ABG439	Domestic	165	23N	6E	15	SW	SE	1371.7	125	E	5
STEVEN DUNLAP		Domestic	98	23N	6E	15	SW	SE	1371.7	125	E	5
ROBERT DONALDSON		Domestic	96	23N	6E	15	SW	SE	1371.7	125	E	5
JIM COOK		Domestic	185	23N	6E	15	SW	SE	1371.7	125	E	5
MEL WALLICK		Domestic	81	23N	6E	10	SE	SW	1372.7	0	NA	5
LONNIE GUIN		Domestic	71	23N	6E	10	SE	SW	1372.7	0	NA	5
LARRY HAYES		Domestic	152	23N	6E	10	SE	SW	1372.7	0	NA	5
LARRY HAYES		Domestic	68	23N	6E	10	SE	SW	1372.7	0	NA	5
DAM PALMER		Domestic	0	23N	6E	10	SE	SW	1372.7	0	NA	5
DAM PALMER		Domestic	137	23N	6E	10	SE	SW	1372.7	0	NA	5
DAN PALMER		Domestic	119	23N	6E	10	SE	SW	1372.7	0	NA	5
DAN PALMER		Domestic	206	23N	6E	10	SE	SW	1372.7	0	NA	5

Appendix K3

Private Wells within 200 Feet of Workspace

Well Owner	Well Name	Type-Use	Depth (ft)	Township	Range	Section	1/4, 1/4 Section		Closest Milepost	Distance from Construction Right-of-Way (ft)	Direction from Work Area	Loop Number
DAN PALMER		Domestic	58	23N	6E	10	SE	SW	1372.7	0	NA	5
BILL BRADLEY		Domestic	200	23N	6E	10	SE	SW	1372.7	0	NA	5
BOB GREGG		Domestic	300	23N	6E	10	SE	SW	1372.7	0	NA	5
EDDY FOWLER LINDNER	APR480	Domestic	165	23N	6E	10	SE	SW	1372.7	0	NA	5
SUSAN BINGEISSER		Domestic	107	23N	6E	10	SE	NW	1373.0	28	W	5
KEITH ANDERSON		Domestic	76	23N	6E	10	SE	NW	1373.0	28	W	5
ANTHONY SINCLETON		Domestic	40	23N	6E	10	SE	NW	1373.0	28	W	5
SUSAN COX	ACG880	Domestic	248	23N	6E	3	SE	NE	1374.0	4	W	5
LEON HUSSY		Domestic	72	25N	6E	34	NE	NW	1381.6	63	W	5
W. S. BENNISON		Domestic	14	27N	6E	16	NW	SW	1396.8	0	NA	6
CHARLES ROBERTS		Domestic	0	27N	6E	16	NW	SW	1396.8	0	NA	6
DALE RHINER		Domestic	612	27N	6E	16	NW	SW	1396.8	0	NA	6
ENID PORTER		Domestic	0	27N	6E	16	NW	NW	1397.0	0	NA	6
JIM ELLIOTT	APR352	Domestic	235	27N	6E	16	NW	NW	1397.0	0	NA	6
JIM ELLIOT	ALS292	Domestic	14	27N	6E	16	NW	NW	1397.0	0	NA	6
MICHAEL SCHAFER		Domestic	320	27N	6E	9	SW	NE	1398.2	45	E	6
Lloyd Chew	APF349	Domestic	400	28N	6E	16	NE	NW	1403.8	109	E	6
MICHAEL TAYLOR	APR702	Domestic	225	28N	6E	4	SW	NE	1405.3	91	W	6
DUANE KUHLMAN		Domestic	59	29N	6E	33	NW	NE	1406.8	13	E	6
HANSON AND HANSON CONSTRUCTION	AFV762	Domestic	229	29N	6E	21	NW	SW	1408.7	0	NA	6
WARREN GOODWIN		Domestic	98	29N	6E	21	NW	SW	1408.7	0	NA	6
TODD THEISON		Domestic	49	29N	6E	21	NW	SW	1408.7	0	NA	6
TIM ELDER		Domestic	98	29N	6E	21	NW	SW	1408.7	0	NA	6
TIM JURAVITCH		Domestic	73	29N	6E	21	NW	SW	1408.7	0	NA	6
RAY BARBER		Domestic	94	29N	6E	21	NW	SW	1408.7	0	NA	6
RANDY ROALSON		Domestic	278	29N	6E	21	NW	SW	1408.7	0	NA	6
MARV SMITH		Domestic	206	29N	6E	21	NW	SW	1408.7	0	NA	6
JIM WEST		Domestic	266	29N	6E	21	NW	SW	1408.7	0	NA	6
HUBER CONSTRUCTION		Domestic	220	29N	6E	21	NW	SW	1408.7	0	NA	6
HARLEN MUNSON		Domestic	97	29N	6E	21	NW	SW	1408.7	0	NA	6
HAROLD EBERLE		Domestic	27	29N	6E	21	NW	SW	1408.7	0	NA	6
DON HAGAR		Domestic	98	29N	6E	21	NW	SW	1408.7	0	NA	6
DAN CRUMBLISS		Domestic	204	29N	6E	21	NW	SW	1408.7	0	NA	6
B. LYBERT		Domestic	119	29N	6E	21	NW	SW	1408.7	0	NA	6
BILL STARTZMAN		Domestic	40	29N	6E	21	NW	SW	1408.7	0	NA	6
TIM ELDER		Domestic	98	29N	6E	21	NW	NW	1408.9	0	NA	6
MEL ROSTEN		Domestic	198	29N	6E	21	NW	NW	1408.9	0	NA	6

Appendix K3

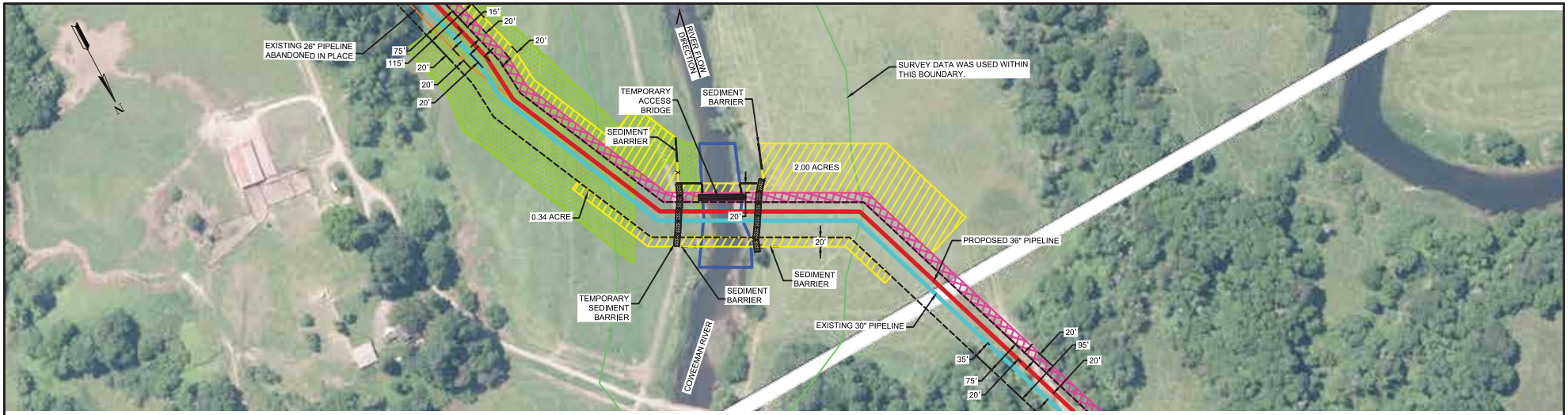
Private Wells within 200 Feet of Workspace

Well Owner	Well Name	Type-Use	Depth (ft)	Township	Range	Section	1/4, 1/4 Section		Closest Milepost	Distance from Construction Right-of-Way (ft)	Direction from Work Area	Loop Number
GARY ALEXANDER		Domestic	0	29N	6E	21	NW	NW	1408.9	0	NA	6
GARY CONARD		Domestic	225	29N	6E	21	NW	NW	1408.9	0	NA	6
DON BOXFORD		Domestic	50	29N	6E	21	NW	NW	1408.9	0	NA	6
TIM STUMPF		Domestic	210	29N	6E	16	SW	SW	1409.2	0	NA	6
ANDREA XAVER		Domestic	80	33N	5E	8	NW	NW	1436.2	91	NE	7
MICHAEL SMITH	BAT235	Domestic	18	34N	5E	18	SE	NW	1441.0	39	E	8
KEITH BROWN		Domestic	19	34N	5E	6	NE	SE	1443.3	0	NA	8
KEITH BROWN		Domestic	9	34N	5E	6	NE	SE	1443.3	0	NA	8
KEITH BROWN		Domestic	19	34N	5E	6	NE	SE	1443.3	0	NA	8
KEITH BROWN		Domestic	24	34N	5E	6	NE	SE	1443.3	0	NA	8
KEITH BROWN		Domestic	28	34N	5E	6	NE	SE	1443.3	0	NA	8
DON LARISON	ACB195	Domestic	47	36N	5E	18	NW	NE	1454.1	143	NW	9
CALFCO		Domestic	78	36N	5E	18	NW	NE	1454.1	143	NW	9
JOHN FORD	AFR120	Domestic	22	37N	5E	29	SW	SE	1457.7	111	W	9
ROY GAVIN		Domestic	29	37N	5E	29	NE	NW	1458.5	0	NA	9
ANNA HANDELAND		Domestic	0	37N	5E	20	SE	SW	1458.8	56	W	9
WILDWOOD RESORT (DIXON)		Domestic	180	37N	5E	20	SE	SW	1458.8	56	W	9
NATIONAL PARK SERVICE		Domestic	61	37N	5E	20	SE	SW	1458.8	56	W	9
ANNA HANDELAND		Domestic	131	37N	5E	20	SE	SW	1458.8	56	W	9
CLYDE SHETLER		Domestic	57	37N	5E	17	SE	NW	1460.0	74	W	9
ROYCE & JEANNA SEIDING		Domestic	27	37N	5E	17	SE	NW	1460.0	74	W	9
AARON SANDY	AHH745	Domestic	39	37N	5E	17	SE	NW	1460.0	74	W	9
KEITH MONTEITH	AHH068	Domestic	40	37N	5E	17	SE	NW	1460.0	74	W	9
H E ROTHENBUHLER		Domestic	16	37N	5E	8	NW	SE	1461.4	3	SE	9
GARY AND BARBARA PITMAN	APH156	Domestic	57	40N	4E	27	NE	SW	1478.8	0	NA	10
MIKE FULLER		Domestic	0	40N	4E	27	NE	SW	1478.8	0	NA	10
JANET CUNNIFFE		Domestic	68	40N	4E	27	NE	SW	1478.8	0	NA	10
LAWRENCE SILVIS		Domestic	31	40N	4E	1	0	0	1483.3	70	SE	10
HENRY VANDER MEULER		Domestic	31	41N	4E	36	SE	SW	1483.9	0	NA	10

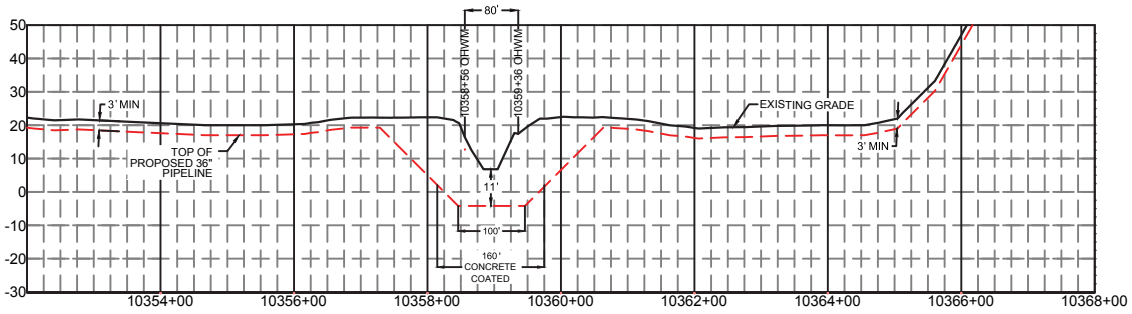
E = east
NA = not applicable
NE = northeast
NW = northwest
S = south
SE = southeast
SW = southwest
W = west

APPENDIX K4

SITE-SPECIFIC WATERBODY AND WETLAND CROSSING PLANS



PLAN VIEW



PROFILE VIEW

100 0 100 200 300 FEET

NOTE:
1) THE INFORMATION SHOWN ON THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY TO CONVEY INTENT FOR PERFORMING THE CROSSING.
2) UTILITY LOCATES AT THIS SITE HAVE NOT BEEN PERFORMED.
3) SURFACE CONTOURS WERE CREATED USING A COMBINATION OF SURVEY DATA PROVIDED FROM WILLIAMS AND GOOGLE EARTH PRO.
4)THIS DRAWING IS NOT FOR CONSTRUCTION. THIS IS A PRELIMINARY PROFILE SHOWING THE GENERAL LOCATION AND MINIMUM DEPTH REQUIREMENTS OF THE CROSSING.
5) DEPTH OF RIVER PROVIDED FROM AS-BUILT DRAWING "COWEEMAN RIVER X-ING 30" 0.0. IGNACIO TO SUMAS LOOP LINE" DATED 1-27-71 DWG NO-1401.2-33.
6) END POINTS OF PROFILE VIEWS ARE BASED ON KNOWN POINTS FROM THE ENVIRONMENTAL ALIGNMENT SHEETS.

LEGEND

- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- Milepost (M 123 P)

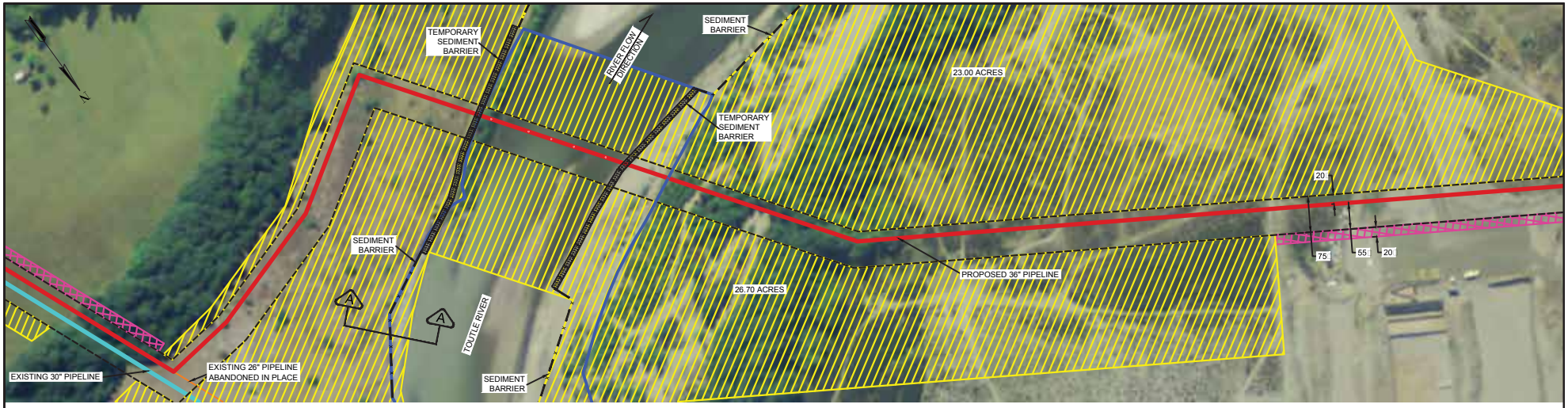
GENERAL NOTES:

1. THIS PIPELINE INSTALLED UNDER CODE: TILE 49, PART 192 CFR.
2. WATERBODY CROSSING TO COMPLY WITH THE FERC WETLAND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES, 2013.
3. THERE WILL BE LIMITED ACCESS, NO PARKING, NO REFUELING, NO VEHICLE MAINTENANCE, NO STORAGE WITHIN 100 FT. OF EACH HIGH BANK.
4. CONSTRUCTION OF THE PIPELINE AT RIVER SHALL BE PERFORMED IN SUCH A MANNER AS TO KEEP TO A MINIMUM DAMAGE TO SHORELINE, WATER CROSSED, AND FISH AND WILDLIFE HABITATS.
5. EROSION CONTROL DEVICES WILL BE INSTALLED AND INSPECTED AND MAINTAINED BY THE CONTRACTOR. SEDIMENT BARRIER SHALL BE MAINTAINED ACROSS THE PIPELINE ROW AT BOTH SIDES OF THE RIVER CROSSING. IN THE TRAVEL LANE, THESE MAY CONSIST OF REMOVABLE SEDIMENT BARRIERS OR DRIVABLE BERMS.
6. FOLLOWING CONSTRUCTION, THE RIVER BOTTOM SHALL BE RETURNED TO ITS ORIGINAL CONTOUR AND GRADIENT.
7. TOPSOIL, APPROACH SOIL AND INSTREAM SPOIL SHALL BE KEPT SEPARATE. AFTER INSTALLATION OF THE PIPE, THE SPOIL SHALL BE REPLACED TO ITS ORIGINAL LOCATION.
8. EXCEPT TO PROVIDE VEHICLE EQUIPMENT ACCESS, RIVER BANKS WILL BE GRADED JUST PRIOR TO CONSTRUCTION OF THE CROSSING. A 10-FT VEGETATED BUFFER STRIP, EXCEPT FOR VEHICLE CROSSING, ON BOTH SIDES OF THE CROSSING SHALL BE MAINTAINED AND ONLY CUT PRIOR TO CONSTRUCTION OF THE CROSSING.
9. PRIOR TO ACTUAL INSTALLATION, THE PIPE SHALL BE WELDED IN AN UPLAND AREA AND PULLED OR CARRIED FOR THE CROSSING.
10. CONTRACTOR SHALL MINIMIZE THE NUMBER OF TREES TO BE REMOVED. EXCLUSION BARRIER TO BE INSTALLED AROUND MARKED TREES TO REMAIN IN PLACE TO BE COORDINATED WITH ENVIRONMENTAL INSPECTOR.
11. STABILIZING VEGETATION REMOVAL SHALL BE KEPT TO A MINIMUM. STREAMSIDE WOODY VEGETATION IS PREFERABLE TO COMPLETE REMOVAL. ANY VEGETATION THAT IS REMOVED SHALL BE REESTABLISHED IN A REASONABLE TIME FRAME AFTER CONSTRUCTION.
12. MOST EQUIPMENT WILL ONLY REQUIRE A ONE-TIME CROSSING, MULTIPLE CROSSINGS SHALL BE KEPT TO A REASONABLE MINIMUM.
13. IMMEDIATELY AFTER THE BACKFILLING OF PIPE, SEDIMENTATION CONTROL DEVICES (HAY BALES, SILT FENCE, ETC.) SHALL BE PLACED ACROSS THE ROW TO CONTROL SEDIMENT FROM THE ROW.

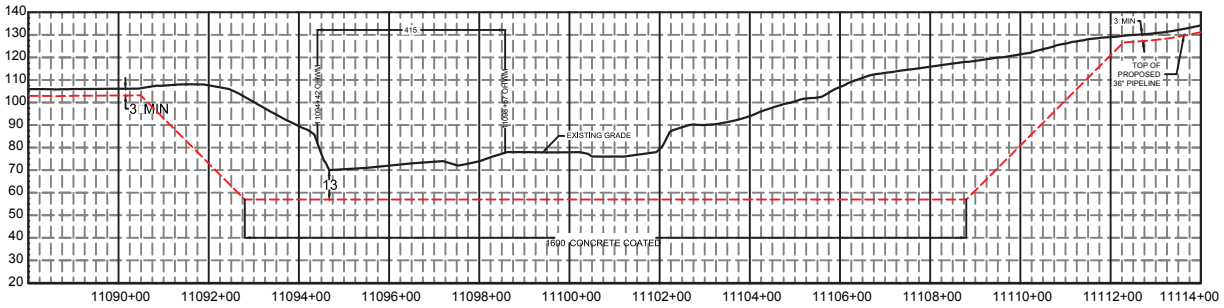
SITE SPECIFIC NOTES:

1. CROSSING TO BE INSTALLED UTILIZING THE DRY OPEN CUT CROSSING METHOD.
2. AFTER PIPE INSTALLATION, CONSTRUCTION EQUIPMENT WILL BE ALLOWED IN THE RIVER TO BACKFILL THE DITCH AS QUICKLY AS POSSIBLE.

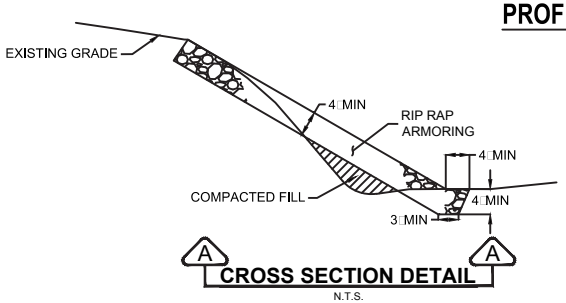
WASHINGTON EXPANSION PROJECT
LOOP 1 WOODLAND LOOP
COWEEMAN RIVER 1260.49 MP
COWLITZ COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW



CROSS SECTION DETAIL

N.T.S.

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SITE SPECIFIC NOTES:

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2. AFTER PIPE INSTALLATION, CONSTRUCTION EQUIPMENT WILL BE ALLOWED IN THE RIVER TO BACKFILL THE DITCH AS QUICKLY AS POSSIBLE.
3. WORK WITHIN THE OHWM LIMITS WILL BE COMPLETED DURING THE IN-WATER WORK WINDOW OR AS OTHERWISE APPROVED BY APPROPRIATE AGENCIES.

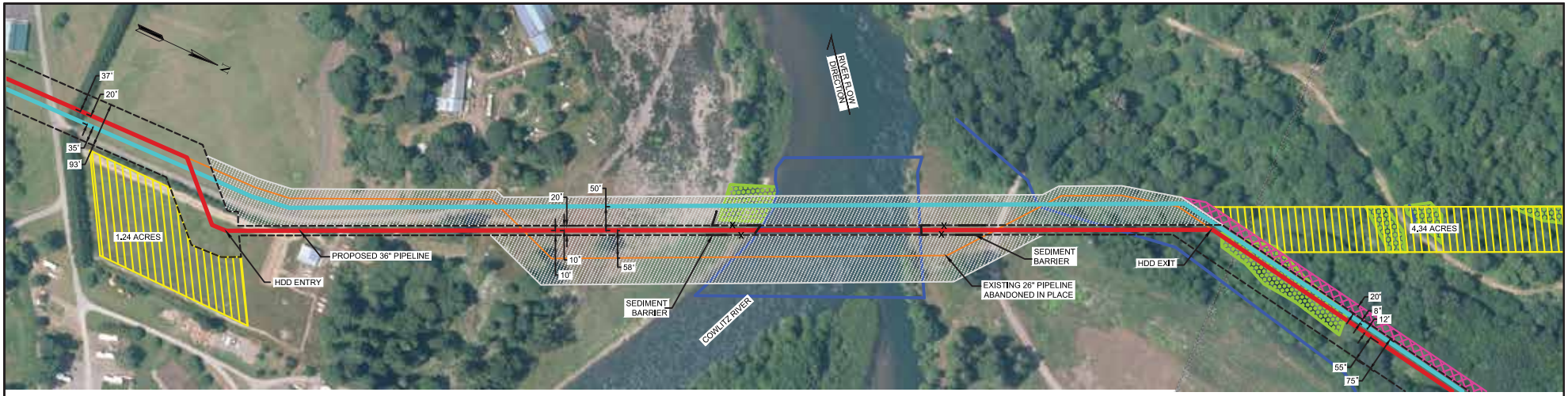
NOTE:
1) THE INFORMATION SHOWN ON THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY TO CONVEY INTENT FOR PERFORMING THE CROSSING.
2) UTILITY LOCATES AT THIS SITE HAVE NOT BEEN PERFORMED.
3) SURFACE CONTOURS WERE CREATED USING A COMBINATION OF SURVEY DATA PROVIDED FROM WILLIAMS AND GOOGLE EARTH PRO.
4)THIS DRAWING IS NOT FOR CONSTRUCTION. THIS IS A PRELIMINARY PROFILE SHOWING THE GENERAL LOCATION AND MINIMUM DEPTH REQUIREMENTS OF THE CROSSING.
5) END POINTS OF PROFILE VIEWS ARE BASED ON KNOWN POINTS FROM THE ENVIRONMENTAL ALIGNMENT SHEETS.
6) DEPTH OF RIVER PROVIDED FROM GOLDER ASSOCIATES PLAN AND PROFILE OF THE TOUTLE RIVER CROSSING PROJECT NUMBER 140-2309 SHEET 002 DATED 2014-04-22.

LEGEND

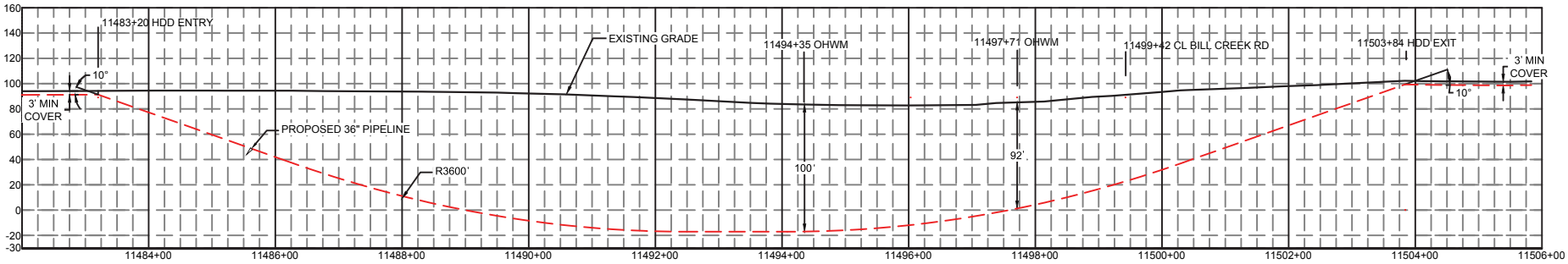
- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM — ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- Milepost (M 123 P)

100 0 100 200 300 FEET

WASHINGTON EXPANSION PROJECT
LOOP 1 WOODLAND LOOP
TOUTLE RIVER 1274.42 MP
COWLITZ COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW

GENERAL NOTES:

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SITE SPECIFIC NOTES:

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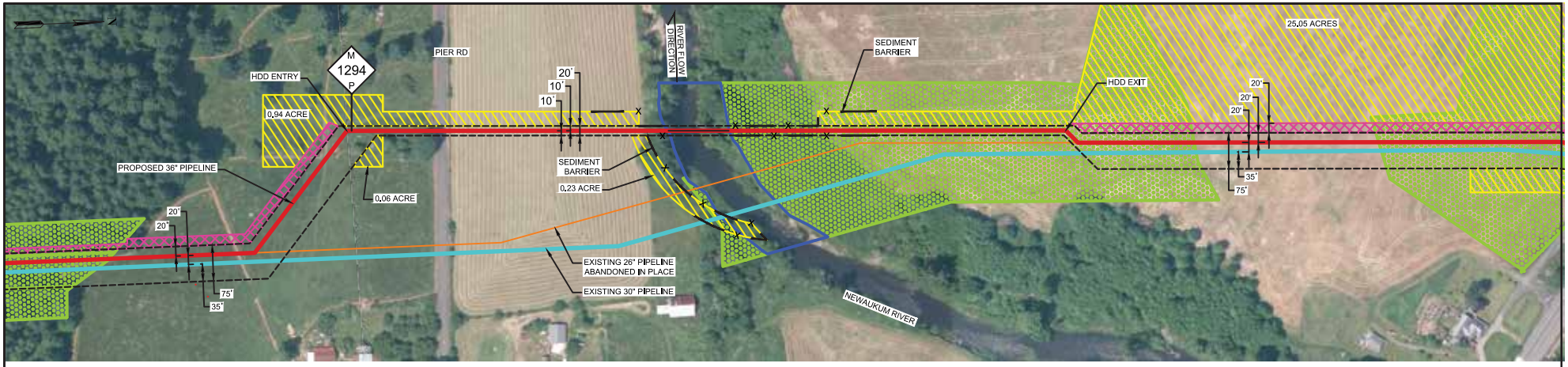
3) SURFACE CONTOURS WERE CREATED USING A COMBINATION OF SURVEY
4)THIS DRAWING IS NOT FOR CONSTRUCTION. THIS IS A PRELIMINARY PROFILE SHOWING THE GENERAL LOCATION AND MINIMUM DEPTH REQUIREMENTS OF THE CROSSING.

LEGEND

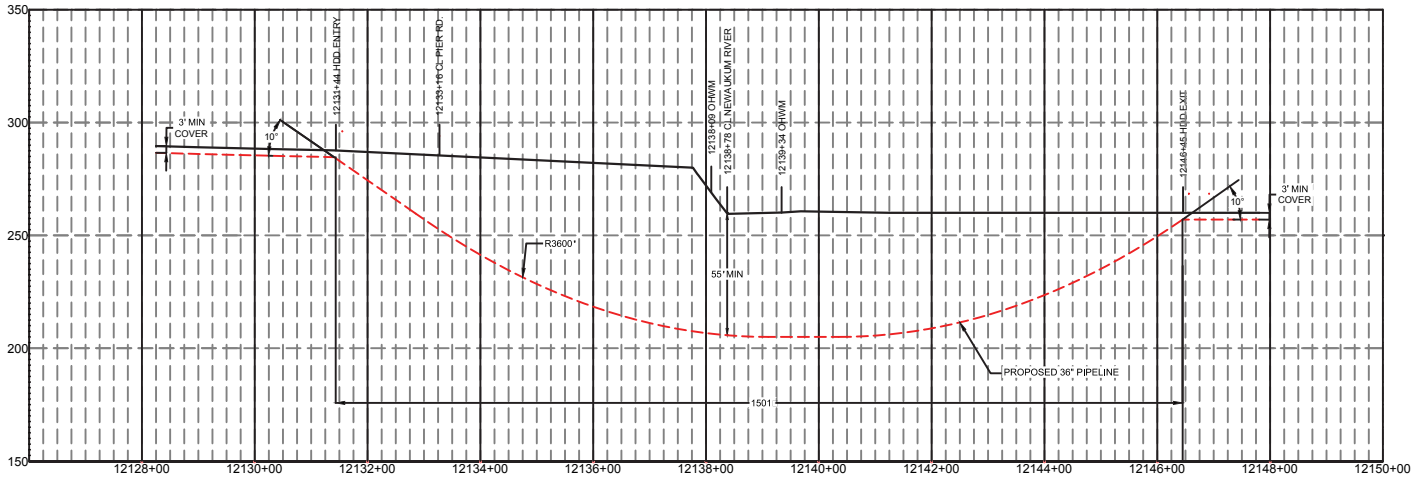
- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- M 123 P Milepost

100 0 100 200 300 FEET

WASHINGTON EXPANSION PROJECT
LOOP 1 WOODLAND LOOP
COWLITZ RIVER HDD 1282.51 MP
LEWIS COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW

SITE SPECIFIC NOTES:

1. CROSSING TO BE INSTALLED UTILIZING THE DRY OPEN CUT CROSSING METHOD.

GENERAL NOTES:

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LEGEND

- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- M 123 P Milepost

100 0 100 200 300 FEET

NOTE:
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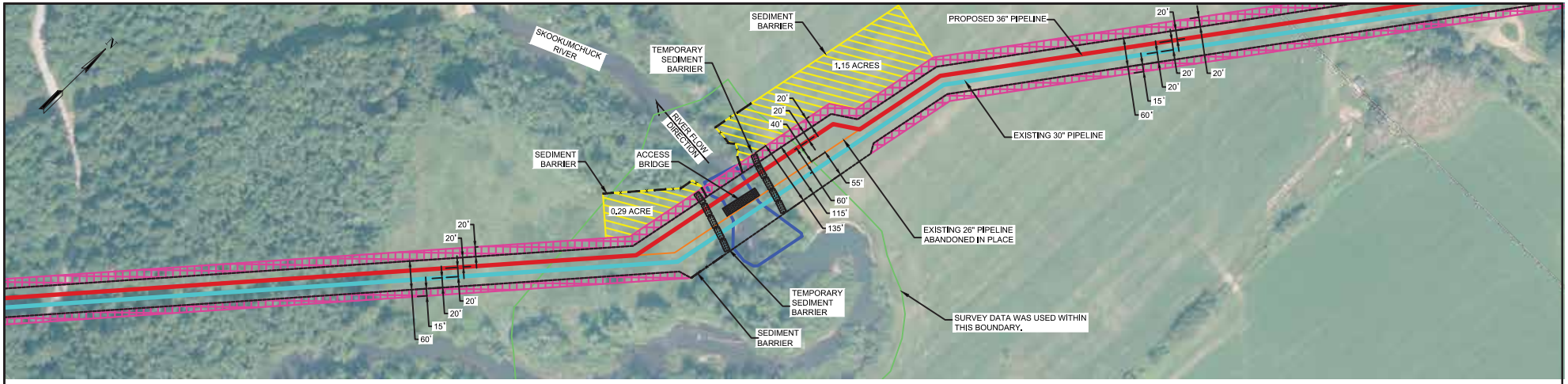
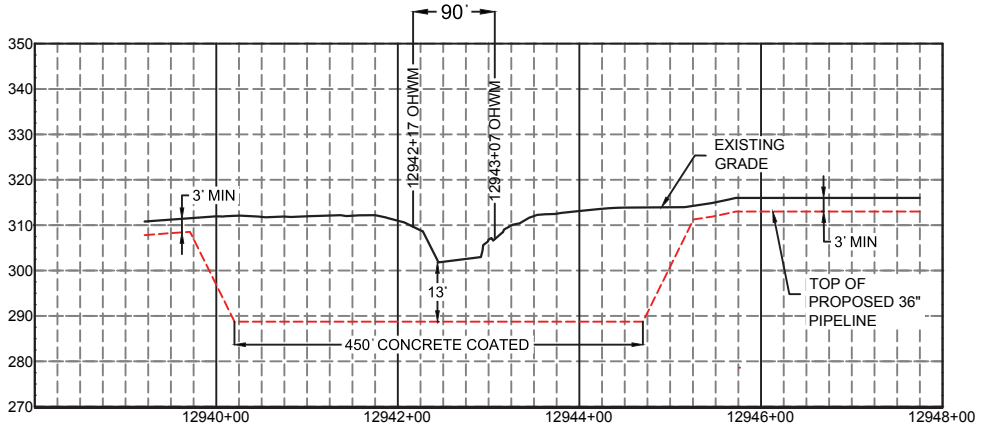
WASHINGTON EXPANSION PROJECT
LOOP 2 CHEHALIS
NEWAUKUM RIVER HDD 1294.13
MP LEWIS COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW

100 0 100 200 300 FEET

NOTE:
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5) DEPTH OF RIVER PROVIDED FROM AS-BUILT DRAWING "COWEEMAN RIVER X-ING 30" 0.0. IGNACIO TO SUMAS LOOP LINE" DATED 1-27-71 DWG NO-1401.2-33.
6) END POINTS OF PROFILE VIEWS ARE BASED ON KNOWN POINTS FROM THE ENVIRONMENTAL ALIGNMENT SHEETS.

LEGEND

- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- M 123 P Milepost

GENERAL NOTES:

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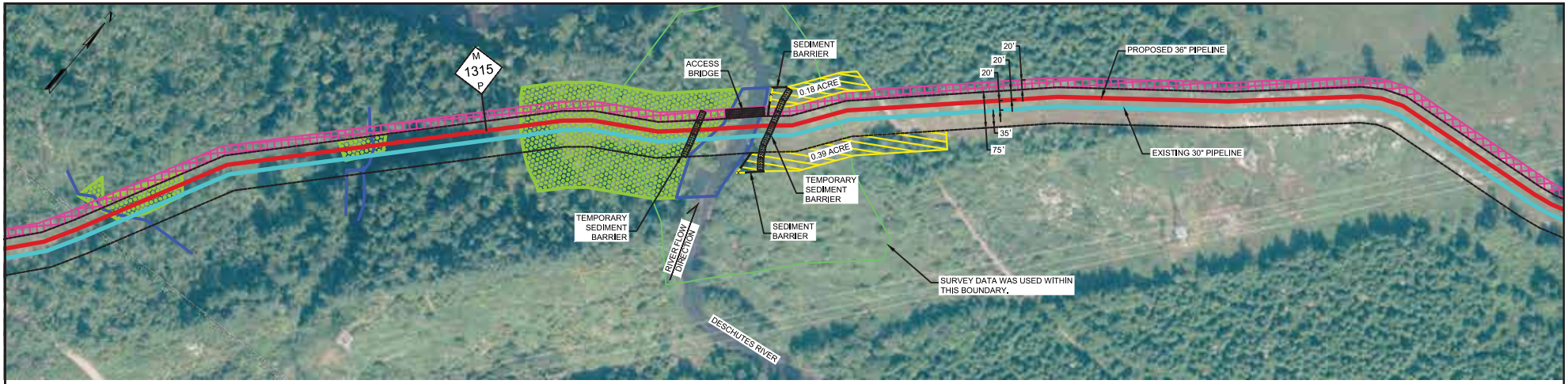
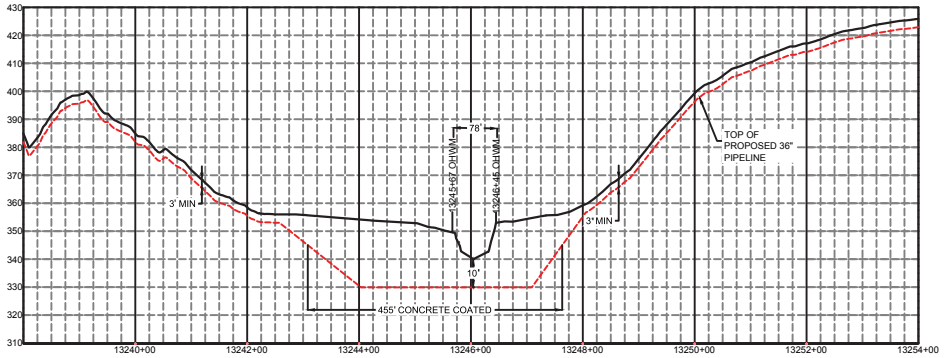
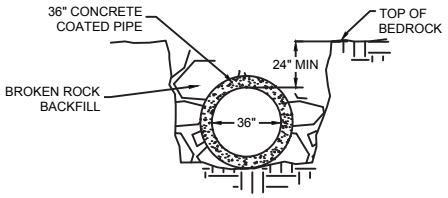
WASHINGTON EXPANSION PROJECT
LOOP 2 CHEHALIS
SKOOKUMCHUCK RIVER 1309.36 MP
THURSTON COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW



① MIN BURIAL IN BEDROCK DETAIL

N.T.S

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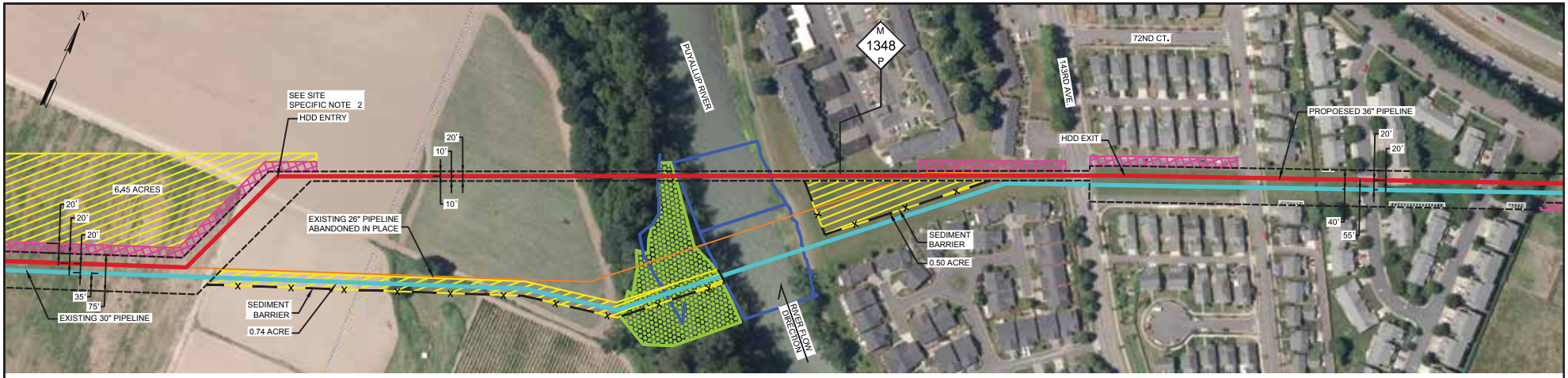
5) BURIAL DEPTH BELOW RIVER BOTTOM SHOWN IN PROFILE IS FOR ERODIBLE SEDIMENT. SEE DETAIL 1 FOR MINIMUM BURIAL IN COMPETENT BEDROCK.
6) END POINTS OF PROFILE VIEWS ARE BASED ON KNOWN POINTS FROM THE ENVIRONMENTAL ALIGNMENT SHEETS.

LEGEND

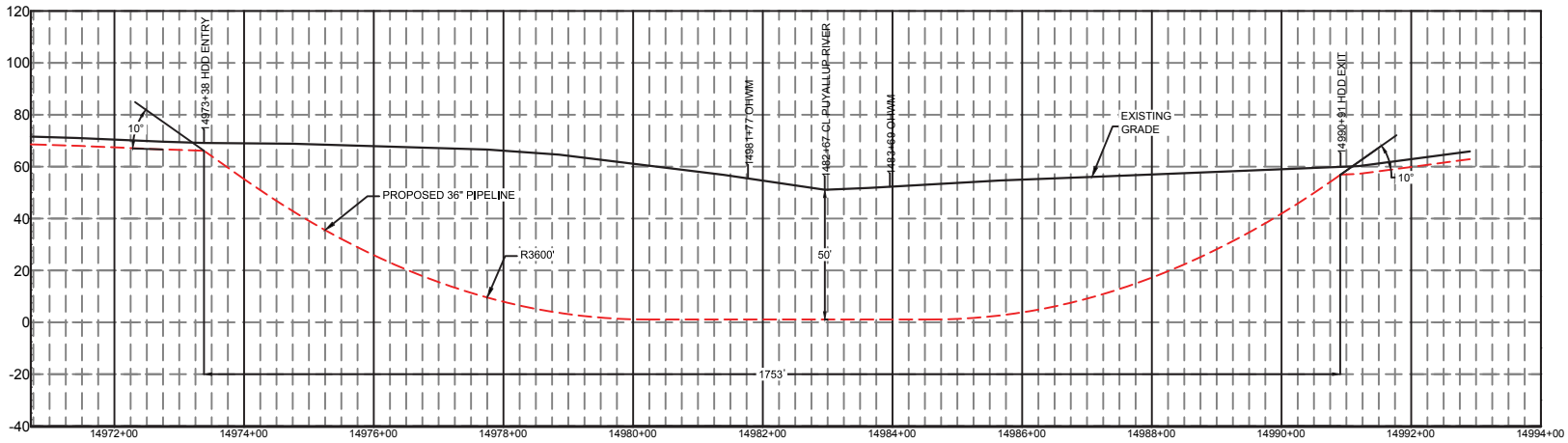
- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- M 123 P Milepost

100 0 100 200 300 FEET

WASHINGTON EXPANSION PROJECT
LOOP 2 CHEHALIS
DESCHUTES RIVER 1315.10 MP
THURSTON COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW

SITE SPECIFIC NOTES:

1. CROSSING TO BE INSTALLED UTILIZING THE DRY OPEN CUT CROSSING METHOD.

GENERAL NOTES:

1. THIS PIPELINE INSTALLED UNDER CODE: TILE 49, PART 192 CFR.
2. WATERBODY CROSSING TO COMPLY WITH THE FERC WETLAND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES, 2013.
3. THERE WILL BE LIMITED ACCESS, NO PARKING, NO REFUELING, NO VEHICLE MAINTENANCE, NO STORAGE WITHIN 100 FT. OF EACH HIGH BANK.
4. CONSTRUCTION OF THE PIPELINE AT RIVER SHALL BE PERFORMED IN SUCH A MANNER AS TO KEEP TO A MINIMUM DAMAGE TO SHORELINE, WATER CROSSED, AND FISH AND WILDLIFE HABITATS.
5. EROSION CONTROL DEVICES WILL BE INSTALLED AND INSPECTED AND MAINTAINED BY THE CONTRACTOR. SEDIMENT BARRIER SHALL BE MAINTAINED ACROSS THE PIPELINE ROW AT BOTH SIDES OF THE RIVER CROSSING. IN THE TRAVEL LANE, THESE MAY CONSIST OF REMOVABLE SEDIMENT BARRIERS OR DRIVABLE BERMS.
6. PRIOR TO ACTUAL INSTALLATION, THE PIPE SHALL BE WELDED TO THE BANK.
7. CONTRACTOR SHALL MINIMIZE THE NUMBER OF TREES TO BE REMOVED. EXCLUSION BARRIER TO BE INSTALLED AROUND MARKED TREES TO REMAIN IN PLACE TO BE COORDINATED WITH ENVIRONMENTAL INSPECTOR.

LEGEND

- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- M 123 P Milepost

100 0 100 200 300 FEET

NOTE:
1) THE INFORMATION SHOWN ON THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY TO CONVEY INTENT FOR PERFORMING THE CROSSING.
2) UTILITY LOCATES AT THIS SITE HAVE NOT BEEN PERFORMED.
3) SURFACE CONTOURS WERE CREATED USING A COMBINATION OF SURVEY
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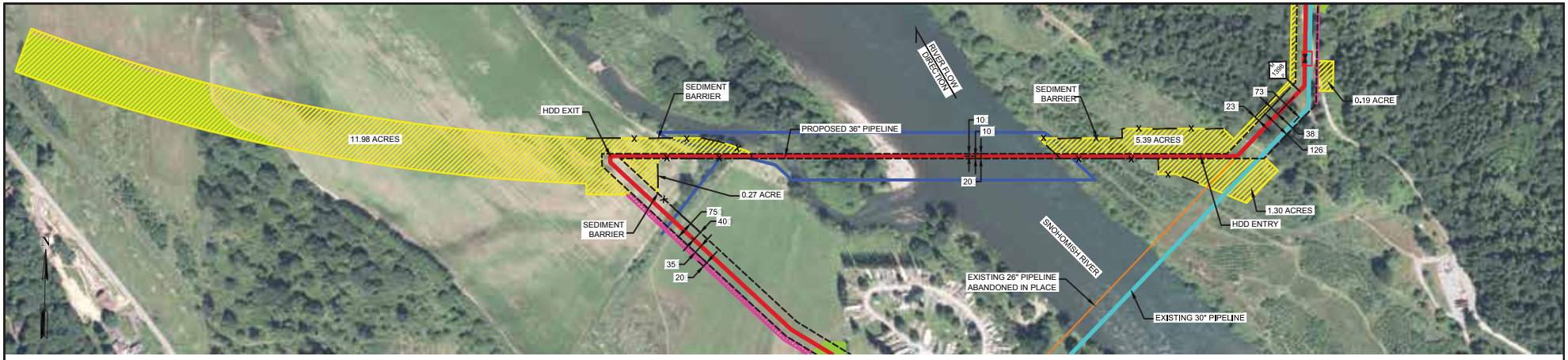
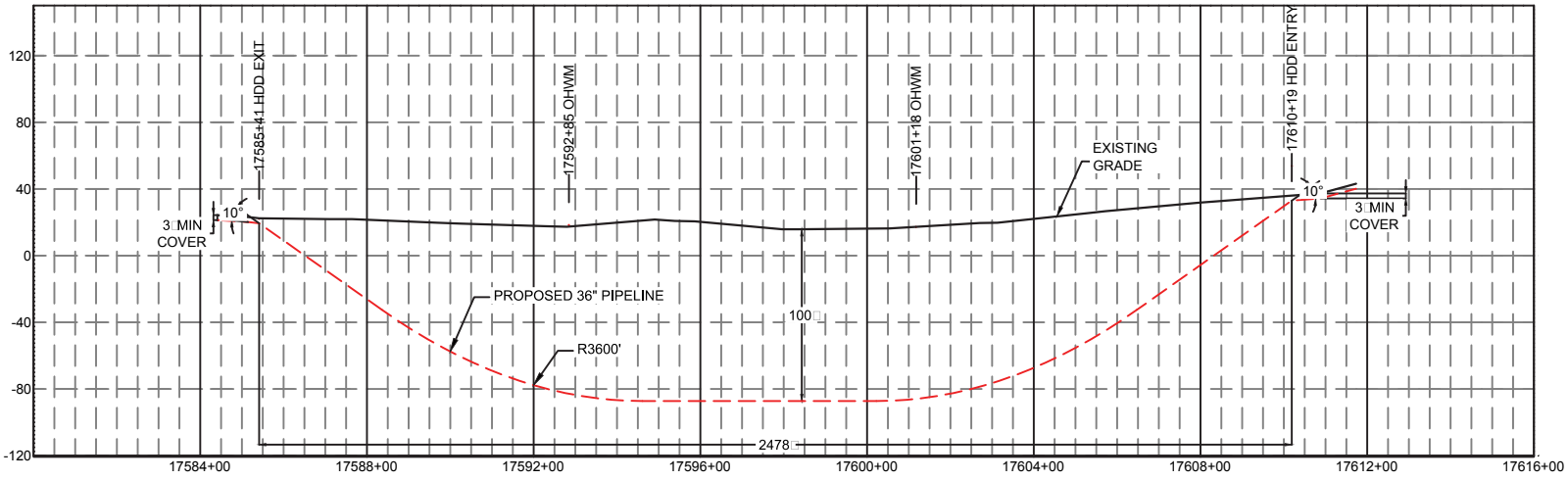
WASHINGTON EXPANSION PROJECT
LOOP 3 SUMNER SOUTH
PUYALLUP RIVER HDD 1348.98
MP LEWIS COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW

SITE SPECIFIC NOTES:

1. CROSSING TO BE INSTALLED UTILIZING THE DRY OPEN CUT CROSSING METHOD.

GENERAL NOTES:

1. THIS PIPELINE INSTALLED UNDER CODE: TILE 49, PART 192 CFR.
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5. EROSION CONTROL DEVICES WILL BE INSTALLED AND INSPECTED AND MAINTAINED BY THE CONTRACTOR. SEDIMENT BARRIER SHALL BE MAINTAINED ACROSS THE PIPELINE ROW AT BOTH SIDES OF THE RIVER CROSSING. IN THE TRAVEL LANE, THESE MAY CONSIST OF REMOVABLE SEDIMENT BARRIERS OR DRIVABLE BERMS.
6. PRIOR TO ACTUAL INSTALLATION, THE PIPE SHALL BE WELDED TO THE BANK.
7. CONTRACTOR SHALL MINIMIZE THE NUMBER OF TREES TO BE REMOVED. EXCLUSION BARRIER TO BE INSTALLED AROUND MARKED TREES TO REMAIN IN PLACE TO BE COORDINATED WITH ENVIRONMENTAL INSPECTOR.

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LEGEND

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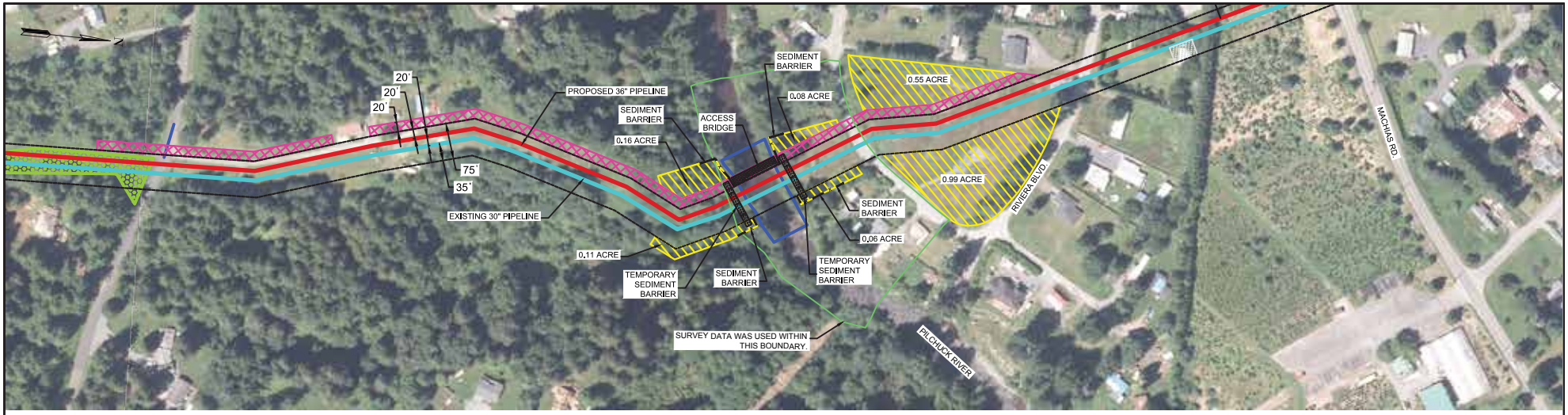
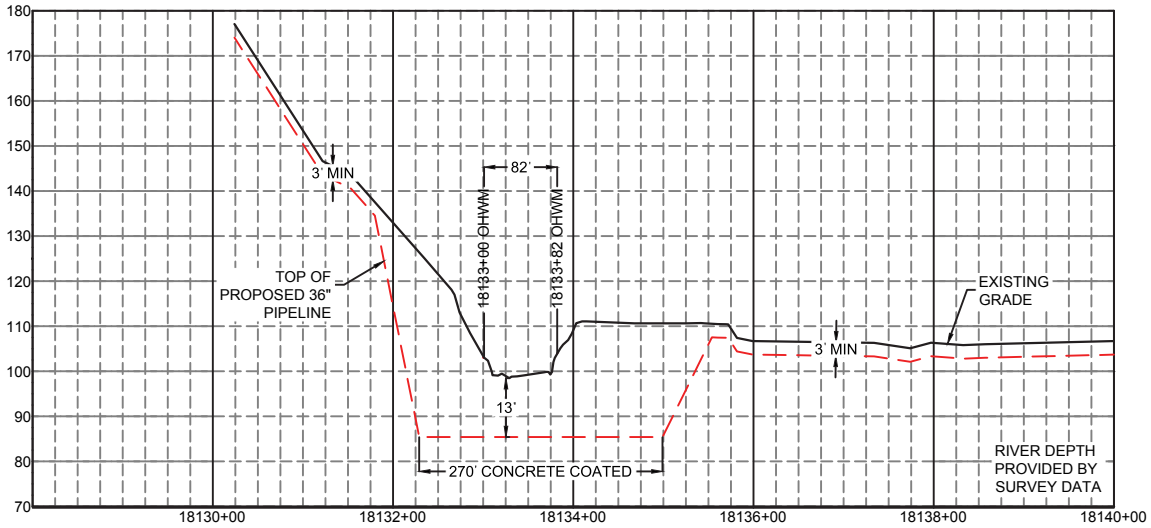
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- Milepost (M 123 P)

100 0 100 200 300 FEET

WASHINGTON EXPANSION PROJECT
LOOP 6 SNOHOMISH
SNOHOMISH RIVER HDD 1397.56 MP
SNOHOMISH COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW

GENERAL NOTES:

1. THIS PIPELINE INSTALLED UNDER CODE: TILE 49, PART 192 CFR.
2. WATERBODY CROSSING TO COMPLY WITH THE FERC WETLAND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES, 2013.
3. THERE WILL BE LIMITED ACCESS, NO PARKING, NO REFUELING, NO VEHICLE MAINTENANCE, NO STORAGE WITHIN 100 FT. OF EACH HIGH BANK.
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6. FOLLOWING CONSTRUCTION, THE RIVER BOTTOM SHALL BE RETURNED TO ITS ORIGINAL CONTOUR AND GRADIENT.
7. TOPSOIL, APPROACH SOIL AND INSTREAM SPOIL SHALL BE KEPT SEPARATE. AFTER INSTALLATION OF THE PIPE, THE SPOIL SHALL BE REPLACED TO ITS ORIGINAL LOCATION.
8. EXCEPT TO PROVIDE VEHICLE EQUIPMENT ACCESS, RIVER BANKS WILL BE GRADED JUST PRIOR TO CONSTRUCTION OF THE CROSSING. A 10-FT VEGETATED BUFFER STRIP, EXCEPT FOR VEHICLE CROSSING, ON BOTH SIDES OF THE CROSSING SHALL BE MAINTAINED AND ONLY CUT PRIOR TO CONSTRUCTION OF THE CROSSING.
9. PRIOR TO ACTUAL INSTALLATION, THE PIPE SHALL BE WELDED IN AN UPLAND AREA AND PULLED OR CARRIED FOR THE CROSSING.
10. CONTRACTOR SHALL MINIMIZE THE NUMBER OF TREES TO BE REMOVED. EXCLUSION BARRIER TO BE INSTALLED AROUND MARKED TREES TO REMAIN IN PLACE TO BE COORDINATED WITH ENVIRONMENTAL INSPECTOR.
11. STABILIZING VEGETATION REMOVAL SHALL BE KEPT TO A MINIMUM. STREAMSIDE WOODY VEGETATION IS PREFERABLE TO COMPLETE REMOVAL. ANY VEGETATION THAT IS REMOVED SHALL BE REESTABLISHED IN A REASONABLE TIME FRAME AFTER CONSTRUCTION.
12. MOST EQUIPMENT WILL ONLY REQUIRE A ONE-TIME CROSSING, MULTIPLE CROSSINGS SHALL BE KEPT TO A REASONABLE MINIMUM.
13. IMMEDIATELY AFTER THE BACKFILLING OF PIPE, SEDIMENTATION CONTROL DEVICES (HAY BALES, SILT FENCE, ETC.) SHALL BE PLACED ACROSS THE ROW TO CONTROL SEDIMENT FROM THE ROW.

SITE SPECIFIC NOTES:

1. CROSSING TO BE INSTALLED UTILIZING THE DRY OPEN CUT CROSSING METHOD.
2. AFTER PIPE INSTALLATION, CONSTRUCTION EQUIPMENT WILL BE ALLOWED IN THE RIVER TO BACKFILL THE DITCH AS QUICKLY AS POSSIBLE.

NOTE:
1) THE INFORMATION SHOWN ON THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY TO CONVEY INTENT FOR PERFORMING THE CROSSING.
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5) END POINTS OF PROFILE VIEWS ARE BASED ON KNOWN POINTS FROM THE ENVIRONMENTAL ALIGNMENT SHEETS.

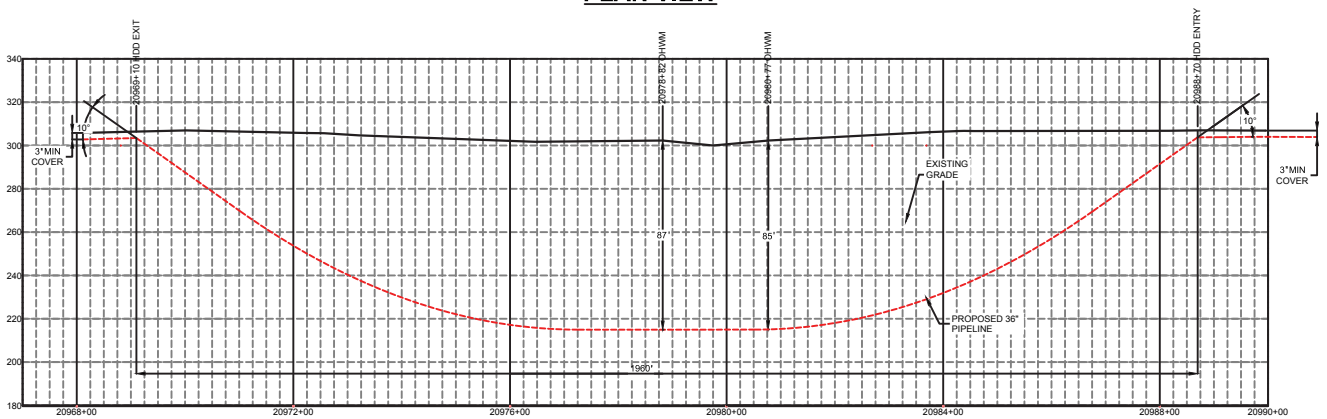
LEGEND

- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- M 123 P Milepost

100 0 100 200 300 FEET

WASHINGTON EXPANSION PROJECT
LOOP 6 SNOHOMISH
PILCHUCK RIVER 1407.81 MP
SNOHOMISH COUNTY, WASHINGTON

PLAN VIEW



PROFILE VIEW

SITE SPECIFIC NOTES:

1. CROSSING TO BE INSTALLED UTILIZING THE HDD CROSSING METHOD (SITE SPECIFIC).
2. PULLBACK WILL NE COMPLETED IN TWO SECTIONS, WITH ONE WELD DURING THE PULLBACK

LEGEND

- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM — ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- M 123 P — Milepost

100 0 100 200 300 FEET

GENERAL NOTES:

1. THIS PIPELINE INSTALLED UNDER CODE: TILE 49, PART 192 CFR.
2. WATERBODY CROSSING TO COMPLY WITH THE FERC WETLAND □ WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES, 2013.
3. THERE WILL BE LIMITED ACCESS, NO PARKING, NO REFUELING, NO VEHICLE MAINTENANCE, NO STORAGE WITHIN 100 FT. OF EACH HIGH BANK.
4. CONSTRUCTION OF THE PIPELINE AT RIVER SHALL BE PERFORMED IN SUCH A MANNER AS TO KEEP TO A MINIMUM DAMAGE TO SHORELINE, WATER CROSSED, AND FISH AND WILDLIFE HABITATS.
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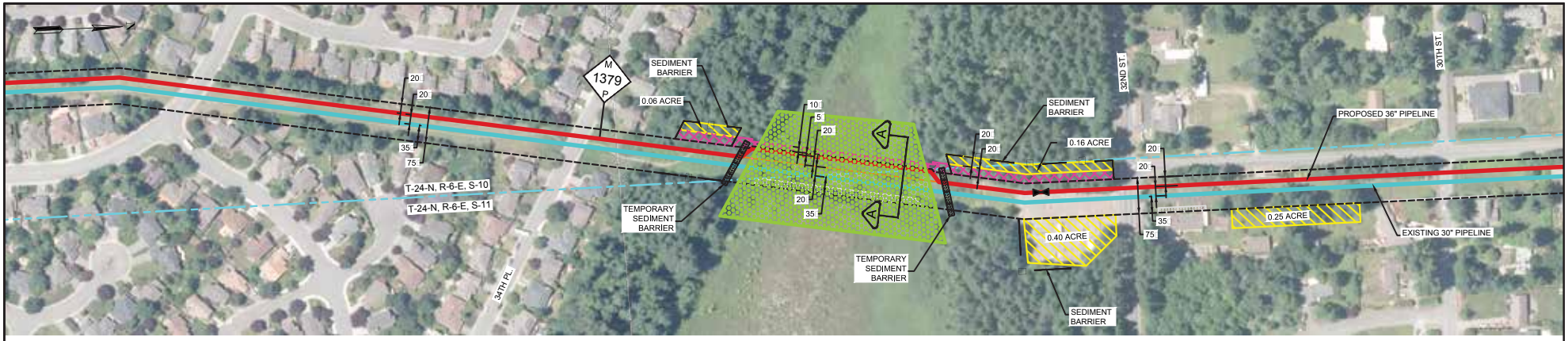
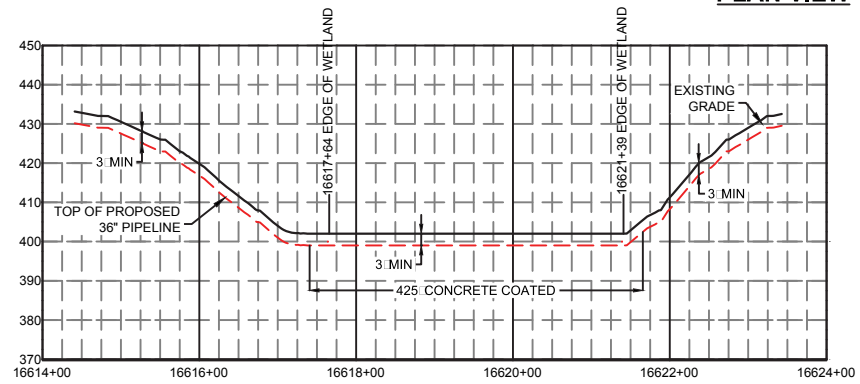
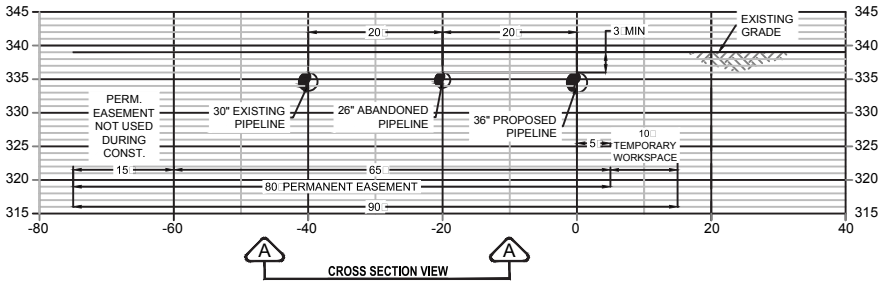
WASHINGTON EXPANSION PROJECT
LOOP 9 MT. VERNON NORTH-B
SOUTH FORK NOOKSACK RIVER HDD 1461.56 MP
WHATCOM COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW



CROSS SECTION VIEW

GENERAL NOTES:

1. THIS PIPELINE INSTALLED UNDER CODE: TILE 49, PART 192 CFR.
2. WETLAND CROSSING TO COMPLY WITH THE FERC WETLAND & WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES, 2013.
3. THERE WILL BE LIMITED ACCESS, NO PARKING, NO REFUELING, NO VEHICLE MAINTENANCE, NO STORAGE WITHIN 100 FT. OF EACH WETLAND.
4. CONSTRUCTION OF THE PIPELINE AT IN THE WETLAND SHALL BE PERFORMED TO MINIMIZE ANY DAMAGE TO THE UPLAND, BOG AND ANY WILDLIFE HABITAT.
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6. TOPSOIL, APPROACH SOIL AND INSTREAM SPOIL SHALL BE KEPT SEPARATE. AFTER INSTALLATION OF THE PIPE, THE SPOIL SHALL BE REPLACED TO ITS ORIGINAL LOCATION.
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11. MOST EQUIPMENT WILL ONLY REQUIRE A ONE-TIME CROSSING, MULTIPLE CROSSINGS SHALL BE KEPT TO A REASONABLE MINIMUM.
12. IMMEDIATELY AFTER THE BACKFILLING OF PIPE, SEDIMENTATION CONTROL DEVICES (HAY BALES, SILT FENCE, ETC.) SHALL BE PLACED ACROSS THE ROW TO CONTROL SEDIMENT FROM THE ROW.

SITE SPECIFIC NOTES:

1. CROSSING TO BE INSTALLED UTILIZING A WET OPEN-CUT CROSSING METHOD.
2. LOW GROUND PRESSURE OR AMPHIBIOUS EQUIPMENT WILL BE UTILIZED WITHIN THE BOG TO MINIMIZE DISTURBANCE TO THE BOG.
3. EXCAVATED MATERIAL FROM THE BOG WILL BE STOCKPILED AS CLOSE TO THE EXCAVATED TRENCH AS PRACTICAL AND UTILIZED TO BACKFILL WITHOUT COMPACTION OVER THE INSTALLED PIPE.

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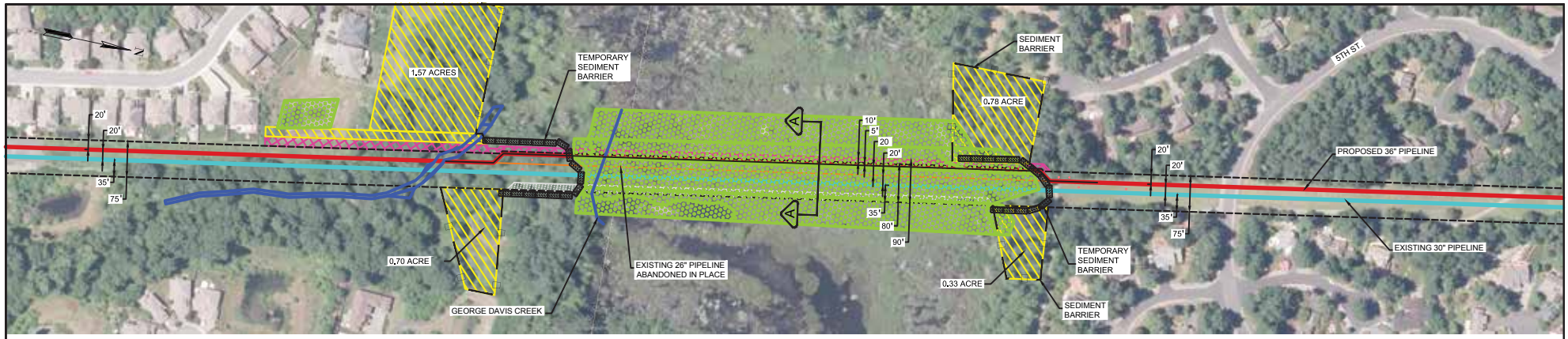
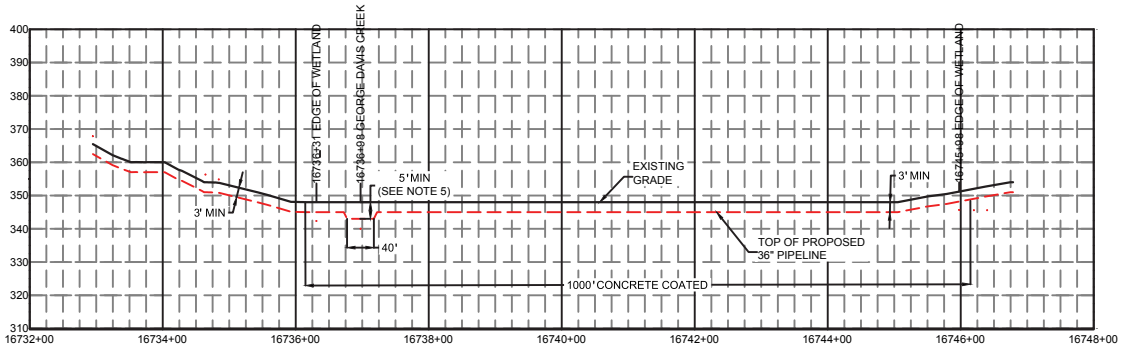
LEGEND
- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM — ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- Milepost

100 0 100 200 300 FEET

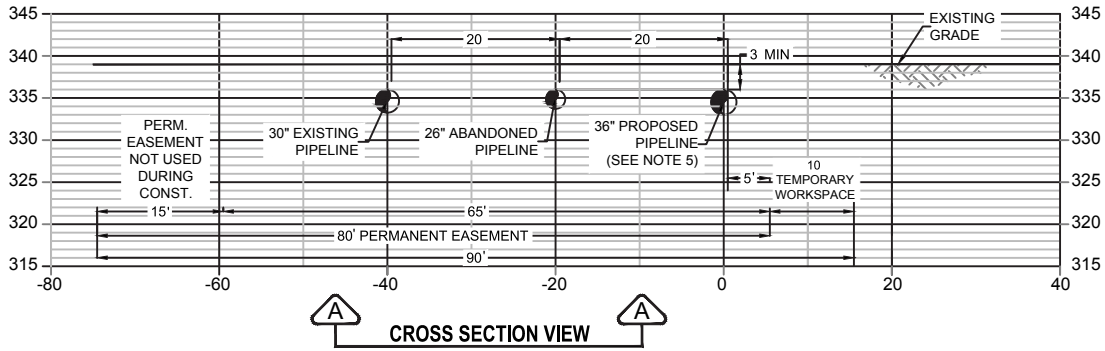
WASHINGTON EXPANSION PROJECT
LOOP 5 SUMNER NORTH B
QUEENS BOG 1379.07 MP
KING COUNTY, WASHINGTON



PLAN VIEW



PROFILE VIEW



CROSS SECTION VIEW

GENERAL NOTES:

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3. EXCAVATED MATERIAL FROM THE BOG WILL BE STOCKPILED AS CLOSE TO THE EXCAVATED TRENCH AS PRACTICAL AND UTILIZED TO BACKFILL WITHOUT COMPACTION OVER THE INSTALLED PIPE.

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4)THIS DRAWING IS NOT FOR CONSTRUCTION. THIS IS A PRELIMINARY PROFILE SHOWING THE GENERAL LOCATION AND MINIMUM DEPTH REQUIREMENTS OF THE CROSSING.
5) END POINTS ON PROFILE VIEWS ARE BASED ON KNOWN POINTS FROM THE ENVIRONMENTAL ALIGNMENT SHEETS.
6) MINIMUM BURIAL OF 36"PIPELINE IS 3', EXCEPT GOT 20' ON EACH SIDE OF THE GEORGE DAVIS CREEK WHERE THE MINIMUM BURIAL IS 5'.

LEGEND
- Proposed 36" WEP Project
- Abandoned 26" Pipeline
- Existing 30" Pipeline
- Existing 36" Pipeline
- Road C/L
- Access Road
- Property Line
- Section Line
- Stream
- Sediment Barrier
- OHWM — ORDINARY HIGH WATER MARK
- Approximate Permanent Easement
- Temporary Extra Work Area
- Temporary Construction ROW
- Perm Easement Not Used During Construction
- Wetland
- Temporary Sediment Barrier
- 123 — Milepost

100 0 100 200 300 FEET

WASHINGTON EXPANSION PROJECT
LOOP 5 SUMNER NORTH B
BOG CROSSING 1381.30 MP
KING COUNTY, WASHINGTON

APPENDIX K5

FISH AND WATERBODY TABLES

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
Woodland Loop										
1244.30	S1_LO1_054	Unnamed	E	2	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1245.25	S1_LO1_056	Unnamed	E	1	U	No	No	No	No	Jul 16 - Sept 30
1245.41	S3_LO1_048	Burris Creek	I	3	F	Yes	Yes	Yes	No	Aug 1 - Aug 31
1246.26	S3_LO1_049	Unnamed	I	3	N	No	No	No	No	Aug 1 - Aug 31
1246.91	S1_LO1_002	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1247.03	S1_LO1_003	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1247.22	S1_LO1_004	Canyon Creek	I	10	N	No	No	No	No	Aug 1 - Aug 31
1247.48	S1_LO1_005	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1247.69	S1_LO1_006	Unnamed	P	9	U	No	No	No	No	Jul 16 - Sept 30
1248.01	S1_LO1_007	Mill Creek	P	7	F	No	No	No	No	Jul 16 - Sept 30
1248.17	S1_LO1_008	Unnamed	P	12	N	No	No	No	No	Jul 16 - Sept 30
1248.26	S1_LO1_009	Unnamed	P	5	N	No	No	No	No	Jul 16 - Sept 30
1248.35	S1_LO1_011	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1249.52	S2_LO1_001	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1249.60	S2_LO1_002	Unnamed	I	2	N	No	No	No	No	Jul 16 - Sept 30
1249.64	S2_LO1_003	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1249.73	S2_LO1_004	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1250.10	S2_LO1_006	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1250.17	S2_LO1_007	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1250.44	S2_LO1_008	Unnamed	P	6	N	No	No	No	No	Jul 16 - Sept 30
1250.56	S2_LO1_009	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1250.82	S2_LO1_010	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1251.15	S3_LO1_007	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1251.41	S3_LO1_001	Cedar Creek	P	3	N	No	No	No	No	Aug 1- Aug 15
1251.42	S3_LO1_003	Cedar Creek	I	1	N	No	No	No	No	Aug 1- Aug 15
1251.92	S3_LO1_004	Unnamed	P	3	N	No	No	No	No	Aug 1- Aug 15
1252.73	S3_LO1_009	Unnamed	P	2	N	No	No	No	No	Aug 1- Aug 15
1253.39	S3_LO1_012	Kalama River	P	238	S	Yes	Yes	Yes	Yes	Aug 1- Aug 15
1254.08	S1_LO1_013	Unnamed	P	5	F	Unknown	Unknown	Unknown	Unknown	Aug 1- Aug 15
1254.13	S1_LO1_014	Unnamed	P	9	F	No	No	No	No	Aug 1- Aug 15
1254.28	S1_LO1_010	Unnamed	E	1	N	Unknown	Unknown	Unknown	Unknown	Aug 1- Aug 15

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1254.39	S1_LO1_015	Unnamed	P	4	N	No	No	No	No	Aug 1- Aug 15
1255.20	S2_LO1_016	Unnamed	I	2	N	No	No	No	No	Aug 1- Aug 15
1255.40	S2_LO1_015	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1255.53	S2_LO1_014	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1255.86	S2_LO1_011	Unnamed	P	2	F	No	No	No	No	Jul 16 - Sept 15
1256.24	S2_LO1_012	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 15
1256.42	S2_LO1_013	Unnamed	P	2	N	No	No	No	No	Jul 16 - Sept 15
1257.08	S1_LO1_019	Owl Creek	P	15	F	No	No	No	No	Jul 16 - Sept 15
1257.28	S1_LO1_020	Unnamed	E	9	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 15
1257.64	S1_LO1_022	Unnamed	P	8	F	No	No	No	No	Jul 16 - Sept 15
1257.66	S1_LO1_023	Unnamed	I	13	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 15
1257.85	S2_LO1_018	Unnamed	E	2	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 15
1257.90	S2_LO1_019	Unnamed	I	2	U	No	No	No	No	Jul 16 - Sept 15
1258.00	S2_LO1_020	Unnamed	E	2	N	No	No	No	No	Jul 16 - Sept 15
1258.59	S1_LO1_024	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 15
1259.27	S3_LO1_016	Unnamed	P	2	N	No	No	No	No	Jul 16 - Sept 15
1259.47	S3_LO1_017	Unnamed	P	2	N	No	No	No	No	Jul 16 - Sept 15
1259.64	S3_LO1_018	Unnamed	P	1	N	No	No	No	No	Jul 16 - Sept 30
1259.92	S3_LO1_019	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1260.24	S3_LO1_020	Unnamed	I	1	N	No	No	No	No	Jul 16 - Sept 30
1260.49	S2_LO1_022	Coweeman River	P	80	S	Yes	Yes	Yes	Yes	Jul 16 - Sept 30
1260.77	S2_LO1_023	Unnamed	P	3	F	Yes	Yes	No	Yes	Aug 1 - Aug 31
1260.83	S2_LO1_024	Unnamed	P	4	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1261.27	S3_LO1_025	Unnamed	I	8	F	No	No	No	No	Aug 1 - Aug 31
1261.33	S3_LO1_024	Unnamed	P	2	N	No	No	No	No	Aug 1 - Aug 31
1261.71	S3_LO1_021	Unnamed	E	4	N	No	No	No	No	Aug 1 - Aug 31
1261.98	S3_LO1_023	Unnamed	P	6	N	No	No	No	No	Aug 1 - Aug 31
1262.66	S1_LO1_025	Unnamed	P	2	N	No	No	No	No	Aug 1 - Aug 31
1262.94	S1_LO1_029	Unnamed	P	7	U	No	No	No	No	Jul 16 - Sept 30
1263.17	S1_LO1_031	Unnamed	P	2	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1263.49	S1_LO1_038	Unnamed	P	7	F	No	No	No	No	Jul 16 - Sept 30
1263.53	S1_LO1_039	Unnamed	E	1	U	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1263.77	S1_LO1_040	Unnamed	P	11	N	No	No	No	No	Jul 16 - Sept 30
1263.81	S1_LO1_042	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1264.13	S2_LO1_025	Unnamed	E	2	N	No	No	No	No	Jul 16 - Sept 30
1264.91	S2_LO1_021	South Fork Ostrander Creek	P	20	S	Yes	Yes	Yes	Yes	Jul 16 - Sept 30
1265.12	SP_L01_001	Unnamed	I	2	N	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1265.25	S1_LO1_057	Ostrander Creek	P	40	S	Yes	Yes	Yes	Yes	Jul 16 - Sept 30
1265.93	S1_LO1_058	Unnamed	I	6	N	No	No	No	No	Jul 16 - Sept 30
1266.50	S1_LO1_045	Unnamed	P	1	N	No	No	No	No	Jul 16 - Sept 30
1266.75	S2_LO1_048	Unnamed	I	2	N	No	No	No	No	Jul 16 - Sept 30
1267.04	S2_LO1_051	Unnamed	E	1	N	No	No	No	No	Jul 16 - Sept 30
1267.37	S2_LO1_054	Unnamed	P	4	F	No	No	No	No	Jul 16 - Sept 30
1267.63	S3_LO1_026	Unnamed	P	3	F	No	No	No	No	Jul 16 - Sept 30
1267.91	S3_LO1_027	Unnamed	I	1	N	No	No	No	No	Jul 16 - Sept 30
1267.97	S3_LO1_028	Unnamed	I	3	N	No	No	No	No	Jul 16 - Sept 30
1268.35	S3_LO1_029	Unnamed	I	3	F	No	No	No	No	Jul 16 - Sept 30
1268.56 and 1268.63	S3_LO1_030	Unnamed	P	4	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1269.36	S1_LO1_032	Coal Mine Creek	P	20	F	No	No	No	No	Jul 16 - Sept 30
1269.83	S1_LO1_034	Unnamed	E	1	N	No	No	No	No	Jul 16 - Sept 30
1269.89	S1_LO1_035	Unnamed	E	1	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1270.66	S2_LO1_027	Unnamed	I	3	N	No	No	No	No	Jul 16 - Sept 30
1270.87	S2_LO1_028	Unnamed	I	2	N	No	No	No	No	Jul 16 - Sept 30
1271.10	S2_LO1_029	Unnamed	I	3	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1271.41	S3_LO1_035	Unnamed	P	3	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1271.89	S3_LO1_036	Unnamed	P	2	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1272.12	S3_LO1_038	Unnamed	P	4	N	No	No	No	No	Jul 16 - Sept 30
1272.23	S3_LO1_039	Salmon Creek	P	4	F	No	No	No	No	Jul 16 - Sept 30
1272.42	S3_LO1_040	Unnamed	P	2	N	No	No	No	No	Jul 16 - Sept 30
1273.11	S2_LO1_033	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1273.13	S2_LO1_032	Unnamed	P	3	N	No	No	No	No	Jul 16 - Aug 15
1273.58	S3_L01_014	Unnamed	P	2	U	No	No	No	No	Jul 16 - Aug 15
1274.42	S3_LO1_013	Toutle River	P	275	S	Yes	Yes	Yes	No	Jul 16 - Aug 15

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1275.69	S3_LO1_041	Unnamed	I	4	F	Yes	Yes	Proposed	Yes	July 16 – Aug 15
1275.88	S4_LO1_003	Unnamed	I	3	N	No	No	No	No	Jul 16 – Aug 150
1276.08 and 1276.18	S4_LO1_002	Unnamed	E	2	N	No	No	No	No	Jul 16 - Aug 15
1277.77	S1_LO1_062	Unnamed	P	7	F	No	No	No	No	Jul 16 - Sept 30
1277.81	S1_LO1_061	Unnamed	P	15	F	No	No	No	No	Jul 16 - Sept 30
1278.12	S1_LO1_060	Unnamed	I	5	N	No	No	No	No	Jul 16 - Sept 30
1278.82	S2_LO1_055	Unnamed	P	11	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1279.17	S2_LO1_056	Hill Creek	P	10	F	No	No	No	No	Jul 16 - Sept 30
1279.33	S4_LO1_004	Unnamed	E	6	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1279.72	S4_LO1_005	Unnamed	I	2	F	No	No	No	No	Aug 1 - Aug 15
1280.07 and 1280.24	S4_LO1_006	Unnamed	I	4	N	No	No	No	No	Aug 1 - Aug 15
1280.28	S4_LO1_007	Unnamed	I	6	N	No	No	No	No	Aug 1 - Aug 15
1280.32	S4_LO1_008	Roadside Ditch	E	4	N	No	No	No	No	Aug 1 - Aug 15
1280.82	S1_LO1_046	Foster Creek	P	30	F	No	No	No	No	Aug 1 - Aug 15
1281.52	S2_LO1_034	Unnamed	P	4	F	Yes	Yes	Yes	No	Aug 1 - Aug 15
1281.69	S2_LO1_035	Unnamed	E	1	U	No	No	No	No	Aug 1 - Aug 15
1282.51	S2_LO1_036	Cowlitz River	P	280	S	Yes	Yes	Yes	No	Aug 1 - Aug 15
1282.65	S3_LO1_047	Unnamed	P	4	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 15
1283.37	S3_LO1_043	Unnamed	P	2	N	No	No	No	No	Aug 1 - Aug 15
1283.74	S1_LO1_047	Unnamed	E	1	F	Yes	Yes	Yes	Yes	Aug 1 - Aug 15
1284.56	S1_LO1_048	Unnamed	P	20	F	Yes	Yes	Yes	Yes	Aug 1 - Aug 15
1284.78	S1_LO1_049	Unnamed	E	1	N	No	No	No	No	Aug 1 - Aug 15
1284.92	S1_LO1_050	Unnamed	I	12	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 15
1285.35	S2_LO1_038	Lacamas Creek	P	7	S	Yes	Yes	Yes	Yes	Aug 1 - Aug 15
1285.43	S2_LO1_039	Unnamed	E	1	X	No	No	No	No	Aug 1 - Aug 15
1286.17	S2_LO1_037	Unnamed	P	3	N	No	No	No	No	Aug 1 - Aug 15
1286.77	S3_LO1_046	Unnamed	P	3	X	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 15
1287.51	S1_LO1_051	Unnamed	I	2	N	No	No	No	No	Aug 1 - Aug 15
1287.90	S1_LO1_052	Unnamed	I	9	N	No	No	No	No	Aug 1 - Aug 15
1288.11	S2_LO1_040	Unnamed	I	6	U	No	No	No	No	Aug 1 - Aug 15
1288.14	S2_LO1_041	Unnamed	E	1	U	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 15
1288.52	S2_LO1_044	Unnamed	P	10	N	No	No	No	No	Aug 1 - Aug 15

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1288.56	S2_LO1_043	Unnamed	P	12	F	Yes	Yes	Yes	Yes	Aug 1 - Aug 15
1288.90	S2_LO1_045	Unnamed	I	1	F	Yes	Yes	Yes	Yes	Aug 1 - Aug 15
1289.32	S2_LO1_046	Olequa Creek	P	10	F	No	No	No	No	Aug 1 - Aug 15
Chehalis Loop										
1291.42	1291.5	Unnamed	I	2	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1292.65	1292.4	Unnamed	I	4	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1293.20 and 1293.26	1293.1	Unnamed	I	4	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1294.13	1294.2	Newaukum River	P	126	S	Yes	No	No	Yes	Aug 1 - Aug 31
1295.08	1295.1	Unnamed	I	2	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1295.44	1295.4	Unnamed	P	2	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1296.14	1296.1	Unnamed	P	1	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1296.50	1296.45	Unnamed	P	2	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1296.66	1296.6	Unnamed	P	5	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1296.78	1296.9	Berwick Creek	P	6	F	Yes	No	No	Yes	Aug 1 - Aug 31
1297.41	1297.6	Dillenbaugh Creek	P	8	F	Yes	No	No	No	Aug 1 - Aug 15
1297.97	1298	Unnamed	P	4	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 15
1299.03	1299	Salzer Creek	P	7	F	Yes	No	No	Yes	Aug 1 - Aug 15
1299.93	1299.95	Unnamed	P	2	N	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 15
1300.05	1300.2	Unnamed	P	6	F	Yes	No	No	Yes	Aug 1 - Aug 15
1300.78	1300.9	Unnamed	P	4	F	No	No	No	No	Aug 1 - Aug 15
1301.68	1301.6	South Hanaford Creek	P	6	F	Yes	No	No	Yes	Aug 1 - Aug 15
1303.23	S2_LO2_002	Unnamed	I	2	F	Yes	No	No	No	Aug 1 - Aug 31
1303.50	S2_LO2_001	Unnamed	I	2	N	No	No	No	No	Aug 1 - Aug 31
1304.26	S3_LO2_001	Unnamed	I	5	F	No	No	No	No	Aug 1 - Aug 31
1305.14	S3_LO2_004	Unnamed	P	5	U	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1305.28	S3_LO2_005	Packwood Creek	P	4	F	Yes	No	No	No	Aug 1 - Aug 31
1306.25	S3_LO2_006	Hanaford Creek	P	5	F	Yes	No	No	Yes	Aug 1 - Aug 31
1306.55	S3_LO2_007	Snyder Creek	P	4	F	Yes	No	No	Yes	Aug 1 - Aug 31
1307.66	S4_LO2_002	Unnamed	E	2	N	No	No	No	No	Aug 1 - Aug 31
1307.69	S4_LO2_001	North Hanaford Creek	E	2	N	No	No	No	No	Aug 1 - Aug 31
1307.94	S1_LO2_100	Unnamed	P	12	N	No	No	No	No	Aug 1 - Aug 31
1308.33	S1_LO2_101	Unnamed	P	3	N	No	No	No	No	Aug 1 - Aug 31

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1308.97	S1_LO2_103	Thompson Creek	P	20	F	Yes	No	No	Yes	Aug 1 - Aug 31
1309.36	S2_LO2_004	Skookumchuck River	P	90	S	Yes	No	No	Yes	Aug 1 - Aug 31
1310.72	S4_LO2_003	Unnamed	I	2	N	No	No	No	No	Aug 1 - Aug 31
1310.79	S4_LO2_004	Unnamed	I	2	N	No	No	No	No	Aug 1 - Aug 31
1311.07	S4_LO2_005	Unnamed	E	2	N	No	No	No	No	Aug 1 - Aug 31
1311.19	S4_LO2_006	Unnamed	E	2	U	No	No	No	No	Aug 1 - Aug 31
1311.23	S4_LO2_007	Unnamed	E	2	N	No	No	No	No	Aug 1 - Aug 31
1311.41	S4_LO2_008	Unnamed	I	4	N	No	No	No	No	Aug 1 - Aug 31
1311.43	S4_LO2_009	Unnamed	I	2	N	No	No	No	No	Aug 1 - Aug 31
1311.65	S2_LO2_008	Unnamed	P	4	N	No	No	No	No	Aug 1 - Aug 31
1312.14	S2_LO2_007	Unnamed	P	5	N	No	No	No	No	Aug 1 - Aug 31
1312.60	S2_LO2_005	Unnamed	I	2	N	No	No	No	No	Aug 1 - Aug 31
1313.05	S1_LO2_104	Unnamed	P	8	F	Yes	No	No	Yes	Aug 1 - Aug 31
1313.35	S2_LO2_010	Unnamed	E	1	N	No	No	No	No	Aug 1 - Aug 31
1313.80	S2_LO2_009	Unnamed	E	1	U	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1314.86	S4_LO2_010	Unnamed	I	1	N	No	No	No	No	Jul 16 - Aug 31
1314.96	S4_LO2_011	Unnamed	I	2	U	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 31
1315.10	SP_LO2_001	Deschutes River	P	78	S	Yes	Yes	Yes	Yes	Jul 16 - Aug 31
Sumner South Loop										
1339.33	S1_LO3_002	Unnamed	I	10	N	No	No	No	No	July 16 - Sept 30
1339.74 and 1339.79	FL-3	Tributary to Clover Creek	I	1	N	No	No	No	No	July 16 - Sept 30
1342.22	S1_LO3_003	Unnamed	E	1	N	No	No	No	No	July 16 - Sept 30
1342.62	S1_LO3_004	Unnamed	E	3	N	No	No	No	No	July 16 - Sept 30
1346.10	S2_LO3_002	Unnamed	I	2	N	No	No	No	No	Jul 16 - Aug 31
1346.82	S3_LO3_004	Unnamed	P	2	U	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 31
1346.97	S3_LO3_003	Unnamed	P	2	N	No	No	No	No	Jul 16 - Aug 31
1347.92	S3_LO3_002	Unnamed	P	3	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 31
1347.98	S3_LO3_001	Puyallup River	P	191	S	Yes	Yes	Yes	Yes	Jul 16 - Aug 31
1349.23 and 1349.27	S4_LO3_101	Unnamed Agricultural Ditch	I	19	N	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 31
1349.31	S4_LO3_102	Roadside Ditch	I	2	N	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 31

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1349.99	S1_LO3_005	Salmon Creek	P	12	F	Yes	No	No	Yes	Jul 16 - Aug 15
1350.05	S1_LO3_006	Unnamed	P	3	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 15
Sumner North A Loop										
1357.14	S1_LO4_001	Unnamed	P	20	F	Yes	No	No	Yes	Jul 16 - Sept 30
1357.17	S1_LO4_002	Unnamed	P	6	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1357.31	S1_LO4_003	Unnamed	P	8	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1359.62	S3_LO4_001	Covington Creek	P	25	S	Yes	Yes	Yes	Yes	Jul 16 - Sept 30
1360.98	S4_LO4_001	Unnamed	P	14	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Sept 30
1361.48	S4_LO4_002	Unnamed	I	4	F	Yes	No	No	Yes	Jul 16 - Sept 30
1362.66	S1_LO4_004	Cranmar Creek	P	14	F	Yes	No	No	Yes	Jul 16 - Sept 30
Sumner North A Loop										
1371.05	S1_LO5_001	Issaquah Creek	P	30	S	Yes	Yes	Yes	Yes	Aug 1 - Aug 31
1371.51	S3_LO5_003	Unnamed	P	3	F	Yes	No	No	No	Aug 1 - Aug 31
1371.73	S1_LO5_005	Unnamed	P	12	N	Yes	No	No	Yes	Aug 1 - Aug 31
1371.96	S2_LO5_006	Fifteenmile Creek	P	21	F	Yes	Yes	Yes	Yes	Aug 1 - Aug 31
1372.35	S2_LO5_005	Unnamed	P	5	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1372.60	S2_LO5_002	Unnamed	P	6	F	No	No	No	No	Aug 1 - Aug 31
1372.69	S2_LO5_001	Unnamed	P	4	U	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1373.66	S4_LO5_002	Unnamed	P	10	F	Yes	No	No	Yes	Aug 1 - Aug 31
1374.25	S2_LO5_010	Unnamed	P	5	F	Yes	No	No	Yes	Aug 1 - Aug 31
1374.57	S2_LO5_009	Unnamed	E	1	N	No	No	No	No	Aug 1 - Aug 31
1374.92	S2_LO5_007	Unnamed	E	1	N	No	No	No	No	Aug 1 - Aug 31
1375.88	S3_LO5_007	Unnamed	P	3	N	No	No	No	No	Aug 1 - Aug 31
1376.12	S2_LO5_004	East Fork Issaquah Creek	P	16	F	Yes	Yes	Yes	Yes	Aug 1 - Aug 31
1376.21	S2_LO5_003	Unnamed	I	6	N	No	No	No	No	Aug 1 - Aug 31
1377.34	S3_LO5_004	North Fork Issaquah Creek	P	4	F	Yes	No	No	No	Aug 1 - Aug 31
1378.08	S3_LO5_005	Unnamed	P	3	N	No	No	No	No	Jul 16 - Sept 30
1379.62	S1_LO5_002	Unnamed	I	20	F	Yes	No	No	No	Jul 16 - Sept 30
1381.25	SN-45	Tributary to Lake Sammamish	I	2	N	No	No	No	No	Jul 16 - Sept 30
1381.31	SP_LO5_001	George Davis Creek	P	3	F	No	No	No	No	Jul 16 - Sept 30

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
Snohomish Loop										
1395.98	S4_LO6_002	Unnamed	E	2	N	No	No	No	No	Aug 1 - Aug 15
1396.59	S4_LO6_005	Unnamed	E	1	N	No	No	No	No	Aug 1 - Aug 15
1396.71	S4_LO6_003	Elliott Creek	P	10	F	No	No	No	No	Aug 1 - Aug 15
1397.36 and 1397.52	S4_LO6_101	Unnamed	P	5	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 15
1397.56	S4_LO6_004	Snohomish River	P	900	S	Yes	Yes	Yes	Yes	Aug 1 - Aug 15
1398.19	S1_LO6_002	Unnamed	I	4	N	No	No	No	No	Aug 1 - Aug 15
1398.62	S1_LO6_003	Unnamed	P	8	N	No	No	No	No	Aug 1 - Aug 15
1399.44	S1_LO6_004	Unnamed	P	3	N	No	No	No	No	Aug 1 - Aug 15
1399.67	S1_LO6_005	Unnamed	P	12	F	No	No	No	No	Aug 1 - Aug 15
1400.46	S2_LO6_001	Unnamed	P	11	N	Yes	No	No	Yes	Aug 1 - Aug 15
1401.53	S2_LO6_002	Unnamed	P	8	F	Yes	No	No	Yes	Aug 1 - Aug 15
1402.42	S3_LO6_001	French Creek	P	10	F	Yes	Yes	Yes	Yes	Aug 1 - Aug 15
1404.64	S1_LO6_008	Unnamed	I	4	F	Yes	No	No	Yes	Aug 1 - Aug 31
1405.39	S1_LO6_007	Unnamed	P	6	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Aug 31
1407.81	S3_LO6_002	Pilchuck River	P	82	S	Yes	Yes	Yes	Yes	Aug 1 - Aug 31
Mt. Vernon South Loop										
1439.07	MV-25	Tributary to Walker Creek	P	6	F	Yes	No	No	Yes	Project specific
Mt. Vernon North A Loop										
1440.25 and 1440.27	S4_LO8_008	Unnamed	I	4	S	Unknown	Unknown	Unknown	Unknown	Project specific
1440.42	S4_LO8_007	East Fork Nookachamps Creek	P	50	S	Yes	Yes	Yes	Yes	Project specific
1441.21	S4_LO8_005	Unnamed	I	4	F	Unknown	Unknown	Unknown	Unknown	Project specific
1441.28	S4_LO8_004	Unnamed	I	4	F	Unknown	Unknown	Unknown	Unknown	Project specific
1441.44	S4_LO8_003	Turner Creek	P	9	F	Yes	No	No	Yes	Project specific
1442.10	S2_LO8_004	Unnamed	I	3	N	No	No	No	No	Project specific
1442.68	S2_LO8_003	Unnamed	P	10	F	Yes	No	No	No	Project specific
1444.26	S4_LO8_002	Unnamed	I	5	F	No	No	No	No	Project specific
Mt. Vernon North B Loop										
1453.67	S1_LO9_001	Unnamed	P	4	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Sept 15
1453.76	S1_LO9_002	Unnamed	P	12	F	No	No	No	No	Aug 1 - Sept 15

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1454.18	S1_LO9_003	Mills Creek	P	20	F	Yes	No	No	Yes	Aug 1 - Sept 15
1454.40	S1_LO9_004	Unnamed	P	15	N	No	No	No	No	Aug 1 - Sept 15
1454.51	S1_LO9_006	Unnamed	P	3	N	No	No	No	No	Aug 1 - Sept 15
1454.57	S1_LO9_007	Unnamed	I	5	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Sept 15
1454.61	S1_LO9_008	Unnamed	P	3	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Sept 15
1454.81	S2_LO9_010	Unnamed	E	2	N	No	No	No	No	Aug 1 - Sept 15
1454.90	S2_LO9_009	Unnamed	I	4	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Sept 15
1454.91	S2_LO9_008	Unnamed	I	12	F	Unknown	Unknown	Unknown	Unknown	Aug 1 - Sept 15
1455.22	S2_LO9_007	Unnamed	I	2	N	No	No	No	No	Aug 1 - Sept 15
1455.42	S2_LO9_006	Unnamed	I	2	F	Yes	No	No	Yes	Aug 1 - Sept 15
1455.54	S2_LO9_005	Unnamed	I	3	N	No	No	No	No	Aug 1 - Sept 15
1455.63	S2_LO9_004	Unnamed	I	6	N	No	No	No	No	Aug 1 - Sept 15
1455.71	S2_LO9_003	Unnamed	I	3	N	Yes	No	No	No	Aug 1 - Sept 15
1455.87	S2_LO9_002	Unnamed	I	8	F	No	No	No	No	Aug 1 - Sept 15
1456.03	S2_LO9_001	Unnamed	I	11	N	No	No	No	No	Aug 1 - Sept 15
1456.62	S3_LO9_002	Unnamed	I	2	F	Yes	No	No	Yes	Aug 1 - Sept 15
1457.40	S3_LO9_003	Little Innis Creek	P	10	F	Yes	Yes	No	Yes	Aug 1 - Sept 15
1457.70	S4_LO9_002	Unnamed	E	1	N	No	No	No	No	Aug 1 - Sept 15
1457.88	S4_LO9_001	Unnamed	E	4	N	No	No	No	No	Aug 1 - Sept 15
1458.87	S4_LO9_003	Unnamed	E	6	N	No	No	No	No	Aug 1 - Sept 15
1460.01	S2_LO9_011	Samish River	P	10	F	Yes	No	No	Yes	Jul 16 - Aug 15
1460.42	S2_LO9_012	Unnamed	I	4	F	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 15
1461.32	SP_LO9_001	Landing Strip Creek	P	6	F	Yes	Yes	No	Yes	Jul 16 - Aug 15
1461.56	S4_LO9_101	South Fork Nooksack River	P	170	S	Yes	Yes	Yes	Yes	Jul 16 - Aug 15
Sumas Loop										
1478.87	S-22	Breckenridge Creek	P	30	S	Yes	Yes	Yes	Yes	Jul 16 - Aug 15
1479.05	S-21	Kinney Creek	P	8	F	Yes	Yes	Proposed	Yes	Jul 16 - Aug 15
1479.99	S-16	Unnamed	I	2	N	No	No	No	No	Jul 16 - Aug 15
1481.02	S-9	Unnamed	P	3	N	No	No	No	No	Jul 16 - Aug 15
1481.40	S-7	Unnamed	P	4	N	Unknown	Unknown	Unknown	Unknown	Jul 16 - Aug 15
1482.80	S-4B	Saar Creek	P	12	S	Yes	Yes	Yes	Yes	Aug 1 - Sept 30

Table K5-1

General Stream and Fish Attributes at the Waterbody Crossing Locations of the Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name	Flow Type[a]	Channel Width (feet)	WDNR Stream Type[b]	Priority Fish Use	ESA-Listed Species Use	ESA Critical Habitat	EFH at Crossing Site	In-water Work Window[c]
1483.08	S-4A	Saar Creek	P	12	S	Yes	Yes	Yes	Yes	Aug 1 - Sept 30

Data Sources:

Stream type definitions can be accessed at: http://www.dnr.wa.gov/businesspermits/topics/forestpracticesapplications/pages/fp_watertyping.aspx.

[a] Flow type: P = Perennial, I = Intermittent, E = Ephemeral.

[b] WDNR Stream Type (Forest Practices Water Typing)

Type "F" = Fish. Streams and waterbodies that are known to be used by fish, or that meet the physical criteria to be potentially used by fish. Fish streams may or may not have flowing water all year; they may be perennial or seasonal.

Type "N" includes either of the following two types of streams, which could not be determined definitively in the field:

Type "NP" = Non-fish perennial. Streams that have flow year round and may have spatially intermittent dry reaches downstream of perennial flow. Type NP streams do not meet the physical criteria of a Type F stream. This also includes streams that have been proven not to contain fish using methods described in Forest Practices Board Manual.

Type "NS" = Non-fish seasonal. Streams that do not have surface flow during at least some portion of the year and do not meet the physical criteria of a Type F stream.

Type "S" = Shoreline. Streams and waterbodies that are designated “shorelines of the state” as defined in *Revised Code of Washington* 90.58.030.

Type "U" is a symbol used on WDNR maps to identify untyped water features that need to be verified and identified on proposed forest practices activity maps.

Type "X" is a symbol used on WDNR maps to identify water features (e.g., irrigation ditches, sanitation ponds, pipelines) that are not part of the above classifications.

[c] WDFW. 2009. Allowable Freshwater Work Times. March. Stream list can be accessed at: http://www.wsdot.wa.gov/NR/rdonlyres/EFF0EF14-31B0-45EC-BC12-DE9BB353F66E/0/AllowableFreshwaterWorkWindows.pdf.

EFH = Essential Fish Habitat; ESA = Endangered Species Act; ID = identification; WDNR = Washington State Department of Natural Resources

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
Woodland Loop									
1253.39	S3_LO1_012	Kalama River	CHK (Sp)	Spw, Rr	Lower Columbia River	Threatened	Yes	Yes	Candidate
			BLT	Mig	Columbia River	Threatened	No	No	Candidate
			CHM	Mig	Columbia River	Threatened	Yes	No	Candidate
			STL (Su)	Spw, Rr	Lower Columbia River	Threatened	Yes	No	Candidate
			COH	Spw, Rr	Lower Columbia River	Threatened	Proposed	Yes	---
			STL (W)	Spw, Rr	Lower Columbia River	Threatened	Yes	No	Candidate
			CHK (F)	Spw, Rr	Lower Columbia River	Threatened	Yes	Yes	Candidate
			PE	Spw, Mig	Southern	Threatened	Yes	Yes	Candidate
			CUT	Present	---	---	---	---	---
1260.49	S2_LO1_022	Coweeman River	COH	Mig	Lower Columbia River	Threatened	Proposed	Yes	---
			STL (W)	Rr, Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			CHK (F)	Mig	Lower Columbia River	Threatened	Yes	Yes	Candidate
			CHM	Mig	Columbia River	Threatened	Yes	No	Candidate
			CUT	Present	---	---	---	---	---
1260.77	S2_LO1_023	Unnamed	COH	Mig	Lower Columbia River	Threatened	Proposed	Yes	---
1264.91	S2_LO1_021	South Fork Ostrander Creek	COH	Spw, Rr	Lower Columbia River	Threatened	Proposed	Yes	---
			STL (W)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			CHK (F)	Mig	Lower Columbia River	Threatened	Yes	Yes	Candidate
			CUT	Present	---	---	No	No	---
1265.25	S1_LO1_057	Ostrander Creek	COH	Spw, Rr	Lower Columbia River	Threatened	Proposed	Yes	---
			STL (W)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			CHK (F)	Mig	Lower Columbia River	Threatened	Yes	Yes	Candidate
			CUT	Present	---	---	No	No	---
1274.42	S3_LO1_013	Toutle River	STL (W)	Spw, Rr	Lower Columbia River	Threatened	Yes	No	Candidate
			CHM	Mig	Columbia River	Threatened	Yes	No	Candidate
			COH	Rr, Mig	Lower Columbia River	Threatened	Proposed	Yes	---
			STL (Su)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			CHK (Sp)	Mig	Lower Columbia River	Threatened	Yes	Yes	Candidate
			CHK (F)	Mig	Lower Columbia River	Threatened	Yes	Yes	Candidate
			PE	Spw, Mig	Southern	Threatened	Yes	Yes	Candidate
			RBT	Present	---	---	No	No	---
			CUT	Present	---	---	No	No	---

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
1275.69	S3_LO1_41	Unnamed	COH	Mig	Lower Columbia River	Threatened	Proposed	Yes	---
1281.52	S2_LO1_034	Unnamed	CHM	Mig	Columbia River	Threatened	Yes	No	Candidate
1282.51	S2_LO1_036	Cowlitz River	CHM	Mig	Columbia River	Threatened	Yes	No	Candidate
			CHK (Sp)	Spw, Rr	Lower Columbia River	Threatened	Yes	Yes	Candidate
			CHK (F)	Spw, Rr	Lower Columbia River	Threatened	Yes	Yes	Candidate
			STL (Su)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			STL (W)	Spw, Rr	Lower Columbia River	Threatened	Yes	No	Candidate
			COH	Mig	Lower Columbia River	Threatened	Proposed	Yes	---
			PE	Spw, Mig	Southern	Threatened	Yes	Yes	Candidate
			RBT	Present	---	---	No	No	---
			CUT	Present	---	---	No	No	---
1283.74	S1_LO1_047	Unnamed	COH	Mig	Lower Columbia River	Threatened	Proposed	Yes	---
			STL (W)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
1284.56	S1_LO1_048	Unnamed	CHM	Mig	Columbia River	Threatened	Yes	No	Candidate
			STL (W)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			COH	Spw, Rr	Lower Columbia River	Threatened	Proposed	Yes	---
			CHK (F)	Mig	Lower Columbia River	Threatened	Yes	Yes	Candidate
1285.35	S2_LO1_038	Lacamas Creek	CHM	Mig	Columbia River	Threatened	Yes	No	Candidate
			STL (W)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			COH	Spw, Rr	Lower Columbia River	Threatened	Proposed	Yes	---
			CHK (F)	Mig	Lower Columbia River	Threatened	Yes	Yes	Candidate
			CUT	Present	---	---	No	No	---
1288.56	S2_LO1_043	Unnamed	STL (W)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
			COH	Mig	Lower Columbia River	Threatened	Proposed	Yes	---
1288.90	S2_LO1_045	Unnamed	COH	Mig	Lower Columbia River	Threatened	Proposed	Yes	---
			STL (W)	Mig	Lower Columbia River	Threatened	Yes	No	Candidate
Chehalis Loop									
1294.13	1294.2	Newaukum River	STL (W)	Spw, Rr	Southwest Washington	Not Warranted	No	No	---
			CHK (Sp)	Spw, Rr	Washington Coast	Not Warranted	No	Yes	---
			CHK (F)	Spw, Rr	Washington Coast	Not Warranted	No	Yes	---
			COH	Rr, Mig	Southwest Washington	Undetermined	No	Yes	---
			CUT	Present	---	---	No	No	---

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
1296.78	1296.9	Berwick Creek	COH	Mig	Southwest Washington	Undetermined	No	Yes	---
			CUT	Present	---	---	No	No	---
1297.41	1297.6	Dillenbaugh Creek	CUT	Present	---	---	No	No	---
1299.03	1299	Salzer Creek	COH	Mig	Southwest Washington	Undetermined	No	Yes	---
1300.05	1300.2	Unnamed	COH	Mig	Southwest Washington	Undetermined	No	Yes	---
1301.68	1301.6	South Hanaford Creek	COH	Mig	Southwest Washington	Undetermined	No	Yes	---
1303.23	S2_L02_002	Unnamed	COH	Mig	Southwest Washington	Undetermined	No	Yes	---
1305.28	S3_LO2_005	Packwood Creek	CUT	Present	---	---	No	No	---
1306.25	S3_LO2_006	Hanaford Creek	STL (W)	Mig	Southwest Washington	Not Warranted	No	No	---
			COH	Mig	Southwest Washington	Undetermined	No	Yes	---
			CUT	Present	---	---	---	---	---
1306.55	S3_LO2_007	Snyder Creek	COH	Mig	Southwest Washington	Undetermined	No	Yes	---
			CUT	Present	---	---	No	No	---
1308.97	S1_LO2_103	Thompson Creek	STL (W)	Spw, Rr	Southwest Washington	Not Warranted	No	No	---
			COH	Spw, Rr	Southwest Washington	Undetermined	No	Yes	---
1309.36	S2_LO2_004	Skookumchuck River	STL (W)	Spw, Rr	Southwest Washington	Not Warranted	No	No	---
			CHK (Sp)	Spw, Rr	Washington Coast	Not Warranted	No	Yes	---
			CHK (F)	Spw, Rr	Washington Coast	Not Warranted	No	Yes	---
			COH	Spw, Rr	Southwest Washington	Undetermined	No	Yes	---
			CUT	Present	---	---	No	No	---
1313.05	S1_LO2_104	Unnamed	COH	Mig	Southwest Washington	Undetermined	No	Yes	---
1315.10	SP_LO2_001	Deschutes River	COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	No	Candidate
			CHK (Sp)	Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			STL (W)	Spw, Rr	Puget Sound	Threatened	Proposed	No	Candidate
			CHK (F)	Spw, Rr	Puget Sound	Threatened	Yes	Yes	Candidate
Sumner South Loop									
1347.98	S3_LO3_001	Puyallup River	BLT	Mig	Coastal-Puget Sound	Threatened	Yes	No	Candidate
			PNK	Spw, Rr	Odd-Year	Not Warranted	No	Yes	---
			CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
			CHK (F)	Rr, Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1349.99	S1_LO3_005	Salmon Creek	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
Sumner North A Loop									
1357.14	S1_LO4_001	Unnamed	COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			CUT	Present	---	---	No	No	---
1359.62	S3_LO4_001	Covington Creek	STL (W)	Spw, Rr	Puget Sound	Threatened	Proposed	No	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CHK (F)	Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			CUT	Present	---	---	No	No	---
1361.48	S4_LO4_002	Unnamed	COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1362.66	S1_LO4_004	Cranmar Creek	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
Sumner North B Loop									
1371.05	S1_LO5_001	Issaquah Creek	SOC	Spw, Rr	Not Determined	Not Determined	No	No	---
			STL (W)	Spw, Rr	Puget Sound	Threatened	Proposed	No	Candidate
			CHK (F)	Spw, Rr	Puget Sound	Threatened	Yes	No	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1371.51	S3_LO5_003	Unnamed	CUT	Present	---	---	No	No	---
1371.73	S1_LO5_005	Unnamed	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
1371.96	S2_LO5_006	Fifteenmile Creek	STL (W)	Rr, Mig	Puget Sound	Threatened	Proposed	No	Candidate
			CHK (F)	Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1373.66	S4_LO5_002	Unnamed	COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			STL (W)	Rr, Mig	Puget Sound	Threatened	Proposed	No	Candidate
			CUT	Present	---	---	No	No	---
1374.25	S2_LO5_010	Unnamed	COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	Candidate

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
1376.12	S2_LO5_004	East Fork Issaquah Creek	SOC	Spw, Rr	---	---	No	No	---
			KOK	Spw, Rr	---	---	No	No	---
			STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CHK (F)	Spw, Rr	Puget Sound	Threatened	Yes	Yes	Candidate
			CUT	Present	---	---	No	No	---
1377.34	S3_LO5_004	North Fork Issaquah Creek	CUT	Present	---	---	No	No	---
1379.62	S1_LO5_002	Unnamed	CUT	Present	---	---	No	No	---
Snohomish Loop									
1397.56	S4_LO6_004	Snohomish River	CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			CHK (F)	Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			CHK (Su)	Spw, Rr	Puget Sound	Threatened	Yes	Yes	Candidate
			STL (Su)	Mig	Puget Sound	Threatened	No	No	Candidate
			SOC	Rr, Mig	Not Determined	Not Determined	No	No	---
			COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			BLT	Rr, Mig	Coastal-Puget Sound	Threatened	Yes	No	Candidate
			STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			PNK	Mig	Even-Year	Not Warranted	No	Yes	---
			CUT	Present	---	---	No	No	---
1400.46	S2_LO6_001	Unnamed	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
1401.53	S2_LO6_002	Unnamed	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
1402.42	S3_LO6_001	French Creek	BLT	Mig	Coastal-Puget Sound	Threatened	Yes	No	Candidate
			STL (Su)	Mig	Puget Sound	Threatened	No	No	Candidate
			STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1404.64	S1_LO6_008	Unnamed	COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
1407.81	S3_LO6_002	Pilchuck River	BLT	Rr, Mig	Coastal-Puget Sound	Threatened	Yes	No	Candidate
			STL (Su)	Mig	Puget Sound	Threatened	No	No	Candidate
			CHK (F)	Spw, Rr	Puget Sound	Threatened	Yes	Yes	Candidate

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
			CHK (Su)	Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			SOC	Mig	Not Determined	Not Determined	No	No	---
			CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			PNK	Spw, Rr	Even-Year	Not Warranted	No	Yes	---
			STL (W)	Spw, Rr	Puget Sound	Threatened	Proposed	No	Candidate
			CUT	Present	---	---	No	No	---
Mt. Vernon South Loop									
1439.07	MV-25	Tributary to Walker Creek	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
Mt. Vernon North A Loop									
1440.42	S4_LO8_007	East Fork Nookachamps Creek	PNK	Mig	Odd-Year	Not Warranted	No	Yes	---
			CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			STL (W)	Spw, Rr	Puget Sound	Threatened	Proposed	No	Candidate
			CHK	Rr, Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			STL (Su)	Mig	Puget Sound	Threatened	No	No	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1441.44	S4_LO8_003	Turner Creek	COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
			CHM	Spw, Rr	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
1442.68	S2_LO8_003	Unnamed	CUT	Present	---	---	No	No	---
Mt. Vernon North B Loop									
1454.18	S1_LO9_003	Mills Creek	COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1455.42	S2_LO9_006	Unnamed	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1455.71	S2_LO9_003	Unnamed	CUT	Present	---	---	No	No	---
1456.62	S2_L09_002	Unnamed	COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	
			CUT	Present					

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
1457.40	S3_LO9_003	Little Innis Creek	CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	Candidate
			CUT	Present	---	---	No	No	---
1460.01	S2_LO9_011	Samish River	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1461.32	SP_LO9_001	Landing Strip Creek	STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1461.56	S4_LO9_101	South Fork Nooksack River	STL (Su)	Mig	Puget Sound	Threatened	No	No	Candidate
			STL (W)	Spw, Rr	Puget Sound	Threatened	Proposed	No	Candidate
			PNK	Spw, Rr	Odd-Year	Not Warranted	No	Yes	---
			SOC	Spw, Rr	Not Determined	Not Determined	No	No	---
			CHM	Spw, Rr	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			BLT	Rr, Mig	Coastal-Puget Sound	Threatened	Yes	No	Candidate
			COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CHK (F)	Spw, Rr	Puget Sound	Threatened	Yes	Yes	Candidate
			CHK (Sp)	Spw, Rr	Puget Sound	Threatened	Yes	Yes	Candidate
			CUT	Present	---	---	No	No	---
Sumas Loop									
1478.87	S-22	Breckenridge Creek	STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			CHK (F)	Mig	Puget Sound	Threatened	Yes	Yes	Candidate
			COH	Spw, Rr	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---
1479.05	S-21	Kinney Creek	COH	Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			CUT	Present	---	---	No	No	---
1482.80	S-4B	Saar Creek	STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			SOC	Mig	Not Determined	Not Determined	No	Yes	Candidate
			CHK (F)	Mig	Puget Sound	Threatened	Yes	No	Candidate
			COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---

Table K5-2

Known Priority Fish Species and Life Stages at Waterbody Crossing Locations for Washington Expansion Project

Waterbody Crossing Milepost	Stream ID	Stream Name at Pipeline Crossing	Species[a] (Run[b])	Life Stage at Crossing[c]	Evolutionary Significant Unit/ Distinct Population Segment	Federal Status	Designated Critical Habitat at Crossing	Essential Fish Habitat at Crossing Site	State Status
			CUT	Present	---	---	No	No	---
1483.08	S-4A	Saar Creek	STL (W)	Mig	Puget Sound	Threatened	Proposed	No	Candidate
			CHM	Mig	Puget Sound/Strait of Georgia	Not Warranted	No	No	Candidate
			SOC	Mig	Not Determined	Not Determined	No	Yes	Candidate
			CHK (F)	Mig	Puget Sound	Threatened	Yes	No	Candidate
			COH	Rr, Mig	Puget Sound/Strait of Georgia	Species of Concern	No	Yes	---
			CUT	Present	---	---	No	No	---

Data source:

StreamNet: Fish Data for the Northwest. Multi-agency database. Funded by the Northwest Power and Conservation Council's Fish and Wildlife Program and by the Bonneville Power Administration and administered by the Pacific States Marine Fisheries Commission. Available at http://www.streamnet.org/.

[a] Species abbreviations:
BLT = Bull trout
CHK = Chinook salmon
CHM = Chum salmon
COH = Coho salmon
CUT = Cutthroat trout
KOK = Kokanee
PE = Pacific eulachon
RBT = Rainbow trout
PNK = Pink salmon
SOC = Sockeye salmon
STL = Steelhead trout

[b] Run definitions:
Sp = spring, Su = summer, F = fall, W = winter.

[c] Life stage definitions:
Spw = spawning, Rr = rearing, Mig = migrating only, Present = known to occur but life stage unknown.

Table K5-3

Approximate Timing of the Life Phases of the Anadromous Salmonids within the Water Resources Inventory Areas and Subbasins Crossed by the Washington Expansion Project

Species (Run [a])	Upstream Migration	Subbasin(s)	Spawning	In-gravel Development	Juvenile Rearing	Juvenile Out-migration
WRIA 27: Lewis Major Watershed: Columbia River						
Bull trout	N/A	Kalama River	Sept – Nov	Sept - Apr	Year-round	N/A
Chinook (F)	Sept - Nov	Kalama River	Sept – Nov	Sept - Apr	Jan - Jun	Apr - Jun
Chinook (Sp)	Apr - June	Kalama River	Aug- Sept	Aug - Jan	Year-round	Apr - May
Chum	Oct 15 - Nov 30	Kalama River	Nov – Dec	Nov - Apr	Feb - Apr	Mar - May
Coho	Aug -Jan	Kalama River	Oct – Jan	Oct - Apr	Year-round	Apr - May
Steelhead (Su)	Apr - Sept	Kalama River	Jan – Jun	Jan - July	Year-round	Apr 1 - May 31
Steelhead (W)	Dec 1 - Mar 31	Columbia and Kalama Rivers	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	April 1 - May 31
WRIA 26: Cowlitz Major Watershed: Cowlitz River						
Chinook (F)	Sept - Nov	Coweeman, Cowlitz, Toutle Rivers	Sept – Nov	Sept - Apr	Jan - Jun	Apr - Jun
Chinook (Sp)	Apr - Jun	Cowlitz and Toutle Rivers	Aug – Sept	Aug - Jan	Year-round	Apr - May
Chum	Oct 15 - Nov 30	Coweeman, Cowlitz, Toutle Rivers	Nov – Dec	Nov - Apr	Feb - Apr	Mar - May
Coho	Aug - Jan	Coweeman, Cowlitz, Toutle Rivers	Oct – Jan	Oct - Apr	Year-round	Apr - May
Steelhead (Su)	Apr - Sept	Cowlitz and Toutle Rivers	Jan – Jun	Jan - July	Year-round	Apr 1 - May 31
Steelhead (W)	Dec 1 - Mar 31	Coweeman, Cowlitz, Toutle Rivers	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	April 1 - May 31
WRIA 23: Upper Chehalis Major Watershed: Chehalis River						
Chinook (Su)	Aug 15 - Nov 30	Newaukum and Skookumchuck Rivers	Sept 15 - Dec 15	Sept 15 - Mar 31	Feb 1 - Aug 15	Mar 15 - Aug 15
Chinook (Sp)	Mar 1 - Apr 15	Newaukum and Skookumchuck Rivers	Aug 15 - Oct 10	Aug 15 - Jan 20	Year-round	Mar 5 - Jun 20
Coho	Sept 15 - Jan 15	Newaukum and Skookumchuck Rivers	Oct 15 - Jan 31	Oct 15 - Apr 30	Feb 1 - Aug 15	Mar 10 - Aug 15
Steelhead (W)	Dec 1 - Mar 31	Newaukum and Skookumchuck Rivers	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	April 1 - May 31
WRIA 13: Deschutes Major Watershed: Deschutes River						
Chinook (F)	Jul 15 - Oct 31	Deschutes River	Sept 15 - Nov 15	Sept 15 - Jan 31	Jan 1 - Sept 15	Feb 15 - Sept 15
Coho	Sept 10 - Dec 31	Deschutes River	Oct 15 - Jan 15	Oct 15 - Mar 31	Year-round	Feb 20 - Apr 10
Steelhead (W)	Dec 1 - Mar 31	Deschutes River	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	April 1 - May 31
WRIA 12: Chambers-Clover Major Watershed: Steilacoom Lake/Puget Sound						
Coho	Sept 15 - Jan 20	Clover Creek	Oct 15 - Jan 20	Oct 15 - Apr 20	Feb 15 - May 15	Feb 15 -0 May 15
WRIA 10: Puyallup-White Major Watershed: Puyallup River						
Bull trout	N/A	Puyallup River	Sept – Nov	Sept - Apr	Year-round	N/A
Chinook (F)	Jul 20 - Oct 31	Puyallup River	Sept 15 - Nov 10	Sept 15 - Feb 15	Dec 15 - Aug 10	Mar 1 - Aug 10
Chum	Sept 20 - Dec 31	Puyallup River	Nov 15 - Jan 20	Nov 15 - Apr 30	Feb 20 - Jul 31	Feb 20 - Jul 31
Coho	Jul 25 - Jan 15	Puyallup River	Oct 15 - Jan 31	Oct 15 - Apr 30	Year-round	Mar 10 - Aug 10
Pink (Odd)	Aug 10 - Oct 20	Puyallup River	Sept 20 - Nov 10	Sept 20 - Apr 15	Feb 15 - Mar 31	Feb 15 - Mar 31

Table K5-3

Approximate Timing of the Life Phases of the Anadromous Salmonids within the Water Resources Inventory Areas and Subbasins Crossed by the Washington Expansion Project

Species (Run [a])	Upstream Migration	Subbasin(s)	Spawning	In-gravel Development	Juvenile Rearing	Juvenile Out-migration
Steelhead (W)	Dec 1 - Mar 31	White River	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	Apr 1 - May 31
WRIA 9: Duwamish-Green Major Watershed: Green River						
Chinook (F)	Jun 5 - Nov 10	Green River/Big Soos Creek	Sept 15 - Nov 25	Sept 15 - Feb 25	Jan 20 - Jul 15	Apr 5 - Jul 15
Chum	Nov 1 - Jan 15	Green River	Nov 5 - Jan 31	Nov 5 - Apr 30	Feb 10 - Jul 15	Feb 10 - Jul 15
Coho	Aug 1 - Jan 25	Green River/Big Soos Creek	Oct 15 - Feb 28	Oct 15 - Apr 15	Year-round	Apr 20 - Jun 10
Steelhead (W)	Dec 1 - Mar 31	Green River	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	Apr 1 - May 31
WRIA 8: Cedar-Sammamish Major Watershed: Lake Sammamish						
Chinook (F)	Jul 1 - Nov 30	Issaquah Creek	Sept 10 - Dec 20	Sept 10 - Mar 31	Dec 15 - Jul 10	Mar 1 - Jul 15
Coho	Aug 10 - Feb 5	Issaquah Creek	Oct 15 - Feb 28	Oct 15 - May 15	Year-round	Mar 1 - Jul 10
Sockeye	Apr 15 - Dec 15	Issaquah Creek	Aug 1 - Dec 31	Aug 1 - May 15	Year-round	Mar 1 - Jul 5
Steelhead (W)	Dec 1 - Mar 31	Issaquah Creek	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	Apr 1 - May 31
WRIA 7: Snohomish Major Watershed Snohomish River						
Bull trout	N/A	Snohomish and Pilchuck Rivers	Sept – Nov	Sept - Apr	Year-round	N/A
Chinook (F)	May 20 - Aug 25	Snohomish and Pilchuck Rivers	Aug 10 - Sept 25	Aug 10 - Jan 15	Year-round	Apr 29 - Jul 25
Chinook (Su)	Jul 1 - Oct 20	Snohomish and Pilchuck Rivers	Sept 15 - Nov 15	Sept 15 - Feb 15	Jan 20 - Jul 15	Apr 20 - Jul 15
Chum	Oct 15 - Jan 5	Snohomish and Pilchuck Rivers	Nov 15 - Jan 20	Nov 15 - Apr 30	Mar 10 - Jun 15	Mar 10 - Jun 15
Coho	Jul 15 - Dec 20	Snohomish and Pilchuck Rivers	Oct 25 - Jan 1	Oct 25 - Apr 30	Year-round	Apr 15 - Jul 15
Pink (even)	Jul 15 - Oct 15	Snohomish and Pilchuck Rivers	Sept 15 - Oct 31	Sept 15 - Apr 30	Mar 20 - May 31	Mar 20 - May 31
Sockeye	Jul 15 - Apr 15	Snohomish and Pilchuck Rivers	Sept 20 - Dec 15	Sept 20 - Mar 15	Year-round	Mar 15 - Jul 15
Steelhead (Su)	N/A	Snohomish and Pilchuck Rivers	Feb – Apr	Feb - Jun	Year-round	Apr 1 - May 31
Steelhead (W)	Dec 1 - Mar 31	Snohomish and Pilchuck Rivers	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	Apr 1 - May 31
WRIA 3: Lower Skagit – Samish Major Watershed: Skagit River						
Bull trout	N/A	Skagit River	Sept – Nov	Sept - Apr	Year-round	N/A
Chinook (Su/F)	Jun 10 - Sept 20	Skagit River	Sept 15 - Oct 15	Sept 15 - Feb 10	Dec 10 - Jun 15	Mar 15 - Jun15
Chinook (Sp)	Apr 5 - Aug 5	Skagit River	Jul 15 - Sept 15	Jul 15 - Jan 20	Year-round	Mar 15 - Jul 15
Chum	Oct 15 - Dec 15	Skagit and Samish Rivers	Nov 1 - Jan 15	Nov 1 - Apr 20	Mar 1 - Jun 10	Mar 1 - Jun 10
Coho	Jul 15 - Dec 31	Skagit and Samish Rivers	Oct 15 - Jan 15	Oct 15 - Apr 15	Year-round	Mar 15 - Jun 15
Pink	Jul 15 - Sept 30	Skagit River	Aug 20 - Oct 25	Aug 20 - Apr 15	Mar 1 - May 25	Mar 1 - May 25
Sockeye	Apr 15 - Jul 30	Skagit River	July 15 - Sept 15	July 15 - June 15	Year-round	Mar 15 - July 15
Steelhead (Su)	N/A	Skagit River	Feb – Apr	Feb - Jun	Year-round	Apr 1 - May 31
Steelhead (W)	Dec 1 - Mar 31	Skagit and Samish Rivers	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	Apr 1 - May 31

Table K5-3

Approximate Timing of the Life Phases of the Anadromous Salmonids within the Water Resources Inventory Areas and Subbasins Crossed by the Washington Expansion Project

Species (Run [a])	Upstream Migration	Subbasin(s)	Spawning	In-gravel Development	Juvenile Rearing	Juvenile Out-migration
WRIA 1: Nooksack Major Watershed: Nooksack and Sumas Rivers						
Bull trout	N/A	Nooksack River	Sept-Nov	Sept-Apr	Year-round	N/A
Chinook (F)	Jul 5 - Sept 30	Nooksack and Sumas Rivers	Sept 5 - Nov 15	Sept 5 - Feb 15	Jan 15 - Jun 5	Apr 15 - Jul 15
Chinook (Sp)	Mar 20 - Aug 5	Nooksack River	Aug 5 - Oct 15	Aug 5 - Jan 15	Year-round	Mar 5 - Jun 20
Chum	Oct 10 - Dec 31	Nooksack and Sumas Rivers	Oct 15 - Jan 20	Oct 15 - Apr 15	Mar 1 - May 15	Mar 1 - May 15
Coho	Jul 10 - Nov 15	Nooksack and Sumas Rivers	Nov 15 - Jan 15	Nov 15 - Apr 15	Year-round	Apr 15 - Aug 20
Pink	Jul 5 - Aug 25	Nooksack River	Aug 25 - Oct 15	Aug 25 - Apr 15	Feb 15 - May 10	Feb 15 - May 10
Sockeye	Jul 10 - Sept 10	Nooksack and Sumas Rivers	Sept 10 - Oct 15	Sept 10 - Mar 15	Year-round	Apr 10 Jul 15
Steelhead (Su)	N/A	Nooksack River	Feb – Apr	Feb - Jun	Year-round	Apr 1 - May 31
Steelhead (W)	Dec 1 - Mar 31	Nooksack and Sumas Rivers	Jan 1 - May 15	Jan 1 - Jun 15	Year-round	Apr 1 - May 31

Data sources:

Lower Columbia Fish Recovery Board. 2010. *Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan.*

National Marine Fisheries Service (NMFS). 2012. Salmon population information –status reviews for various species. Available at http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/.

StreamNet. 2007. Fish Data for the Northwest. Multi-agency database. Funded by the Northwest Power and Conservation Council's Fish and Wildlife Program and by the Bonneville Power Administration. Administered by the Pacific States Marine Fisheries Commission. Available at http://www.streamnet.org/.

Washington Department of Fish and Wildlife (WDFW). 1975. *A Catalog of Washington Streams and Salmon Utilization*. Seattle, Washington. 4 vols.

Washington Department of Fish and Wildlife (WDFW). 1993. Salmon and Steelhead Stock Inventory.

Lower Columbia Fish Recovery Board. 2010. *Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan*.

[a] Run definitions:
Sp = spring, Su = summer, F = fall, W = winter, Odd = odd year runs.
N/A = not applicable
WRIA = Water Resources Inventory Area

APPENDIX L

OTHER SPECIAL STATUS SPECIES FOR THE WEP

TABLE L-1

Other Special Status Species for the WEP

Species	Status [a]	Habitat/Presence	Impacts	Mitigation Measures
Terrestrial Invertebrates				
Beller's ground beetle *Agonum belleri*	PHS SC SOC	Acidic sphagnum bogs in forested regions.	If beetles are present at time of construction, individuals could be killed or displaced. Habitat could be affected if construction alters water quality.	Northwest would coordinate with WDFW to determine if mitigation measures are needed.
Hatch's click beetle *Eanus hatchi*	PHS SC SOC	Sphagnum bogs; known only from King County.	If beetles are present at time of construction, individuals could be killed or displaced. Habitat could be affected if construction alters water quality.	Northwest would coordinate with WDFW to determine if mitigation measures are needed.
Birds				
Northern goshawk *Accipiter gentilis*	PHS SC SOC	None observed in project area and buffer zone during 2013 aerial survey.	Construction activity within 0.25 mile of active nest could affect nesting success.	Northwest would conduct preconstruction raptor nesting surveys if any clearing would occur during breeding season.
Golden eagle *Aquila chrysaetos*	PHS SC	None observed in project area and buffer zone during 2013 aerial survey.	Construction activity within 0.25 mile of active nest could affect nesting success.	Northwest would conduct preconstruction raptor nesting surveys if any clearing would occur during breeding season.
Great blue heron *Ardea herodias*	PHS	Nests in colonies in trees along or near streams/rivers. Forages in aquatic habitats.	Construction activity within 0.25 mile of active nest could affect nesting success.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Vaux's swift *Chaetura vauxi*	PHS SC	Late stages of coniferous and mixed deciduous/coniferous forest.	Construction noise could disturb nesting birds up to 500 feet from right-of-way centerline.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Snow goose *Chen caerulescens*	PHS	Migrant/winter resident. Roosts in lakes and large ponds, feeds in sileage fields and meadows.	Construction activity could temporarily displace birds.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Band-tailed pigeon *Columba fasciata*	PHS	Montane and mixed-species forests.	Construction noise could disturb nesting birds up to 500 feet from right-of-way centerline.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Sooty grouse *Dendragapus fuliginosus*	PHS	Conifer forest edges and openings.	Construction noise could disturb nesting birds up to 500 feet from right-of-way centerline.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Pileated woodpecker *Dryocopus pileatus*	PHS SC	Late successional deciduous or coniferous forest; younger forest with large trees.	Construction noise could disturb nesting birds up to 500 feet from right-of-way centerline.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Bald eagle *Haliaeetus leucocephalus*	PHS ST SOC	Riparian and lacustrine habitats; nests in large trees. Four nests identified and individuals incidentally observed within project area and buffer zone in 2013 survey.	If active nests present, could be directly impacted by clearing activities. Construction during nesting season could affect nest success.	Northwest would conduct preconstruction raptor nesting surveys if any clearing would occur during breeding season.
Harlequin duck *Histrionicus histrionicus*	PHS	Nests along fast moving, low gradient, clear mountain streams. In winter found along marine shorelines	Construction noise could disturb nesting birds up to 500 feet from right-of-way centerline.	Northwest would coordinate with WDFW to determine if mitigation measures needed.

TABLE L-1

Other Special Status Species for the WEP

Species	Status [a]	Habitat/Presence	Impacts	Mitigation Measures
Wild turkey (nonnative game species) *Meleagris gallopava*	PHS	Variety of wooded, shrubby and agricultural habitats.	Tolerant of human activity. If active nests present, could be directly affected by construction activity.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Mountain quail *Oreortyx pictus*	PHS	Shrubby habitats. Limited range in WA may not overlap with project. Suitable blocks of brushy habitat unlikely on mowed right-of-way.	None anticipated due to lack of suitable habitat on project.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Black-backed woodpecker *Picoides arcticus*	PHS SC	Early successional burned coniferous forest.	None anticipated due to lack of suitable habitat on project.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Cavity-nesting ducks Multiple species	PHS	Breeding habitat (trees/snags) not present on previously cleared and maintained right-of-way.	Clearing in forested areas could remove nest trees and/or destroy nests.	Preconstruction nest surveys as needed immediately prior to clearing. Avoid nesting season as possible.
Waterfowl concentrations Multiple species	PHS	Some open fields and large lakes/wetlands near right-of-way (e.g. Tradition and Round Lakes near Sumner North B Loop) can be migratory stop-over habitat during fall and winter.	Migrant or resident birds could be temporarily displaced during construction.	Preconstruction surveys as needed. Avoid nesting season as possible.
Reptiles and Amphibians				
Northwestern pond turtle *Actinemys marmorata marmorata*	SE SOC	Ponds and lakes with logs and other basking structures at surface. Some potential habitat from south end of project to Snohomish Loop.	If present, direct mortality and/or nest loss from construction and maintenance activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Western toad *Bufo boreas*	PHS SC SOC	Variety of terrestrial habitats (prairies, forests, woodlands, canyon grasslands). Breeding habitat includes permanent waters (wetlands, ponds, lakes, etc.). Some potential habitat present through length of project.	If present, direct mortality and/or egg loss from construction and maintenance activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Sharptail snake *Contia tenuis*	PHS SC SOC	Habitats that are moist in spring may be dry in summer (rocky slopes, open pine-oak woodland, deciduous floodplains, woody debris). Some potential habitat in Sumner South Loop, but species very rare in WA.	If present, could be directly affected or displaced by construction or maintenance activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Larch Mountain salamander *Plethodon larselli*	PHS SS SOC	Habitat includes talus, scree, and gravelly soils on steep slopes in a variety of forested and nonforested habitats with woody debris and leaf litter. In nonforested areas, occupied sites are usually north-facing rocky slopes dominated by mosses. Patchy distribution that could include some of southern portion of project.	If present, direct mortality and/or egg loss from construction and maintenance activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Van Dyke's salamander *Plethodon vandykei*	PHS SC SOC	Cool, moist habitats in forest. Some potential habitat in Woodland, Chehalis, and Sumner South Loops.	If present, direct mortality and/or egg loss from construction and maintenance activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.

TABLE L-1

Other Special Status Species for the WEP

Species	Status [a]	Habitat/Presence	Impacts	Mitigation Measures
Cascades frog *Rana cascadae*	SOC	Primarily above 2,000-foot elevation, typically but not always near water. Breeds in standing water (wetlands, ponds, lakes, flooded meadows, etc.). Widespread throughout its range in WA, which includes coastal and Cascade regions.	If present, direct mortality and/or egg loss from construction and maintenance activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Columbia spotted frog *Rana luteiventris*	PHS SC	Wetlands in forested and nonforested habitats.	If present, adults, egg masses, and metamorphs could be crushed during construction and maintenance of right-of-way; adults could be displaced from right-of-way by disturbance.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Cascade torrent salamander *Rhyacotriton cascadae*	PHS SC	Along streams in southern WA; not widely present. Could potentially be present in vicinity of Woodland and Chehalis Loops.	If present, direct mortality and/or egg loss from construction and maintenance activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Mammals				
Elk *Cervus elaphus*	PHS	Occur primarily in the mountain ranges and shrublands east of the Cascades crest (east of project area). Small herds have been established, or reestablished, throughout other parts of western Washington.	If present, individuals could be temporarily displaced by construction or maintenance noise and activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Marten *Martes americana*	PHS	Mature conifer or mixed forests, usually subalpine, with greater than 35 percent canopy cover.	If present, could be temporarily displaced by construction activity.	None proposed, per consultation with FWS. Northwest would work with WDFW as needed.
Fisher (West Coast DPS) *Martes pennanti*	PHS SE FC	Dense montane forests with abundant large woody debris, snags, cavity trees. No potential habitat on project.	None anticipated due to lack of suitable habitat on project.	None proposed, per consultation with FWS. Northwest would work with WDFW as needed.
Columbian black-tailed deer *Odocoileus hemionus columbianus*	PHS	Common species west of Cascade crest in brushy, logged lands and coniferous forests.	Individuals could be temporarily displaced by construction and maintenance noise and activities.	Northwest would coordinate with WDFW to determine if mitigation measures needed.
Western gray squirrel *Sciurus griseus*	PHS ST SOC	Oak woodlands. One small potential habitat patch in Sumner South Loop.	Presence unlikely. If present, could be directly (mortality, habitat loss) or indirectly (displacement) affected by construction.	None proposed, per consultation with FWS. Northwest would work with WDFW as needed.
Mazama pocket gopher *Thomomys mazama* ssp. *glacialis, pugetensis, tumuli, yelmensis*	PHS ST FC	Prairies, pastures, open meadows with light-textured, well-drained soils. Some potentially suitable habitat in north portion of Chehalis Loop. No record of presence within construction footprint.	If present, could be temporarily displaced by ground disturbance within construction footprint. Pipeline could impede burrowing.	Preconstruction surveys. Minimize/avoid construction activities where species present.

[a] PHS = Priority Habitat Species; SE = State Endangered; ST = State Threatened; SC = State Candidate; SS = State Sensitive; SOC= Species of Concern; DPS = Distinct Population Segment; FC = Federal Candidate

APPENDIX M

DEMOGRAPHICS AND INCOME DISTRIBUTION OF CENSUS TRACTS ADJACENT TO THE WEP

Demographics and Income Distribution of Census Tracts Adjacent to the WEP

	Demographics (2010)							Income (2008-2012)	
Area	Percent Caucasian	Percent African American	Percent Asian	Percent American Indian and Alaska Native	Percent Native Hawaiian and Other Pacific Islander	Percent Two or More Races	Percent Hispanic or Latino	Median Income	Percent Persons Below Poverty Level
Washington	71.6	3.9	7.7	1.8	0.7	4.3	11.7	$59,374	12.9
Clark County	81.8	1.9	4.1	0.7	0.6	3.3	7.6	$58,764	12.0
Census Tract 402.01	90.2	0.6	1.4	0.9	0.1	2.5	4.4	$70,618	8.0
Census Tract 403.01	90.8	0.3	1.8	0.7	0.1	2.3	3.9	$64,375	12.9
Census Tract 403.02	89.8	0.7	1.9	0.6	0.2	2.3	4.5	$88,221	5.3
Cowlitz County	85.8	0.6	1.4	1.3	0.2	2.9	7.8	$46,568	17.9
Census Tract 3	71.3	0.8	3.7	1.8	0.0	2.9	19.4	$12,944	49.5
Census Tract 8	90.2	0.4	2.4	0.9	0.2	2.3	3.5	$68,496	7.6
Census Tract 9	87.7	0.4	1.0	0.8	0.2	3.0	6.8	$54,370	12.2
Census Tract 11	78.9	0.8	1.8	1.9	0.1	4.0	12.6	$31,642	0.3
Census Tract 15.01	92.1	0.2	0.7	1.0	0.1	2.1	3.7	$62,917	8.5
Census Tract 18	90.8	0.3	0.7	1.5	0.0	2.7	4.1	$49,489	17.5
Census Tract 20.01	92.4	0.2	0.9	1.3	0.2	2.3	2.7	$51,618	10.7
Lewis County	86.0	0.5	0.9	1.3	0.1	2.5	8.7	$43,490	13.9
Census Tract 9701	91.7	0.1	0.9	1.1	0.2	2.2	3.6	$48,339	18.5
Census Tract 9702	87.3	0.4	1.4	0.6	0.1	2.1	8.1	$40,298	18.2
Census Tract 9704	76.0	0.3	0.9	1.2	0.1	2.6	18.8	$40,631	14.8
Census Tract 9707	74.8	0.6	0.9	1.6	0.4	2.5	19.2	$37,404	27.4
Census Tract 9709	78.9	0.7	1.6	0.6	0.0	2.2	16.0	$33,255	7.4
Census Tract 9710	81.8	2.7	1.2	1.4	0.3	1.7	10.9	$44,231	12.6
Census Tract 9712	90.0	0.2	0.6	1.6	0.1	2.6	4.8	$43,093	8.7
Census Tract 9715	88.8	0.3	0.5	1.6	0.1	2.6	6.1	$53,600	12.1
Census Tract 9718	91.3	0.5	0.4	2.0	0.1	2.1	3.4	$34,699	17.5
Census Tract 9719	93.0	0.4	0.4	1.3	0.0	1.8	3.0	$43,000	14.1
Thurston County	78.9	2.5	5.1	1.2	0.7	4.3	7.1	$63,224	11.1
Census Tract 124.11	79.2	2.3	2.1	1.7	0.6	5.4	8.6	$51,529	19.8
Census Tract 124.12	79.8	2.1	2.2	1.6	0.8	5.2	8.2	$61,250	14.8
Census Tract 124.20	85.0	1.1	1.9	1.7	0.5	4.6	4.8	$76,165	8.1
Census Tract 125.10	83.4	1.3	1.6	1.1	0.5	4.9	6.9	$61,375	11.1
Census Tract 126.10	89.8	0.5	1.4	0.8	0.1	2.8	4.5	$70,213	4.4
Census Tract 127.10	84.2	1.0	1.9	0.9	0.5	3.5	8.0	$55,789	10.9
Pierce County	70.3	6.5	5.8	1.1	1.3	5.6	9.2	$59,105	11.9
Census Tract 702.03	87.0	0.7	1.5	0.6	0.1	4.2	5.7	$93,102	5.9
Census Tract 703.07	90.3	0.3	2.2	0.5	0.1	2.2	4.3	$108,237	6.2
Census Tract 703.08	86.8	0.8	1.9	0.9	0.3	3.9	5.3	$78,590	9.5
Census Tract 703.09	88.8	0.7	1.2	1.0	0.1	3.1	4.9	$79,117	7.1
Census Tract 703.12	82.0	2.0	3.8	0.6	0.2	4.0	7.3	$88,259	2.2
Census Tract 703.14	88.0	0.7	3.0	0.5	0.3	3.2	4.3	$81,319	6.4
Census Tract 703.16	67.0	3.8	16.1	0.7	0.5	5.0	6.8	$72,786	1.7
Census Tract 704.04	83.8	1.7	1.9	1.0	0.4	4.3	6.5	$87,667	5.8
Census Tract 712.06	76.9	3.4	4.5	1.3	1.0	5.8	6.9	$59,974	6.7
Census Tract 713.05	74.7	4.1	5.0	1.1	1.2	5.5	8.3	$54,811	11.9
Census Tract 713.06	72.8	6.6	5.8	1.1	1.6	6.3	5.7	$71,696	5.6
Census Tract 713.07	78.7	4.1	3.9	0.7	1.4	4.6	6.5	$60,938	8.7
Census Tract 714.07	69.5	6.9	4.8	0.7	2.0	7.8	8.0	$65,257	6.3
Census Tract 714.08	59.4	10.0	5.4	1.1	4.0	8.4	11.5	$50,081	16.3
Census Tract 714.09	61.5	10.3	5.1	1.0	3.7	7.5	10.8	$53,947	12.5
Census Tract 714.10	58.6	10.2	7.5	0.8	3.9	7.5	11.1	$64,438	15.2
Census Tract 714.11	54.1	13.6	7.2	0.7	4.0	7.6	12.7	$64,517	8.3
Census Tract 715.06	64.0	9.7	6.3	1.0	4.1	7.2	7.7	$71,837	12.0
Census Tract 729.06	70.3	11.4	3.1	0.6	1.0	2.2	11.4	$55,833	0.0
Census Tract 730.01	84.1	1.2	1.6	1.8	1.1	4.3	5.7	$58,968	11.6
Census Tract 730.06	87.6	0.9	1.2	1.4	0.3	4.6	3.9	$70,516	8.2
Census Tract 731.10	84.0	2.4	3.2	0.9	0.5	4.1	4.8	$90,354	3.8
Census Tract 731.11	80.3	2.4	2.4	1.0	0.9	4.5	8.4	$69,294	4.1
Census Tract 731.14	76.4	3.7	2.7	1.4	2.6	6.0	7.1	$63,384	12.0
Census Tract 731.20	70.3	6.6	5.2	0.7	2.1	6.1	8.9	$64,821	13.8
Census Tract 731.21	71.0	4.8	7.3	0.8	1.2	5.6	9.2	$81,736	3.4
Census Tract 731.25	70.6	6.5	5.5	0.8	1.5	6.1	8.8	$66,538	9.5
Census Tract 734.04	86.2	1.1	1.6	1.3	0.3	4.4	5.1	$63,550	9.9
Census Tract 734.05	76.9	3.3	4.8	1.2	0.7	4.0	8.9	$49,694	8.4

Demographics and Income Distribution of Census Tracts Adjacent to the WEP

	Demographics (2010)							Income (2008-2012)	
Area	Percent Caucasian	Percent African American	Percent Asian	Percent American Indian and Alaska Native	Percent Native Hawaiian and Other Pacific Islander	Percent Two or More Races	Percent Hispanic or Latino	Median Income	Percent Persons Below Poverty Level
Census Tract 734.07	82.0	1.4	1.7	2.3	0.5	3.7	8.4	$50,665	18.6
Census Tract 735	88.4	0.9	2.5	0.8	0.3	3.1	3.9	$73,066	5.0
Census Tract 9400.10	81.7	1.9	2.4	2.2	0.5	3.8	7.4	$46,183	15.8
King County	64.8	6.0	14.5	0.7	0.7	4.1	8.9	$71,175	10.9
Census Tract 304.04	78.7	1.9	8.6	1.0	1.2	3.4	5.2	$74,331	6.7
Census Tract 306	71.1	4.3	4.2	1.5	3.1	4.0	11.8	$40,923	17.0
Census Tract 309.02	63.2	3.1	9.6	1.6	1.9	4.7	15.8	$43,775	22.0
Census Tract 310	76.1	3.9	8.6	0.5	0.7	5.2	4.9	$84,375	4.2
Census Tract 311	62.9	4.8	4.8	8.7	1.6	4.6	12.4	$49,444	15.8
Census Tract 312.02	70.3	1.1	2.1	15.7	0.5	3.0	7.2	$85,547	12.1
Census Tract 312.05	65.0	6.9	13.8	0.8	0.8	3.6	9.0	$71,368	12.1
Census Tract 312.06	65.7	3.8	10.4	1.2	0.7	3.5	14.4	$60,577	11.0
Census Tract 316.03	84.9	1.8	3.9	1.0	0.2	3.5	4.7	$88,750	6.7
Census Tract 316.04	78.5	2.2	5.1	0.7	0.8	5.1	7.5	$99,833	2.9
Census Tract 316.05	91.1	0.8	1.3	0.6	0.2	3.0	3.0	$95,337	4.7
Census Tract 317.04	61.9	6.8	13.2	0.5	0.9	5.2	11.4	$79,875	9.4
Census Tract 317.05	74.1	4.3	9.9	0.4	0.5	4.0	6.7	$101,979	0.9
Census Tract 317.06	68.4	4.9	12.4	0.7	0.6	5.1	7.7	$83,224	6.9
Census Tract 318	72.9	2.6	14.5	0.5	0.6	4.1	4.5	$92,813	7.5
Census Tract 319.03	77.9	1.4	6.4	0.7	0.3	3.6	9.6	$86,288	3.4
Census Tract 319.06	73.8	2.4	14.3	0.6	0.2	3.3	5.3	$112,292	5.2
Census Tract 320.02	86.8	1.5	2.3	0.7	0.2	3.5	4.7	$89,900	3.7
Census Tract 320.03	90.4	1.0	2.0	0.6	0.0	2.2	3.7	$90,230	5.2
Census Tract 320.08	85.1	1.4	2.2	0.5	0.3	4.2	6.0	$99,750	0.0
Census Tract 320.10	84.2	1.9	4.4	0.3	0.3	3.9	4.7	$89,924	4.1
Census Tract 320.11	83.8	2.1	4.6	0.3	0.1	3.6	5.4	$104,018	0.6
Census Tract 321.03	79.6	0.9	6.7	0.4	0.1	3.8	8.4	$60,232	7.8
Census Tract 321.04	81.4	1.5	6.0	0.4	0.3	3.2	7.1	$85,906	3.6
Census Tract 322.03	74.9	1.3	16.7	0.2	0.2	2.9	3.7	$123,393	3.9
Census Tract 322.07	79.1	0.8	12.4	0.3	0.0	2.8	4.5	$132,604	1.2
Census Tract 322.08	77.1	0.9	14.9	0.4	0.1	2.5	4.0	$73,889	3.0
Census Tract 322.15	66.2	0.8	25.2	0.0	0.1	3.5	3.8	$169,236	0.7
Census Tract 323.07	87.0	0.8	3.9	0.4	0.2	3.3	4.3	$114,943	1.8
Census Tract 323.11	87.9	0.7	3.9	0.4	0.2	2.8	3.8	$138,421	1.0
Census Tract 323.15	87.2	0.4	4.3	0.2	0.2	3.5	4.0	$128,341	3.1
Census Tract 323.16	73.8	0.7	17.9	0.2	0.0	3.6	3.6	$161,829	1.4
Census Tract 323.17	79.6	0.8	11.1	0.2	0.0	3.6	4.5	$136,917	5.9
Census Tract 323.28	85.2	0.8	5.9	0.2	0.1	3.1	4.3	$128,155	1.0
Census Tract 324.01	87.5	0.4	2.2	0.6	0.0	2.8	6.3	$90,476	5.8
Census Tract 325	85.6	0.8	3.0	0.7	0.1	2.5	7.2	$86,396	6.1
Census Tract 326.01	90.2	0.1	0.9	0.8	0.1	2.7	5.1	$72,447	6.9
Census Tract 326.02	80.8	0.9	9.1	0.6	0.1	3.7	4.6	$121,828	5.1
Census Tract 327.02	91.0	0.3	1.5	0.7	0.2	2.6	3.5	$96,146	5.8
Snohomish County	74.3	2.4	8.8	1.2	0.4	3.7	9.0	$68,338	9.8
Census Tract 415	84.4	2.7	2.5	1.4	0.1	3.7	5.0	$56,467	15.1
Census Tract 416.01	72.3	3.1	12.0	0.6	0.3	3.9	7.5	$78,214	6.3
Census Tract 416.07	78.6	1.2	10.0	0.4	0.1	3.8	5.6	$109,952	5.6
Census Tract 416.08	78.1	1.5	10.2	0.5	0.2	3.4	6.0	$89,612	6.9
Census Tract 519.12	88.8	0.3	3.9	0.5	0.2	2.2	3.5	$91,765	2.5
Census Tract 519.26	72.2	1.2	19.9	0.3	0.0	2.9	3.5	$110,156	1.6
Census Tract 521.04	76.7	1.5	7.7	1.0	0.5	5.0	7.4	$80,313	0.8
Census Tract 521.07	74.2	0.4	15.2	0.6	0.4	3.7	5.4	$106,955	7.1
Census Tract 521.18	77.6	1.4	10.4	0.4	0.2	4.0	5.9	$110,291	4.4
Census Tract 522.03	85.0	0.9	3.0	0.6	0.1	2.8	7.4	$92,250	3.1
Census Tract 522.06	92.3	0.3	1.1	0.4	0.1	2.1	3.4	$86,216	5.6
Census Tract 522.08	67.3	0.5	1.7	0.8	0.1	3.1	26.4	$50,332	15.0
Census Tract 522.09	65.7	10.0	1.4	2.5	1.0	1.9	17.4	$47,865	15.1
Census Tract 524.01	87.3	0.4	1.4	1.1	0.2	2.8	6.5	$68,167	7.8
Census Tract 524.02	84.7	0.5	1.7	0.8	0.1	2.7	9.2	$43,411	18.2
Census Tract 525.02	88.6	0.4	2.6	0.5	0.2	2.3	5.2	$66,006	6.4
Census Tract 525.04	90.9	0.9	0.8	0.8	0.0	2.8	3.7	$66,250	9.1

Demographics and Income Distribution of Census Tracts Adjacent to the WEP

	Demographics (2010)							Income (2008-2012)	
Area	Percent Caucasian	Percent African American	Percent Asian	Percent American Indian and Alaska Native	Percent Native Hawaiian and Other Pacific Islander	Percent Two or More Races	Percent Hispanic or Latino	Median Income	Percent Persons Below Poverty Level
Census Tract 526.03	86.9	0.6	1.6	1.0	0.2	3.6	5.9	$75,817	7.5
Census Tract 526.04	83.1	1.3	1.8	0.8	0.4	3.6	8.9	$53,450	20.2
Census Tract 526.05	87.4	0.7	2.1	0.5	0.2	3.6	5.4	$78,374	5.5
Census Tract 533.01	85.8	0.7	1.6	0.7	0.3	3.0	7.7	$60,357	11.9
Census Tract 533.02	91.4	0.6	1.2	0.8	0.1	2.5	3.2	$81,715	2.7
Census Tract 534	92.1	0.5	1.1	1.4	0.1	2.3	2.4	$84,015	4.5
Census Tract 535.06	91.6	0.3	1.1	1.0	0.1	2.3	3.5	$69,888	4.7
Census Tract 536.02	91.8	0.5	0.8	0.6	0.1	2.6	3.5	$69,153	6.5
Census Tract 536.03	91.6	0.3	1.3	0.8	0.1	2.5	3.5	$79,464	5.1
Census Tract 537	90.4	0.2	0.4	2.3	0.0	3.5	3.0	$43,147	16.3
Census Tract 538.01	90.2	0.5	1.1	1.1	0.2	2.3	4.5	$62,768	14.0
Skagit County	76.7	0.5	1.7	1.7	0.2	2.1	16.9	$56,457	12.6
Census Tract 9508	88.2	0.2	1.2	0.9	0.2	2.2	6.8	$77,101	3.2
Census Tract 9510	92.2	0.1	0.4	1.1	0.1	2.3	3.6	$55,078	11.9
Census Tract 9511	89.2	0.2	0.6	3.1	0.0	2.8	3.6	$42,244	16.3
Census Tract 9514	84.8	0.4	0.9	1.1	0.0	1.9	10.8	$50,959	6.1
Census Tract 9515	80.6	0.4	1.4	1.6	0.0	2.2	13.7	$51,615	14.3
Census Tract 9516	67.9	0.3	2.0	0.6	0.1	1.6	27.3	$56,983	11.2
Census Tract 9521	81.1	0.4	0.8	1.8	0.2	1.1	14.4	$56,955	10.9
Census Tract 9523.02	60.9	0.9	3.3	0.9	0.2	2.1	31.5	$61,107	9.7
Census Tract 9524.02	67.4	0.5	2.3	0.7	0.3	1.9	26.7	$59,559	13.5
Census Tract 9526	78.3	0.4	0.9	1.4	0.2	2.0	16.7	$54,535	6.7
Census Tract 9901	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Whatcom County	81.9	0.9	3.5	2.5	0.2	3.0	7.8	$51,639	15.8
Census Tract 8.06	88.2	0.7	1.5	0.9	0.2	3.3	5.0	$69,234	10.3
Census Tract 103.03	83.8	0.5	2.9	0.6	0.2	1.5	10.3	$62,897	6.0
Census Tract 107.01	83.4	0.4	2.4	0.5	0.1	1.7	11.5	$69,068	3.6
Census Tract 107.02	70.0	0.2	0.9	7.7	0.0	4.5	16.5	$59,741	11.6
Okanogan County	68.3	0.3	0.5	10.7	0.1	2.4	17.6	$40,924	20.6
Census Tract 9709	95.0	0.1	0.6	0.9	0.0	0.8	2.5	$44,612	9.3

Source: U.S. Census Bureau, 2010; 2008-2012.

APPENDIX N—REFERENCES

Adams, L.W. and D.L. Leedy. 1994. Managing Pipeline Rights-of-Way for Wildlife. Chapter XI. Greenways: Wildlife and Natural Gas Pipeline Corridors. K.G. Hay. The Conservation Fund, Arlington, Virginia. pp. 177-191.

Adams, P.B., C.B. Grimes, J.E. Hightower, S.T. Lindley, and M.L. Moser. 2002. Status Review for the North American Green Sturgeon (*Acipenser medirostris*). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California. 49 pp.

Al-Humaidhi, A.W., M.A. Bellman , J. Jannot , and J. Majewski. 2012. Observed and Estimated Total Bycatch of Green Sturgeon and Pacific Eulachon in 2002-2010 U.S. West Coast Fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, Washington 98112.

Allen, C. 2003. Replacing Salmon – Columbia River Indian Fishing Rights and the Geography of Fisheries Mitigation. Oregon Historical Quarterly. Vol. 104, Issue 2.

Allen, B. M. and R. P. Angliss. 2013. Alaska marine mammal stock assessments, 2012. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC-245, 282 p.

American Industrial Hygiene Association. 2013. ERPG/WEEL Handbook, http://www.aiha.org/get-involved/AIHAGuidelineFoundation/EmergencyResponsePlanningGuidelines, 2013.

Anchor Environmental, Los Angeles Contaminated Sediments Task Force. 2003. Literature Review of Effects of Resuspended Sediments Due to Dredging Operations.

Angliss, R.P. and R.B. Outlaw. 2008. Alaska Marine Mammal Stock Assessments, 2007. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFSAFSC-180. 252 pages.

Applegate, R., J. Bayless, B. Beroza, B. Davenport, D. Wood. 2005. Lewis and Clark National Historic Park Museum Management Plan. National Park Service, Pacific West Region.

Arner, D.H. 1994. Enhancing Wildlife Habitat on Utility-Rights-of-Ways. Chapter X in Greenways: Wildlife and Natural Gas Pipeline Corridors. K. G. Hay. The Conservation Fund, Arlington, Virginia.

Baba, N., H. Nitto, and A. Nitta. 2000. Satellite Tracking of Young Steller Sea Lions off the Coast of Northern Hokkaido. Fisheries Science 66:180-181.

Baird, R.W. 2001. Status of Killer Whales, Orincus orca, in Canada. Canadian Field Naturalist 115(4):676-701.

Baker, D.L. 2002. Holocene (2-16 Kz) Sedimentation in the Columbia River Estuary. Masters Thesis. Portland State University, 2002.

Ballantyne, D. 2008. The ShakeOut Scenario, Supplemental Study – Oil and Gas Pipelines. Prepared for U.S. Geological Survey and California Geological Survey.

Bard, J.C. 2007. LNG Development Company – LNG Receiving Terminal and Pipeline Project, Warrenton, Oregon Scope of Work: Research Design & Field Survey Methods. CH2M HILL, Inc. Prepared for the LNG Development Company, LLC and Oregon Pipeline Company, LLC. June 26, 2007.

Bard, J.C. and R.D. McClintock. 2008. Oregon LNG Terminal and Oregon Pipeline Project: Cultural Resources Survey and Evaluation Report. CH2M HILL, Inc. Prepared for LNG Development Company, LLC and Oregon Pipeline Company, LLC. October 2008.

Barlow, J. 2003. Preliminary Estimates of the Abundance of Cetaceans along the U.S. West Coast: 1991-2001. Southwest Fisheries Science Center Administrative Report LJ-003-03. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla California. 31 pp.

Barlow, J. and B.L. Taylor. 2001. Estimates of Large Whale Abundance Off California, Oregon, Washington, and Baja California Based on 1993 and 1996 Ship Surveys. Administrative Report LJ-01-03 available from National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, California. 12 pp.

Barre, L./National Oceanic and Atmospheric Administration (NOAA). 2008. Personal communication with J. Lorenz/CH2M HILL. March 20, 2008.

Bennett, A.F. 1991. Roads, Roadsides, and Wildlife Conservation: A Review. Pages 99-117 in D.A. Saunders and R.J. Hobbs (editors). Nature Conservation 2: The Role of Corridors.

Bennett, D.H., T.J. Dresser Jr., K.B. Lepla, T. Curet, and M.A. Madsen. 1993. Lower Granite Reservoir In-water Disposal Test: Results of the Fishery, Benthic, and Habitat Monitoring Program—Year 4 (1991). Completion Report to the U.S. Army Corps of Engineers, Walla Walla District. College of Fish and Wildlife, University of Idaho, Moscow.

Berge, H.B. and K. Higgins. 2003. The Current Status of Kokanee in the Greater Lake Washington Watershed. King County Department of Natural Resources and Parks, Water and Land Resources Division. Seattle, Washington. 50 pp.

Biederbeck, H./ODFW. 2008. Personal communication with R. Storey/CH2M HILL. August 18, 2008.

Bird, B.L., L.C. Branch, and D.L. Miller. 2004. Effects of Coastal Lighting on Foraging Behavior of Beach Mice. Conservation Biology 18(5): 1435-1439.

Bisson, P.A., R.E. Bilby, M.D. Bryant, C.A. Dollof, G.B. Grette, R.A. House, M.L. Murphy, K.V. Koski, and J.R. Sedell. 1987. Large Woody Debris in Forested Streams in the Pacific Northwest: Past, Present and Future. *In* Streamside Management: Forestry and Fishery Interactions. E.O. Salo and T.W. Cundy, eds. University of Washington Institute of Forest Resources Contribution No. 57. College of Forest Resources, University of Washington. Seattle, Washington. Pages 143–190.

Black, B.B., M.W. Collopy, H.F. Percival, A.A. Tiller, and P.G. Bohall. 1984. Effects of Low-level Military Training Flights on Wading Bird Colonies in Florida. U.S. Air Force Technical Report Number 7. Florida Cooperative Fisheries and Wildlife Resources Unit, Gainesville, Florida.

Blake, D., A.M. Hutson, P.A. Racey, J. Rydell, and J.R. Speakman. 1994. Use of Lamplit Roads by Foraging Bats in Southern England. Journal of Zoology 234: 453-462.

Bonneville Power Administration (BPA). 2000. Transmission System Vegetation Management Program Final Environmental Impact Statement. DOE/EIS-0285. Portland, Oregon. May 2000.

_____. 2012. I-5 Corridor Reinforcement Project Draft Environmental Impact Statement. Chapter 26, Cumulative Impacts. Available at http://www.bpa.gov/Projects/Projects/I-5/Pages/Draft-EIS.aspx

Borg, E. 1981. Physiological and Pathogenic Effects of Sound. Acta Oto-Laryngologica (Supplement) 381:7-68.

Bottom, D.L., K.K. Jones, and M.J. Herring. 1984. Fishes of the Columbia River Estuary. Columbia River Estuary Data Development Program, Astoria, Oregon.

Bottom, D.L., C.A. Simenstad, J. Burke, A.M. Baptista, D.A. Jay, K.K. Jones, E. Casillas, and M.H. Schiewe. 2005. Salmon at River's End: the Role of the Estuary in the Decline and Recovery of Columbia River Salmon. U.S. Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum. NMFS-NWFSC-68, 246 pp.

Bowles, A.E. 1995. Responses of Wildlife to Noise. Wildlife and Recreationists: Coexistence through Management and Research. R.L. Knight and K.J. Gutzwiller, eds. Island Press, Covelo, California. pp. 109–156.

Bramble, W.C., R.H. Yahner, and W.R. Byrnes. 1992. Breeding-bird Population Changes Following Rights-of-way Maintenance Treatments. Journal of Arboriculture 18(1): 23–32. January.

Brown, C. R. 1997. Purple Martin (*Progne subis*). In, No. 287 (A. Poole and F. Gill, eds.). The Birds of North America Online, Ithaca, New York The Birds of North America.

Brown, E.R., Tech. Ed. 1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington, Volumes I and II. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, Oregon.

Buchanan, B.W. 1993. Effects of Enhanced Lighting on the Behavior of Nocturnal Frogs. Animal Behavior 45: 893–99.

Buchanan, D.V., M.L Hanson, and R.M. Hooton. 1997. Status of Oregon's Bull Trout, Distribution, Life History, Limiting Factors, Management Considerations, and Status, 1997 Technical Report. Report to Bonneville Power Administration, Contract No. 1994BI34342, Project No. 199505400, 185 electronic pages (BPA Report DOE/BP-34342-5).

Bureau of Land Management and U.S. Forest Service (BLM and USFS). 2008. Biological Assessment: Fiscal Years 2008-2012 Programmatic Biological Assessment for the Initiation of Consultation on Sudden Oak Death (*Phytophthora ramorum*) Eradication Activities that May Affect Listed Species in the Chetco River Subbasin. Coos Bay District Bureau of Land Management and Rogue River – Siskiyou National Forest. February 21.

Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. National Marine Fisheries Service, Northwest Fisheries Science Center, National Oceanic and Atmospheric Administration Technical Memorandum. NMFS-NWFSC-27. August.

Calambokidis, J., J.D. Darling, V. Deecke, P. Gearin, M. Gosho, W. Megill, C. Tombach, D. Goley, C. Toropova, and B. Gisborne. 2002. Abundance, range and movements of a feeding aggregation

of gray whales (*Eschrichtius robustus*) from California to southeastern Alaska in 1998. Abstract J. CETACEAN RES. MANAGE. 4(3):267–276, 2002

California Department of Fish and Game, 2001. True Smelts. California's Living Marine Resources: A Status Report. December 2001.

California Department of Transportation (Caltrans). 2009. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Prepared by ICF Jones and Stokes. February.

Cameron, J. 2008. Pacific States/British Columbia Oil Spill Task Force. 2008 Annual Report.

Carlson, T.J. and G.E. Johnson. 2010. Columbia River Channel Improvement Project Rock Removal Blasting: Monitoring Plan - Final Plan. Prepared for the U.S. Army Corps of Engineers, Portland District, under an Interagency Agreement with the U.S. Department of Energy Contract DE-AC05-76RL01830.

Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M.S. Lowry. 2005. U.S. Pacific Marine Mammal Stock Assessments: 2004. U.S. Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NMFS-SWFSC-375.

Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M.S. Lowry. 2007. U.S. Pacific Marine Mammal Stock Assessments: 2006. U.S. Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NOAA-TM-NMFS-SWFSC-398. January 2007.

Carretta, J.V., Karin A. Forny, Mark S. Lowry, Jay Barlow, Jason Baker, Dave Johnston, Brad Hanson, Marcia M. Muto, DeaNNA Lynch, and Lilian Carswell. 2008. U.S. Pacific Marine Mammal Stock Assessment: 2008. NOAA-TM-NMFS-SWFSC-434 prepared for U.S. Department of Commerce.

Carretta, J.V., Oleson, E., Weller, D.W., Lang, A.R., K.A. Forney, Martien, K., M.M. Muto, J. Barlow, J. Baker, B. Hanson, Lynch, D., Carswell, L., Brownwell, J., Mattila, D.K., Hill, M.C., and M.S. Lowry. 2013. U.S. Pacific Marine Mammal Stock Assessments: 2012. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NOAA-TM-NMFS-SWFSC-504. January.

Carter, J.A., G.A. McMichael, I.D. Welch, R.A. Harnish, and B.J. Bellgraph. 2009. Seasonal Juvenile Salmonid Presence and Migratory Behavior in the Lower Columbia River. PNNL-18246, Pacific Northwest National Laboratory, Richland, Washington.

Castro, J.M., A. Macdonald, E. Lynch, and C.R. Thorne. 2014. Risk-based approach to designing and reviewing pipeline stream crossings to minimize impacts to aquatic habitats and species. River Research and Applications 2014. DOI: 10.1002/rra.2770.

Center for Biological Diversity. 1998. Petition to list the yellow-billed cuckoo (*Coccyzus americanus)* as a Federally Endangered Species. Available online at http://www.biologicaldiversity.org/species/birds/yellow-billed_cuckoo/pdfs/petition.pdf. Accessed November 1, 2013.

Center for Plant Conservation. 2013. National Collection of Imperiled Plants. http://www.centerforplantconservation.org/. Accessed October 14, 2013.

CH2M HILL, Inc. 2005. Wildlife Inventory. Prepared for LNG Development Company, LLC and Oregon Pipeline Company, LLC. July 10, 2005.

_____. 2007. Skipanon Peninsula Wildlife Survey, May 31 and June 1, 2007. Technical Memorandum. Prepared for LNG Development Company, LLC and Oregon Pipeline Company, LLC. June 13, 2007.

_____. 2008. Screening Level Thermal Plume Evaluation of LNG Vessels Cooling Water System Discharges to the Columbia River. Prepared for Oregon LNG. September 10, 2008

_____. 2009. Underwater Noise Propagation, Monitoring, and Mitigation.

_____. 2013a. Geotechnical Investigation Report for the Oregon LNG Bidirectional Project. Appendix J.1 to Resource Report 13. Prepared for LNG Development Company, LLC. May.

_____. 2013b. Dredge Material Management Plan, Oregon LNG Terminal (Draft). Appendix 2.1 to Oregon LNG's Resource Report 2.

_____. 2013c. Site-Specific Seismic Hazard Evaluation for the Oregon LNG Bidirectional Terminal. Appendix I.1 to Resource Report 13. Prepared for LNG Development Company, LLC. May.

_____. 2013d. Wetland Delineation Report for the Oregon LNG Bidirectional Project. Cowlitz County, Washington. Prepared for LNG Development Company, LLC (d/b/a Oregon LNG) and Oregon Pipeline Company, LLC. June 2013.

_____. 2013e. Applicant-prepared Biological Assessment. Prepared for LNG Development Company, LLC (d/b/a Oregon LNG) and Oregon Pipeline Company, LLC.

_____. 2013f. Traffic Impact Study, Oregon LNG Bidirectional Project, Warrenton, Oregon (TIS). Available in Appendix 5D of this Resource Report.

_____. 2014. Technical Memorandum: Channel Response Matrix for Pipeline Crossings of Perennial and Endangered Species Act Streams (Appendix 2G to Resource Report 2 for the Washington Expansion Project).

Chevron and Apache. 2015a. Kitimat LNG Community New. Issue No. 4, winter 2015. Available at http://www.chevron.ca/docs/default-source/publications/Kitimat/klng-chevron-winter-newsletter.pdf?sfvrsn=0.

_____. 2015b. Kitimat LNG Fact Sheet No. 1, v. 1.0, available at http://www.chevron.ca/docs/default-source/publications/Kitimat/kitimat-project-overview.pdf?sfvrsn=0

City of Warrenton. 2011. City of Warrenton Comprehensive Plan. January 25, 2011.

_____. 2013. City of Warrenton Development Code, Ordinance No. 1058-A. February 2013.

Clatsop County. 2005. Clatsop County Demographics and General Overview.

_____. 2012. Clatsop County Comprehensive Plan Goals and Policies. June 23, 2012.

_____. 2013a. Clatsop County Land and Water Development and Use Ordinance, Ordinance 80-14. March 29.

_____. 2013b. *Public Safety Contacts*. Available online at: http://www.co.clatsop.or.us. Accessed on March 28, 2013

Close, D.A., M. Fitzpatrick, H. Li, B. Parker, D. Hatch, and G. James. 1995. Status report of the Pacific lamprey (*Lampetra tridentate*) in the Columbia River Basin. Report (Contract 95BI39067) to Bonneville Power Administration, Portland, Oregon.

Coast and Harbor Engineering. 2009. LNG Development Company/Oregon LNG Project Part 1 – Turning Basin Hydrodynamic Modeling Study. Appendix O to Resource Report 2 for Oregon LNG Project.

_____. 2013. Technical Memorandum: Oregon LNG Tsunami Hydrodynamic Modeling. Attachment 1 to Appendix I.2 of Resource Report 13

Columbia Basin Bulletin. 2011. A Record-Breaking Oddity: Why Are Pink Salmon (Humpies) Heading Up the Columbia River? Friday, September 16, 2011. http://www.cbbulletin.com/412455.aspx , Accessed October 15, 2014.

Columbia County Economic Team. 2013. Facts & Stats. Available online at: http://www.columbiacountyoregon.com/facts-stats/. Accessed on March 26, 2013

Columbia River Bar Pilots. 2012. Personal communication between Captain Johnson and Oregon LNG. July 27, 2012.

Columbia River Estuary Study Taskforce (CREST). 2002. Columbia River Estuary Dredged Material Management Plan.

Comer, R.D. 1982. Understanding secondary effects of development on wildlife resources in mitigation planning. Pages 16-31 in Issues and Technology in the Management of Impacted Western Wildlife. Thorne Ecological Institute Technical Publication No. 14. Boulder, Colorado.

Comyns, B. 2003. Conversation between B. Comyns (University of Southern Mississippi) and V. Whalon (e2M) regarding natural mortality of ichthyoplankton. May 21. *As cited in* CH2MHill, 2013.

Council on Environmental Quality (CEQ). 1997. Considering Cumulative Effects under the Environmental Policy Act. January 1997.

_____. 2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. Memorandum from J.L. Connaughton, Chairman, Executive Office of the President –Council on Environmental Quality. June 24, 2005.

Cowlitz County. 2014. Cowlitz County Noxious Weed Program. http://www.co.cowlitz.wa.us/index.aspx?nid=1349.

Csuti, B., J.A. Kimerling, T.A. O'Neil, M.M. Shaughnessy, E.P. Gaines, and M.P. Huso. 2001. Atlas of Oregon Wildlife: Distribution, Habitat and Natural History. Oregon State University Press, Corvallis, Oregon.

Davidson, I., M. Sytsma, and G. Ruiz. 2006. Preliminary Investigations of Biofouling of Ships' Hulls: Non-Indigenous Species Investigations in the Columbia River. Coast Guard Research and Development Center, Groton, Connecticut.

Dawley, E.M., R.D. Ledgerwood, C.W. Sims, J.T. Durkin, R.A. Kirn, A.E. Rankis, G.E. Monan, and F.J. Ossiander. 1986. Migrational Characteristics, Biological Observations, and Relative Survival of Juvenile Salmonids Entering the Columbia River Estuary, 1966–1983. Coastal Zone and Estuarine Studies Division Northwest and Alaska Fisheries Center. National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Department of Geology and Mineral Industries (DOGAMI). 1984. Mineral Resources Map of Oregon. Publication Geological Map Series 36. Map Scale: 1:500,000. Prepared by M.L. Ferns and D.F. Huber

_____. 1985. Oil and Gas Investigation of the Astoria Basin, Clatsop and Northernmost Tillamook Counties, Northwest Oregon. Oregon Department of Geology and Mineral Industries, Oil and Gas Investigations 14. Map Scale 1:100,000. Prepared by A.R. Niem and W.A. Niem.

_____. 1999. Relative Earthquake Hazard Maps for Selected Urban Areas in Oregon: Astoria-Warrenton, Brookings, Coquille, Florence-Dunes City, Lincoln City, Newport, Reedsport-Winchester Bay, Seaside-Gearhart-Cannon Beach, Tillamook. Interpretive Map Series 10 (IMS-10). Prepared by I.P. Madin and Z. Wang. Map Scale 1:24,000.

_____. 2013a. Oil and Gas Permits Spreadsheet, June 25, 2013, Mineral Land Regulation & Reclamation Program. http://www.oregongeology.org/mlrr/oilgas-report.htm

_____. 2013b. Tsunami Inundation Maps for Warrenton North, Clatsop County, Oregon TIM-Clat-02. 2 plates. Scale 1:10,000; for Warrenton South - Rilea, Clatsop County, Oregon TIM-Clat-03. 2 plates. Scale 1:10,000.

Det Norske Veritas and ERM-West, Inc. 2010. Aleutian Islands Risk Assessment Phase A—Preliminary Risk Assessment. Task 1: Semi-quantitative Traffic Study Report. Prepared for National Fish and Wildlife Foundation, United States Coast Guard, Alaska Department of Environmental Conservation. Report No./DNV Reference No. EP007543. September 2010

Dohaniuk, S. 2012. City of Astoria, Administrative Assistant to Finance Director. CH2M Hill personal communication via telephone. March 2, 2012

Dolorey, A. 1992. Conservation of Rare and Threatened Species in Linear Reserves. Victorian Naturalists. 109(4): 121–125.

Domina, D.J. 1997. Evaluation of the Downstream Migrant Bypass System, T.W. Sullivan Plant, Willamette Falls, Oregon. Portland General Electric Progress Report for 1996.

_____. 1 998. Evaluation of the Downstream Migrant Bypass System, T.W. Sullivan Plant, Willamette Falls, Oregon. Portland General Electric Progress Report for 1997.

Dumbauld, B.R., D.L. Holden, and O.P. Langness. 2008. Do Sturgeon Limit Burrowing Shrimp Populations in Pacific Northwest Estuaries? Environmental Biology of Fishes. DOI 10.1007/s 10641-008-9333-y.

Durkin, J.T., and R.L. Emmett. 1980. Benthic Invertebrates, Water Quality, and Substrate Texture in Baker Bay, Youngs Bay, and Adjacent Areas of the Columbia River Estuary. Final report of research financed by U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries. March 1980.

E&S Environmental Chemistry, Inc. and Skipanon River Watershed Council. 2000. Skipanon River Watershed Assessment. August, 2000.

E&S Environmental Chemistry, Inc. and Youngs Bay Watershed Council, 2000. Youngs Bay Watershed Assessment. August 2000

eBird. 2014. eBird: an online database of bird distribution and abundance [web application]. Cornell Lab of Ornithology, Ithaca, New York. http://www.ebird.org. (Accessed: December 12, 2014).

Ecology and Environment, Inc. 2010. Astoria Marine Construction Company, Site Inspection Report, Astoria Marine Construction Company, Astoria, Oregon. June 2010.

ECONorthwest. 2006. Forecast of the Net Economic Benefits of a Proposed LNG Terminal in Coos County, Oregon, An economic impact Analysis. Prepared for the South Coast Development Council. October. Available online at http://www.scdcinc.org/t.

_____. 2008. Natural Gas Pipelines and Residential Property Values: Evidence from Clackamas and Washington Counties. February 20, 2008.

_____. 2012. An Economic Impact Analysis of the Oregon LNG Project in Northwest Oregon.

_____. 2013. Pipeline Impact on Property Taxes. May 3, 2013.

Ehrlich, P.R., D.S. Dobkins, and D. Wheye. 1988. The Birder's Handbook. Simon and Schuster, Fireside Books. New York.

Ellis Ecological Services, Inc. 2009. Oregon LNG: Analysis of ESA-Listed Salmonid Entrainment at Ballast and Cooling Water Intakes. Prepared for Oregon LNG.

Entrix. 2008. Spatial Analysis of Beach Susceptibility for Stranding of Juvenile Salmonids by Ship Wakes. Unpublished report prepared for the Port of Vancouver by Entrix, Inc. Olympia, WA. Project No. 4154501. *Cited in*: Pearson, W.H. 2008. Estimation of Probability of Stranding and Number of Stranding Events for Juvenile Salmon from LNG Carrier and Base Ship Traffic along the Lower Columbia River, RM21 to RM39.

Environmental Protection Agency (EPA). 1971. Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. (NTID300.1), Washington, DC: Environmental Reports for Natural Gas Act Applications, 18 CFR Part 380.12(k)(2), Resource Report 9—Air and Noise Quality (FERC Noise Requirements).

_____. 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. EPA‑550/9‑74-004. March 1974.

_____. 1996. 40 CFR 68 Final Rule: Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7), 61 Federal Register 31667-31732, Vol. 61, No. 120, Thursday, June 20, 1996

_____. 1999. Consideration of Cumulative Impacts in EPA Review of NEPA Documents. Memorandum from U.S. EPA, Office of Federal Activities (2252A), EPA 315-R-99-002/May 1999.

_____. 2010. EPA Region 10: The Pacific Northwest Sole Source Aquifer Program. http://yosemite.epa.gov/r10/water.nsf/sole+source+aquifers/ssa.

_____. 2011. Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 National Ambient Air Quality Standard. T. Fox. EPA Air Quality Modeling Group. March 1, 2011.

_____. 2012a. National Priorities List. http://www.epa.gov/superfund/sites/npl/where.htm.

_____. 2012b. Superfund Sites. Available at: http://www.epa.gov/superfund/sites/. Accessed March 2012.

_____. 2013a. Enviromapper. http://www.epa.gov/enviro/geo_data.html. November 18, 2013. Accessed June 5, 2014.

_____. 2013b. Sources of Acute Dose Response Information, http://www.epa.gov/ttn/atw/toxsource/acutesources.html, December 3, 2013.

_____. 2013c. Acute Exposure Guideline Levels, http://www.epa.gov/oppt/aegl/pubs/chemlist.htm, December 3, 2013.

_____. 2014. Superfund Sites. Available online: http://www.epa.gov/superfund/sites/. Information accessed in July 2014.

Environmental Protection Agency (EPA) and U.S. Army Corps of Engineers (USACE). 2011. 2011 Annual Use Plan, Management of Open Water Dredged Material Disposal Sites, Mouth of the Columbia River, OR and WA. U.S. Army Corps of Engineers, Portland District, Portland OR and U.S. Environmental Protection Agency, Region 10, Seattle WA. April

Environmental Protection Agency (EPA), Department of the Army Department of Agriculture, Department of Commerce, Department of the Interior, Department of Transportation, Department of Energy, Advisory Council on Historic Preservation, Federal Energy Regulatory Commission, and the Council on Environmental Quality. 2002. Interagency Agreement on Early Coordination of Required Environmental and Historic Preservation Reviews Conducted in Conjunction with the Issuance of Authorizations to Construct and Operate Interstate Natural Gas Pipelines Certified by the Federal Energy Regulatory Commission. May 2002.

Erickson, D.L. and J.E. Hightower. 2007. Oceanic distribution and behavior of green sturgeon (*Acipenser medirostris*). In Munro, J., J.E. Hightower, K. McKown, K.J. Sulak, A.W. Kahnle and F. Caron, editors. Anadromous sturgeons: habitats, threats, and management. American Fisheries Society Symposium 56: 197–211.

Evans, A. and L.J. Ogden. 1996. Collision Course: The Hazards of Lighted Structures and Windows on Migrating Birds. Report published by World Wildlife Fund Canada and the Fatal Light Awareness Program. Toronto, Ontario, Canada.

Evans, W.R. and K.V. Rosenberg. 1999. Acoustic Monitoring of Night-migrating Birds: A Progress Report.

Evans Mack, D., W.P. Ritchie, S.K. Nelson, E. Kuo-Harrison, P. Harrison, and T.E. Hamer. 2003. Methods for Surveying Marbled Murrelets in Forests: A Revised Protocol for Land Management and Research.

Eyring, V., J.J. Corbett, D.S. Lee, and J.J. Winebrake. 2007. *Brief Summary of the Impact of Ship Emissions on Atmospheric Composition, Climate, and Human Health.* November 2007.

Farm Service Agency (FSA). 2013a. Conservation Programs. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp. Accessed April 8, 2013.

_____. 2013b. CH2M Hill Personal Communication, D. Schettler. April 2, 2013.

Federal Aviation Administration (FAA). 2011. Determination of No Hazard to Air Navigation. Aeronautical Study Nos. 2008-ANM-2262-OE, 2008-ANM-2264,-OE, and 2008-ANM-2264-OE.

Federal Emergency Management Agency (FEMA). 1981-2004. Digital Flood Rate Insurance Maps.

_____. 1996. Q3 Flood Data, Cowlitz County, Washington.

_____. 2009. Digital Flood Rate Insurance Maps for Clatsop County, Oregon; Columbia County, Oregon; and Tillamook County, Oregon.

_____. 2010. National Flood Insurance Program, Clatsop County Oregon and Incorporated Areas, Flood Insurance Rate Maps 41007C0216E and 41007C0217E.

_____. 2012. HAZUS-MH 2.1. February 2012.

Federal Energy Regulatory Commission (FERC). 2006. Appendix C: FERC Draft Guidance for LNG Terminal Operator's Emergency Response Plan. 9/21/2006 Draft.

_____. 2007. Bradwood Landing Project Draft Environmental Impact Statement. FERC/EIS-0214D. August 17, 2007. P. 4-5. http://www.ferc.gov/industries/gas/enviro/eis/2007/08-17-07-eis.asp.

_____. 2008. Bradwood Landing Project Final Environmental Impact Statement. FERC/EIS-0214F.

_____. 2013a. Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

_____. 2013b. Wetland and Waterbody Construction and Mitigation Procedures (Procedures).

Federal Energy Regulatory Commission (FERC) and Fish and Wildlife Service (FWS). 2011. Memorandum of Understanding between the Federal Energy Regulatory Commission and the U.S. Department of the Interior United States Fish and Wildlife Service Regarding Implementation of Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds.

Federal Highway Administration (FHWA). Visual Impact Assessment for Highway Projects. Publication No. FHWA-HI-88-054. 1989. Office of Environmental Policy, Washington, D.C.

Federal Land Managers' Air Quality Related Values Work Group (FLAG). 2010. Phase I Report – Revised. Natural Resource Report NPS/NRPC/NRR–2010/232. October 2010.

Fish Passage Center. 2008 Online data query for Bull Trout from 03/01/1998 to 12/31/2015 accessed at http://www.fpc.org/bulltrout/bulltrout_queries/smp_bulltrout_results.asp

_____. 2013. Bull Trout — *Salvelinus confluentus*. http://www.fpc.org/bulltrout/bulltrout_home.html.

Forman R.T., and L.E. Alexander. 1998. Roads and Their Major Ecological Effects. Annual Review of Ecology and Systematics 29:207-231.

Fox, D.S., S. Bell, W. Nehlsen, and J. Damron. 1984. The Columbia River Estuary: Atlas of Physical and Biological Characteristics. Columbia River Estuary Data Development Program, Astoria, Oregon.

Frank, K. 1988. Impact of Outdoor Lighting on Moths: An Assessment. Journal of the Lepidopterists' Society. 42(2):63-93.

Franklin, J.F. and C.T. Dyrness. 1988. Natural Vegetation of Oregon and Washington. Oregon State University Press. Corvallis, Oregon.

Fresh, K.L., E. Casillas, L. Johnson, and D.L. Bottom. 2003. Role of the Estuary in the Recovery of Columbia River Basin Salmon and Steelhead: An Evaluation of Limiting Factors. National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum. Northwest Fisheries Science Center.

Fresh, K.L., E. Casillas, L.L. Johnson, and D.L. Bottom. 2005. Role of the Estuary in the Recovery of Columbia River Basin Salmon and Steelhead: an Evaluation of the Effects of Selected Factors on Salmonid Population Viability. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-NWFSC-69, 105 p.

Gaines, D. and S. A. Laymon. 1984. Decline, Status and Preservation of the Yellow-billed Cuckoo in California. *Western Birds* 15:49-80.

Gartman, D.K. 1984. The Impact of a Pipeline Crossing on the Benthos of a Pennsylvania Trout Stream. Proceedings of the Third International Symposium on Environmental Concerns in Rights-of-way Management. Mississippi State University, Mississippi.

Gas Transmission Northwest LLC (GTN). 2014. Company website accessed 11/23/2014 at http://www.gastransmissionnw.com/.

Gauthreaux, S.A., Jr., and C.G. Belser. 2006. Effects of artificial night lighting on migratory birds. In: Rich, C. and Longcore, T. (Eds.) Ecological Consequences of Artificial Night Lighting. Pp. 67-93. Island Press, Washington.

Geomatrix Consultants. 1995. Seismic Design Mapping, State of Oregon, Final Report. Prepared for Oregon Department of Transportation.

Georgia-Pacific. 2013. Company Overview. Available online at http://gp.com/facilitydirectory/index.html. Accessed on May 26, 2013.

Gilligan, J., M. Smith, D. Rodgers, and A. Contreras (eds.). 1994. Birds of Oregon: Status and Distribution. Cinculus Publications, McMinnville, Oregon.

Goldfinger, C., C.H. Nelson, and J.E. Johnson. 2003. Holocene Earthquake Records from the Cascadia Subduction Zone and Northern San Andreas Fault Based on Precise Dating of Offshore Turbidities. Annual Review of Earth and Planetary Sciences. 31:555-577.

Goldfinger, C., C.H. Nelson, A.E. Morey, J.E. Johnson, J.R. Patton, E. Karabanov, J. Gutiérrez-Pastor, A.T. Eriksson, E. Gràcia, G. Dunhill, R.J. Enkin, A. Dallimore, and T. Vallier. 2012. Turbidite event history—Methods and implications for Holocene paleoseismicity of the Cascadia subduction zone: U.S. Geological Survey Professional Paper 1661–F, 170 p. (Available at http://pubs.usgs.gov/pp/pp1661f/).

Good, T.P., R.S. Waples, and P. Adams (eds). 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum. NMFS-NWFSC-66.

Green, G.A., J.J. Brueggeman, R.A. Grotefendt, C.E. Bowlby, J.L. Bonnell, and K.C. Balcomb, III. 1992. Cetacean Distribution and Abundance off Oregon and Washington, 1989-1990. Oregon and Washington Marine Mammal and Seabird Surveys. J.J. Brueggeman, ed. Minerals Management Service Contract Report 14-12-0001-30426.

Greig, S.M., D.A. Sear, and P.A. Carling. 2005. The impact of fine sediment accumulation on the survival of incubating salmon progeny: Implications for sediment management. Science of the Total Enviroment 344 (2006) 241-258. Available online at www.sciencedirect.com.

Grosboll, D.N. 2005. *Euphydryas editha taylori.* Completed as Part of an Individual Learning Contract for the Master's in Environmental Sciences Program. The Evergreen State College. http://academic.evergreen.edu/projects/ants/TESCBiota/kingdom/animalia/phylum/arthropoda/class/insecta/order/lepidoptera/family/nymphalidae/genera/euphydryas/species/taylori/taylori.html. Accessed on February 10, 2009.

Gulf Interstate Engineering. 1999. Temporary Right-of-Way Width Requirements for Pipeline Construction. Prepared for the INGAA Foundation Inc., Washington, D.C.

Gustafson, R.G., T.C. Wainwright, G.A. Winans, F.W. Waknitz, L.T. Parker, and R.S. Waples. 1997. *Status Review of Sockeye Salmon from Washington and Oregon*. United States Department of Commerce, National Oceanic and Atmospheric Administration. Technical Memorandum NMFS-NWFSC-33.

Hansen, O.R. and D.M. Johnson. (2014). Improved far-field blast predictions from fast deflagrations, DDTs and detonations of vapor clouds using FLACS CFD. J. Loss Prev. Proc. Ind., doi:10.1016/j.jlp.2014.11.005

Hanson, J., M. Helvey, and R. Strach, Eds. 2003. Non-fishing Impacts to Essential Fish Habitat and Recommended Conservation Measures. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, version 1. Southwest Region, Long Beach, California.

Hardyniec, S. and S. Skeen. 2005. Pile Driving and Barotraumas Effects. Transportation Resource Record 1941:184-190.

Harris, L.D. 1984. The Fragmented Forest, Island Biogeographic Theory and the Preservation of Biotic Diversity. University of Chicago Press, Chicago and London.

Hastings, M.C. and A.N. Popper. 2009. The effects of anthropogenic source of sound on fishes. Journal of Fish Biology. 75, 455-489.

Hay, K.G. 1994. Greenways: Wildlife and Natural Gas Pipeline Corridors. The Conservation Fund, Arlington, Virginia.

Hayes, D.F. 1986. Guide to Selecting a Dredge for Minimizing Resuspension of Sediments. Army Engineer Waterways Experiment Station, Environmental Lab, Vicksburg, Mississippi. Environmental Effects of Dredging Technical Notes, EEDP-09-1.

Hayes, M.P. 1994. The spotted frog (*Rana pretiosa*) in western Oregon. Part I. Background. Part II. Current status. Oregon Department of Fish and Wildlife Technical Report 94–1–01. Unpublished Report.

Highland, L.M. and P. Bobrowsky. 2008. The landslide handbook—A guide to understanding landslides: Reston, Virginia, U.S. Geological Survey Circular 1325, p. 4.

Hinton, S.A. and R.L. Emmett. 1994. Juvenile Salmonid Stranding in the Lower Columbia River, 1992 and 1993. Prepared by the National Marine Fisheries Service, Northwest Fisheries Center, Coastal Zone and Estuaries Studies Division, Seattle, Washington. Technical Memorandum NMFS-NWFSC-20. 48 pp.

Howell, M.D., M.D. Romano, and T.A. Rein. 2002. Migration Timing and Distribution of Larval Eulachon in the Lower Columbia River, Spring 2001. Report B In: Eulachon Studies Related to Lower Columbia River Channel Deepening Operations. Final Report to US Army Corps of Engineers Contract No. W66QKZ13237198.

Huff, M.H., M.G. Raphael, S.L. Miller, S.K. Nelson, and J. Baldwin. 2006. Chapter 6 – What we have learned. Pp. 147-149. In Northwest Forest Plan—The first 10 years (1994-2003): status and trends of populations and nesting habitat for the marbled murrelet. Gen. Tech. Rep. PNW-GTR-650. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 149 p.

Hughes, J.M. 1999. Yellow-billed Cuckoo (*Coccyzus americanus*). In The Birds of North America Online. Edited by A. Poole. Ithaca, NY: Cornell Lab of Ornithology. Birds of North America Online. Available online http://bna.birds.cornell.edu/bna/species/418. Accessed November 1, 2013.

Intergovernmental Panel on Climate Change (IPCC). 2007. Climate Change 2007: Synthesis Report. November 12-17, 2007.

Interstate Natural Gas Association of America Foundation (INGAA). 2004. INGAA Foundation Natural Gas Pipeline Impact Study.

_____. 2005. Greenhouse Gas Emission Estimation Guidelines for Natural Gas Transmission and Storage – Volume I GHG Emission Estimation Methodologies and Procedures. Revision 2, September 28, 2005.

Isaacs, F.B., and R.G. Anthony. 2011 Bald Eagles (Haliaeetus leucocephalus) Nesting in Oregon and Along the Lower Columbia River, 1978 - 2007. Oregon Cooperative Fish and Wildlife Research Unit, Oregon State University, Corvallis, Oregon.

James, B. 2004. Cumulative Monthly Gillnet Harvest of White and Green Sturgeon in the Lower Columbia River, 1981-2004. Washington State Department of Fish and Wildlife.

Jeffries, S.J., P.J. Gearin, H.R. Huber, D.L. Saul, and D.A. Pruett. 2000. Atlas of Seal and Sea Lion Haulout Sites in Washington. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, Washington. http://wdfw.wa.gov/publications/00427/.

Johnson, D.H. and T.A. O'Neil. 2001. Wildlife-Habitat Relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Johnson, O.W., T.A. Flagg, D.J. Maynard, G.B. Milner, and F.W. Waknitz. 1991. Status Review for Lower Columbia River Coho Salmon. NOAA-NMFS-NWC-202.

Johnson, O.W., W.S. Grant, R.G. Kope, K. Neely, F.W. Waknitz, and R.S. Waples. 1997. Status Review of Chum Salmon from Washington, Oregon, and California. NOAA-NMFS-NWFSC TM-32.

Jones, K.K. and D. Bottom. 1984. Zooplankton and Larval Fishes of the Columbia River Estuary. Columbia River Estuary Data Development Program, Astoria, Oregon. Joslin, G. and H. Youmans, Coords. 1999. Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.

Judd, C., C. Roegner, R. Thom, J. Vavrinec, A. Borde, Z. Yang, D. Woodruff and J. Zhang. 2009. Eelgrass Enhancement and Restoration in the Lower Columbia River Estuary. Pacific Northwest National Laboratory, prepared for the U.S. Department of Energy under Contract DE-AC05-76RL01830

Kelly, J.T., A.P. Klimley, and C.E. Crocker. 2007. Movements of Green Sturgeon, Acipenser medirostris, in the San Francisco Bay Estuary, California. Environmental Biology of Fishes 79:281-295.

Kerr, S.J. 1995. Silt, turbidity and suspended sediments in the aquatic environment: an annotated bibliography and literature review. Ontario Ministry of Natural Resources, Southern Region Science & Technology Transfer Unit Technical Report TR-008. 277 pp

King County. 2004. Log Cabin Reach Natural Area Site Management Guidelines. October 2004. http://your.kingcounty.gov/dnrp/library/2004/kcr1814.pdf. Accessed October 19, 2014.

_____. 2006. Coal Mine Hazards. King County Geographic Information System Center GIS data dated August 3, 2006. http://www5.kingcounty.gov/gisdataportal/Default.aspx. Last accessed November 5, 2012.

Knight, R.L. and S.A. Temple. 1995. Origin of Wildlife Responses to Recreationists. Wildlife and Recreationists Coexistence through Management and Research. R.L. Knight and K.J. Gutzwiller, eds. Island Press, Inc., Washington, DC. pp. 81–91.

Knight, R.L., D.E. Andersen, M.J. Bechard, and N.V. Marr. 1987. Geographic Variation in Nest-defense Behavior in Red-tailed Hawk (*Buteo jamaicensis*). Ibis 131:22-26.

Knudsen, F.R., C.B. Schreck, S.M. Knapp, P.S. Enger, and O. Sand. 1997. Infrasound Produces Flight and Avoidance Responses in Pacific Juvenile Salmonids. Journal of Fish Biology 51:824-829.

Knutson, K.L. and V.L. Naef. 1997. Management Recommendations for Washington's Priority Habitats. Washington Department of Fish and Wildlife (WDFW), Olympia, Washington.

Kostow, K. 1995. Biennial Report on the Status of Wild Fish in Oregon. Oregon Department of Fish and Wildlife, Portland, Oregon.

Krausman, P.R., B.D. Leopold, and D.L. Scarborough. 1986. Desert Mule Deer Responses to Aircraft. Wildlife Society Bulletin 14:68–70.

Lane, R. and B. Lane. 1999. Treaty Rights Workshop: Chehalis River Treaty Council and the Treaty of Olympia. Institute for the Development of Indian Law. Fourth World Documentation Project, Center for World Indigenous Studies, Olympia, Washington, www. cwis.org.

Lara-Lara, J.R., B.E. Frey, and L.F. Small. 1990a. Primary Production in the Columbia River Estuary: Grazing Losses, Transport, and a Phytoplankton Carbon Budget. Pacific Science 44:38–50.

_____. 1990b. Primary Production in the Columbia River Estuary: Spatial and Temporal Variability of Properties. Pacific Science 44:17–37.

Larsen, E.M. (ed). 1997. Management Recommendations for Washington's Priority Species, Volume III: Amphibians and Reptiles. Washington Department of Fish and Wildlife, Olympia, Washington. 122 pp.

Larson, K. and C. Moehl. 1990. Fish Entrainment by Dredges in Grays Harbor, Washington. Effects of Dredging on Anadromous Pacific Coast Fishes. C.A. Simenstad, ed. Washington Sea Grant Program, University of Washington, Seattle. pp. 102–12.

Laymon, S.A. and M.D. Halterman. 1989. A proposed habitat management plan for Yellow-billed Cuckoos in California. U.S.D.A. Forest Service GTR PSW-110. Available online http://www.treesearch.fs.fed.us/pubs/27981 Accessed November 1, 2013.

Leedy, D.L. 1975. Highway-Wildlife Relationships. Volume 1: A State-of-the-Art Report.

Lewis, A.F.J., M.D. McGurk, and M.G. Galesloot. 2002. Alcan's Kemano River Eulachon (*Thaleichthys pacificus*) Monitoring Program 1988-1998. Consultant's report prepared by Ecofish Research Ltd. for Alcan Primary Metal Ltd., Kitimat, B.C.

Lewis, M., E. Brown, B. Sounhein, and M. Weeber. 2012. Status of Oregon Stocks of Coho Salmon, 2011. Monitoring Program Report Number OPSW-ODFW-2012-3, Oregon Department of Fish and Wildlife, Salem, Oregon.

Lewis County Geographic Information Services. 2012. Unpublished Lewis County Mining Data. Data obtained from Lewis County Washington Geographic Information Services by CH2M HILL on October 8, 2012.

Lima, S.L. and L.M. Dill. 1990. Behavioral Decisions Made Under the Risk of Predation: A Review and Prospectus. Canadian Journal of Zoology 68(4): 619-640.

Lindley, S.T., D.L. Erickson, M.L. Moser, G. Williams, O.P. Langness, B.W. McCovey, M. Belchik, D. Vogel, W. Phinnix, J.T. Kelly, J.C. Heublein and A.P. Klimley. 2011. Electronic tagging of green sturgeon reveals population structure and movement among estuaries. Transactions of the American Fisheries Society. Vol. 140: 108-122.

Longcore, T. and C. Rich. 2004. Ecological Light Pollution. Frontiers in Ecology 2(4): 191-198.

Lower Columbia River Estuary Partnership (LCREP). 2011. Lower Columbia River Estuary Plan. Comprehensive Conservation and Management Plan, Update. December.

Lusseau, D., D.E. Bain, R. Williams, and J.C. Smith. 2009. Vessel Traffic Disrupts the Foraging Behavior of Southern Resident Killer Whales (*Orcinus orca)*. Endangered Species Research. Vol. 6: 211–221.

Marko, L.M. 2008. Ichthyoplankton of the Lower Columbia River Estuary in Relation to Environmental Variables. Master's Thesis. Washington State University Vancouver. School of Earth and Environmental Science.

Marsh, R.E. and R.W. Steele. 1992. Pocket gophers. In: Silvicultural approaches to animal damage management in Pacific Northwest forests. pp. 205-230. (H. C. Black, editor). Gen. Tech. Rep. PNWGTR-287. USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon. 422 pp.

Marshall, D.B. 1988. Status of the Marbled Murrelet in North America with Special Emphasis on Populations in Washington, Oregon and California. Audubon Society of Portland, Portland OR.

Matthews, G.M. and R.S. Waples. 1991. Status Review for Snake River Spring and Summer Chinook Salmon. United States Department of Commerce. National Oceanic and Atmospheric Administration (NOAA) Tech. Memo. NMFS-F/NW-200.

McCabe, G.T., Jr., R.L. Emmett, T.C. Coley, and R.J. McConnell. 1988. Distribution Density and Size-Class Structure of Dungeness Crabs in the River-Dominated Columbia River Estuary Washington, Oregon, USA. Northwest Science 62(5).

McCabe, G.T. Jr., S.A. Hinton, and R.L. Emmett. 1998. Benthic Invertebrates and Sediment Characteristics in a Shallow Navigation Channel of the Lower Columbia River, Before and After Dredging. Northwest Science 72(2):116–126.

McCaffery, K.R., J.E. Ashbrenner, and J.C. Moulton. 1981. Forest Opening Construction and Impacts in Northern Wisconsin. Wisconsin Department of Natural Resources Technical Bulletin No. 120. Madison, Wisconsin. 41 pp.

McCauley, R.D., J. Fewtrell, A.J. Duncan, C. Jenner, M-N Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe. 2000. Marine seismic surveys: A study of environmental implications. Appea Journal 692-706.

McClintock, R.D., A. Fergusson, and J. Wilt. 2013. Northwest Pipeline GP Washington Expansion Project Cultural Resources Overview and Survey Report. CH2M HILL, Inc. June.

McClintock, R.D. and J. Wilt. 2014. Northwest Pipeline LLC Washington Expansion Project Revised Addendum to Cultural Resources Overview and Survey Report—Survey of Highway 410 Reroute and Temporary Extra Workspace Areas and Easements. CH2M HILL, Inc. September.

Mesa, M.G., J.M. Bayer, and J.G. Seelye. 2003. Swimming Performance and Physiological Responses to Exhaustive Exercise in Radio-tagged and Untagged Pacific Lampreys. Transactions of the American Fisheries Society 132:483-492.

Midvalley Birding. 2009. Willamette Valley Birders Discussion List, Yellow-billed Cuckoo No. July 23. Available online http://www.midvalleybirding.org/pipermail/birding/2009-July/003087.html. Accessed November 1, 2013.

Mincemoyer, S. 2005. Range-wide status assessment of *Howellia aquatilis* (water howellia). Prepared for USFWS. Montana Natural Heritage Program, Helena, Montana. July 2005 (Revised December 2005).

Misitano, D.A. 1977. Species Composition and Relative Abundance of Larval and Postlarval Fishes in the Columbia River Estuary, 1973. Fisheries Bulletin 75:218–222.

Mongillo, Paul E. and Molly Hallock. 1999. Washington State Status Report for the Olympic Mudminnow. Washington Department of Fish and Wildlife Fish Program. Olympia, Washington.

Montana State University (MSU) Extension Service. 2000. Electric Fencing to Control Deer and Elk on Montana's Farms and Ranches. MontGuide fact sheet MT 2000-10 Agriculture. http://animalrangeextension.montana.edu/articles/wildlife/electric_fence_deer_elk.htm

Moran, K.K. 1994. Wildlife Corridors and Pipeline Corridors A Comparative Analysis. Chapter VII. Greenways: Wildlife and Natural Gas Pipeline Corridors. K.G. Hay. The Conservation Fund, Arlington, Virginia. pp. 99-120.

Moser, M. and S. Lindley. 2007. Use of Washington Estuaries by Subadult and Adult Green Sturgeon. Environmental Biology of Fishes. 79:243-253.

Mote, P., A. Petersen, S. Reeder, H. Shipman, and L.W. Binder. 2008. Sea Level Rise in the Coastal Waters of Washington State. A report by the University of Washington Climate Impacts Group and the Washington Department of Ecology. January 2008.

Moursund, R.A, M.D. Bleich, K.D. Ham, and R.P. Mueller. 2003. Evaluation of the Effects of Extended Length Submerged Bar Screens on Migrating Juvenile Pacific Lamprey at John Day Dam in 2002. Final Report of Research. United States Army Corps of Engineers. Portland, Oregon.

Myers, J.M., C. Busack, D. Rawding, A. Marshall, D. Teel, D.M. Van Doornik, and M.T. Maher. 2006. Historical Population Structure of Pacific Salmonids in the Willamette River and Lower Columbia River Basins. United States Department Commerce, NOAA Tech. Memo. NMFS-NWFSC-73.

National Marine Fisheries Service (NMFS). 1991. Endangered and Threatened Species: Endangered Status for Snake River Sockeye Salmon. 56 Federal Register 58619. November 20.

_____. 1992. Endangered and Threatened Species: Threatened Status for Spring/Summer Chinook Salmon. 57 Federal Register 14653. April 22.

_____. 1993a. Designated Critical Habitat: Stellar Sea Lion. 58 Federal Register 45269. August 27.

_____. 1993b. Designated Critical Habitat: Snake River Sockeye Salmon, Snake River Spring/Summer Chinook Salmon, and Snake River Fall Chinook Salmon. 58 Federal Register 68543. December 28

_____. 1996a. Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale. National Marine Fisheries Service, Environmental and Technical Services Division, Habitat Conservation Division. Portland, Oregon.

_____. 1996b. NOAA Technical Memorandum NMFS-NWFSC-27. Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California. Prepared by P.J. Busby, T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino for National Marine Fisheries Service and the Department of Commerce. August 1996.

_____. 1997a. Endangered and Threatened Species: Listing of Several Evolutionary Significant Units (ESUs) of West Coast Steelhead, 62 Federal Register 43937. August 18.

_____. 1997b. Magnuson-Stevens Act Provision: Essential Fish Habitat (EFH). Federal Register 62(244):66531–66559.

_____. 1998. Endangered and Threatened Species: Threatened Status for two ESUs of Steelhead in Washington, Oregon and California. 65 Federal Register 13347. March 19.

_____. 1999a. Endangered and Threatened Species: Threatened Status for Three Chinook Salmon Evolutionarily Significant Units (ESUs) in Washington and Oregon, and Endangered Status for One Chinook Salmon ESU in Washington. 64 Federal Register 14308. March 24.

_____. 1999b. Endangered and Threatened Species: Threatened Status for Two ESUs of Chum Salmon in Washington and Oregon. 64 Federal Register 14508. March 25.

_____. 1999c. Endangered and Threatened Species: threatened Status for Two ESUs of Steelhead in Washington and Oregon. 64 Federal Register 14518. March 25.

_____ 2002. Endangered Species Act—Section 7 Consultation and Magnuson-Stevens Act Essential Fish Habitat Consultation, Biological Opinion. Columbia River Channel Improvements Project.

_____. 2003. Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Mouth of the Columbia River Maintenance Dredging Program and Ocean Disposal Site Designation.

_____. 2004. Endangered Species Act Section 7 Formal Consultation and Conference and Magnuson-Stevens Fishery and Conservation Management Act Essential Fish Habitat Consultation for the Columbia River North and South Jetties Rehabilitation, Columbia River Basin, Clatsop County, Oregon. Corps No.: 1165-2-26a.

_____. 2005a. Endangered Species Act – Section 7 consultation biological opinion and conference opinion & Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation Columbia River Channel Operations and Maintenance Program Columbia River Basin Mouth of the Columbia River to Bonneville Dam. NMFS No 2004/01041. Northwest Region. Seattle, Washington. March 11, 2005

_____. 2005b. Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology. Final Report of the National Oceanic and Atmospheric Administration (NOAA) International Symposium. May 18-19, 2004. Released April 27, 2005.

_____. 2005c. Endangered and Threatened Species; Designation of Critical Habitat for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead in Washington, Oregon, and Idaho; Final Rule. 70 Federal Register 52630. September 2.

_____. 2005d. Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs. Federal Register 70 FR 37160. June 28.

_____. 2005e. Salmon at River's End: The Role of the Estuary in the Decline and Recovery of Columbia River Salmon. Prepared by Bottom, D.L., C.A. Simenstad, J. Burke, A.M. Baptista, D.A. Jay,

K.K. Jones, E. Casillas, and M.H. Schiewe. U.S. Dept. of Commerce Memo. NMFS-NWFSC-68, 246 p. August 2005.

_____. 2006a. Draft Recovery Plan for the Fin Whale (*Balaenoptera physalus*). National Marine Fisheries Service, Silver Spring, MD.

_____. 2006b. Draft Recovery Plan for the Sperm Whale (*Physeter Macrocephalus*). National Oceanic and Atmospheric Administration (NOAA).

_____. 2006c. Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead; Final Rule. Federal Register 71(3): 834-862. January 5

_____. 2007. Endangered and Threatened Species: Final Listing Determination for Puget Sound Steelhead. Federal Register 50 CFR Part 223. 72 FR 26722.

_____. 2008a. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon.

_____. 2008b. NMFS Southeast Region Vessel Strike Avoidance Measures and Reporting for Mariners; revised February 2008. http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/copy_of_vessel_strike_avoidance_february_2008.pdf

_____. 2008c. Endangered and Threatened Species: Final Threatened Listing Determination, Final Protective Regulations, and Final Designation of Critical Habitat for the Oregon Coast Evolutionarily Significant Unit of Coho Salmon. 73 Federal Register 7894. February 11

_____. 2008d. Endangered Species Act Section 7 Formal and Informal Consultation and Magnuson-Stevens Fishery Conservation and Management Act, Essential Fish Habitat Consultation for the Port of Astoria Maintenance Dredging for Slips 1 and 2 and the Face of Piers 1 and 2, Columbia River (HUC 1708000107) Clatsop County, Oregon (Corps No.: NWP- 2004-369).

_____. 2008e. Endangered and Threatened Wildlife and Plants: Proposed Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. 73 *Federal Register* 52084. September 8.

_____. 2009a. Endangered Species Act Section 7 Informal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Georgia Pacific Piling and Deck Replacement, Coos Bay, Isthmus Slough (6th field HUC: 171003040302), Coos County, Oregon. Corps No.: NWP-2003-472/3.

_____. 2009b. Interim Sound Threshold Guidance: NOAA Fisheries West Coast Region. NOAA Fisheries current in-water and in-air acoustic thresholds. Accessed at http://www.westcoast.fisheries.noaa.gov/protected_species/marine_mammals/threshold gu.

_____. 2009c. Endangered and Threatened Wildlife and Plants: Final Rulemaking To Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon; Final Rule. 74 Federal Register. 52300.

_____. 2010. NOAA Technical Memorandum NMFS-NWFSC-105. Status Review of Eulachon (*Thaleichthys pacificus)* in Washington, Oregon, and California. Prepared by R.G. Gustafson,

M.J. Ford, D.Teel, and J.S. Drake for National Marine Fisheries Service and the Department of Commerce. March 2010.

_____. 2011a. Final recovery plan for the sei whale (*Balaenoptera borealis*). Office of Protected Resources, National Marine Fisheries Service, Silver Spring, Maryland. December 2011.

_____. 2011b. Endangered and Threatened Species, Designation of Critical Habitat for the Southern Distinct Population Segment of Eulachon. 76 Federal Register 65324. October 10, 2011.

_____. 2011c. Status Review Update for Pacific Salmon and Steelhead Listed under the Endangered Species Act: Pacific Northwest. NOAA Technical Memorandum NMFS-NWFSC-113. November 2011.

_____. 2012. Reinitiation of Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington (HUCs 1708000605,1708000307, 1708000108), NMFS No. 2011/02095.

_____. 2013a. Pacific Marine Mammal Stock Assessment: 2012. NOAA-TM-NMFS-SWFSC-504, Southwest Fisheries Science Center.

_____. 2013b. Southern Resident Killer Whale Satellite Tagging. Northwest Fisheries Science Center, available at http://www.nwfsc.noaa.gov/research/divisions/cb/ecosystem/marinemammal/satellite_tagging/blog.cfm. Accessed September 12, 2014.

_____. 2013c. Final Recovery Plan for the North Pacific Right Whale (*Eubalaena japonica*). National Marine Fisheries Service, Silver Spring, Maryland. June 3, 2013.

_____. 2014a. Humpback Whales. Office of Protected Resources, National Marine Fisheries Service. http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/humpbackwhale.htm Accessed November 17, 2014.

_____. 2014b Issuance of an Incidental Harassment Authorization to BlueCrest Operating Alaska LLC, for the take of small numbers of sea otters incidental to conducting an exploratory drilling program in Cook Inlet, Alaska.

_____. 2015. Draft Environmental Assessment for Issuance of an Incidental Harassment Authorization for Anacortes Ferry Terminal Tie-up Slip Dolphins and Wingwall Replacement Project, Anacortes, Washington.

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and FWS). 2006. Appendix A: Lower Columbia Regional Summary. Final Environmental Impact Statement for the Washington State Forest Practices Habitat Conservation Plan. Available at http://www.dnr.wa.gov/BusinessPermits/Topics/ForestPracticesHCP/Pages/fp_hcp_feis.aspx

National Oceanic and Atmospheric Administration (NOAA). 1985. Narrative Summaries, Tables and Maps for Each State with Overview of State Climatologist Programs, Third Edition, Volume 2: New York-Wyoming. http://www.wrcc.dri.edu/narratives/WASHINGTON.htm. Accessed July 11, 2014.

_____. 1987. Coastal Services Center. Columbia River Estuary Regional Management Plan. Columbia River Estuary Study Taskforce.

_____. 2013. Public Exposure Guidelines, http://response.restoration.noaa.gov/oil-and-chemical-spills/chemical-spills/resources/public-exposure-guidelines.html, December 3, 2013.

National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (FWS). 1998a. Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle (Lepidochelys olivacea). National Marine Fisheries Service, Silver Spring, Maryland

_____. 1998b. Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle. National Marine Fisheries Service, Washington, D.C.

_____. 1998c. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring, Maryland.

_____. 1998d. Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, Maryland.

National Park Service (NPS). 2006. Foundation Document. Lewis and Clark National Historic Trail. U.S. Department of the Interior.

_____. 2010. U.S. Department of the Interior. Federal Land Managers' Air Quality Related Values Work Group (Flag). Phase I Report, NPS/NRPC/NRR—2010/232

_____. 2012. National Wild & Scenic Rivers System. http://www.rivers.gov/rivers/. Accessed November 2012.

Natural Resources Conservation Service (NRCS). 1973. Soil Survey Report of King County Area, Washington issued November 1973. By D.E. Snyder, P.S. Gale, and R.F. Pringle, Soil Conservation Service.

_____. 1979. Soil Survey Report of Pierce County Area, Washington issued February 1979. By A.S. Zulauf, Soil Conservation Service.

_____. 1983. Soil Survey Report of Snohomish County Area, Washington issued July 1983. By A. Debose and M.W. Klungland, Soil Conservation Service.

_____. 1986. Soil Survey of Columbia County. Extracted Pages. GIS Soil Mapping Data: Soil Survey Staff, Natural Resource Conservation Service (NRCS), United States Department of Agriculture.

_____. 1987. Soil Survey Report of Lewis County Area, Washington issued May 1987. By R.L. Evans, Washington State Department of Natural Resources, and W.R. Fibich, Soil Conservation Service.

_____. 1988. Soil Survey of Clatsop County. Extracted Pages. GIS Soil Mapping Data: Soil Survey Staff, Natural Resource Conservation Service (NRCS), United States Department of Agriculture.

_____. 1989. Soil Survey Report of Skagit County Area, Washington issued September 1989. By M.W. Klungland, Soil Conservation Service, and M.McArthur, Washington State Department of Natural Resources.

_____. 1990. Soil Survey Report of Thurston County Area, Washington issued June 1990. By R.F. Pringle, Soil Conservation Service.

_____. 1992. Soil Survey Report of Whatcom County Area, Washington issued May 1992. By A. Goldin, Ph.D., Soil Conservation Service.

_____. 2000. The Oregon & Washington Guide for Conservation Seedings and Plantings. Prepared by the U.S. Department of Agriculture and NRCS. Portland, Oregon. April 2000

_____. 2012. Soil Survey of Cowlitz County. Extracted Pages issued 2006. GIS Soil Mapping Data: Soil Survey Staff, Natural Resource Conservation Service (NRCS), United States Department of Agriculture. 2012. Soil Survey Geographic (SSURGO) Database for Cowlitz County, Washington. http://soildatamart.nrcs.usda.gov. SSA Version 11, 6/22/2012.

_____. 2013a. Soil Survey of Tillamook County. Extracted Pages. GIS Soil Mapping Data: Soil Survey Staff, Natural Resource Conservation Service (NRCS), United States Department of Agriculture.

_____. 2013b. Wetlands Reserve Program. http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/wetlands/. Accessed March 4, 2014.

NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed: October 21, 2013.

Nightingale, B. and C.A. Simenstad. 2001. Dredging Activities, Marine Issues White Paper. Research Project T1803, Task 35. Washington State Transportation Commission. July.

North, J., C. Rodriquez, M. Miller, J. Sewall, P. Frazier, S. Gray, T. Jones, A. Dietrichs, T. Miethe. 2004. Select Area Fishery Evaluation Project, 1993-2003 Final Project Completion Report. U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon.

Nuka Research and Planning Group. 2006. Vessel Traffic in the Aleutians Subarea. Updated Report to Alaska Department of Environmental Conservation. September 20, 2006.

Olson, G. 2011. Mazama pocket gopher occupancy modeling. Research Scientist, Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, Washington. 45 pp.

Ontario Ministry of Natural Resources. 2000. Conserving the forest interior: A threatened wildlife habitat. Ohio Extension Notes, Land Owner Resource Centre, Manotick, Ontario. Oregon Biodiversity Information Center (ORBIC). 2011. Rare, threatened, and endangered plant and animal records for the OR LNG Project. August 28, 2011.

Oregon Department of Agriculture (ODA). 1990. State of Oregon endangered and threatened lists for plants. Oregon Administrative Rules 603-73-070-1. Salem, Oregon.

_____. 2014. Noxious Weed Policy and Classification System. Noxious Weed Control Program, Salem, Oregon

Oregon Department of Energy (ODE). 2008. Safety Advisory Report on the proposed Oregon LNG Liquefied Natural Gas Terminal. November 10, 2008.

_____. 2009. Oregon Dept. of Energy, Memorandum of Understanding and Agreement by and Between Oregon LNG and the State of Oregon for Emergency Preparedness, CO2, and Financial Assurance for Facilities Retirement. FERC Accession No. 20090619-5110.

Oregon Department of Environmental Quality (ODEQ). 1997. Memorandum from Water Quality Division for final guidance on Management Practices for the Disposal of Chlorinated Water. May 19, 1997.

_____. 2001. Antidegradation Policy Implementation Internal Management Directive for NPDES Permits and Section 401 Water Quality Certifications. March 2001.

_____. 2004. Oregon's 2004 Water Quality Assessment Section 305(b) Report. July 2004.

_____. 2010. 2010 Oregon Air Quality Data Summaries. http://www.deq.state.or.us/aq/forms/annrpt.htm. Accessed March 14, 2012.

_____. 2011. Passenger Vessels Impact on Water Quality. Report to the Environmental Quality Commission and Legislature. Last Updated: 1/28/11 by B. Moore. DEQ 11-WQ-003.

_____. 2012. Oregon's 2012 Water Quality Assessment Database. Available online: http://www.deq.state. or.us/wq/assessment/rpt2012/search.asp. Information accessed on July 2014.

_____. 2014. Environmental Site Cleanup Information database. Available online: http://www.deq.state.or.us/lq/ECSI/ecsiquery.asp. Accessed July 2014.

Oregon Department of Fish and Wildlife (ODFW). 2003. ODFW Timing Tables, North Willamette District .https://nrimp.dfw.state.or.us/nrimp/default.aspx?p=327 Accessed March 13, 2014.

_____. 2004. Fish Passage Criteria. October 22, 2004. Salem, OR.

_____ 2006a. The Oregon Conservation Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon. February 2006. http://www.dfw.state.or.us/conservationstrategy/read_the_strategy.asp.

_____. 2006b. Oregon Nearshore Strategy. Oregon Department of Fish and Wildlife, Salem, Oregon. February 2006.

_____. 2006c. Division 415 Fish and Wildlife Habitat Mitigation Policy. http://www.dfw.state.or.us/OARs/415.pdf.

_____. 2008a. Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources. June, 2008.

_____. 2008b. Oregon Sensitive Species List. http://www.dfw.state.or.us/wildlife/diversity/species/docs/SSL_by_Taxon.pdf.

_____. 2008c. Species Fact Sheet: Water Howellia (*Howellia aquatilis*). http://www.fws.gov/oregonfwo/Species/Data/WaterHowellia/.

_____. 2008d. M. Hunter, Shellfish Biologist. Personal communication with L. Brown (CH2M Hill). August 13, 2008

ODFW and WDFW. 2002. Eulachon Studies related to Lower Columbia River Channel Deepening Operations. Edited by D.L. Ward. Final Report to U. S. Army Corps of Engineers, Contract Number W66QKZ13237198, November 2002.

Oregon Department of Forestry (ODF). 2000. Astoria District Recreation Management Plan. Clatsop State Forest. September.

_____. 2003. Astoria District Implementation Plan. Oregon Department of Forestry, Salem, Oregon.

_____. 2010. Northwest Oregon State Forests Management Plan. January 2001 Plan Structure Classes and Habitat Conservation Plan; Revised Plan April 2010. Final Plan, available at http://www.oregon.gov/ODF/STATE_FORESTS/docs/management/nwfmp/NWFMP_Revised_April_2010.pdf

_____. 2013. Commonly Requested GIS Data Sets. Available at: http://www.oregon.gov/ODF/GIS/gisdata.shtml. Accessed on April 4, 2013.

Oregon Department of Human Services (ODHS) Drinking Water Program. 2013. Drinking Water Data Online. Available online: https://yourwater.oregon.gov/search.htm. Accessed March 2013.

Oregon Department of Revenue. 2011-2012. Oregon Property Tax Statistics, Fiscal Year 2011-2012. http://www.oregon.gov/dor/STATS/Pages/303-405-11-toc.aspx. Accessed April 1, 2013.

Oregon Department of Transportation (ODOT). 1999. Oregon Highway Plan.

_____. 2011. Noise Manual. Salem, OR.

Oregon Division of State Lands (ODSL). 2001. Guidebook for Hydrogeomorphic (HGM)-based Assessment of Oregon Wetland and Riparian Sites: Statewide Classification and Profiles. Prepared for Oregon Wetland-Riparian Assessment Project by Paul R. Adamus. February 2001.

_____. 2006. Hydrogeomorphic (HGM) Assessment Guidebook for Tidal Wetlands of the Oregon Coast Part 1: Rapid Assessment Method. P.R. Adamus; produced by Coos Watershed Association. August 2006.

_____. 2010. Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP). Version 2.0.2 by P.R. Adamus. July 2010.

Oregon Flora Project. 2013. Rare Plant Guide. http://www.oregonflora.org/rareplants.php?#sr. Accessed October 2013.

Oregon Natural Heritage Information Center (ORNHIC). 2009. Rare, Threatened, and Endangered Species within 2 miles of the Oregon LNG Project. February. http://oregonstate.edu/ornhic/plants/view_plants2.php. Accessed on February 10, 2009.

Oregon Water Resources Department (OWRD). 2013. Well Log Query. Available at http://apps.wrd.state.or.us/apps/gw/well_log/default.aspx. Information accessed on March 2013. Orr, E.L., W.N. Orr, and E. Baldwin. 1999. Geology of Oregon. Kendall/Hunt Publishing Company. Dubuque, Iowa.

Pacific Biological Institute. 2002. Brown Pelicans. Website: http://www.pacificbio.org/ESIN/Birds/BrownPelican/pelican_overview.htm

Pacific Fishery Management Council (PFMC). 1998. Amendment 8 to the Northern Anchovy Fishery Management Plan. Changed title of report to Coastal Pelagic Species Fishery Management Plan. December.

_____. 2000. Amended Sections of the Pacific Coast Salmon Plan, Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and California, as Revised through Amendment 14.

_____. 2011. Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species. Portland, OR.

Pacific Maritime Institute (PMI). 2008. Oregon LNG Ship Simulation Report, Appendix 11H of Resource Report 11. Filed separately as Critical Energy Infrastructure Information (CEII).

Pater, D.E., S.A. Bryce, T.D. Thorson, J. Kagan, C. Chappell, J.M. Omernik, S.H. Azevedo, and A. J. Woods. 1998. Ecoregions of Western Washington and Oregon (two-sided color poster with map, descriptive text, summary tables, and photographs). U.S. Geological Survey. Reston, Virginia. Scale 1:1,350,000.

Pearce, D. and Moran, D. 1994. The economic value of biodiversity. Earthscan Publications, London.

Pearl, C.A. and M.P. Hayes. 2004. Habitat associations of the Oregon spotted frog (*Rana pretiosa*): A literature review. Final Report. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

Pearson, W.H., G.D. Williams, and J.R. Skalski. 2003. Estimated Entrainment of Dungeness Crabs during Maintenance Dredging of the Mouth of the Columbia River, Summer 2002. Prepared for the U.S. Army Corps of Engineers, Portland District. Pacific Northwest National Laboratory, Marine Sciences Laboratory, Sequim, Washington. PNNL-14190.

Pearson W.H., J.R. Skalski, K.L. Sobocinski, M.C. Miller, G.E. Johnson, G.D. Williams, J.A. Southard, and R.A. Buchanan. 2006. A Study of Stranding of Juvenile Salmon by Ship Wakes along the Lower Columbia River using a Before and After Design: Before-Phase Results. PNNL-15400, Prepared for the U.S. Army Corps of Engineers, Portland District, by Pacific Northwest National Laboratory, Marine Sciences Laboratory, Sequim, Washington.

Pearson, W.H., W.C. Fleece, K. Gabel, S. Jennings, J.R. Skalski. 2008. Spatial Analysis of Beach Susceptibility for Stranding of Juvenile Salmonids by Ship Wakes. Final Report. Prepared for the Port of Vancouver, 3103 NW Lower River Rd., Vancouver, WA, 98660 (February 4).

Pederson, R.V.K., U.N. Orr, and D.E. Hay. 1995. Distribution and Preliminary Stock Assessment (1993) of the Eulachon, Thaleichthys pacificus, in the Lower Kitimat River, British Columbia. Canadian Manuscript Report of Fisheries and Aquatic Sciences 2330, Vancouver, B.C.

Peeke, H.V.S. and M.J. Herz (eds). 1973. Habituation, Vol. 1., Behavioral Studies. Academic Press, Inc., New York, New York.

Piatt, J.F. K.J. Kuletz, A.E. Burger, S.A. Hatch, V.L. Friesen, T.P. Birt, M.L. Arimitsu, G.S. Drew, A.M.A. Harding, and K.S. Bixler. 2006. Status Review of the Marbled Murrelet (*Brachyramphus Marmoratus*) in Alaska and British Columbia, Open-File Report 2006-1387.

Pierce County. 2011a. Mine Hazard Areas. GIS data dated June 15, 2011. http://yakima.co.pierce.wa.us/geodataexpress/main.html. Last accessed November 5, 2012.

_____. 2011b. Mine Hazards Tunnels. GIS data dated June 15, 2011. http://yakima.co.pierce.wa.us/geodataexpress/main.html. Last accessed November 5, 2012.

Pipeline and Hazardous Materials Safety Administration (PHMSA). 2014. Pipeline Safety Stakeholder Communications, Significant Incidents Listing, accessed at http://primis.phmsa.dot.gov/comm/reports/safety on October 1, 2014.

Pool, S. and R. Ledgerwood. 1997. Benthic Invertebrates in Soft-Substrate, Shallow-Water Habitats in Lower Granite Reservoir, 1994-1995. Northwest Fisheries Science Center, National Marine Fisheries Service. Seattle, Washington.

Poole, B.C., J. Risley, and M. Hicks. 2001. Issue Paper 3 Spatial and Temporal Patterns of Stream Temperature Prepared as Part of EPA Region 10 Temperature Water Quality Criteria Guidance Development Project.

Port of Kalama. 2014. Determination of Significance and Request for Comments on Scope of EIS.

Port of Woodland. 2011. Strategic Plan 2020. http://www.portofwoodland.com/?s=strategic+plan&submit=. Accessed April 23, 2013.

Portland State University (PSU). 2001. Lower Columbia-Clatskanie Watershed Assessment. Prepared for the Lower Columbia River Watershed Council.

Prakash, S., V. Kolluru, and C. Young. 2014. Evaluation of the Zone of Influence and Entrainment Impacts for an Intake Using a 3-Dimensional Hydrodynamic and Transport Model. Mar. Sci. Eng. 2014, *2*, 306-325

Pruett, C.L., D.D. Gibson, and K. Winker. 2000. Molecular "cuckoo clock" suggests listing of western yellow-billed cuckoos may be warranted. Wilson Bulletin 113:228-231.

Read, W. 2008. The Great Coastal Gale of December 1 – 3, 2007. http://www.climate.washington.edu/stormking/December2007.html.

Reed, J.R., J.L. Sincock, and J.P. Hailman. 1985. Light Attraction in Endangered Procellariiform Birds: Reduction By Shielding Upward Radiation. The Auk 102: 377-383.

Reid, S. and P.G. Anderson. 1999. Effects of sediment released during open cut pipeline water crossings. Canadian Water Resources Journal 24(3): 235-251.

_____. 2000. Evaluation of Isolated Watercourse Crossings during Winter Construction along the Alliance Pipeline in Northern Alberta. Proceedings of the 7th International Symposium, Environmental Concerns in Rights-of-Way Management. September 9 - 13, 2000. Calgary, Alberta, Canada. Elsevier Science Ltd.

Reine, K.J., D.G. Clarke, and R.M. Engler. 1998. Entrainment by Hydraulic Dredges—A Review of Potential Impacts. U.S. Army Corps of Engineers (USACE), Army Engineer Waterways Experiment Station, Environmental Lab, Technical Note DOER-E1, Vicksburg, Mississippi.

Reyff, J. 2007. Compendium of Pile Driving Sound Data. Prepared for the California Department of Transportation 1120 N Street Sacramento, CA 94274. Illinworth & Rodkin. South Petaluma, CA 94952.

Rice, D.W. 1977. Synopsis of Biological Data on the Sei Whale and Bryde's Whale in the Eastern North Pacific in Report of the International Whaling Commission - Special Issue 1: Page(s) 92-97.

Richardson, W.J., C.R. Greene, Jr., C.I. Malme, and D.H. Thomson. 1995. Marine Mammals and Noise. Academic Press, San Diego, California.

Ripple, W.J., S.K. Nelson, and E.M. Glenn. 2003. Forest Landscape Patterns Around Marbled Murrelet Nest Sites in the Oregon Coast Range. Northwestern Naturalist 84:80–89.

Robbins, C.S. 1988. Forest fragmentation and its effects on birds. In Johnson, J.E. (ed.) 1988. Managing North Central forests for non-timber values. Publication 88-4, Society of American Foresters, Bethesda, MD.

Roberts, T. H, and Arner, D. H. 1984. Food Habits of Beaver in East Central Mississippi. Journal of Wildlife Management 48:14141419.

Robinson, W.D. and R.P. Moore. 2005. Range, Abundance, and Habitat Associations of Streaked Horned Lark (*Eremophila alpestris strigata*) During Winter. Oregon State University, Corvallis, Oregon. http://www.southsoundprairies.org/documents/RobinsonandMoore2005.pdf. Accessed February 2009.

Rodewald, A.D. 2001. Managing for forest songbirds. Ohio State University Extension, Columbus, Ohio. Fact Sheet W-6-2001.

Roegner, G.C., H.L. Diefenderfer, A.B. Borde, R.M. Thom, E.M. Dawley, A.H. Whiting, S.A. Zimmerman, and G.E. Johnson. 2008a. Protocols for Monitoring Habitat Restoration Projects in the Lower Columbia River and Estuary. PNNL-15793. Report by Pacific Northwest National Laboratory, National Marine Fisheries Service, and Columbia River Estuary Study Taskforce submitted to the U.S. Army Corps of Engineers, Portland District, Portland, Oregon.

Roegner GC, A. Baptista,D.L. Bottom, J. Burke, L. Campbell, C. Elliot, S. Hinton, D.Jay, M. Lott, T. Lundrigan, R. McNatt, P. Moran, C.A. Simenstad, D. Teel, E.Volk, J. Zamon, and E. Casillas 2008b. *Estuarine Habitat and Juvenile Salmon – Current and Historical Linkages in the Lower Columbia River and Estuary, 2002-2004*. Northwest Fisheries Science Center, National Marine Fisheries Service, Seattle, Washington.

Rogers, P. H. and Cox, M. 1988. Underwater sound as a biological stimulus. In Sensory Biology of Aquatic Animals (ed. J. Atema, R. R. Fay, A. N. Popper and W. N. Tavolga), pp. 131-149. New York, NY: Springer-Verlag

Romano, M.D., M.D. Howell, and T.A. Rien. 2002. Use of an artificial substrate to capture eulachon eggs in the lower Columbia River. Report C in D. L. Ward editor. Eulachon studies related to Lower Columbia River channel deepening operations. Final report by the Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife to the U. S. Army Corps of Engineers. Contract Number W66QKZ13237198.

Rose, Robin and Diane Haase. 2006. Guide to Reforestation in Oregon. College of Forestry, Oregon State University, Corvallis 48 p. 2006.

Rosenberg, K.V., R.W. Rohrbaugh, Jr., S.E. Barker, R.S. James, J.D. Lowe, and A.A. Dhondt. 1999. A land manager's guide to improving habitat for scarlet tanagers and other forest interior birds. The Cornell Lab of Ornithology, Ithaca, NY.

Rosgen, Dave. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rowland, M.M., M.J. Wisdom, B.K. Johnson, and J.G. Kie. 2000. Elk distribution and modeling in relation to roads. Journal of Wildlife Management. 64: 672-684.

Rugh, D., J. Breiwick, M. M. Muto, R. Hobbs, K. Shelden, C. D'vincent, I. M. Laursen, S. Reif, S. Maher, and S. Nilson. 2008. Report of the 2006-2007 census of the eastern north Pacific stock of gray whales. AFSC Processed Rep. 2008-03, 157 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Ruiz, G.M. and A. H. Hines. 1997. The Risk of Nonindigenous Species Invasion in Prince William Sound Associated with Oil Tanker Traffic and Ballast Water Management: Pilot Study. Regional Citizens' Advisory Council of Prince William Sound, Valdez, Alaska. Report number 632f.97.1.

_____. 2000. Biological Invasions of Cold-Water Coastal Ecosystems: Ballast-Mediated Introductions in Port Valdez/Prince William Sound Alaska.

Salinger, D.H. and J.J. Anderson. 2006. Effects of Water Temperature and Flow on Adult Salmon Migration Swim Speed and Delay. Transactions of the American Fisheries Society 135(1):188-199.

Sandia National Laboratories. 2004. Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water. SAND2004-6258. December.

Satake, K., Shimazaki, K., Tsuji, Y., and Ueda, K. 1996. Time and Size of a Giant Earthquake in Cascadia Inferred from Japanese Tsunami Records of January 1700. Nature. 379:246-249.

Satake, K., Wang, K., and Atwater, B.F., 2003, Fault slip and seismic moment of the 1700 Cascadia earthquake inferred from Japanese tsunami descriptions: Journal of Geophysical Research, B, Solid Earth and Planets, v. 108, p. ESE 7-1.

Sauter, S.T., J. McMillan, and J. Dunham. 2001. Salmonid Behavior and Water Temperature. U.S. Environmental Protection Agency, Washington, DC. Report USEPA-910-D0-01-001.

Schreck, C.B., H.W. Li, C.S. Sharpe, K.P. Currens, P.L. Hulett, S.L. Stone, and S.B. Yamada. 1986. Stock Identification of Columbia River Chinook Salmon and Steelhead Trout. Report to Bonneville Power Administration, Contract DE-A179-83BP13499, Project 83-451. 184 pp.

Sedell, J.R., P.A. Bisson, E.J. Swanson, and S.V. Gregory. 1988. What We Know about Large Trees that Fall into Streams and Rivers. *In* From the Forest to the Sea: A Story of Fallen Trees. C. Maser, R.F. Tarrant, J.M. Trappe, and J.E. Franklin, eds. U.S. Forest Service, Portland, Oregon. General Technical Report PNW-GTR-229. Pages 47–81.

Sherwood, C.R., J.S. Creager, E.H. Roy, G. Gelfenbaum, and T. Dempsey. 1984. Sedimentary Processes and Environments in the Columbia River Estuary. Columbia River Estuary Data Development Program, Astoria, Oregon.

Simenstad, C.A., D. Jay, C.D. McIntire, W. Nehlsen, C.R. Sherwood, and L.F. Small. 1984. The Dynamics of the Columbia River Estuarine Ecosystem. Volumes I and II. Columbia River Estuary Data Development Program, Astoria, Oregon.

Simenstad, C.A., B.J. Nightingale, R.M. Thom, D.K. Shreffler. 1999. Impacts of Ferry Terminals on Juvenile Salmon Migrating Along Puget Sound Shorelines Phase I: Synthesis of State of Knowledge. Washington State Transportation Center (TRAC), University of Washington, Seattle, Washington. June.

Skalski, J.R., R.L. Townsend. 2005. Pacific Northwest Hatcheries Smolt-to-Adult Ratio (SAR) Estimation using Coded Wire Tags (CWT) Data. Columbia Basin Research School of Aquatic and Fishery Sciences University of Washington, Seattle, Washington.

Skidmore P.B., C.R. Thorne, B.L. Cluer, G.R. Pess, J.M. Castro, T.J. Beechie, C.C. Shea. 2011. Science Base and Tools for Evaluating Stream Engineering, Management and Restoration Proposals, NOAA Technical Memorandum NMFS-NWFSC-112, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161, USA, 253p. Available via http://www.nwfsc.noaa.gov

Skinner, Kate J/ODF. 2015. Personal communication with Molly Brown/HDR Inc. February 24, 2015.

Smith, W.E. and R.W. Saalfeld. 1955. Studies on Columbia River Smelt, *Thaleichthys pacificus* (Richardson). Fisheries Research Papers. Washington State Department of Fisheries. 1:3-26, *as cited in* Northwest Power Conservation Council. 2004. Volume III, Chapter 4 Eulachon.

Smith, W. P. 1981. Status and habitat use of Columbian white-tailed deer in Douglas County, Oregon. Dissertation, Oregon State University, Corvallis, Oregon, USA.

Snohomish County. 2011. Mineral Resource Overlay. Snohomish County Planning and Development Services, Cartography-Geographic Information System Section GIS data dated October 21, 2011. http://www1.co.snohomish.wa.us/Departments/PDS/Divisions/PlanningandTechnology/LR_Planning/Information/Maps/mapsgisdata.htm. Last accessed November 5, 2012.

Society of Vertebrate Paleontology (SVP). 1995. Assessment and Mitigation of Adverse Impacts to Nonrenewable Paleontologic Resources: Standard Guidelines. Society of Vertebrate Paleontology News Bulletin 163:22-27.

_____. 1996. Conditions of Receivership for Paleontologic Salvage Collections. Society of Vertebrate Paleontology News Bulletin 166:31-32.

Stafford, K.M., S.L. Nieukirk, and C.G. Fox. 1999. An Acoustic Link between Blue Whales in the Eastern Tropical Pacific and the Northeast Pacific. Marine Mammal Science 15(4): 1258-1268.9

Stalmaster, M.V. 1976. Winter Ecology and Effects of Human Activity on Bald Eagles in the Nooksack River Valley, Washington. Master of Science Thesis, Western Washington State University, Bellingham, Washington.

Stalmaster, M.V. and J.R. Newman. 1978. Behavioral Responses of Wintering Bald Eagles to Human Activity. Journal of Wildlife Management 47:349-359

Steidl, R.J. and R.G. Anthony. 1996. Responses of Bald Eagles to Human Activity during the Summer in Interior Alaska. Ecological Applications 6(2):482-491

Stinson, D. W. 2013. Draft Mazama Pocket Gopher Status Update and Washington State Recovery Plan. Washington Department of Fish and Wildlife, Olympia. 91+ vi pp.

StreamNet. 2014a. Online fish distribution data. http://map.streamnet.org/website/bluesnetmapper/viewer.htm Accessed on March 14, 2014.

_____. 2014b. Streamnet Mapper. http://www.streamnet.org/mapping_apps.cfm (accessed June 18, 2014).

Sullivan, B.E., F.G. Prahl, L.F. Small, and P.A. Covert. 2001. Seasonality of Phytoplankton Production in the Columbia River: A Natural or Anthropogenic Pattern? Geochimica et Cosmochimica Acta 65:1125–1139.

Suttles, Wayne. 1990. Kwalhioqua and Clatskanie, in W. Suttles, Vol. Ed. 1990. Handbook of North American Indians, Vol. 7: Northwest Coast. William C. Sturtevant, General Editor. Smithsonian Institution, Washington, D.C.

Swanson, F.J., L.E. Benda, S.H. Duncan, G.E. Grant, W.F. Megahan, L.M. Reid, and R.R. Ziemer. 1987. Mass Failures and Other Processes of Sediment Production in Pacific Northwest Forest Landscapes. Chapter 2. Streamside Management: Forestry and Fishery Interactions. E.O. Salvo and T.W. Cundy, eds. University of Washington, Institute of Forestry Resources, Seattle, Washington. College of Forestry Resources Contribution No. 57.

Sytsma, Mark; Cordell, Jeffery; Chapman, John; and Draheim, Robyn. 2004. Lower Columbia River Aquatic Nonindigenous Species Survey 2001-2004. Final Technical Report. Center for Lakes and Reservoirs Publications. Paper 23. http://pdxscholar.library.pdx.edu/centerforlakes_pub/23

Tabor, R.A., G.S. Brown, V.T. Luiting. 2004. The Effect of Light Intensity on Sockeye Salmon Fry Migratory Behavior and Predation by Cottids in the Cedar River, Washington. North American Journal of Fisheries Management 24:128-145.

Tanaka, H., Y. Takagi, and Y. Naito. 2001. Swimming speeds and buoyancy compensation of migrating adult chum salmon (*Oncorhynchus keta)* revealed by speed/depth/acceleration data logger. Journal of Experimental Biology 204, 3895–3904 (2001).

Taulman, J.F. 1998. Modification of a Hierarchical Model of Forest Disturbance. Environmental Conservation 25(1):3-7. Temple, S.A. and J.R. Cary. 1988. Modeling Dynamics of Habitat-Interior Bird Populations in Fragmented Landscapes. Conservation Biology 2(4):340-347.

Tetra Tech. 1992. Reconnaissance Survey of the Lower Columbia River. Lower Columbia Bi-State Program. Task 3 Summary Report: Review of Physical and Hydrological Characteristics.

_____. 1993. Reconnaissance Survey of the Lower Columbia River. Task 6: Reconnaissance Report. Volume 1: Reconnaissance Report. Prepared for Lower Columbia River Bi-State Committee. Tetra Tech, Inc., Redmond, Washington. TC 8526-06.

Thomas, D.W. 1983. Changes in Columbia River Estuary Habitat Types over the Past Century. Columbia River Estuary Study Taskforce, Astoria, Oregon.

Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon, and J. Vener. 1990. A Conservation Strategy for the Northern Spotted Owl. Report to the Interagency Scientific Committee tp

Address the Conservation of the Northern Spotted Owl. USDA Forest Service, USDI Bureau of Land Management, Fish and Wildlife Service, and National Park Service, Washington DC.

Thorson, T.D., S.A. Bryce, D.A. Lammers, A.J. Woods, J.M. Omernik, J. Kagan, D.E. Pater, and J.A. Comstock. 2003. Ecoregions of Oregon. Color poster with map (map scale 1:1,500,000), descriptive text, summary tables, and photographs. U.S. Geological Survey, Reston, Virginia.

Thurston County. 2012. Unpublished Thurston County Mining Data obtained by CH2M HILL from Thurston GeoData Center on October 10, 2012.

Tillamook County. 2002. Tillamook County Land Use Ordinance, Ordinance 33. December 18.

_____. 2004. Tillamook County Comprehensive Plan.

Trombulak, S.C., and C.A. Frissell. 2000. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Middlebury College, Middlebury, VT.

Turnstone Environmental Consultants (TEC). 2008. Habitat Assessment—Potential Northern Spotted Owl and Marbled Murrelet Habitat on Lands Adjacent to the Oregon LNG Pipeline. Prepared for CH2M HILL. April.

_____. 2009. Final Report for Oregon LNG Northern Spotted Owl and Marbled Murrelet Surveys. Prepared for CH2M HILL.

_____. 2013a. Northern Spotted Owl and Marbled Murrelet Habitat and Impact Assessment for the Oregon LNG Project. Prepared for CH2M HILL. November.

Turnstone Environmental Consultants (TEC) and CH2M HILL. 2015. Northern Spotted Owl and Marbled Murrelet Habitat and Impact Assessment. *In* Appendix 13 of Applicant-Prepared Draft Biological Assessment and Essential Fish Habitat Assessment for the Oregon LNG Terminal and Oregon Pipeline Project. Revised March 2013.

U.S. Army Corps of Engineers (USACE). *n.d.*. Approved Work Windows for Fish Protection for All Freshwaters excluding Waters within National Park Boundaries, Columbia River, Snake River, and Lakes by County and Specific Watercourse.

_____. 1987. Wetlands Delineation Manual by Environmental Laboratory. Wetlands Research Program Technical Report Y-87-1 (on-line edition). January 1987 – Final Report.

_____. 2001. Columbia River Navigation Channel Improvement Project (CRNCIP) Biological Assessment. December 28.

_____. 2003. Final Supplemental Integrated Feasibility Study and Environmental Impact Statement – Channel Improvement Project. Portland District.

_____. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). Wetlands Regulatory Assistance Program. May 2010.

_____. 2012a. Environmental Assessment Proposed Nearshore Disposal Locations at the Mouth of the Columbia River Federal Navigation Project, Oregon and Washington. Portland District.

_____. 2012b. User's Guide for Nationwide Permits in Washington State. Includes: National Conditions, Seattle District Regional General Conditions, 401 Certification General Conditions, 401Water Quality Certifications, and Coastal Zone Management Act Consistency Determinations. Effective Date: June 15, 2012.

_____. 2014. Columbia River Channel Improvement Project, History Accessed October 28, 2014 at http://www.nwp.usace.army.mil/Missions/Currentprojects/ColumbiaRiverChannelImprovement.aspx

U.S. Army Corps of Engineers (USACE) and D.H. Bennett. 2001. Dredged Material Management Plan and Environmental Impact Statement McNary Reservoir and Lower Snake Reservoirs. Appendix K, Aquatic Resources.

U.S. Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA). 2012. 2012 Annual Use Plan Management of Open Water Dredged Material Disposal Sites Mouth of the Columbia River, OR and WA. April 2012.

U.S. Army Corps of Engineers (USACE), U.S. Environmental Protection Agency (EPA), Washington Department of Ecology (WA Ecology), Washington Department of Natural Resources (WDNR), Oregon Department of Environmental Quality (ODEQ), Idaho Department of Environmental Quality, National Marine Fisheries Service (NMFS), and U.S. Fish and Wildlife Service (FWS). 2006. Northwest Regional Sediment Evaluation Framework. Interim Final. September 2006.

U.S. Army Corps of Engineers (USACE) Portland District, U.S. Environmental Protection Agency, National Marine Fisheries Services, U.S. Fish and Wildlife Service, Washington Dept. of Ecology, Oregon Department of Environmental Quality. Sediment Evaluation Team data recency review of Oregon Liquid Natural Gas's September 2008 Dredge Material Characterization Report, Oregon LNG Terminal. June 2013

U.S. Census Bureau. 2008-2012. Available at: http://quickfacts.census.gov/qfd/states/. Accessed April 24, 2014.

_____. 2010. U.S. Census 2010 Results. http://www.census.gov/. U.S. Census Data. Available at: http://quickfacts.census.gov/qfd/states/. Accessed on March 27, 2013 and March 13, 2014.

_____. 2014. State and County QuickFacts. Available online at http://quickfacts.census.gov/qfd/states/41000.html.

U.S. Coast Guard (Coast Guard). 2011. Navigation and Vessel Inspection Circular (NVIC) NO. 01-2011, Guidance Related to Waterfront Liquefied Natural Gas (LNG) Facilities.

U.S. Department of Education. 2013. Institute of Educational Sciences, National Center for Education. Available online at: http://nces.ed.gov/ccd/schoolsearch/index.asp?Search=1&DistrictID=%205308020&SchoolPageNum=2. Accessed March 26, 2013 and April 15, 2013

_____. 2014. National Center for Education Statistics, Common Core of Data (CCD). Local Education Agency (School District) Universe Survey, 2011-12, v.1a. http://nces.ed.gov/ccd/elsi/quickFacts.aspx

U.S. Department of Energy (DOE). 2008. Temporary Emergency Exposure Limits for Chemicals: Methods and Practice, DOE Handbook, DOE-HDBK-1046-2008, August 2008

U.S. Department of Interior (USDI). 1988. Endangered and threatened wildlife and plants; determination of endangered status for Bradshaw's lomatium (*Lomatium bradshawii*). Federal Register, Vol. 53:38451. September 30, 1988.

U.S. Department of Labor, Bureau of Labor Statistics, Consumer Price Index, October 2014. CPI Inflation Calculator. Accessed online at http://www.bls.gov/data/inflation_calculator.htm. October 8, 2014.

U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration Interpretation Re: Application of the Siting Requirements in Subpart B of 49 CFR Part 193 to the Mount Hope Bay Liquefied Natural Gas Transfer System (March 25, 2010)

U.S. Fish and Wildlife Service (FWS). 1978. Redetermination of the Gray Wolf in the United States and Mexico, with Determination of Critical Habitat in Michigan and Minnesota. Federal Register Vol. 43, No. 47, March 9.

_____. 1981. U.S. Fish and Wildlife Service Mitigation Policy. Federal Register 46(15):7644-7663 (as corrected in the Federal Register of February 4, 1981).

_____. 1990. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the Northern Spotted Owl. 55 Federal Register 26114- 26194.

_____. 1992a. Endangered and threatened wildlife and plants: determination of threatened status for the Washington, Oregon, and California population of the marbled murrelet. 57 Federal Register 45328-45337. October.

_____. 1992b. Endangered and threatened wildlife and plants: determination of critical habitat for the northern spotted owl. 57 Federal Register. January 15.

_____. 1993. Determination of Threatened Status for the Plant *Sidalcea nelsoniana* (Nelson's Checker-mallow). 58 Federal Register No. 28. February 12.

_____. 1994. Endangered and Threatened Wildlife and Plants; The Plant Water Howellia (*Howellia aquatilis*) Determined to be a Threatened Species. 59 Federal Register, No. 134: 35860-35864 July 4.

_____. 1996. Water Howellia (*Howellia aquatilis*) Recovery Plan. U.S. Fish and Wildlife Service, Helena, Montana.

_____. 1997a. Recovery Plan for the Threatened Marbled Murrelet *(Brachyramphus marmoratus)* in Washington, Oregon and California. U.S. Fish and Wildlife Service.

_____. 1997b. Determination of threatened status for *Castilleja levisecta* (golden paintbrush). Federal Register 62(112):31740-31748.

_____. 1998. Recovery Plan for the Threatened Nelson's Checker-mallow (*Sidalcea nelsoniana*). United States Fish and Wildlife Service. Portland, Oregon.

_____. 2000a. Service Interim Guidelines for Recommendations on Communications Tower Siting, Construction, Operation, and Decommissioning. September 14, 2000. www.fws.gov/habitatconservation/com_tow_guidelines.pdf.

_____. 2000b. Recovery Plan for the Golden Paintbrush (*Castilleja levisecta*) U.S. Fish and Wildlife Service, Portland, Oregon. vii + 51 pp.

_____. 2000c. Endangered and threatened wildlife and plants; Endangered status for *Erigeron decumbens* var. *decumbens* (Willamette daisy) and Fender's blue butterfly (*Icaricia icarioides fenderi*) and threatened status for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's lupine). Federal Register 65(16):3875-3890.

_____. 2001. Oregon silverspot butterfly (*Speyeria zerene hippolyta*) Revised Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon. http://www.USFWS.gov/pacific/ecoservices/endangered/recovery/silverspot/Oregon_Silverspot_cover.pdf. Accessed on February 10, 2009.

_____. 2002. Lower Columbia Recovery Unit Chapter of the Bull Trout Recovery Plan. Region 1 USFWS, Portland, Oregon.

_____. 2005. Endangered Species Fact Sheet: Oregon Silverspot Butterfly. http://www.fws.gov/pacific/oregonfwo/EndSpp/FactsInverts/Silverspot.htm.

_____. 2006. Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California. July 26. http://www.fws.gov/arcata/es/birds/mm/documents/MAMU-NSO%20Harassment%20Guidance%20NW%20CA%202006Jul31.pdf. Accessed on October 20, 2013.

_____. 2007a. Draft Recovery Plan for the Northern Spotted Owl, *Strix occidentalis caurina*: Merged Options 1 and 2. Portland, Oregon. 170 pp.

_____. 2007b. Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Proposed Rule. Federal Register Vol. 72, No. 234, December 6.

_____. 2008a. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Northern Spotted Owl. 73 Federal Register, No. 157. August 13.

_____. 2008b. Endangered and Threatened Wildlife and Plants; Review of Native Species that are Candidates for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions; Proposed Rule. 73 Federal Register 75175. December 10.

_____. 2008c. Species Fact Sheet: Bradshaw's desert parsley (*Lomatium bradshawii*). http://www.fws.gov/oregonfwo/Species/Data/BradshawsLomatium/.

_____. 2008d. Final Recovery Plan for the Northern Spotted Owl, *Strix occidentalis caurina*. U.S. Fish and Wildlife Service, Portland, Oregon. xii + 142 pp.

_____. 2008d. Species Fact Sheet: Whulge (Taylor's) Checkerspot (*Euphydryas editha taylori*). Oregon Fish and Wildlife Office.

_____. 2009. Federally Listed, Proposed, Candidate, Delisted Species and Species of Concern in Western Washington. Washington Fish and Wildlife Office. Lacey, Washington

_____. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. U.S. Fish and Wildlife Service, Portland, Oregon.

_____. 2011a. Endangered and Threatened Wildlife and Plants; Reissuance of Final Rule To Identify the Northern Rocky Mountain Population of Gray Wolf as a Distinct Population Segment and To Revise the List of Endangered and Threatened Wildlife. Federal Register. 76 (87) 25590-25592.

_____. 2011b. Endangered and Threatened Wildlife and Plants; Revised Critical Habitat for the Marbled Murrelet. Final Rule. Federal Register 76 (193): 61599-61621. October 5.

_____. 2011c. Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). U.S. Fish and Wildlife Service, Portland, Oregon. xvi + 258 pp.

_____. 2012a. Endangered and Threatened Wildlife and Plants; Designation of Revised Critical Habitat for the Northern Spotted Owl. Final Rule. 77 Federal Register, No. 33: 71875-72068. December 4.

_____. 2012b. Endangered and Threatened Wildlife and Plants; Listing Taylor's Checkerspot Butterfly and Streaked Horned Lark and Designation of Critical Habitat; Proposed Rule. Federal Register 77 (197): 61938-62058. October 11.

_____. 2012c. Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards. Washington Fish and Wildlife Office, Lacey, WA. June 19, 2012. Available at: http://www.fws.gov/wafwo/pdf/FishExclusionProtocolsandStandards6222012%20DR.pdf

_____. 2013a. Translocation – An Effort To Save Columbian White-tailed Deer. Available online http://www.fws.gov/jbh/translocation.html. Accessed on October 23, 2013.

_____. 2013b. Julia Butler Hansen Refuge, Columbian White-tailed Deer. Available online http://www.fws.gov/jbh/wildlife/wildlife.html#deer Accessed on October 25, 2013.

_____. 2013c. Biological Opinion for Effects to Northern Spotted Owls, Critical Habitat for Northern Spotted Owls, Marbled Murrelets, Critical Habitat for Marbled Murrelets, Bull Trout, and Critical Habitat for Bull Trout from Selected Programmatic Forest Management Activities March 25,2013 to December 31,2023 on the Olympic National Forest Washington. (USFWS Reference: 13410-2009-F-0388).

_____. 2013d Experimental Removal of Barred Owls to Benefit Threatened Northern Spotted Owls Final Environmental Impact Statement. Oregon Fish and Wildlife Office, Portland, Oregon.

_____. 2013e. Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (Coccyzus americanus); Proposed Rule. Federal Register 78(192): 61622─61666. October 3.

_____. 2013f. Species Fact Sheet Gray wolf (*Canius lupus*). Accessed: October 21, 2013. http://www.fws.gov/wafwo/species/Fact%20sheets/Gray%20wolf%20final.pdf

_____. 2013g. PCH_Thomomys_mazama_glacialis_pugetensis_ tumuli_yelmensis_201212.kmz Accessed: October 21, 2013 http://www.fws.gov/wafwo/mpg.html.

_____. 2013h. Species Fact Sheet Northern spotted owl (*Strix occidentalis caurina*). Accessed: October 30, 2013. http://www.fws.gov/wafwo/species/Fact%20sheets/NSOfinal.pdf.

_____. 2013i. Endangered and Threatened Wildlife and Plants; Critical Habitat Designation for Taylor's Checkerspot Butterfly and Streaked Horned Lark; Final Rule. Federal Register 78(192): 61506─61589. October 3.

_____. 2013j. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Taylor's Checkerspot Butterfly and Threatened Status for the Streaked Horned Lark; Final Rule. Federal Register 78(192): 61452─61503. October 3.

_____. 2013k. Endangered and Threatened Wildlife and Plants; Threatened Status for Oregon Spotted Frog; Proposed Rule. Federal Register 78(168):53582-53623. August 29.

_____. 2013l. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Oregon Spotted Frog; Proposed Rule. Federal Register 78(168):53538-53579. August 29.

_____. 2013m. Species Fact Sheet: Mazama pocket gopher Thomomys mazama (*ssp. couchi, douglasii, glacialis, louiei, melanops, pugetensis, tacomensis, tumuli, yelmensis*). Accessed: October 21, 2013. http://www.fws.gov/wafwo/species/Fact%20sheets/MazamaPocketGopher_final.pdf

_____. 2014a. Revised Conservation Framework for the Northern Spotted Owl and Marbled Murrelet: Jordan Cove Energy and Pacific Connector Gas Pipeline Project. USFWS, Ecological Services, Region 1. With support from PC Trask & Associates, Inc. in collaboration with Mason, Bruce & Girard, Inc. August.

_____. 2014b. Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-Billed Cuckoo (*Cozzyzus americanus*). Federal Register Vol. 79, No. 192, October 3.

_____. 2014c. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Western Distinct Population Segment of the Yellow-Billed Cuckoo (*Coccyzus americanus*). 17. Federal Register Vol. 79, No. 67154.

_____. 2014d. IPaC – Information, Planning and Conservation System. http://ecos.fws.gov/ipac/. (Accessed October 2014.)

_____. 2014e. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Olympia Pocket Gopher, Roy Prairie Pocket Gopher, Tenino Pocket Gopher, and Yelm Pocket Gopher, With Special Rule. Federal Register 79 (68): 19760─19795. April 9.

_____. 2014f. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Mazama Pocket Gopher. Federal Register 79 (68): 19712─19757. April 9.

_____. 2014g. Endangered and Threatened Wildlife and Plants; Threatened Status for Oregon Spotted Frog; Final Rule. Federal Register 79(168):51657-51710. October 29.

_____. 2014h. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Oregon Spotted Frog; Final Rule. Federal Register 79(117):34685-34696. June 18.

U.S. Fish and Wildlife Service, U.S. Bureau of Land Management, and U.S. Department of Agriculture, Forest Service. 2008. Methodology for Estimating the Number of Northern Spotted Owls Affected by Proposed Federal Actions. Version 2.0. Oregon Fish and Wildlife Office, Fish and Wildlife Service, Portland, Oregon.

U.S. Forest Service (USFS). 2009. Sand River Delta Habitat Restoration Annual Report, January 2008 to March 2009. Prepared for Bonneville Power Administration. Project No. 1999-025-00. July. Available online http://www.osti.gov/scitech/search/author/%22Dobson,%20Robin%20[USDA%20Forest%20Service,%20Columbia%20River%20Gorge%20National%20Scenic%20Area]%22 Accessed November 1, 2013.

U.S. Geological Survey (USGS). 1996. Digital data set of volcano hazards for active Cascade Volcanos, Washington. Steve P. Schilling. USGS Open-File Report: 96-178. http://pubs.er.usgs.gov/publication/ofr96178.

_____. 2004. Digital Engineering Aspects of Karst Map: A GIS Version of Davies, W.E., J.H. Simpson, G.C. Ohlmacher, W.S. Kirk, and E.G. Newton, 1984, Engineering Aspects of Karst: U.S. Geological Survey, National Atlas of the United States of America. Map Scale 1:7,500,000. USGS Open File Report 2004-1352. Prepared by B.D. Tobin and D.J. Weary.

_____. 2005a. Hurricane Hazards—A National Threat. Fact Sheet 2005 – 3121.

_____. 2005b. Ground Water Atlas of the United States. Idaho, Oregon, Washington. HA 730-H. http://capp.water.usgs.gov/gwa/ch_h/H-text1.html.

_____. 2005c. Mineral Resources Data System: U.S. Geological Survey. http://tin.er.usgs.gov/mrds. Last accessed November 5, 2012.

_____. 2005d. Active Mines and Mineral Processing Plants in the United States in 2003. http://mrdata.usgs.gov/mineplant/. Last accessed November 5, 2012.

_____. 2006. Quaternary fault and fold database for the United States, accessed 2012, from USGS web site: http//earthquakes.usgs.gov/regional/qfaults.

_____. 2008. National Seismic Hazard Maps. http://earthquake.usgs.gov/research/hazmaps/products_data/2008. Last accessed November 5, 2012.

_____. 2010. Significant United States Earthquakes, 1568-2004. National Atlas of the United States, Reston, VA. http://www.nationalatlas.gov/atlasftp.html#lsoverp. Last Accessed November 5, 2012.

_____. 2012. Quaternary Fault and Fold Database for the United States. http://geohazards.usgs.gov/cfusion/qfault/index.cfml.

_____. 2013. Global Earthquake Search. http://earthquakes.usgs.gov/eqarchives/epic/epic_global.php.

_____. 2014. Mineral Commodity Summaries 2014. U.S. Geological Survey, 196 p.

U.S. Global Change Research Program (USGCRP). 2014. Global Climate Change Impacts in the United States. Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press. June 2009.

U.S. Government Accountability Office (GAO). 2007. Public Safety Consequences of a Terrorist Attack on a Tanker Carrying Liquefied Natural Gas Need Clarification. Report ot Congressional Requesters. February 2007.

Vaccaro, J.J., D.G. Woodward, M.W. Gannett, M.A. Jones, C.A. Collins, R.R. Caldwell, and A.J. Hansen. 1997. Summary of the Puget-Willamette Lowland Regional Aquifer-System Analysis, Washington, Oregon, and British Columbia. United States Geological Survey Open-File Report 96-353.

_____. 1998. Hydrogeologic Framework of the Puget Sound Aquifer System, Washington and British Columbia. U.S. Geological Survey Professional Paper 1424-B.

Vagle, S. 2003. On the Impact of Underwater Pile-driving Noise on Marine Life. Report prepared for the Canadian Coast Guard, Department of Fisheries and Oceans, Canada (unpublished). 41 pp. [Available from www.dfo-mpo.gc.ca].

Verts, B.J. and Leslie N. Carraway. 1998. Land Mammals of Oregon. University of California Press. Berkeley and Los Angeles California.

Wada, T., H. Seino, Y. Ogawa, and T. Nakasuga. 1987. Evidence of Autumn Overseas Migration in the Rice Planthoppers, Nilaparvata lugens and Sogatella furcifera: Analysis of Light Trap Catches and Associated Weather Patterns. Ecol. Entomol. 12: 321-330.

Wahl, T.R., B. Tweit, S.G. Mlodlinow. 2005. Birds of Washington: status and distribution. Oregon State University Press, Corvallis, OR.

Waples, R.S., R.P. Jones, Jr., B.R. Beckman, and G.A. Swan. 1991. Status Review for Snake River Fall Chinook Salmon. United States Department of Commerce, NOAA Tech. Memo. NMFS F/NWC-201.

Warren, K. 2006. Identification Field Guide to the Geese of the Willamette Valley and Lower Columbia River Second Edition. Wild Spirit Resources LLC.

Washington Department of Ecology (WA Ecology). 2004. Washington State Wetland Rating System for Western Washington. Revised. Annotated Version August 2006. Ecology Publication #04-06-025. Prepared by Thomas Hruby, PhD of Washington State Department of Ecology. August 2004.

_____. 2012a. Environmental Information Management (EIM) System. Ground Water Search Available at: https://fortress.wa.gov/ecy/eimreporting/Groundwater/GWSearch.aspx?SearchType=Groundwater&State=newsearch&Section=well. Accessed October 2012

_____. 2012b. Shoreline Management. Available at: http://www.ecy.wa.gov/programs/sea/sma/st_guide/intro.html. Accessed December 2012.

_____. 2012c. Cleanup Site Search. Available at: https://fortress.wa.gov/ecy/gsp/SiteSearchPage.aspx. Accessed October 2012.

_____. 2013. Water Quality Assessment Categories. Available at: http://www.ecy.wa.gov/programs/wq/303d/WQAssessmentCats.html. Information accessed in March 2013.

Washington Department of Fish and Wildlife (WDFW). 2002. Integrated Streambank Protection Guidelines. Washington State Aquatic Habitat Guidelines Program, 2002.

_____. 2004. Management Recommendations for Washington's Priority Species: Volume V Mammals - Columbian White-tailed Deer (*Odocoileus virginianus leucurus*). Available online at http://wdfw.wa.gov/publications/00027/cwtd.pdf. Accessed October 13, 2013.

_____. 2010. Priority Habitat and Species Digital Data.

_____. 2012a. Priority Habitats and Species (PHS) database search results for the Oregon LNG Pipeline. February 28, 2012.

_____. 2012b. Stream Habitat Restoration Guidelines. Co-published by the Washington Departments of Fish and Wildlife, Natural Resources, Transportation and Ecology, Washington State Recreation and Conservation Office, Puget Sound Partnership, and the U.S. Fish and Wildlife Service. Olympia, Washington.

_____. 2013a. Threatened and Endangered Wildlife in Washington: 2012 Annual Report. Listing and Recovery Section, Wildlife Program, Washington State Department of Fish and Wildlife, Olympia. 251 pp. Available online http://wdfw.wa.gov/publications/01542/ Accessed October 16, 2013.

_____. 2013b. Gray Wolf Conservation and Management, Wolves in Washington. Accessed: October 22, 2013. http://wdfw.wa.gov/conservation/gray_wolf/wolves_in_washington.html

_____. 2013c. Mazama pocket gopher distribution and habitat survey in Western Washington-2012 Summary Report.

_____. 2014. Priority Habitat and Species Digital Data. Viewed online in 2014.

Washington Department of Fish and Wildlife (WDFW) and Oregon Department of Fish and Wildlife. (ODFW). 2001. Washington and Oregon Eulachon Management Plan. Washington State Department of Fish and Wildlife and Oregon Department of Fish and Wildlife. Olympia, Washington.

_____. 2003. Exhibit K-2, Evaluation Report Smelt (Revised). From the Final Supplement Integrated Feasibility Report and EIS of the Columbia River Channel Improvement Project. 61 p. January 9, 2003

_____. 2012. Joint Stadd Report: Stock Status and Fisheries for Fall Chinook Salmon, Coho Salmon, Chum Salmon, Summer Steelhead, and White Sturgeon. July 12, 2012. Available at: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=8&cad=rja&uact=8&ved=0CFMQFjAH&url=http%3A%2F%2Fwdfw.wa.gov%2Fpublications%2F01397%2Fwdfw01397.pdf&ei=5HN-U4aSJ5SfyASHjIHgAw&usg=AFQjCNF-gACj8ifodrmnKorWvqWjcIDEfA&bvm=bv.67720277,d.aWw

Washington Department of Fisheries (WDF), Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State Salmon and Steelhead Sock Inventory (SASSI). Washington State Department of Fish and Wildlife, Olympia, Washington.

Washington Department of Health. 2012a. Office of Drinking Water Sentry Internet and Database. Available at: https://fortress.wa.gov/doh/eh/portal/odw/si/Intro.aspx. Information accessed in September 2012.

_____. 2012b. Environmental Health Division. Source Water Assessment Program, SWAP GIS Mapping Tool, Snohomish County. Office of Drinking Water. Available at: https://fortress.wa.gov/doh/eh/dw/swap/maps/default.cfm?action=maps.

Washington Department of Natural Resources (WDNR). 1997. West Tiger Mountain Natural Resources Conservation Area Management Plan. July.

_____. 2004. Inactive and Abandoned Mine Lands. GIS data dated 2004. http://www.dnr.wa.gov/ReseaerchScience/Topics/GeosciencesData/Pages/gis_data.aspx. Last accessed November 5, 2012.

_____. 2010a. Tsunami Inundation. GIS data dated June 2010. http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/gis_data.aspx. Last accessed November 5, 2012.

_____. 2010b. Ground Response. GIS data dated June 2010. http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/gis_data.aspx. Last accessed November 5, 2012.

_____. 2010c. Surface Geology. Map Scale 1:100,000. GIS data dated June 2010. http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/gis_data.aspx. Last accessed November 5, 2012.

_____. 2011. Seismogenic Features. GIS data dated September 2011.http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/gis_data.aspx

_____. 2013. Available GIS Data. Available online at: http://fortress.wa.gov/dnr/app1/dataweb/dmmatrix.html.

_____. 2014. The Geology of Washington State. http://www.dnr.wa.gov/ResearchScience/Topics/GeologyofWashington/Pages/geolofwa.aspx, Last accessed September 17, 2014.

Washington Natural Heritage Program (WNHP). 2013a. Geographic information system (GIS) data set. Data compiled by Jack McMillen. February.

____. 2013b. Field Guide to Selected Rare Plants of Washington. http://www1.dnr.wa.gov/nhp/refdesk/fguide/htm/fsfgabc.htm. Accessed October 2013.

Washington State Department of Agriculture. 2012. http://agr.wa.gov/pestfert/natresources/docs/2011CropDistributionData.exe. Accessed November 2012.

Washington State Department of Community, Trade, and Economic Development. 2003. Updated January 2007. Critical Areas Handbook: Protecting Critical Areas within the Framework of the Washington Growth Management Act.

Washington State Department of Transportation (WSDOT). 2010a. Allowable Freshwater Work Times. May 2010.

_____. 2010b. Washington State Scenic and Recreational Highways Strategic Plan, 2010-2030. Available at: http://www.wsdot.wa.gov/LocalPrograms/ScenicByways/BywaysPlan.htm#DraftPlan. Accessed December 2012.

_____. 2012. WSDOT Standard Fish Moving Protocol, August 2012. Available at: http://www.wsdot.wa.gov/NR/rdonlyres/70E7E285-ECC6-41BA-A2DF-87FD0D68128D/0/BA_FishHandling.pdf .

_____. 2014. Biological Assessment Preparation for Transportation Projects - Advanced Training Manual - Version 2014. Available online: http://www.wsdot.wa.gov/environment/biology/ba/baguidance.htm#manual. Accessed November 4, 2013.

Washington State Hospital Association. 2012. Available at: http://www.wsha.org/about.htm. Accessed August 24, 2012.

Wells, R. 2013. Personal communication between Ray Wells, U.S. Geological Survey Geologist and CH2M HILL. August 13, 2013.

Whale Museum, The. 2005. Annual Monthly Arrivals & Departures from the Salish Sea. http://www.whalemuseum.org/education/library/whalewatch/arrivals.html.

Whatcom County. 1998. Geo Hazards. Whatcom County Geographic Information System Center. http://www.co.whatcom.wa.us/pds/gis/gisdata.jsp. Prepared by Sarah Watts and Chris Behee. Last accessed November 5, 2012.

_____. 2001. Natural Gas and Hazardous Liquid Pipeline Background Report. Whatcom County, Washington. October 2001

Whiteaker, L., J. Henderson, R. Holmes, L. Hoover, R. Lesher, J. Lippert, E. Olson, L. Potash, J. Seevers, Marty Stein, and N. Wogen. 1998. Survey Protocols for Survey & Manage Strategy 2 Vascular Plants. V. 2.0 December 1998

Whitehead, R.L. 1994. Groundwater Atlas of the United States: Segment 7, Idaho, Oregon, Washington. Hydrologic Atlas 730-H.

Williams Northwest Pipeline. 2014. Company website accessed 11.23.2014 at http://co.williams.com/williams/operations/gas-pipeline/northwest-pipeline/.

Willson, M.F., R.H. Armstrong, M.C. Hermans, and K. Koski. 2006. Eulachon: A Review of Biology and an Annotated Bibliography. AFSC Processed Report 2006-12 (August). National Marine Fisheries Service, Alaska Fisheries Science Center. Juneau.

Wilt, J. and R. McClintock. 2013. Oregon LNG Bidirectional Project Cultural Resources Survey and Evaluation Report. CH2M HILL, Inc. Prepared for LNG Development Company, LLC and Oregon Pipeline Company, LLC. June 2013.

Wilt, J. and R. McClintock. 2014. Oregon LNG Bidirectional Project Cultural Resources Survey and Evaluation Report. CH2M HILL, Inc. Prepared for LNG Development Company, LLC and Oregon Pipeline Company, LLC. Originally prepared June 2013, revised April 2014.

Witherington, B.E. 1997. The Problem of Photopollution for Sea Turtles and Other Nocturnal Animals. In: Clemmons, J. R. and Buchholz, R. (eds.) Behavioral Approaches to Conservation in the Wild. Cambridge University Press, Cambridge, UK, pages 303–328.

Wolfe, J.L. and C.T. Summerlin. 1989. The Influence of Lunar Light on Nocturnal Activity of the Old-field Mouse. Animal Behaviour 37(3): 410-414.

Wonham, M.J., J.T. Carlton, G.M. Ruiz, and L.D. Smith. 2000. Fish and Ships: Relating Dispersal Frequency to Success in Biological Invasions. Marine Biology 136:1111–1121.

Woodbury, D. 2012. Email from D. Woodbury, NMFS, to K. MacDonald, NMFS. Green Sturgeon Lengths from Columbia River. May 16, 2012. Reported in NMFS (2012). As cited in: Oregon LNG. 2013. LNG Development Company, LLC/Oregon Pipeline Company, LLC (Oregon LNG). Docket Nos. CP09-6-001, CP09-7-001- Environmental Information Request. August 21, 2013.

Woodward, M. Gannett, and J.J. Vaccarro. 1998. Hydrogeologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington. United States Geological Survey Professional Paper 1424-B.

Workforce Explorer. 2012. Labor Market Information Through July 2012. Available at: http://www.workforceexplorer.com.

Wydoski, R.S. and R.R. Whitney. 2003. Inland Fishes of Washington. Second Edition. University of Washington Press. Seattle, Washington.

Yahner, R.H. 1998. Changes in Wildlife Communities near Edges. Conservation Biology 2(4):333–339.

Yurk, H. and A.W. Trites. 2000 Experimental Attempts to Reduce Predation by Harbor Seals on Out-migrating Juvenile Salmonids. Transactions of the American Fisheries Society 129:1360–1366.

Zwieniecki, M.A. and M. Newton. 1999. Influence of Streamside Cover and Stream Features on Temperature Trends in Forested Streams of Western Oregon. Western Journal of Applied Forestry 14:106-113.

APPENDIX O

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APPENDIX O – LIST OF PREPARERS

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APPENDIX P

KEYWORD INDEX

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